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Dover's 'Bunker Mentality'; Dover, its people and its
tunnels in two world wars

Rory Joseph Semple

Presented for Examination
for the Degree of Doctor of Philosophy



F185895

Rory Joseph Semple

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Abstract

This thesis is a re-evaluation of the effects of two world wars on the town of Dover. The aim of the thesis is to show how the townspeople reacted to the new phenomena of bombardment from the air. Aerial bombing has become an accepted part of modern warfare but it was virtually unthought-of in 1914. In 1939 aerial bombing had become a part of warfare whilst shelling from sites in France added another unexpected twist to the town's fortunes.

The thesis will show that a common goal existed, in both world wars, namely the winning of the war, but that disagreement on how to reach that goal also existed. It will also show the interactions between national and local agencies which controlled ordinary people's lives during warfare and that national priorities are not necessarily the same as those of a local community.

To analyse the civilian reaction it has been necessary to review also the way that the military reacted to the same threats. This military presence has remained a part of the town's fabric for centuries and without an evaluation of this aspect the civilian reactions cannot be placed in their full context.

The Dover area is riddled with tunnels. This has come about because of both military and civilian needs. The civilian tunnels have served as storage space and dwellings over the centuries. During the twentieth century they became more important to the town than at any point in the past. To the people of Dover the 'tunnels' were a fact of life but few would have envisaged their full significance before the first bomb fell on the town in 1914.

Life in the 'frontline' of two world wars was a difficult experience for the people of Dover. Daily life was interrupted by bombing and shelling attacks. In such a situation it was inevitable that the people developed a 'bunker mentality'. The most visible facet of this mentality was the town's desire for more air raid shelters. It was also apparent in the reaction of the town to the restrictions of British officialdom and to what was perceived as negative press and radio reports.

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Introduction: Dover and its 'Bunker Mentality'

Dover has occupied a unique position in British history for at least two millennia. It has been the gateway from England to continental Europe and perhaps more importantly the gateway from continental Europe to England. English history from the reign of Queen Elizabeth I to that of Queen Elizabeth II is generally seen as one of expansion until the British Empire covered much of the earth's landmass. Dover was in the dichotomous position of being a frontier post only seventy miles from the capital of that vast Empire.¹ It was only a further twenty-six miles to the shore of that Empire's most implacable enemy over the centuries, France.

Dover's importance has always centred on its situation as a port. The valley cut by the river Dour provides a gap in the thirteen mile long cliff line which stretches from Folkestone in the west to Deal in the east. Dover is not quite the closest point in England to France but it is the closest point which can be used as an anchorage. This importance as a port has seen Dover involved in many wars and expeditions. The Pharos, Roman towers with beacons, inside the castle guided Roman galleys from Gaul. Crusaders left for the Holy Land from there, and some of their messages still survive within the castle's church. Henry VIII left for the Field of the Cloth of Gold from Dover. Later in his reign he would greet a future wife in Dover. It was the loss of Calais, the last of England's possessions in France, which sealed Dover's role as the gateway to England.

In the Roman period Dover was known as Dubris.² It was an important trading post and provided one of the major links between Roman Britain and Roman Gaul. The two Pharos were important beacons which guided ships safely into the town's anchorage. One survives within the castle grounds, but only the foundations of the other on the western heights remain. Trade was therefore at this early stage the most important aspect of the town's economy but this would become intertwined with war

¹ The head of state only assumed the Imperial title in 1876 when Queen Victoria became the Empress of India. Neither Elizabeth sat on an Imperial throne.

² This comes from the British Dubra, meaning waters or streams. See J. Coad, *Dover Castle* (London, 1995) p.14. For the history of Dover as seen from different historical perspectives see; S. Statham, *The History of Dover* (London, 1899); A. Hasenson, *The History of Dover Harbour* (London, 1980); J. Firth, *Dover and the Great War* (Dover, 1922)

as the strength of Rome decreased. Dubris became a base for the Roman fleet in the second century and in the third century it became a site of a Saxon Shore Fort.

In the thirteenth century Dover had been termed the 'Key to England' by Matthew Paris.³ This was at the time when the castle faced its greatest test. In 1216 Prince Louis of France landed in Thanet in support of the rebels against King John. After John's withdrawal to Winchester the castle's garrison was left to face the rebel army. The siege continued on and off for almost a year but finally when the battle of Lincoln decided the issue in favour of the new king, Henry III, the siege was raised. Dover had shown its importance in this conflict and it was not lost on Henry III or his successors. As the centuries passed other castles fell into disrepair whilst Dover was maintained. It was the reign of Henry VIII which saw Dover's importance increase still further with the construction of a new harbour. This was protected by new forts closer to sea level which could bring artillery fire to bear on enemy ships. Concurrent with this new artillery forts were being built at Sandown, Deal and Walmer to the east of Dover and at Sandgate to the west. Dover's new harbour was protected by three gun batteries.⁴ This marked the end of the castle as the centre piece of Dover's fortifications. The harbour became the place to defend and the castle a mere piece in the jigsaw of defences which would eventually defend the landward side of Dover. Whereas the sixteenth century saw a vast improvement in Dover's defences the seventeenth century saw them being neglected. This was despite the fact that Dover continued to be one of the nation's most important ports. As the Royal Navy grew in strength it became more apparent to both would be invaders and defenders that Dover would be the prime target. It offered the shortest sea route to Britain and thereby the shortest sea route to defend after an invasion had taken place. Dover would provide a safe anchorage for troop and supply ships, without which, any invasion would be impossible. Therefore from the middle of the eighteenth century until the end of the Napoleonic Wars the defences of Dover became a major concern for the government no less than they were for the people of Dover itself. Through all the wars Dover's

³ Matthew Paris (d.1259) was a Benedictine monk at the Abbey of St. Albans. He wrote a number of works including his *Chronica Majora* and *Historia Anglorum*. As his abbey held lands in Dover it seems likely that he would have taken a particular interest in the town.

⁴ J. Coad, *op. cit.* p.54

raison d'être remained trade. Without trade to and from Europe there would have been no need for Dover harbour and therefore no trade or harbour to protect.⁵

As tensions between Britain and France lessened the defences of Dover were steadily run down over the next twenty-five years. However, in 1840 Dover was classified as a 'Harbour of Refuge' that was to be able to receive any class of vessel under any weather conditions.⁶ In 1847 work on the Admiralty Pier, on the western side of Dover bay, was begun to create sheltered moorings, and by 1866 it was nearly one thousand five hundred feet long. This increase in the size of the harbour was reflected in the defences provided for the town.⁷ The end of the Crimean War saw the return of vast numbers of troops to the town and in 1859 a Royal Commission was set up to report on the defences of the town and harbour. The transformation of sea travel caused by the replacement of sail by steam would alter Dover's role yet again.⁸ The coming of the steam-ship altered journeys across the English Channel forever; dependency on wind and tide was gone and cross Channel voyages could be timetabled to meet the new railway services coming into Dover. The railway line between London and Dover was one of the earliest lines in Kent. It was in the 1840s that Dover's growth became more rapid. Prior to the coming of the railway Dover had become a resort for the wealthy. Property speculators were building large houses on Marine Parade. Dover was not seen just as a port but also as a fashionable sea-side watering place. The first railway line reached Dover in 1844; this was the South Eastern Railway (SER) line which reached Dover via Tonbridge, Ashford and Folkestone. The second route came down through the Medway towns courtesy of the London, Chatham and Dover Railway (LCDR) with the final link to London being completed in 1861. It was in the next year that the SER decided to concentrate its cross-channel traffic in Folkestone. This meant that the two towns became associated with the rival companies even though the SER continued to serve Dover with local trains from Folkestone. This railway rivalry continued until the two companies

⁵ For details on the development of the harbour's facilities see A. Hasenson *op. cit.* L. Smith, *Stories of Dover and the Grand Tour* (Inverness, 1981) provides insight into the passenger traffic through Dover during the eighteenth and nineteenth centuries.

⁶ J. Coad, *op. cit.* p.91

⁷ The increase of facilities at Dover did not always see a corresponding increase in defensive provision. As already stated this was more dependent upon the external military and political situation.

⁸ *ibid.* p.96. The year 1859 also saw the start of another surge in volunteering across the country and Dover was the home to the 8th Cinque Ports' Rifle Volunteers. S. Statham, *op. cit.* pp.160-162 provides a view from the perspective of the end of the nineteenth century

merged to form the South Eastern and Chatham Railway; however the rivalry between the two towns continues to the present day.

The railway companies of the mid-nineteenth century and their successors up to the Second World War concentrated mainly on the luxury end of the travel market. It was the arrival of the passenger airliner which caused this traffic to be lost to the railways and consequently to the ports of Dover and Folkestone. The coming of the Channel Tunnel has seen a shift of some of this market back to the railways but of course neither Dover nor Folkestone benefit greatly from these trains. The emphasis on luxury travel was reflected in 1910 by the arrival of Pullman carriages for the prestigious boat trains. This emphasis continued until the beginning of the Second World War. The *Golden Arrow* service from London to Dover was inaugurated on 15 May 1929; passengers were carried across the Channel on the new ferry the TSS *Canterbury*. In Calais the passengers would board *La Flèche d'Or* service on which they would travel to Paris.⁹ In Paris passengers with the wherewithal could then transfer to the *Orient Express* for onward travel to south-eastern Europe and Istanbul. Journey times from London to Paris were in the region of six and one half hours, a time only beaten by the opening of the Channel Tunnel. Dover was therefore the focal point of travel between England and Europe. Prior to the Second World War virtually all travel was by train and ferry. Chamberlain's visit to Hitler by aeroplane in 1938 was not how normal diplomacy was conducted between the wars. European diplomats entered Britain via Dover and so Dover would seem to have been as cosmopolitan as anywhere in Europe. The rich, the famous, and the powerful travelled to Dover or to be more accurate they travelled through Dover. Speed was as much of the essence then as it is now and Dover was seen by most of its foreign visitors merely through a carriage window or a porthole. The Southern Railway organised campaigns to encourage holidays to the towns served by its tracks. In the 'South for Sunshine' campaign, destinations including Dover and Folkestone were advertised as amongst 'the finest resorts in the world'.¹⁰ At the end of the nineteenth century Dover's sea front was still a popular destination for visitors. The Burlington Hotel and the Dover Grand Hotel were both situated adjacent to the sea front and were very popular

⁹ D. Thomas & P. Whitehouse, *SR 150; A Century and a Half of the Southern Railway* (London, 1988) pp.66-68. *La Flèche d'Or* had been introduced almost three years previously on 13 September 1926.

¹⁰ M. Searle, *Down the Line to Dover* (Tunbridge Wells, 1983) p 70.

destinations for visitors to the town, not just for those passing through.¹¹ Sea bathing remained the primary goal of many visitors and Dover's great harbour offered this in as complete safety as anywhere along the south coast of England.¹² Dover at the start of the twenty-first century is regarded primarily as a port, any pretensions the town has to being a premier resort have long since past and the town's tourist trade continues as a small adjunct to its role as a ferry port.

Dover's geographical position has therefore led to a relationship with outsiders which generally being of benefit to the town's economy does not mean that this fact has been appreciated by Dovorians. As with many towns dependent on visitors a love/hate relationship has developed. Dovorians appreciate the income brought in by the visitors but hate the visitors' presence in their town. Dover at the start of the twenty-first century is reliant on the cross-channel traffic for its economic survival. The ferry companies and the Harbour board are the largest employers in the town at the start of the twenty-first century. Prior to the Second World War, Dover did not rely solely on the ferry traffic but had quite a substantial tourist trade of its own. As the ferry traffic has increased in importance the importance of Dover as a tourist destination has reduced. A busy port is not as attractive to holidaymakers as a seaside town and so in Dover the ferry business has outshone its tourist counterpart. The very success of the roll on roll off ferry services helped to lessen the tourist potential of the town due to the high levels of traffic which the town now sees. In 2003, despite possessing one of the world's greatest medieval castles, the town is not high on a holiday destination list.¹³ The damage caused to the town in the Second World War has robbed it of much of its Victorian charm and today nineteenth century splendour

¹¹ J. Bavington Jones, *Dover* (Dover, 1907) pp.217-226 emphasises this aspect of Dover life. At the end of the Nineteenth Century the *Times* regularly carried advertisements on its front page for Dover's premier hotels, alongside those for hotels located in what today would be considered to be holiday resorts. The *Times* of 28 September 1898 provides a case in point beneath advertisements for the Grand Hotel, Brighton, and the Hotel Burlington, Bournemouth was an advertisement for the Lord Warden Hotel, Dover. The Lord Warden was described as "one of the most luxurious Hotels in Europe", "sanitation by George Jennings, Lambeth" and "electric lighting everywhere". The hotel also had a "first class orchestra" which played through dinner and in "the large Marble Renaissance Hall" during the evening. *Kelly's Directory of Kent, Sussex and Surrey*, 1915 (London, 1915) p.237 lists "several excellent hotels" in Dover.

¹² The other attractions for visitors to Dover included regattas both sailing and rowing, fireworks, military tattoos and the sight of battleships and liners. The sea front was also bedecked with thousands of electric light bulbs for the benefit of promenaders. See J. Bavington Jones, *op. cit.* p.217; Dover was therefore still a popular destination and the town's authorities were keen to promote this aspect of the town until the Second World War.

¹³ Dover Castle is the second most visited English Heritage site after Stone Henge. English Heritage Visitor Figures 1998.

and late twentieth century functionality rub shoulders alongside the town's main streets, the results are not always pleasing.¹⁴ Where the bulk of the Burlington Hotel once sprawled behind the seafront, today there stands the tower of a 1970s hotel which 'nestles' beside a dual carriageway.

Dover's other role as a fashionable holiday destination for all classes suffered due to the First World War. East Kent had long been a fashionable destination for the upper classes of Britain; the favourable climate and the proximity both to France and London made it an ideal situation for country mansions, rest homes and private schools. East Kent was also popular with London's working and middle classes who could travel easily to the sea and back in a day (see Figures 1 and 2 overleaf).¹⁵ Dover was a party to all of this and like many of the towns in east Kent there are areas of Dover which contain large Victorian town houses set in tree-lined streets.¹⁶ Dover still has two private schools; Dover College and the Duke of York's Royal Military School. The coming of the aeroplane as a weapon of war meant that east Kent was no longer a safe area to live, recuperate or study. Those who could afford to do so were quick to relocate from the area during the First World War bombing attacks. Each town and locality had its own particular response to the threat of bombing and in the First World War local initiative was much more important than central government intervention in deciding how a community responded. It was left for individual towns to take decisions with regard to how best to counter the aerial attack. Similarities existed in their responses such as the need to reduce lighting but variations were present in the instructions issued to the inhabitants of the various towns.¹⁷ We shall also investigate how this relationship between central and local government developed during the Second World War.

¹⁴ The Dover Museum, with its Georgian façade, and the White Cliffs' Experience, of a 1960's modernist design, stand beside each other at the end of Biggin Street. Neither style complements the other in my opinion. The White Cliffs' Experience was designed to show the history of Dover to visitors but it closed in 2001 due to a lack of such visitors. This is yet another example of how Dover's tourist trade has declined while the numbers of people passing through it continues to rise.

¹⁵ The photograph shown comes from Public Record Office (PRO) Information Office (Inf) document 9/551. This document contains a series of photographic scenes of Dover between the wars. They illustrate the extent of the town's tourist potential even at this later stage.

¹⁶ The Dover Castle Estate on the land just to the west of the castle was considered amongst the most exclusive residential areas of Dover. Park Avenue, Salisbury Road, Frith Road and Albert Road are the main streets in this part of Dover.

¹⁷ This will be explored more fully in Chapter 2 See pp.72-73



Figure 1: *Dover on Regatta Day, 1925*



Figure 2: *Dover's East Cliff and beach between the wars*

Dover had the misfortune of being the first town in Britain to be bombed from an aeroplane.¹⁸ In late 1914 a bombing attack had no more than a nuisance value. Nothing other than a direct hit by the crude missiles dropped from the aeroplanes would cause much damage or loss of life. The increasing severity of air raids from 1915 to 1918 caused Dover to find itself very much in the frontline of this new air war. The Royal Navy's supremacy had secured Dover's trade and livelihood for one hundred years; by controlling the seas around the British coast Britons had remained secure from foreign aggression. Now this supremacy was seen to be all for nought as attackers could fly from Europe in less than half an hour. There would be little time to warn of impending attacks, especially when a town was on the coastline and so the leaders and people of Dover sought to make themselves as secure as they could. The town's military authorities who had tunnelled extensively in the cliffs and hills around the town had set an example for the townspeople in how to provide security in the face of an attack. In the First World War it was to be the civilian authorities who were most concerned with tunnelling; by excavating tunnels some form of security could be attained for its inhabitants.

The end of the First World War did not spell the end of strong nationalist and imperialist sentiment within British Society as is sometimes suggested.¹⁹ John MacKenzie in *Propaganda and Empire and Imperialism and Popular Culture* looks at the manner in which Imperialism had suffused British society. The evidence given ranged from maps in schools which still showed the dominating position of the British Empire in red, to feature films celebrating its achievements. The role of the Imperial Marketing board is cited as having strongly supported this attitude, as is the BBC. There is also the fact that the great sacrifices of the First World War made it necessary to believe that they had been in pursuit of a greater good. The British Empire grew larger after the Versailles settlement and the idea of Empire remained a potent idea in the minds of the British people. For Dover the importance of the Imperial idea was heightened by the town's strategic position on the coast line closest to France. Dover along with neighbouring Folkestone and Deal maintained its military establishments

¹⁸ For further discussion see below Chapter 3 pp.68-69. The first Zeppelin raid on England took place on King's Lynn on 19 January 1915.

¹⁹ See J.M. MacKenzie ed., *Imperialism and Popular Culture* (Manchester, 1986) and *Propaganda and Empire*(Manchester, 1984) for worthwhile re-evaluations of the nature of British popular culture and its relationship with the Imperial idea in the twentieth century.

throughout the twentieth century even when the Channel was no longer the direct invasion route.²⁰ Being so close to France it was important to the people of Dover to be part of the British Empire as it gave them strength and confidence along with a sense of belonging. The trade upon which Dover's economy relied was underpinned by Britain's Imperial strength.

The two World Wars brought other changes in attitudes within British society. Arthur Marwick has argued that the experience of the First World War was one shared by all and that in the aftermath of that war a more interventionist approach to public life together with an associated decline in deference to authority became apparent.²¹ Marwick began to construct models in the 1960s and 1970s looking at the interrelationship between total war and social change. In the words of Ian Beckett "Marwick's interpretation of the Great War was an event making a discontinuity with the past."²² More recent contributions such as Gerard DeGroot's *Blighty: British Society in the era of the Great War* have in contrast emphasised the continuity which Great Britain experienced rather than the change.²³ DeGroot likened the war to "a winter storm which swelled the rivers of change."²⁴ The events of the First World War offered opportunity for change but these same events also "stimulated conservatism and counter-reaction".²⁵ Marwick argued that society became more egalitarian during the course of the war, DeGroot that it did not. Dover's situation would therefore seem to be an ideal one in which to explore these hypotheses on a local level. Dover was close to the front line and came under direct attack, a scenario in which it might have been expected that this sense of egalitarianism would come to the fore.

In Kent the political situation at the local government was largely one controlled by the Conservative Party. As Brian Atkinson has argued local government was largely conducted on local issues and national allegiances were often put aside.²⁶ This thesis will be able to test this hypothesis in relation to the issue of Air Raid

²⁰ Dover and Folkestone still have sizeable military bases. The Royal Marine base in Deal was closed in the late twentieth century.

²¹ A. Marwick, *The Deluge: British Society and the Great War* (London, 1965) A revised edition was published in 1991

²² I.F.W. Beckett *The Great War 1914-1918* (Harlow, 2001)

²³ G.J. DeGroot, *Blighty: British Society in the era of the Great War* (London, 1996)

²⁴ *ibid.* p.291

²⁵ *ibid.* p.291

²⁶ B. Atkinson, 'Politics' in N. Yates (ed.) *Kent in the Twentieth Century* (Woodbridge, 2001)

Precautions (ARP). ARP was certainly one in which local priorities might clash with those of the nation as a whole. The topic of ARP will also allow me to examine the workings of local government and whether the political thinking of Edwardian England carried through to the Second World War.²⁷ In the view of McKibbin the middle class became a less cohesive class, divided he argued between 'traditional' (Edwardian) and 'non-traditional' (post-Edwardian) groups.²⁸ The 'traditional' group came mainly from a non-conformist commercial background. The 'non-traditional' group was also involved in commerce and in new technical industries. They tended not to have the non-conformist religious background of the 'traditional' group. Marwick went so far as to say that "no one but a romantic reactionary would wish to regret the world which disappeared in the deluge of 1914-1918."²⁹ Millman writing on regional issues within the First World War has noted that "historians interested in more particular, or local questions, often produce a vision of wartime reality at variance with commonly perceived patterns."³⁰ This work on Dover will show if "the world" known to Doverians did in fact disappear after 1918 and how much variation there was with national patterns. At the end of the First World War Lloyd George's coalition remained in power, whilst in 1945 Churchill's government was heavily defeated. I shall therefore investigate how the political landscape of Dover changed during the first half of the twentieth century to ascertain whether Dover followed the "commonly perceived patterns"

In the inter-war years there was a hiatus in such concerns about Dover being attacked. The Treaty of Versailles of 1919 appeared to have put an end to German militarism for good. The clause banning Germany from building up an air force seemed to have brought the short but fearful chapter of aerial bombing on Britain to a close. Britain and France were on good terms on most issues and the possibility of a French attack seemed remote to all but the most ardent of Francophobes.³¹ That

²⁷ R. McKibbin *Classes and Cultures: England, 1918-1951* (Oxford, 1998) pp.90-98 for changes in the 'middle class' between the world wars. In McKibbin's view the middle class was the politically dominant group in British society at this time.

²⁸ *ibid.* p.91 and 530. McKibbin uses both "traditional" and "non-traditional" as well as "Edwardian" and "post-Edwardian" in this work.

²⁹ A. Marwick, *op. cit.* p.313

³⁰ B. Millman, "Battle of Corry Hall, November 1916: Patriots meet dissenters in wartime Cardiff" *Canadian Journal of History* April 2000

³¹ In the 1930s when preparing defensive schemes for Gibraltar the Royal Navy did regard the French as the most likely aggressors. See PRO Air Ministry (AIR) document 2/1888 the 'Gibraltar Air Defence Scheme 1936'.

another chapter was opening became apparent with the formation of the Luftwaffe after Hitler's accession to power in Germany in 1933. Now that an aggressive government in Germany was openly re-arming mixed emotions were felt throughout Britain. Some saw Germany as a useful bulwark against Communism, others despised what had been forced upon Germany in the Treaty of Versailles. Others warned of the rebirth of German militarism which had been blamed for war in 1914. In Dover the response was purely pragmatic; if Germany was building bombers which made the aircraft of the Great War seem like toys then Dover should ready itself with air raid shelters to make itself secure. This is what the town's leaders had done twenty years before and they would do again. Work on Air Raid Precautions (ARP) began before the national act in 1937, a fact which would cause much bemusement in various Civil Service departments.³²

If the Second World War heralded a greater involvement of central government with ordinary people's lives, what is sometimes seen as the birth of Britain's 'Nanny State', then Dover had no wish to be 'nannied'. For writers such as Calder the Second World War was truly a 'People's War' in that all sections of society were intricately involved.³³ It has been seen by some authors as a time when all sections of society came together to fight a common and nationally despised and hated opponent. The foremost proponent of this argument was Titmuss writing in the 1950s.³⁴ Marwick who, as mentioned above, has argued for the power of total war to change society criticised Titmuss's arguments for providing a too simple a model.³⁵ Marwick however convinced that the basic total war and social change' thesis remained sound if more emphasis was placed on the forces acting on society. Calder, Pelling and Smith have in contrast concluded that the Second World War did not result in the degree of social change suggested by Titmuss and Marwick.³⁶ All of society was undoubtedly involved in the Second World War but this involvement did not lead inexorably to a remodelling of society. I shall investigate in the context of Dover whether these broader national models are valid and if they satisfactorily

³² For further discussion on the start of Dover's ARP work see below Chapter 3 pp.100-101

³³ See A. Calder, *The People's War* (London, 1992)

³⁴ R. Titmuss *Problems of Social Policy* (London, 1950)

³⁵ See H.L. Smith ed., *War and Social Change: British Society in the Second World War* (Manchester, 1986) pp. viii-ix for a discussion on the various arguments and models.

³⁶ See A. Calder *op. cit.*, H. Pelling, *Britain and the Second World War* (London, 1970) and H.L. Smith, *Britain in the Second World War: A social history* (Manchester, 1986)

reflect the local situation. ARP in particular became an issue which divided Dover from national thinking. The town council and newspaper deeply resented any outside interference in its affairs. In the Second World War the issue of ARP became one of the most hotly contested between Dover and all representatives of central government. For Dover's leaders, ARP and Civil Defence were day to day issues which involved the life and death of their townsfolk. Dover in 1940 became the first place in Britain to be attacked directly from continental Europe by shellfire and also the last place to be so attacked in 1944. In those five years Dovorians knew that at any time their town could be attacked and there was no means of stopping it. In many places it was cited that the sound of the anti-aircraft guns did wonders for morale as people felt that they were being protected.³⁷ In Dover there was no physical way to shoot down a shell as one could a bomber. Just over one minute from being fired from a long-range gun in France a shell weighing approximately one tonne, filled with high explosives, would land somewhere in east Kent. For nine out of ten shells that fell on east Kent Dover and its environs would be their target.³⁸ Dover and its people have seen themselves as being on the frontline of English history for two millennia but in the last century of the second millennium the town saw itself attacked in a way unparalleled in its history.³⁹ (See map on p.14 of Dover and east Kent.) The attacks and the threats of attack before the invention of powered flight had been two dimensional; the attackers could only come by sea and were likely to have to defeat the Royal Navy *en route*. An attacker possessing aircraft could simply and quickly arrive over Dover, the castle and the harbour making Dover instantly recognisable to any aviator.

This thesis sets out to illustrate how the community of Dover reacted to the coming of the aeroplane, in its most dreadful form the bomber. The aeroplane made possible direct attack on the town even though no enemy soldier came within firing

³⁷ *ibid.* p.168 in which he illustrates the ineffectiveness of anti-aircraft fire during the 'Blitz'

³⁸ The records show that Dover had over two thousand two hundred shells land in or around the town, while the other towns had in total just over two hundred shells targeted at them. For further discussion of this see below Chapter 6 pp.211-212.

³⁹ Since people living on either side of the Channel began trading with each other Dover's position has made it a valuable anchorage, and as such the town which grew up has been a vital centre for anyone wanting to control the straits. William the Conqueror fortified the town in 1066. In the later Middle Ages the port played a major role in safeguarding communications with English territories in France. After these territories were lost the port still retained its importance as a means to secure the Channel. Should an invasion take place the port and town needed to be well defended to prevent their use by invaders.

distance of the town.⁴⁰ The threat of attack had always been there, Dover's geographical position dictated this. It was in the Napoleonic period that the scale of the threat to the town began to escalate. Chapter One will illustrate how Dover gained many of the extensive defensive works which helped to shape the town and its people through to the twentieth century. The chapter begins with an overview of the military developments in the town from the Napoleonic period. This period was chosen as a starting point as it was then that the potential of underground works was first exploited for defensive military purposes on a large scale within Dover. Dover was a military town and was proud of the fact and even to this day the military community remains a part of the town.

However, until the First World War the threats from across the Channel remained just that and Dover, despite being so close to France, had remained untouched by military action from 1294 to 1914. The Napoleonic era saw the most visible changes to the defences of Dover since the building of the outer walls of the castle in the thirteenth century and so it is vital to look at that period and see how the town came to be protected on all sides. This protection would be rendered obsolete by the bomber aircraft. After this analysis of how the town's defences were painstakingly built up Chapter Two will investigate how the civilian population of Dover in the First World War dealt with a threat which was not seriously envisaged before that war began. This threat affected not just their personal safety but also how they lived their lives. Peace in 1918 brought security to Dover but in the 1930s the town took further steps to secure itself should it be faced with such a danger again. Chapter Three will discuss how by the summer of 1939 Dover's authorities thought of the town being as 'ready', in the face of impending aerial attacks, as it had been allowed to be given the circumstances. Dover's Town Council had taken action before the Air Raid Protection Act was passed in 1938 and thereafter entered into battle with the Home Office to secure the very best ARP provision it could for the townspeople. Chapters Four and Five will show how the town's community dealt with an entirely new level of bombing and shelling during the Second World War and the effects that they had on Dover's society. These attacks were not unexpected as they had been in 1914 but they were unlike anything previously experienced by the people of Dover. The theme of

⁴⁰ In the Second World War the town did come within the range of German cross-Channel batteries situated on the French coastline.

Dover and the White Cliffs and their central place in English mythology will also run through this thesis.

The sales figures of *The Dover Express*, in the 1930s, show that over twelve thousand copies were sold consistently every week. In a town with a population of approximately forty thousand this means that virtually everyone would have had access to a copy whether they bought one or not. *The Dover Express* is of course a newspaper and its primary function was to sell copies and not to serve as a historical document. This means that it was often outspoken in its comment and prone to exaggeration but it also of course means the newspaper was likely to concentrate on the stories which were significant to its readers and as we shall see the provision of adequate air raid shelters for the town was one of the major issues with which the town was confronted between 1914 and 1945. The fact that *The Dover Express* was the town's only newspaper, during the 1930s and the Second World War, did enable the editor to deal with issues which he felt were important as well as those which would interest the readers. *The Dover Express* therefore was able to undertake a 'crusading' role on behalf of the town safe in the knowledge that there was no alternative newspaper for those who wanted to know what was happening in the Dover area. However, as Wilson put it in *The Myriad Faces of War*, newspapers are "reflectors rather than creators" of opinion and as such offer an invaluable insight into the views of a period.⁴¹ The editor of *The Dover Express* may have taken it upon himself to act as a self-appointed leader of the town in matters relating to ARP but the people would only follow as long as his views reflected theirs. The views expressed in local newspapers do offer the great advantage that, except in the periods when the censor was called upon to act, they have not been sanitised as might be the case with official documents. The opinions of the townspeople themselves are of course included within the letter column of the newspaper. There is a need to pay careful consideration to general currency which can be given to the views so expressed. They do not necessarily represent the views of the entire population but at most a letter writing percentage of it. The views are, however, most certainly those being

⁴¹ T. Wilson, *The Myriad Faces of War* (Cambridge, 1986) p.678

expressed at the time and cannot be subtly altered to suit future political or so truths as may be the case with memoirs and oral history.⁴²

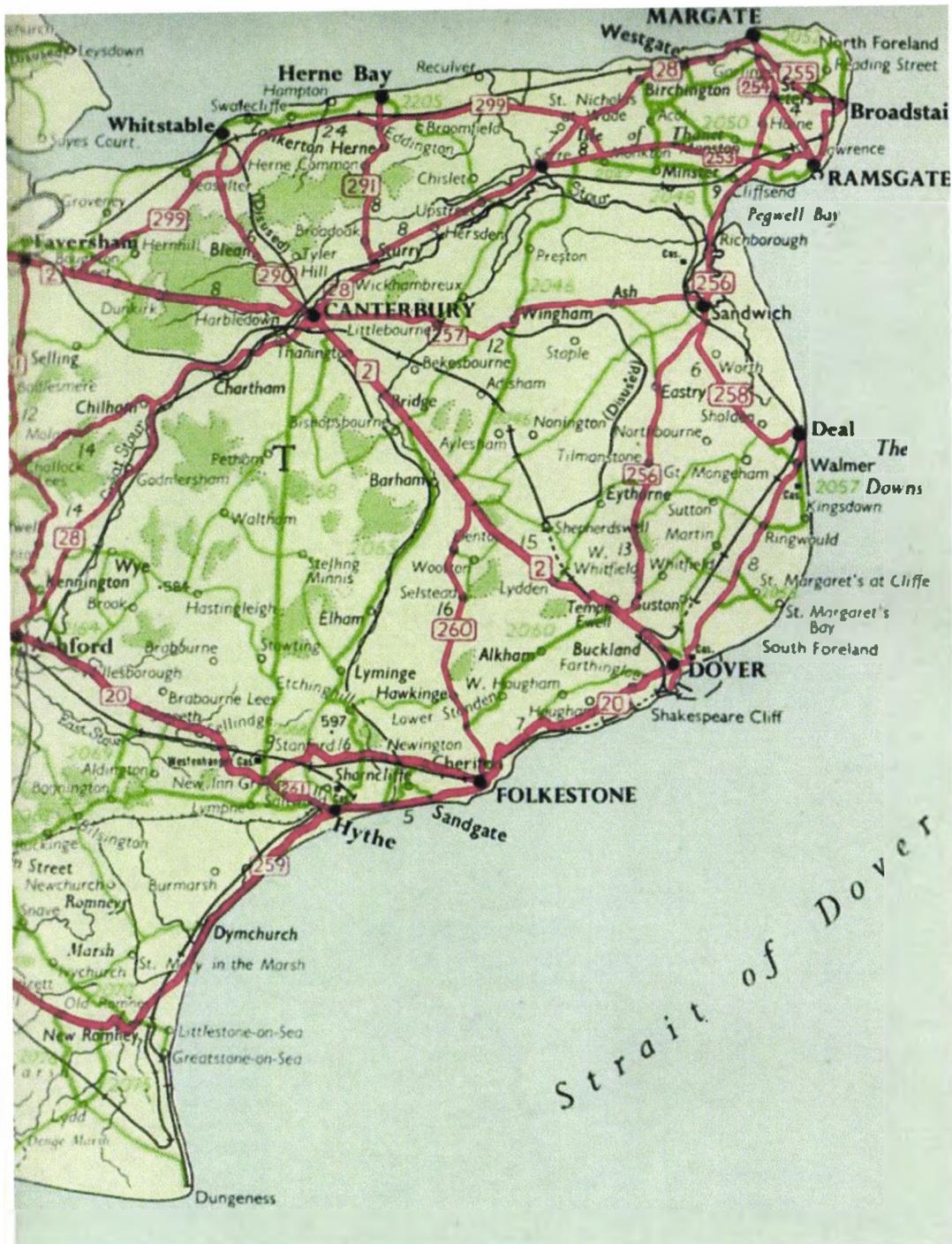


Figure 3: Map of Kent showing all major road and rail routes as they looked in the first half of the twentieth century. (From *Odhams Road Atlas of Great Britain*, 195

⁴² See M. Connelly, *We can take it. Britain and the meaning of the Second World War* (London, 200) for a comprehensive discussion and explanation of Britain and the ‘myth’ of the Second World War

The opinions formed within Dover by its inhabitants did not of course take shape within a vacuum and they were also influenced and shaped by national and international events. However, national and international events did not have the same immediacy as events which were taking place within the town. National priorities were not always those of Dover and its inhabitants. The thesis therefore contains reports and commentary from *The Times* and *The Dover Express*. The two have been deliberately juxtaposed. This was particularly relevant to the 1930s period as it was then that Air Raid Precautions policy was being made. *The Times* was the voice of the British establishment and while its circulation in 1939 may have been only around 200,000 its influence extended much further than this. In contrast *The Dover Express* only ever attempted to represent the views of Dover and its environs. The two views will be seen to have been at odds with one another.

It had originally been intended that oral history would play a major part in this thesis. Unfortunately sixty years after the most recent of the events discussed in the thesis it was difficult to find much useful evidence that could be incorporated into the work. Several interviews were carried out with both former military personnel and also with civilians who lived in Dover. What emerged was a rather consistent theme in that those interviewed believed that the Second World War had for Dover been truly a time when everyone had pulled together and united against a common external enemy. When interviewed those who lived and worked in Dover during the town hardly ever mentioned the bombing and shelling at first but would state later during the same interview how dreadful it had been. This of course provided a welcome support for my theories that Dover had its own 'mentality' with which it faced external danger but unfortunately it simplified Dover's past in a way that belittled what the residents of Dover, including those interviewed, had gone through. As we shall see the pages of *The Dover Express* and the official documents of the time paint a very different scene to that of a united Churchillian Britain battling the 'Blitz' which was so often repeated in interviews. It is also the view presented in most of the historical works published by local historians on the subject of Dover at war.⁴³

⁴³ See R. Humphreys, *Dover at War, 1939-1945* (Stroud, 1993) for a good example of this. It provides a useful chronology of the events of the Second World War as far as Dover was concerned. T. Wilson *op. cit.* p 755 discusses the arguments with regard to positive and negative memories. He concludes that

This thesis is entitled 'Dover's Bunker Mentality' and it shall seek to prove that the town did have a unique attitude even at times when the fear of aerial bombing was prevalent across Britain. This mentality did not extend merely to the relatively simple issues of ARP and Civil Defence but would in times of stress colour every issue in which the town saw the possibility of outside interference damaging the town's interests. In Dover there was undoubtedly appreciation of the national interest but the appreciation that their town could be attacked at any moment meant that the town's interests would outweigh those of the nation. This does not mean that Dovorians behaved unpatriotically or in any way that they would have seen as being detrimental to the war effort. It did mean that Dovorians living in view of the enemy for over four years from 1940 to 1944 developed their own mentality to make sense of the war and what it meant to them and their town, a mentality which was not found elsewhere around the country or indeed the county. Today there remains something evocative and exciting about standing in Dover, or indeed Folkestone, and seeing France. On some days the view is so clear that even with the naked eye movement can be seen on the French side of the Channel. Nowhere else in the British Isles could civilians actually see German troops, even if they were over twenty-five miles away.⁴⁴ The war was therefore much more immediate for the people of Dover, in a way that it could not be for the rest of the British population. There is definitely a parallel here with the 'Troubles' in Northern Ireland, the attacks on Dover initially made the headlines in the national media but as with Northern Ireland the regularity of the attacks soon lessened their newsworthiness. The people of Dover also developed their own attitudes to the dangers; these attitudes could only be explained by the population's forced acceptance of events outside their control but through which they would carry on their daily existence.

The term 'bunker mentality' is I am afraid an anachronism. None of the sources which I have seen used the term bunker to describe any of the fortifications or shelters used in Dover. For the people of the town the tunnels in the cliffs were simply the 'caves' and reports from the time refer to the tunnels in these terms. The use of the

people "remember the positives rather than the negatives." This would seem to be supported by the results of my interviews.

⁴⁴ Obviously the Channel Islanders did get a much closer view of German troops but there was nowhere else in unoccupied Britain that people could get such a view, no matter how distant.

word bunker in the context of a place of refuge would seem in fact to have grown from the *Führerbunker* in Berlin. The word was then used during the 'Cold War' to describe various underground facilities built or adapted to defend against nuclear attack.⁴⁵ By the term 'bunker mentality' an attitude is meant in which people draw in on themselves in reaction to an external threat. It may be a figurative expression but in the case of Dover between 1914 and 1945 it found a literal outcome in the expansion of the town's caves as a defence against aerial attack. No other town in Britain suffered so long from such attacks, no other town had the weight of ordinance fall on it as Dover had and we might therefore reasonably expect the attitude of the people of Dover to reflect this. This thesis sets out to tell how they responded when faced with a form of warfare that had been unknown before 1914.

As Connelly points out in *Britain and the Memory of the Second World War* the British people had by the end of the nineteenth century acquired a sense of national identity that was based upon the ideals of nationalism, protestantism and racial superiority.⁴⁶ This sense of national identity was clearly felt in Dover but as with other areas it was superimposed upon the pre-existing local identity. This local identity and the loyalty to the locality were as important to the people of Dover as their Britishness. The terms 'Man of Kent' and 'Kentishman' had historical resonances pre-dating the idea of Britain.⁴⁷ The two world wars of the twentieth century were the first occasions in which sections of British society outside the armed forces were called upon to involve themselves in a war. In previous wars only the military had been involved. Twentieth century war meant 'total war' for the people of Britain. Dover became a special example of this because it was literally on the 'front-line' in a way that no town in Britain had been before. In the First World War Dover was bombed and shelled; the town's population thereby came closer to war than the majority of civilians in Britain. In 1940 the English Channel became in effect the 'no-man's land' between the German and British armies. No other town experienced this

⁴⁵ The military tunnels under Dover Castle were in fact turned into such a 'bunker'. The official designation being a Regional Seat of Government; to the people of Dover it became the 'nuclear bunker'.

⁴⁶ M. Connelly, *We can take it! Britain and the memory of the Second World War* (London, 2004) pp.20-23.

⁴⁷ The terms supposedly date from 1066 when the Men of Kent (east of the River Medway) opposed William 'the Conqueror' while the Kentishmen (west of the River Medway) did not. Dover is of course east of the River Medway. For a current discussion on this topic see http://www.bbc.co.uk/kent/places/features/manofkent_kentishman.shtml

as Dover did. Dover's 'bunker mentality' is much easier to understand if the significance of its geographical situation is comprehended. French and Belgian towns in the frontline of the First World War were evacuated. In the Second World, Dover's adult civilian population remained there despite the fact that they were within range of German artillery and that their town would be one of the most important objectives should an invasion be launched. The people of Dover went about their lives, but they did not lead a 'normal' existence. In this context it is therefore understandable that the town developed a 'bunker mentality'.

Chapter 1: The Military 'Bunker Mentality' at Dover

Dover has had a long history of having defences due to its prime strategic position. The Iron Age Hill fort which lies beneath the foundations of the Norman Castle is the first example. The Castle itself has had an almost continuous military connection until the 1950s. It was the Napoleonic Wars which really triggered the military building at Dover which led to the town and the area around it being so heavily fortified and with most of the fortifications being built underground. The Castle was the most intensively tunnelled area, but tunnels exist on the Western Heights. These were used to link the various defensive posts on that hill top.

The siege of 1216, however, saw the real beginning of the military tunnelling at Dover. The besieging force under Prince Louis of France established itself upon the high ground to the north of the castle and combined the use of the great medieval siege engines: the trebuchet, mangonel and belfry, with the use of mines to undermine the walls of the castle. The first success of these miners was the undermining of a wooden barbican, when the defenders were then forced within the main stone walls; the French miners then turned their attention to those defences. They would eventually undermine the eastern gate tower, but the garrison had not been content to let this type of attack continue uncontested. The garrison dug several counter-mines in an attempt to prevent the undermining of the gate. They were ultimately unsuccessful in this and the eastern gate collapsed into the ditch. The battle which ensued at the breach was the climax of the siege as the defenders managed to repel the assault. After the end of the siege the castle would be strengthened further and it would remain one of the premier fortresses in England until the start of the sixteenth century.

From the start of the Tudor dynasty until the middle of the eighteenth century the defences of the castle itself fell into disrepair. The coming of the cannon made medieval defences obsolete and in Dover the castle became only one of a number of defensive positions and not the foremost of those. New artillery forts were built; Archcliffe fort to the west of the harbour and Moats bulwark to the east. Both of these forts were constructed close to sea level so that their artillery pieces would be able to fire upon enemy ships or enemy troops as soon as they landed. The importance of

Dover's harbour never waned and through the centuries its defence was always regarded as a very important matter. The dominance of artillery would cause much re-organisation of Dover's defences throughout the eighteenth century. It was the remodelling of the 1750s, carried out by the engineer, Captain John P Desmaretz, which saw the first major work on the castle since the thirteenth century.⁴⁸ The spur to the north of the castle was rebuilt, gun batteries and barracks were added and walls altered in height to allow clearer fields of fire for the newly installed artillery. Although much more modest in scale than his work in and around Chatham, Desmaretz had brought Dover castle's defences up to date and his work would be improved upon throughout the century. The American War of Independence saw the defences of Dover being treated for the first time as a complete entity with the construction of a line of defences on the Western Heights. This high ground to the west of the town had long been recognised for its tactical importance should there be an invasion but it was only during the 1780s that the first steps were taken to make it defensible. If Dover had not been the first priority for defensive spending since the Middle Ages the Napoleonic Wars changed all that. The defences constructed from 1793 to 1815 cost approximately £500,000. No other fortifications in Britain had anything like this sum spent upon them during the Napoleonic Wars.⁴⁹

During the Napoleonic Wars the extent of the fortifications at Dover excited controversy. In some quarters it was their cost which aroused disapproval, but they were also disapproved of because they encouraged some soldiers to believe that they could hide from their foes. William Cobbett proposed this view very forcefully in his letter written in Dover, dated 3 September 1823. Cobbett could not understand why digging tunnels to hide Englishmen from Frenchmen had warranted such expense. The problem with spending vast sums on fixed defences was that they were likely to become obsolete before they were used or indeed not to be used in action at all. Both of these factors came into play when considering the Dover defensive works. The works started when Napoleon's *Grand Armee* waited in Boulogne were never finished and as Napoleon never gained control of the Channel they were never put to the test.

⁴⁸J. Coad, *op. cit.* p.62 cites the spelling as Desmaretz but P. Bloomfield, *Kent and the Napoleonic Wars* (Gloucester, 1987) gives it as Desmoretz. I have opted to follow Coad's spelling.

⁴⁹J. Coad, *op. cit.* p.69

The work carried out during the Napoleonic period was indeed vast; new defences were built on the Western Heights to protect the town and port from attack from the landward side. The citadel which had been begun during the American War of Independence was to be completed and a further fort, known as the 'Drop Redoubt', was to be built at the eastern end of the Western Heights. These fortifications were able to house one thousand five hundred men, but due to the sheer nature of the cliffs on which they were constructed there was no easy means of access from them to the town and port. It was because of this that the 'Grand Shaft' was constructed to enable men to be transferred quickly from the Western Heights to the town or vice-versa.⁵⁰ The defences of the castle were further strengthened by the addition of tunnelled artillery and musket positions to protect the links between the northern spur and the castle proper. The main tunnels under the castle near the cliff edge were also constructed at the beginning of the nineteenth century. Further defences were added around Dover later in the nineteenth century under the direction of Major Jervois. A new fort, Burgoyne, was added on the higher ground to the north of the castle to complete the defences on the high ground surrounding the town.

Using tunnels had always been a feature of Dover life; medieval carvings exist in the Trevanion Street Caves to this day.⁵¹ It was the Napoleonic era which saw their use for military purposes really take off. Tunnelling of course had played an important role in the siege of 1216 but it was the advent of more and more effective artillery which finally drove the military engineers underground. The tunnels which were excavated under Dover Castle during this period were a truly massive undertaking. This can be appreciated by visitors to the castle today, with the eighteenth century tunnels having dimensions considerably in excess of their twentieth century counterparts. Construction started in 1797 under the guidance of Lieutenant-Colonel William Twiss, four parallel tunnels each one hundred feet long were excavated from the cliff face. In 1798 a second set of tunnels of considerably greater length and diameter were added at the cliff face. Their construction was recorded in the diary of Thomas Pattenden, a resident of Dover, who wrote; "and in the year 1798 three more

⁵⁰ According to Coad nearly £240,000 were spent on the Western Heights between 1804 and 1815. See J. Coad, *op. cit.* p.90

⁵¹ I visited these caves during an English Heritage Staff tour in November 1998. The cave entrance is just behind the terraced houses on Marine Parade but is invisible from the road.

subterranean for the officers were dug...⁵² These tunnels at Dover followed on from the extensive excavations at the Rock of Gibraltar and Fort Amherst, Chatham. In 1810 the tunnels were brick-lined due to the number of rock falls within and around them.⁵³ The tunnels were originally intended to serve as barracks for the Castle's ever expanding garrison during the Napoleonic Wars but in their aftermath the tunnels became a vast ammunition dump. It was as stores that the tunnels would continue in use for the next one hundred years. At the end of the Napoleonic era the tunnels were placed in the hands of the Coast Blockade. Their base in the Dover Castle tunnels was established in 1818.⁵⁴ The idea behind the blockade was to prevent smuggling along the Kent coast. It would seem that the tunnels were in fact poorly sited for this task as on 30 July 1826 Lieutenant Samuel Hellard reported that "the Casemates are difficult of ingress and egress being so far up the cliff".⁵⁵ In 1827, Congreve rockets were to be transferred from Guildford Battery and stored in the Casemates. From a map dated 16 October 1827, it would appear that already there was a vast amount of ammunition being stored in the tunnels.⁵⁶ The addition of the rockets to the ammunition store left only two tunnels unoccupied, but it is not known when the tunnels ceased to serve this function.

The nineteenth century saw the view of the British army transformed in the eyes of its people. At the time of the Napoleonic Wars soldiers remained outside the mainstream of society and were looked down upon and feared by the majority of the population. However, in the second half of the nineteenth century "regiments became a source of local and civic pride, a vital part of national and local ceremonial and pageantry".⁵⁷ This was true of Dover. The town became proud of its regimental associations. Dover has been host to many regiments over the last century and a half and their parades and concerts became part of the culture of the town. The army's popularity was also increased as it came to be seen as a shield against the militarism

⁵²Kent Archive Office (KAO) Document Do/Z1; 'The Diary of Thomas Pattenden'. Diary entry immediately following the entry for 1797.

⁵³J. Coad, *op. cit.* p.79

⁵⁴From the records of the Customs Board. The examples looked at were facsimiles in Dover Museum.

⁵⁵*ibid.*

⁵⁶PRO map MPH 1/893

⁵⁷J.M. Mackenzie, *Propaganda and Empire* (Manchester, 1984) p. 5

of continental Europe. The 'Town and Garrison' column in the *Dover Express* underlined the centrality of the army presence to the life of the town.

The next invasion scares arose with the rapid growth of German naval power at the beginning of the twentieth century. It was only at such times that many of the defensive positions around Dover were activated. In the early 1880s the possibility of the construction of a Channel Tunnel had seen the publication of a number of pamphlets seeking to warn Britons of the danger of the tunnel. *The Battle of Boulogne*, *The Surprise of the Channel Tunnel* and *The Taking of Dover* all warned of the terrible consequences of having such a tunnel. French spies would be able to infiltrate Britain and seize Dover.⁵⁸ Literature such as Erskine Childers' *Riddle of the Sands* which was published in 1903 and William Le Quex's *The Invasion of 1910*, which was serialised in the *Daily Mail* in 1906, did much to increase public awareness and heighten fears of the threat of invasion. The fear of invasion and spies reached into children's literature. The plot of E. Nesbit's *The Railway Children* was based on the fact that the father in the story was charged with spying for and selling secrets to the Russians.⁵⁹ The military preparations at this time in Dover would appear to have been linked to just such a threat.⁶⁰ In the case of the British publications on this subject most implied that Britain would be the attacked party. I.F. Clark makes this distinction very apparent in his anthology *The Great War with Germany, 1890-1914*.⁶¹ In the works that he presents Clark produces a coherent picture of the essentially defensive nature of the British fiction as compared to the essentially offensive nature of the German work. Such literature Clark suggests did much to fuel the quarrels between the two countries.⁶² Both Childers and Le Quex centred their tales on the possibility of an invasion force setting out across the North Sea to land in eastern England. It would seem that Dover was not necessarily still the 'Key to England'. It was still seen as an important location by many authors; Louis Tracy in

⁵⁸ I.F. Clark, *The Great War with Germany, 1890-1914* (Liverpool, 1997) p.80

⁵⁹ E. Nesbit *The Railway Children* (London, 1906) pp.176-191

⁶⁰ E Childers, *Riddle of the Sands* (London, 1903) which was subsequently made into a film of the same title in the 1970s, did much to alert the British people to the supposed threat posed by the German navy, it was ironic that Childers himself was executed for treason during the Irish War of Independence, on 24 November 1922. Le Quex's work was published in 1906 and was therefore intended to show what might happen in four years if the threat was not met. These books were themselves part of a very much larger propaganda campaign which was intent on creating an anti-German attitude within British society.

⁶¹ I.F. Clark, *op. cit.*

⁶² *ibid.* pp.10-18

his *The Final War* has the powers seeking to ally against Great Britain share Dover which was to be "held by a joint garrison."⁶³ Dover was seen as being a vital strategic location and steps were taken to improve its defences which had languished from the middle of the nineteenth century.

Britain's military planners therefore chose to improve and expand the defences of Dover at this time. Since the addition of the gun turret in the Admiralty pier to meet the threat of similarly armed warships in the mid-Victorian period, little work was carried out to improve the port's defences. Again, it was the arrival of an external threat, the enlarged Germany Navy, which prompted action to be taken in Dover. The Edwardian improvements greatly added to the fire power which could be directed at any foreign warships which might approach the port with any hostile intent. New batteries were added and existing batteries received more modern weaponry. During the First World War Dover was considered to be a secure location and the great Plantagenet Keep of Dover Castle was used as an ammunition dump despite it being clearly visible from the sea.

No extensions were therefore made to the military tunnels within the castle during the First World War. Royal Engineers were called upon to excavate tunnels for the town's civilians in 1917 at the height of the 'Gotha Bomber Scare', but neither those raids nor the earlier Zeppelin raids had caused the military to take any action on improving their own bombproof facilities. However, the fear of raids on the coast was taken seriously enough for Dover to be provided with a ring of defences on the landward side. These dug-outs and trenches served the additional purpose of controlling visitors to Dover. This was important when the fear of spying was prevalent and Dover was the main port for transporting troops to France and Belgium, as well as being the port from which the Dover Patrol helped to keep the Channel free from German raiders and submarines. Dover was classified as a fortress area during World War One and entrance to the town was only permitted by train or along the main Canterbury, Folkestone and Deal roads. This was announced to the people of the town by a joint proclamation from the Mayor, E W T Farley, and the Fortress Commander, Brigadier F H Crampton, on 4 August 1914 (see Figure 4 on p.27).⁶⁴ It

⁶³ Extract from L. Tracy, *The Final War* (London, 1896) in I.F. Clark *op. cit.* p.77

⁶⁴ Proclamation in First World War Ephemera Box 17A, Dover Museum Library

was only in 1915 that it was decreed that everyone must have a valid identification card to enter the Fortress Area.⁶⁵ The restrictions on entry and exit were in fact lifted for a time in 1915 but were reinstated in October.⁶⁶ The actual Fortress Area extended along the coastline from St. Margaret's Bay in the east to Folkestone Pier in the west. It was bounded on the landside by a line of dug-outs and trenches, continuously manned by sentries. The ring of landside defences were completed in the first six weeks of the war. These were replaced in 1916 by a new line of trenches which were similar to those in use on the western front and were designed with all the perils experienced at the front in mind.⁶⁷ The threat of a raid or land attack was obviously still being considered a possibility in 1916, otherwise such modernisation would not have been considered necessary.

The control of the entry of outsiders into Dover was completed by the removal of all cross-Channel passenger services from the port on 4 August. The last ship to enter Dover was the Belgian Steamer *Rapide* which arrived from Ostende on that day with eight hundred and ninety three passengers. It left with six.⁶⁸ However, a taste of what war might bring to the town was given on 13 August when the Royal Flying Corps (RFC) aircraft left for France from the cliffs just to the east of the Castle. The first RFC aircraft to come to Dover had arrived there in 1913, when two officers, two sergeants, ten men and two aircraft had been stationed on the War Department land to the North West of Dover Castle. The RFC personnel were accommodated by the Royal Garrison Artillery in Dover Castle.⁶⁹ Only five years before Bleriot, on 25 July 1909, had landed in Northfall Meadows close to the castle narrowly missing its keep at the end of his momentous cross-Channel flight. It was on 2 June 1910 that the

⁶⁵ From *The Dover Express*' book *Dover and the European War, 1914-1918* (Dover, 1919) p.16. This book was a compendium of reports made during the war by the newspaper with added commentary.

⁶⁶ *The Dover Express* 31 December 1915

⁶⁷ *The Dover Express*, *op. cit.* p.5

⁶⁸ *ibid.*

⁶⁹ PRO AIR document 1/788/204/4/614 outlines details of temporary accommodation for a RFC detachment in Dover in 1913.

to the INHABITANTS of DOVER and neighbourhood and
ALL whom it may concern.

TAKE NOTICE

A STATE OF WAR exists and MOBILIZATION has been ordered.

The defences of DOVER will be forthwith placed on a WAR FOOTING both
LAND and SEA.

THE GENERAL OFFICER COMMANDING DOVER FORTRESS will issue from
time to time such REGULATIONS and ORDERS for the security of the
FORTRESS as may have to be obeyed by the CIVIL POPULATION as well
as those under Military Authority.

THE LIMITS OF THE FORTRESS for the purpose of this notice shall be deemed
to be—(1) ON THE LAND SIDE the outer line of SENTRIES and PATROLS
and (2) THE COAST LINE (including the Breakwater at DOVER) between
ST. MARGARET'S BAY and FOLKESTONE PIER.

ENTRANCE to and EXIT from the FORTRESS will be permitted only:—

- (a) By railway (i.e., by train only).
- (b) By the Main Roads to DEAL, FOLKESTONE and CANTERBURY.
- (c) By Sea (under certain restrictions)

But a limited number of SPECIAL PASSES signed by or on behalf of the
FORTRESS COMMANDER may be granted to those who can show GOOD REASONS
for their issue, to enable them to enter or leave Dover other than under the above
restrictions. Such passes will NOT BE TRANSFERABLE and must always be
carried. Holders of such passes will be held PERSONALLY RESPONSIBLE for
the SAFE CUSTODY of the same. Any ABUSE of this special privilege will entail
the INSTANT ARREST of all passes concerned.

6. All persons ENTERING or LEAVING Dover Fortress are liable to SEARCH at the
outpost line, or on arrival at the stations, piers or shore if proceeding by
rail or sea.

7. Should it be necessary to establish a CENSORSHIP, it is to be clearly understood
that PRIVATE CORRESPONDENCE is liable to be opened and dealt with
accordingly.

Every copy of each issue of every NEWSPAPER or journal published in Dover will
be sent to Fortress Headquarters at Dover Castle four hours before PUBLI-
CATION. Should anything calculated to give INFORMATION to the ENEMY
regarding the Fortress or the Naval or Military forces appear, the journal or
newspaper will be liable to IMMEDIATE SUPPRESSION.

Officers and soldiers on or off duty have power to ARREST any person who shall
commit, or endeavour to commit, or incite any person to commit any act
PREJUDICIAL to the SAFETY of the Fortress, or Naval or Military OPERATIONS
of any kind. Any such person if a civilian shall be handed over to the CIVIL
POWER as early as possible.

All persons resident within the Fortress not being BRITISH SUBJECTS will
notify their ADDRESSES to the Civil Police IMMEDIATELY.

WARNING

All persons are WARNED:—

- (a) Not to approach DEFENSIVE Works except on business.
- (b) Not to approach SENTRIES, especially by NIGHT, except on duty or business.
- (c) To obey INSTANTLY the orders of any SENTRY, PICQUET, PATROL or POSTMAN or any MILITARY POLICEMAN.
- (d) To make use of PATHS as little as POSSIBLE, and only for the purpose of approaching their residences. MAIN ROADS and Streets should be used as a rule.

The Fortress Commander and the Mayor of Dover appeal to the
patriotism of all ranks and classes of the population for their ready
assistance and co-operation, and wish them to understand that the
liberty of the subject will be interfered with as little as possible
consistent with Naval and Military requirements.

GOD SAVE THE KING.

Figure 4: Proclamation to people of Dover by the Mayor and the Fortress
Commander 4 August 1914

Honourable C S Rolls completed the first return flight across the channel.⁷⁰ This was undoubtedly a warning that Britain's island status was no longer a safe guard from attack, but such was the fragile nature of the aircraft that their use as an attacking force was not thought possible.

In 1914 no-one anticipated that Dover would come under attack from aircraft. At the outset of the war the town was defended by one twelve pounder anti-aircraft gun, there were no search lights to back up the gun and so night raiders would have been immune to the town's defences.⁷¹ Further anti-aircraft guns were added in October 1914, some near the castle church to the east of the town and some on the Western Heights. The Royal Navy Volunteer Reserve (RNVR) was called upon to operate the first searchlights for the defence of the port; they came into service in November. These were mostly men still living in the town who did their four hour shifts on the searchlights after a full day's work. This situation continued into 1916; even when the government was taking over the air defence of London there was no such reorganisation on the eastern frontier of the United Kingdom's air defence line. *The Dover Express* in its editorials felt that the soldiers who were "kicking their heels" in the town should have been utilised for its air defence.⁷² To give an example of the manner in which the air war expanded from August 1914 to November 1918; in the first ten months of the war Britain produced 530 aircraft. In the last ten months Britain produced 26,500 aircraft. The bomb capacity of the aircraft in 1918 was 3000lbs (1364kg) compared with 20lbs (9kg) in 1914.⁷³

The air raids on Dover and the neighbouring towns while representing a new form of warfare for which there was initially no appropriate defence did little or no damage. The disruption to the functioning of the military units based in the town was negligible. As long as this situation continued the military authorities were not prepared to take any action. The German air raids of 1917 altered this view as the Gotha bombers seemed, initially, to be unstoppable. The destruction wrought by these

⁷⁰ Both of these aviators are commemorated in Dover. Bleriot by a granite aeroplane set in the turf where he landed after that first cross-channel flight and Rolls by a bronze statue on Marine Parade.

⁷¹ *Dover Express*, *op. cit.* p.3

⁷² *The Dover Express* 17 December 1915

⁷³ T. Wilson, *op. cit.* p.787

raids was nothing to the disruption that they caused to the town's life. Most of the town's civilian population was by then involved in supporting the military infrastructure in and around the town. The fact, that workers were worried for their safety and that of their families to the extent that they were prepared to sleep outside Dover when a "Bombers' Moon" was in the sky, helped jolt the military authorities into action. This civilian exodus was particularly pronounced from working class areas of the town, areas where people did not have basements or did not feel that their houses were substantial enough to withstand the bigger bombs which could now be carried by the Gotha bombers. The number of anti-aircraft guns and searchlights was increased. The most significant action was the employment of military personnel to excavate tunnels for Dover's civilian population.⁷⁴ The first stage in this military involvement in the civilian air defence was the agreement granted by Admiral Bacon for the use of the Trevanion Street caves as civilian air raid shelters in 1917.⁷⁵ Trevanion Street was a working class area of the town and the majority of the men worked in the naval dockyard nearby.⁷⁶ Today this naval dockyard is better known as Dover Eastern Docks. A Royal Engineers Tunnelling Company was employed to excavate a series of tunnels between the Chalk pit in the Folkestone Road and the chalk pit in Tower Hamlets.⁷⁷ These tunnels were never used during the First World War but those in the Tower Hamlets area were an important part of the town's deep shelter provision when war broke out again in 1939.

The air raids between 1914 and 1918 did not disrupt the military life of Dover to any great extent. The troop ships for the Army in France and Belgium were able to continue using the port throughout the war. No ships were sunk by aircraft and the Dover Patrol was never seriously challenged in its control of the Straits. Air Power was by no means the force it would become and it was in fact the civilian authorities of Dover who realised its potential rather than the military authorities. In the period between the two wars it was the civilian authorities who set out to utilise the town's caves and tunnels as safe refuges; the military authorities seemed determined to ignore the growing potential of the bomber. The Royal Navy despite having taken the

⁷⁴ *The Dover Standard* 24 November 1917

⁷⁵ The caves were in fact privately owned but agreement had to be sought from the Navy because they were so close to the Naval Dockyard. Admiral Bacon was then in command of the Dover Patrol and the shore establishments at Dover.

⁷⁶ *The Dover Express* 7 September 1917

⁷⁷ *Dover Express, op. cit.* p.36.

world lead in naval aviation during the First World War did not secure this lead between the wars and returned to the pre-war position of battleships and battlecruisers being the most important weapons which the navy possessed.⁷⁸ The spending cuts ordered by various governments also helped to ensure that the Fleet Air Arm remained a very small force; it only possessed 159 aircraft in 1931.⁷⁹

After the First World War the military establishment at Dover soon returned to its pre-war level. The port was re-opened for cross channel traffic and the Dover Patrol finally finished its duties in September 1919 when the last of the mine clearance flotilla was paid off.⁸⁰ The Dover Patrol had safeguarded the transport of sixteen million troops and one and one quarter million tons of supplies across the straits during the war. As a result Dover was at the heart of securing the supply routes to France. The block-ships, which had been put in place in early 1915, were removed from the western entrance to the harbour and commercial traffic gradually returned to the town.⁸¹ The run down of the naval presence in Dover was swift and complete, but the harbour still remained a Royal Dockyard until 1923. The army therefore became the principal service in Dover. In the 1920s the danger of any air raids seemed very remote and no efforts were made to improve Dover's air defences or to provide any extra accommodation which might be of use in the event of an attack. Despite the increasing international tension in the 1930s it was only towards the end of the decade that Dover's air defences were in any way improved.

Few written records exist of the tunnel building during the Napoleonic period but for the next period during which a substantial amount of tunnel construction took place a vast array of documentation is available; this period being the Second World War. The Second World War or more specifically that war after the Dunkirk evacuation and before the D-Day landings saw an unprecedented degree of military

⁷⁸ The Navy's position on the bomber aircraft is well illustrated by a portion of an internal memorandum quoted in U. Bialer *The Shadow of the Bomber: The fear of Air Attack and British Politics 1932-9* (London, 1980) p.24

⁷⁹ C. Barnett, *The Collapse of British Power* (London, 1972) p.297. This book offers a full discussion of the reasons why Britain was not able to maintain its global power between the world wars.

⁸⁰ After that time only four naval destroyers remained and the Admiral's flag, by this time Vice-Admiral Dampier was in command, was hauled down for the last time on 15 October 1919. See A. Hasenson, *op. cit.* p.325

⁸¹ The block-ships were not completely removed until 1933. The work had started in 1931. See *ibid.* p.336

tunnelling work being carried out in Britain. The works carried out in the late eighteenth and early nineteenth centuries were minor compared to the projects completed between 1941 and 1944. In the summer of 1940 Britain attempted to make defensible as much of the coastline in the south and east of the country before the equinoctial gales ruled out the possibility of an invasion. In the winter of 1940-1 and throughout 1941 these defences were improved. At this point tunnelling to provide safe underground communications and headquarter accommodation became a priority. This was particularly true in Dover which became the best defended part of the British coastline. Dover had always been vital to the defence of Britain and the military's 'bunker mentality' became pronounced in this period. Underground Headquarters were provided in many locations across the country, the three largest being at Portsmouth, Plymouth and Dover. These were centres for combined operations. The Portsmouth Head Quarters (HQ) was Eisenhower's operations base for Operation 'Overlord', while simultaneously Dover became vital for Operation 'Fortitude'; the deception carried out in 1944 to persuade the Germans that an attack was imminent on the Pas de Calais.⁸² Such was the fear of German air strength prior to the invasion of the Soviet Union that all military installations were offered some degree of protection from aerial attack.

This was particularly true in Dover where the military as well as the civilian population suffered from the effects of German shelling. Dover was categorised as an active service sector of the British army. Troops in the Dover area were therefore the only soldiers in Britain to be classified as being on active service during the Second World War. It will therefore be no surprise to discover that Dover's underground military accommodation was the most extensive provided anywhere in Britain, rivalled only by the extensive works carried out in Gibraltar.⁸³ Neither of these installations was tested by ground attack but without the benefit of hindsight it was

⁸² 'Overlord' was the codename for the allied invasion of Normandy in 1944. 'Fortitude' was the codename, as already stated, for the deception plan which was to lead the Germans into thinking that 'Overlord' was but a feint and that the real invasion was to come from Kent towards the Pas de Calais. 'Fortitude's' success was achieved by bogus radio transmissions from imaginary units all over Kent which the Germans believed were real and that General Patton and this army would cross the Channel once the Germans diverted their troops to Normandy. R. Hesketh, *Fortitude; the D-Day Deception Campaign* (St. Ives, 1999) provides more details on this topic.

⁸³ See PRO War Office (WO) document 166/8043 for the transfer of tunnelling personnel from Dover to Gibraltar in 1942. The last Tunnelling Company in Britain was Number 172. It finished the work at the Plymouth Combined HQ and was then transferred abroad in May 1943.

difficult to see that this would be the case. Dover was therefore the apogee of the pre-nuclear bunker mentality; that this is so can only be seen by investigating the scale of the tunnelling work which was actually carried out in Dover between 1941 and 1943.

The Munich Crisis, during the autumn of 1938, saw the first use of the tunnels under Dover Castle in an operational capacity by military personnel since the end of the Napoleonic Wars. The tunnels, between the First and Second World Wars, were used as Royal Engineers stores. During the Munich Crisis parts of them were transformed into a temporary HQ for the Navy and Army. The tunnels, of course, provided excellent defence against bombing and it was proposed after the Crisis to convert the original Napoleonic officers' accommodation into a series of offices for the Fortress Commander and the Rear Admiral. This work was carried out and a series of wooden partitions erected to create the various offices, signalling and planning rooms which were part of a mid-twentieth century HQ. From September 1939 to May 1940 the tunnels remained in use but as German aerial activity over Britain remained virtually non-existent the need for the tunnels seemed to decrease.⁸⁴ The 'Phoney War' therefore did not see any additions to the Castle's tunnels. It was only after the evacuation from Dunkirk that it was decided that it would be necessary to excavate more tunnels for the military. The work would be carried out, as it had been in the First World War, by the Tunnelling Companies of the Royal Engineers.

Tunnelling companies had played a very important role in the British offensives on the Western Front during the First World War. They had been used to dig tunnels for mines under the German lines, in essentially what was a repeat of medieval siege techniques. In 1939 1st Tunnelling Engineers, Royal Engineers formed part of the British Expeditionary Force (BEF). The units of 1939 were obviously seen as successors to their First World War predecessors as the same unit designations were used.⁸⁵ Their role in 1939 never developed as the war settled into one of total inaction. The Head Quarters 1st Tunnelling Engineers co-ordinated 170, 171, 172 and 173 Tunnelling Companies. It was these units that would primarily be

⁸⁴ PRO WO document 166/1343. The diary of the Dover Garrison from September 1939 to October 1940 recorded that the Garrison HQ transferred in full to the tunnels on 29 May 1940.

⁸⁵The main First World War Tunnelling Companies were numbers, 171, 172 & 173. These units were first formed in 1915 when it was recognised that trench warfare was to be ongoing. War Diaries to consult in relation to the units activities in World War One are PRO Documents with the WO 95 prefix. See documents numbered between WO 95/245 and WO 95/557.

responsible for the works carried out in Dover Castle during the Second World War. They were evacuated with the rest of the BEF through Dunkirk and were then sent to Chester to reform. They returned through Dunkirk without any equipment but it was not long before they started work. 172 Company dug the 'Western Command Shelter' at Chester from June to November 1940.⁸⁶ 170 Company was sent to Ringmer in Sussex in September 1940 and 171 Company was sent briefly to Halton, Lancashire from July to September 1940 and then on to Aldershot to construct the 'Aldershot Command Dugout'.⁸⁷

It was after finishing its work in Chester that 172 Tunnelling Company became the first tunnelling company to transfer into the east Kent region, arriving in Dover and Deal on 16 November 1940.⁸⁸ On 21 December 1940 170 Tun. Co. followed and arrived in Deal for "defencive (sic) work".⁸⁹ By 1st January 1941 172 Tun. Co. was involved in six projects in the Dover area, five of these were air raid shelters for various coastal artillery units in the area: the Saint Margaret's Bay 5.5" Battery, Saint Margaret's at Cliffe, Fan Bay 5.9" Battery, the Western Heights 414 Beach Defence Battery and the Lydden Spout 5.9" Battery. The sixth was in Dover Castle, this involved the building of "Extra underground accommodation for fixed coastal defence".⁹⁰ There would seem to have been an additional casemate somewhere inside the castle, for on 21 February 1941 it was reported that the "Dover Castle casemate" was completed.⁹¹ With this finished, work began on a "new engine house" to supply extra power to the HQ in the casemates.⁹²

On 7 March 1941 the Commander, Royal Engineers (CRE) of 1st Tunnelling Engineers was at Dover visiting sites for new tunnelling jobs. He met with Brigadier Rawe, who was the garrison commander at Dover, and the commanding Officer of 172 Tun. Co., Major Foss. Unfortunately, the war diary does not state which sites these were.⁹³ However the work on the Western Heights tunnel shelters was completed in mid-March and would probably have been among the sites visited at the

⁸⁶PRO WO document 166/3535 War Diary of HQ 1st Tunnelling Engineers, Royal Engineers

⁸⁷*ibid.*

⁸⁸ Hereafter the designation Tunnelling Company will be abbreviated to Tun. Co.

⁸⁹WO 166/3535 War Diary of HQ 1st Tunnelling Engineers, Royal Engineers

⁹⁰*ibid.*

⁹¹*ibid.*

⁹²*ibid.*

⁹³*ibid.*

start of the month by the CRE.⁹⁴ The dangerous nature of the tunnelling work, even in a medium as conducive to tunnelling as chalk, is shown by a rock fall at the Capel dug-out on 8 April 1941 when two men from 172 Tun. Co. were killed and another seriously injured. The dead men were Sergeant J G Riley and Sapper C W Howard.⁹⁵ Six days later 171 Tun. Co. was ordered to take over from 172 Tun. Co. in Dover. At the end of May the Canadian Tunnelling Engineers made their first appearance in the Dover area with 1st Canadian Tunnelling Engineers(Cdn. Tun. Eng.) being ordered "to put in bore holes to prove ground" at the difficult site at Capel.⁹⁶ Lieutenant Demorest arrived at Capel with a detachment from 1st Cdn. Tun. Eng. on 4 June to undertake "a Horizontal drilling programme underground to locate suitable ground for chambering in."⁹⁷ Meanwhile, Captain Hall and his Canadian tunnellers were engaged in work at St. Martin's, Canterbury for 44 Division's HQ dug-out. The Capel work was finished on 14 June 1941 despite some difficulties in completing their bore-holes.⁹⁸ Lieutenant Demorest was kept busy in the Dover area as he and his detachment were also called upon to carry out some "experimental drilling in the concrete pier"... "with a view to demolition".⁹⁹ British military thinking believed that a successful amphibious invasion required a suitable port to supply it; the British were determined to deny Dover to the Germans. Demorest then went to carry out some work at the deep dug-out which was to become the HQ of 12th Corps south of Tunbridge Wells.

On 2 July 1941 the CRE visited the "proposed jobs at the castle."¹⁰⁰ These were to be a new tunnel for the garrison commander and a dressing station. This demonstrates that even at this relatively early stage in the war underground accommodation at the Castle was in very short supply. The 1939 plan indicated that one of the long casemates had been reserved for the garrison commander and his staff.

⁹⁴ WO 166/3653 War Diary of 172 Tun. Co. for March 1941. This work at Western Heights was for four officers and one hundred and fifty men of the 414th Coastal Battery, Royal Artillery who were based there. Similar accommodation was provided at, St. Margaret's Bay, Fan Bay, Wanstone Farm and Lydden Spout for the artillery units based there.

⁹⁵ *ibid.* for April 1941

⁹⁶ PRO Document WO 166/3535 War Diary of HQ 1st Tunnelling Engineers, Royal Engineers 29 May 1941

⁹⁷ PRO Document WO 166/3652. War Diary of 171 Tun. Co. 4 June 1941

⁹⁸ PRO Document WO 166/3535. War Diary of HQ 1st Tunnelling Engineers, Royal Engineers 14 June 1941

⁹⁹ PRO Document WO 179/469. War Diary of 1st Canadian Tun. Eng. 11 June 1941

¹⁰⁰ PRO Document WO 166/3535. War Diary of HQ 1st Tunnelling Engineers, Royal Engineers 2 July 1941.

During the Dunkirk evacuation the army actually moved into the tunnels rather than being forced to move out due to the Navy's requirements; perhaps the close proximity of the two staffs helped in the co-ordination of the evacuation.¹⁰¹ This tunnel is often portrayed as the one housing the dynamos for the tunnel network, from which Operation Dynamo took its name.¹⁰² In fact Dynamo was the Admiralty's designation for the evacuation from Dunkirk the name was not chosen by Ramsay and his staff in Dover.¹⁰³

Supplies were brought in through Kearsney railway station and in the week preceding the start of construction one railway wagon of pit props and eight of colliery arch material were unloaded in the space set aside in the railway yard for the tunnelling supplies.¹⁰⁴ The plans for this "Garrison Commander's Tunnel" changed on at least two occasions. Work began on 7 July and by the 19 July the approximate size of the chamber was one hundred feet long, nine feet high and twelve feet wide. It was a considerable feat of engineering even taking into consideration the relative ease of boring into chalk.¹⁰⁵ Number 1 Section of 171 Tun. Co. was moved from St. Margaret's Bay to Kearsney on 7 July to begin tunnelling work in the castle.¹⁰⁶ A high level of priority would seem to have been placed on the construction of this underground accommodation by the army and the navy given the way that the tunnelling units were concentrated in the south-east and around Dover in particular to carry out this work.

Resources were in short supply at this time but a considerable amount of them was utilised in the work around Dover even before the biggest tunnelling project of 1941, the construction of an Underground Dressing Station (UDS) was undertaken. The UDS was to be built under the castle close to the existing Napoleonic tunnel system and would be eventually linked to these pre-existing tunnels. The rationale behind such an UDS was that battlefield casualties would be received there, treated and then either returned to their units after being 'patched up' or sent on to hospitals

¹⁰¹PRO Document WO 166/1343. War Diary of the Dover Garrison 29 May 1940

¹⁰²I was careful not to call it the dynamo room as the room in which the planning/improvisation for the Dunkirk evacuation was carried out became known as the "Dynamo Room"

¹⁰³Chalmers W.S. *Full Cycle* p.69 Admiralty signal of 22 May 1940

¹⁰⁴PRO Document WO 166/3652 War Diary of 171 Tun. Co. Progress report for the week ending 5 July 1941

¹⁰⁵PRO Document WO 166/3652 War Diary of 171 Tun. Co. 19 July 1941

¹⁰⁶*ibid.* 7 July 1941

in a safer area for further treatment. The construction of the UDS therefore predicated the belief that an invasion of Britain was likely if not imminent. The significance of such work would not have been lost on those constructing it, nor on those who discovered that it was being constructed for just such an outcome.

The first step in its construction was taken on 12 June when the O.C. 171 Tun. Co., Major Sim and Mr. James, the Garrison Engineer, made a reconnaissance of the proposed site. On 17 June the Assistant Director of Medical Services (ADMS) and the Senior Medical Officer requested further underground accommodation at St. Margaret's Bay and at the Castle.¹⁰⁷ The CRE of 1st Tun. Eng. carried out a further reconnaissance with Mr. James on 29 July "to locate a possible site for an adit to work the proposed Medical Services dug-out in preference to a shaft which was under consideration."¹⁰⁸ The CRE met Brigadier Wigmore, Deputy Director Medical Services (DDMS) 12 Corps, to discuss the Dressing Station on 8 August and it was the CRE who suggested the "construction of entirely new tunnelled accommodation under the parade ground as the present site in the old casemate is only splinter proof."¹⁰⁹ The "present site" of the Dressing Station referred to here was one of the casemates in the eastern wall of the castle rather than the deep casemates where the HQ was situated.

This was obviously a considerable change in plan for on 15 August the Commander of the Royal Engineers (CRE) in the area met with the Chief Engineer of South Eastern Command (SECo), Brigadier Wigmore and his superior Major General Sheehy the DDMS of SECo. Four days later the Army Commander, together with his staff, came to view the proposed site and the CRE's layout was approved in principle.¹¹⁰ On 29 August "work started on clearing and levelling the entrance to the dressing station adit."¹¹¹ This was the day after the Garrison Commander's tunnel was completed. These works were obviously considered to be of a very high importance judging from the speed at which construction was carried out. In the late summer of 1941 the German advances deep into the Union of Soviet Socialist Republics (USSR)

¹⁰⁷*ibid.* 17 June 1941

¹⁰⁸*ibid.* 29 July 1941

¹⁰⁹PRO Document WO 166/3535 War Diary of HQ 1st Tunnelling Engineers, Royal Engineers 8 August 1941

¹¹⁰*ibid.* 19 August 1941

¹¹¹*ibid.* 29 August 1941. An adit is a horizontal entrance to a mine.

seemed to herald the collapse of Britain's latest ally. With the defeat of the USSR the Germans would have been able to turn their full attention to Britain and therefore the completion of the underground accommodation around Dover was of vital importance.

With the decision taken to construct the UDS the details of its internal layout had to be worked out. Meetings were held throughout September among the various interested parties. On 3 September the CRE met the DDMS 12 Corps at the castle to discuss; "the internal disposition of the Dressing Station" and two days later the CRE and the DDMS met the Chief Engineer, SECo at the dressing station.¹¹² On 8 and 19 September he met with the DDMS SECo to discuss the "layout and arrangements" together with the "position of the entrances for the Dressing Station." On occasions other engineers were brought in to survey the work, including among others on 25 September: Brigadier Ling, Lieutenant-Colonel Fenwick, Major Wood, Major Campbell of the 1st Canadian Tun. Co. and a party of civilian technical engineers.¹¹³ On 9 October Colonel Graeme Deputy Chief Engineer (DCE) SECo met with Majors Harris and Easterbrook. This illustrated just how much interest the project was generating, and that such interest was not being completely discouraged.

While the problems of the exact arrangements of the UDS were being thrashed out, the tunnellers themselves were confronted with the problem of the spoil. The UDS represented a new scale of project and where was the spoil to go? The easiest solution was to tip it over the front of the cliff. This proposed solution did, however, invite much discussion between the tunnellers and the garrison engineer, and finally the garrison commander agreed to this method of disposal. However, by the 30 August only two days after work began 171 Tun. Co.'s war diary recorded that "The spoil dump below the castle spreads, and falling chalk alarms those civilians living adjacent to it. The matter receives immediate attention, and a close observation is maintained."¹¹⁴ This was no doubt a great comfort to "those civilians". On 5 September the spoil dump had been investigated and it was noted that there was "a

¹¹²*ibid.* for 3 September 1941

¹¹³PRO Document WO 166/3652 War Diary of 171 Tun. Co. 25 September 1941 and WO 166/3535 War Diary of HQ 1st Tunnelling Engineers, Royal Engineers 25 September 1941.

¹¹⁴PRO Document WO 166/3652 War Diary of 171 Tun. Co. 30 August 1941

tendency for some lumps of chalk to roll on to private property.”¹¹⁵ This resulted in a visit by Captain W.H.T. Olver of the Royal Engineers who took the “details required for a scraper to be used on the castle dump, to help with its control.”¹¹⁶

Decauvill tracks had been laid from the new entrance of the UDS to the cliff face by the 6 September so that continuous work could start from the 8 September.¹¹⁷ Initially only part of No. 1 Section was involved in the work and in the first week of work the adit was advanced three feet. By the end of the second week which was the week ending 13 September 1941 the work face was now one hundred and twelve feet into the cliff and all four sections of the company were employed in the work. Shifts were of six hours with round the clock working Monday to Friday and by the end of the third week, 20 September 1941, a further one hundred and thirty-one feet were tunnelled. The weekends were spent working on the dump to prevent the spoil from falling on private property.¹¹⁸

The fact that the spoil from these new workings was visible as a white scar on the greying cliff face also had the added side effect that the existence of these workings must have been known to the Germans. Through high powered binoculars or telescopes the growing scar would have been noted in Calais. There was little that the Germans could do to stop underground workings which by their very nature were intended to be immune to the German guns and bombs. The scar did show the Germans that considerable work was going on in Dover, a fact which would have provided little comfort to the residents of Dover who already felt that they were enough of a target for the Germans. Later in the war deliberate steps would be taken to convince the Germans that eastern Kent was the base for the allied invasion force. These steps ranged from mock landing craft being moored in Dover harbour, to bogus radio traffic from imaginary allied formations supposedly based in the Dover area. Operation ‘Fortitude’ was amazingly successful and contributed greatly to the success of the Normandy landings. It was also undoubtedly a contributory factor to the extent

¹¹⁵ *ibid.* 5 September 1941

¹¹⁶ *ibid.* 29 September 1941

¹¹⁷ A temporary rail system on which to carry spoil wagons

¹¹⁸ PRO Document WO 166/3652 War Diary of 171 Tun. Co. 21 September 1941

of the German shelling on the Dover area in the summer of 1944.¹¹⁹ The shelling experienced by Dover during this period was the worst of the war and in most historical works is explained in terms of the fact that the Germans wished to expend their ammunition before their batteries were captured.¹²⁰ However, as Operation 'Fortitude' had deceived the Germans into believing that another Allied army was waiting in Dover, it is not perhaps surprising that the Germans sought to make life 'uncomfortable' for this imaginary army. It was the civilians of Dover who would suffer for this military coup.

Members of 171 Tun. Co. were called upon to demolish the remnants of the Burlington Hotel which had been bombed on 7 September 1941. The Officer Commanding (OC) Major Sim, together with Company Sergeant-Major Canvin, Lance-Sergeant Wright and Lance-Corporal Crampton joined the Borough Engineer Mr. Boulton Smith in the work. They started laying charges on 11 September and the work was finished on the following day. One hundred and forty-six pounds of guncotton were required and very full details of this operation are included in the Company's war diary, probably reflecting Major Sim's role in it.¹²¹ The tunnellers were also faced with their own accommodation problems at Kearsney. Their quarters were in a poor state with inadequate cooking and no bathing facilities. The Deputy Commander of the Royal Engineers in Dover was called upon to "repair all existing accommodation and to provide better cooking facilities and baths etc."¹²² These facilities might now be thought to have been essential for tunnellers, but baths were certainly not a feature of most British coal mines at this time. The Tunnelling Company was also seeking to extend its accommodation by taking over adjacent properties, but the war diary does not state how successful this scheme was.

The main work continued throughout October 1941. The only incident which detracted from the progress being made was the bombing of one of the company's lorries at 11.50 on the night of 1 October. Three men were slightly wounded in this

¹¹⁹ The fact that Operation 'Fortitude' was deliberately intended to divert German activity towards an imaginary invasion force in east Kent is almost totally ignored when the German shelling of Dover in the summer of 1944 is considered.

¹²⁰ R. Humphreys, *op. cit.* pp. 183-4. He describes the German shelling as "reprisal actions" for allied bombing of German cities and ranks it with the V' weapons as a form of retaliatory attack on British civilians.

¹²¹ PRO Document WO 166/3652 War Diary of 171 Tun. Co.

¹²² *ibid.* Diary entry for the week ending 20 September 1941

incident and the lorry was totally destroyed. By 5 October a scraper had been installed in the dump in order to reduce its size, but by the 25 October such was the pressure on the scraper that "a heavier and larger scraper" was installed.¹²³ This extra pressure may have been a result of the new working procedures in which competition was encouraged by each shift being comprised of men from only one company section. On 7 November 1941 608 General Construction Company of the Royal Engineers was called in to lay bricks inside the tunnels. By 16 November a working party was sent down to the spoil dump at the bottom of the castle cliff to "trim the overflow and erect a deflecting barrier"¹²⁴ Some residents of Dover were discovering that their homes were at risk not just from German bombs and shells, but also from the spoil coming out of the military works in the castle. Later in the same month a detachment from 183 Tun. Co., of thirty-seven men under Lieutenant Radcliffe, carried out some drilling boreholes into the UDS kitchen. This shaft was seventy-nine feet in depth and presumably formed the outlet for the kitchen's ventilation system and a flue for the cooking equipment. It is also in November that weekly tallies of cubic feet of spoil began to be recorded. In the week ending on 15 November the tally was 12,137 cubic feet or one thousand, three hundred and forty-six cars of spoil to dump over the cliff. The tally for the following week was 12,490 cubic feet or one thousand, four hundred and six cars. The total was 12,322 cubic feet or one thousand, three hundred and twenty cars for the week ending 29 November. On 15 November "A suggested layout for underground accommodation for the staff of the Command Centre Coastal Artillery (CCCA)" was submitted.¹²⁵ It is not clear if this construction was carried out at this point. In February 1942 the CRE of 1st Tunnelling Engineers and Brigadier Raw made listening tests in Dover Castle with a Geophone, and on 6 March the CRE discussed with Brigadier Raw the requirements for a further room alongside the CCCA. No. 3 section of 171 Tun. Co. began work "on a small chamber at the Castle for CCCA" in April 1942.¹²⁶

¹²³*ibid.* for the week ending 25 October 1941

¹²⁴*ibid.* 16 November 1941

¹²⁵*ibid.* for the week ending 15 November 1941

¹²⁶PRO Document WO 169/5389 War Diary of HQ 1st Tunnelling Engineers, Royal Engineers for April 1942. This room is the one in which visitors are shown English Heritage's film on the Dunkirk evacuation.

On 8 December, with work almost complete, three eight-hour shifts were introduced in place of four six-hour shifts. This was necessitated by the fact that Number 4 Section was training elsewhere and so the other three sections had to take up the slack.¹²⁷ By New Year's Eve the company diarist was able to record proudly that the UDS "has proved one of the most attractive and interesting underground systems that the Co. has been employed on."¹²⁸ December 1941 saw a major development in military planning which would have great implications for Dover Castle when the plan for a combined Naval and Military HQ at Fort Southwick in Portsmouth was submitted to the Chief Engineers at General HQ (GHQ) and Southern Command. This operation necessitated the withdrawal of 171 Tun. Co. from Dover; this transfer began on 20 April 1942 when the first two sections were moved. The rest of the Company followed on 28 April.¹²⁹

The work on the UDS was reported as being completed on 10 January only a few days behind the original schedule despite the project being very much extended during its construction.¹³⁰ On 31 January the final borehole from the parade ground to the kitchen was completed and as far as 171 Tun. Co. was concerned the UDS had "been put to bed".¹³¹ The extent to which operations then closed down in the Dover area is seen by the fact that before the end of the month seventeen wagon loads of equipment were despatched from Kearsney to the unit's HQ at Tonbridge. February 1942 was spent on Company training; this included laying and clearing anti tank minefields, field craft and Bren gun range firing.¹³² The last was particularly important because the unit's four Bren guns only arrived on the previous 25 November!¹³³ 171 Tun. Co. returned to Dover, after a brief sojourn at Fort Southwick, in late April and early May and left Dover for a posting to the Middle East on 27 May 1942. There were now no tunnelling units in Dover, this would remain the case for only a short period, until August 1942 when work on the Combined Head Quarters (CHQ) began.

¹²⁷PRO Document WO 166/3652 War Diary of 171 Tun. Co. 8 December 1941

¹²⁸*ibid.* 31 December 1941

¹²⁹PRO Document WO 166/8042 War Diary of HQ 1st Tunnelling Engineers, Royal Engineers April 1942.

¹³⁰PRO Document WO 166/8104 War Diary of 171 Tun. Co. 10 January 1942

¹³¹*ibid.* 31 January 1942

¹³²*ibid.* February 1942

¹³³*ibid.* 25 November 1941

The UDS was intended initially as a first aid point for casualties should there be an invasion. It was used throughout the war as the castle's medical centre, replacing the other medical facilities scattered within the castle's perimeter. The UDS was never utilised as a Camp Reception Centre. It became the home of Dover's twice weekly Optical clinic together with other day to day clinics, but the UDS received few battle casualties. Civilian casualties were treated in the town's hospital and there were many more civilian casualties in Dover than military. Military casualties in Dover were remarkably light and the castle itself was only occasionally struck by shells. The UDS was designated in the Camp Reception role again at the time of the Normandy landings but casualties were lower than expected and Dover's UDS received no casualties.¹³⁴ By March 1945 it had been reduced to a capacity of forty beds under the command of Lieutenant-Colonel Edgar Walsh.¹³⁵ The UDS was therefore in many ways a completely under utilised resource. The scenario for which it was conceived, the invasion of Great Britain by the Germans, never came about. As with many other underground military facilities built at this time it never really justified the resources which went into its construction. However, at the time the need was seen as not only necessary but also pressing and hence the work was completed in the short time frame already outlined. The tunnelling work would continue under the castle with further works which would greatly expand the underground command facilities then available. The expansion of the command facilities supposedly began with the construction of Bastion level.¹³⁶ They would be completed with the level which became known as 'DUMPY'.¹³⁷

The very full programme for the units which had already been stationed in Dover leaves one very major quandary in the story of the military tunnels inside Dover Castle. There was supposedly another level of tunnels between the UDS and the Napoleonic tunnels; this level was termed 'Bastion'.¹³⁸ 'Bastion' level was supposedly an extension of the existing facilities within the Napoleonic tunnels of 'Casemate' level. It was intended to provide additional accommodation, the centre-

¹³⁴ PRO Document WO 177/288 War Diary of 192 Field Ambulance Co.

¹³⁵ Walsh took a number of photographs of the hospital during his tenure there and these formed the basis of English Heritage's reconstruction of the Hospital Complex

¹³⁶ See discussion on whether 'Bastion' level was ever constructed below pp.36-38

¹³⁷ 'DUMPY' is an acronym for Deep Underground Military Position Yellow.

¹³⁸ The UDS was termed 'Annexe' level later in WWII, and the Napoleonic tunnels became 'Casemate' level. It was this alphabetical progression that missed the letter 'B' which has led many to believe that another level, which had a codename beginning with a 'B', existed.

piece of which was to be a large central planning area from where combined operations would be controlled. It would therefore allow greater co-ordination between the three services. The records left by Mr Grove, which provide our main source of evidence for 'Bastion's' existence, are now held by English Heritage and Dover Museum. Mr Grove was apparently the Sergeant in charge of supply to the tunnelling companies which were stationed in the Dover area. However, from his surviving papers, it is very difficult to determine when 'Bastion' was built. 'Bastion' could not have been constructed before the UDS, as there is no mention of any such work in any of the Tunnelling Company war diaries.^{139, 140} It is in the period between the completion of that project and the beginning of work on 'DUMPY' that we must ascertain if 'Bastion' was indeed brought to an advanced state of completion. The plan of 'Bastion' provided by Mr Grove is dated 23 January 1941. (This plan is shown in Figure 5 on page 45.) The work involved is shown as having been approved. This would imply that construction would have begun shortly afterwards. No record survives of any such work being undertaken in the first half of 1941.¹⁴¹ The only piece of evidence which may support this early date of construction is a cryptic message in the War Diary of 171 Tun. Co. for 30 May 1941. This was just over a month after they took over the tunnelling operations in Dover. The entry stated that "Second-Lieutenant Greenham RE makes a reconnaissance (sic) of a special and secret nature."¹⁴² What this reconnaissance involved is never revealed in the War Diary but most probably had something to do with work in Dover Castle.

English Heritage was certain of the veracity of Mr Grove's material as they engaged a firm of Rock Mechanics Specialists in trying to find 'Bastion' in the early part of 2000.¹⁴³ A Geophysical survey was undertaken in the first instance and certain anomalies were found in the area underneath the officers' mess building where it is thought that 'Bastion' was constructed. It may in fact have been because of its position under the officers' mess that construction on 'Bastion' was stopped. Work on the Plymouth Underground Headquarters was delayed for several months because of

¹³⁹"The Grove Correspondence" is in the Dover Museum Library Reference: World War II Box 17

¹⁴⁰See below pp.42-45 for further discussion of this matter

¹⁴¹ The search for such evidence was carried out at the PRO and at the Royal Engineers Museum in Chatham.

¹⁴²WO 166/3652 War Diary of 171 Tun. Co. 30 May 1941

¹⁴³ The work was carried out by Graham Dawes Associates Ltd. on 8 and 9 February 2000, following a preliminary study in December 1999. Graham Dawes Associates Ltd. *Investigation to locate the Bastion Level of Tunnels beneath Dover Castle Kent* (Report for English Heritage, 2000)

complaints from the admiral about noise and disruption to his working environment.¹⁴⁴ The Dover Castle officers' mess was home to the Vice-Admiral (VA) Dover from late 1939 onwards and it is possible that he could have had the work on 'Bastion' level halted. The geophysical survey resulted in a series of boreholes being worked into that area but the tunnelling engineers of today did not find 'Bastion'. Mr Grove cites the collapse of the main chamber in 'Bastion' as the reason for its abandonment shortly before its completion. It was this abandonment which in his view led directly to the construction of 'DUMPY'. This obviously pre-supposes that 'Bastion' was intended as a CHQ with a large central planning area. However, plans for a CHQ at Dover were not made until the summer of 1942, after the completion of the CHQ at Fort Southwick in Portsmouth.¹⁴⁵ The CHQ was originally intended to open on 1 March 1943 but delays meant that it in fact opened on 1 May 1943.¹⁴⁶ It would therefore seem that 'Bastion' was either intended in 1941 to provide additional underground accommodation for the army or as a CHQ in 1942. However, a request made on 26 June 1942 that the "closer the new HQ is to the VA Dover's HQ the better" is the only evidence that I can find which suggests that 'Bastion' could indeed have been the first site of the CHQ.¹⁴⁷ 'Bastion' would obviously have been more convenient as it was in fact only a few feet higher than the casemates and did not require any steep staircases, as do the entrances to 'DUMPY'. In this scenario 'Bastion' would indeed have been the site of the CHQ and with its collapse the project was moved swiftly down to 'DUMPY'. This could explain the delay to the opening of the CHQ, but the delay caused would surely have been more than two months. The CHQ only took nine months for completion (August 1942 to April 1943), while the UDS took five months (September 1941 to January 1942), and so it is very unlikely given the scale of both the 'Bastion' and 'DUMPY' projects that there would have been enough time to almost complete one and complete the other in the nine months available. The evidence against the existence of 'Bastion' is at present all negative; the lack of any building reports and the failed boring investigation in 2000. However,

¹⁴⁴PRO Document WO 166/12075 War Diary of 172 Tun. Co. January-April 1943

¹⁴⁵PRO Document ADM 1/12837. At a meeting of 20 August 1942 the size of the accommodation which would be needed at the Dover CHQ was discussed at an inter-service meeting.

¹⁴⁶*ibid.* These delays were known as far back as October 1942 and a Major Hagon who was present at a meeting on 23 October 1942 said that he would make enquiries as to "whether American unskilled (perhaps coloured) labour could be made available."

¹⁴⁷PRO Document WO199/40 26 June 1942. This document is a collection of papers referring to tunnelling units from 1942-1943

since the only evidence for its existence is that provided by Mr Grove, then the ju must surely be won over to at least a verdict of "not proven".

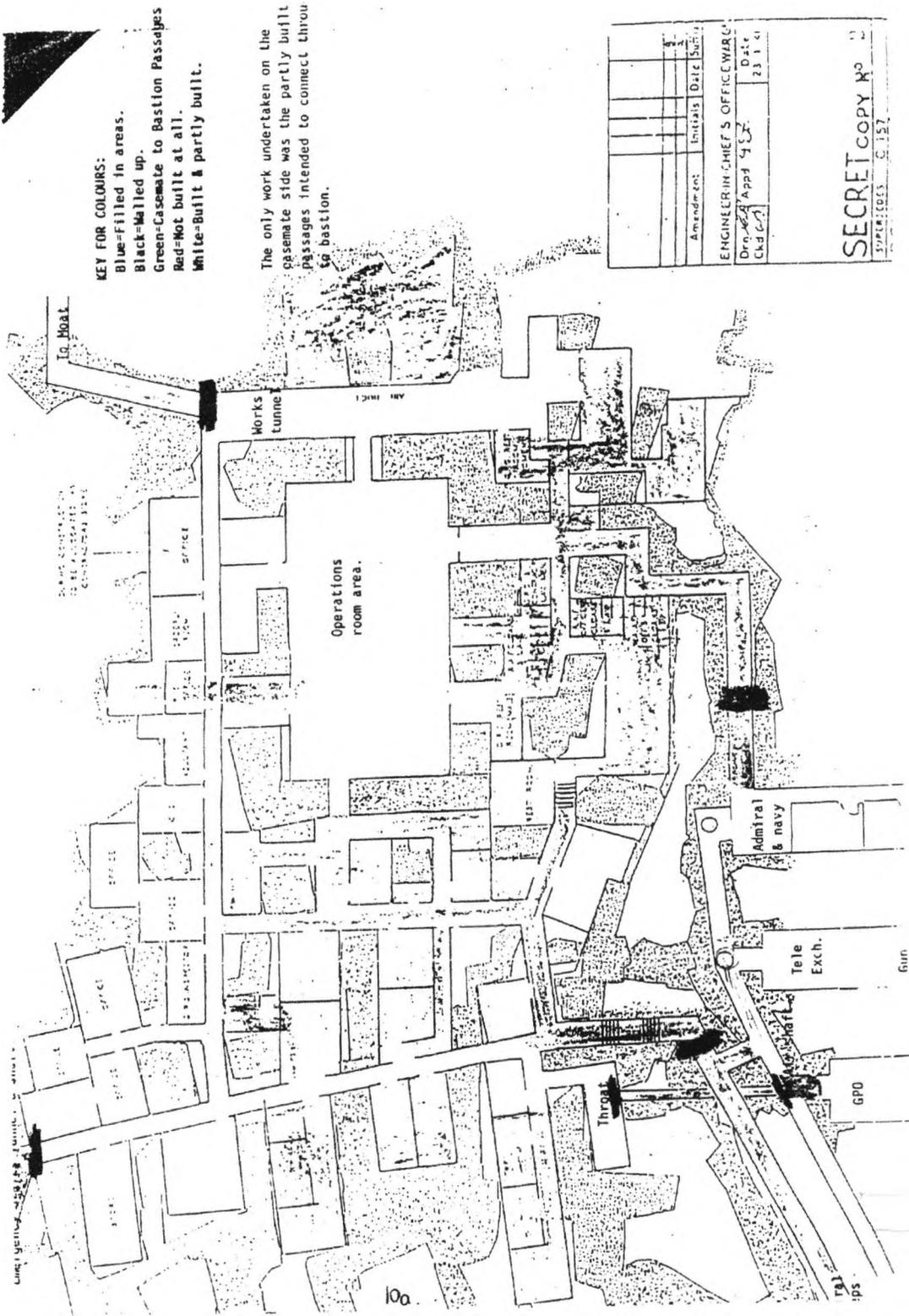


Figure 5: Plan showing 'Bastion' Level (Plan dated 21 January 1941)

In February 1942 South Eastern Command (SECo) did indeed make requests to GHQ for additional tunnelled accommodation in the Dover area.¹⁴⁸ GHQ queried the need for additional underground accommodation "as it is known that there is a considerable amount of tunnelled accommodation in the castle other than that in the actual casemates" and because of this confirmation was "requested that the possibility of using such tunnels for rest purposes have been fully explored as an alternative to providing new tunnels in the casemates."¹⁴⁹ The reply from the Commander-in-Chief of South Eastern Army, Lieutenant-General Montgomery was suitably forthright. He urged that the highest priority be given to the extra tunnelled accommodation at Dover Castle "so that the ninety ATS [Auxiliary Territorial Service] on the staff of CCCA and Garrison Commander Dover may live underground in the conditions of prolonged siege and constant bombing attacks to which this fortress may well be subjected."¹⁵⁰

In Montgomery's view Dover Castle "must therefore be self contained" and if no tunnelled space could be built then the ATS could not be used in this frontier fortress.¹⁵¹ He then went on to link his appeal to that of the Vice Admiral Dover, who wanted similar facilities for the members of Women's Royal Naval Service (WRNS) in the castle. This request for underground accommodation therefore refers to living accommodation and not office space. Its timing does however seem to fit in with the date given in Mr Grove's Contractor's schedule of 4 March 1942 if not that on the plan of 23 January 1941. However, if this scheme is what Mr Grove saw as being Bastion then it got no further than the planning stage for on 14 March 1942 the Chief of the General Staff wrote again to Montgomery to inform him that 171 Tunnelling Company was being transferred abroad and "it is regretted, therefore, that there is now no prospect of a Tunnelling Company being available to carry out work at Dover for a period of some months."¹⁵² The haste with which 171 Tun. Co. was transferred would seem to suggest that the transfer was a convenient way of preventing the work from being carried out. 171 left for the Middle East on 27 May 1942. With 171 Tun. Co.'s transfer abroad this left 172 Tun. Co. as the only remaining tunnelling company in the

¹⁴⁸*ibid.* 23 February 1942

¹⁴⁹*ibid.* 1 March 1942

¹⁵⁰*ibid.* 8 March 1942

¹⁵¹*ibid.* 8 March 1942

¹⁵²*ibid.* 14 March 1942

south of England and it was fully involved in the Fort Southwick project.¹⁵³ The 'Bastion' scheme was therefore not even begun at this time and it remains doubtful if it ever was. The work which was planned but not carried out in the spring of 1942 would therefore seem to have formed the basis for the CHQ which was begun in the summer. In fact the work at Dover was given higher priority than other proposed projects at Folkestone and Tonbridge, but this did not lead to it being carried out immediately.¹⁵⁴

The construction of the CHQ ('DUMPY' level) began in the summer of 1942.¹⁵⁵ The CHQ was intended to provide an area in which the three services could co-ordinate operations in the region. The most demanding operations in terms of co-operation were the 'commando' raids on the French coast, as all three services had to work together and co-ordinate their activities to ensure the success of the operation. The work was carried out by 172 Tun. Co. The records in that unit's War Diary for 1942 are rather scanty and little can be gleaned from them with regards to the progress of construction. An entry for August 1942 stated openly that two sections of the company had been sent to Dover "where work has commenced on an Underground Operational HQ."¹⁵⁶ By the middle of September all but eleven other ranks of Number 2 Section had joined the rest of the Company at Dover, having been transferred from Portsmouth.¹⁵⁷ No other details were forthcoming until November 1942 when work "commenced on two underground wireless stations in the proximity of the Dover HQs."¹⁵⁸ Also in November a detachment from 184 Special Tunnelling Company left Ryde on the Isle of Wight to proceed to Dover for attachment to 172 Tun. Co.¹⁵⁹ This detachment consisted initially of Second-Lieutenant Philips and four men but before the end of the month all of Number 2 Section were in Dover working on tunnelled accommodation. Unfortunately, it is not clear if this work was in the castle but the section remained there at least until the end of 1942.

¹⁵³The Fort Southwick project was reported as having an expected cost of £89,000. Reference in PRO Document WO 199/40 9 May 1942

¹⁵⁴ PRO Document WO 199/40; A letter citing the approval of the Commander in Chief of the South Eastern Army/ Lt. General B.L. Montgomery, for the Dover scheme dated 8 March 1942.

¹⁵⁵ It would seem that 'DUMPY' is either a post war title or a local designation as it was never so referred to during WWII in official documents.

¹⁵⁶ PRO Document WO 166/8105 War Diary of 172 Tun. Co. August 1942

¹⁵⁷*ibid.* September 1942

¹⁵⁸*ibid.* November 1942

¹⁵⁹ PRO Document WO 166/8110 War Diary of 184 Special Tun. Co. 3 November 1942

In 1943 the Canadian tunnellers made a re-appearance at Dover when on the 3rd January the OC arrived to "make a recce of some holes to be drilled..."¹⁶⁰ Reports of detachments in Dover continued until at least the end of April 1943 when on the 25th "Lt Whittaker made a trip to Dover where a check was made on the boring job on castle hill."¹⁶¹ A report earlier in the month mentioned the problems of German shelling on the work in the Dover area. Sergeant Behnsen's report "told of damage and delay caused to the job by German cross-channel shelling" and also that "casualties were suffered by the Royal Engineers there."¹⁶² The work at Dover as far as this unit was concerned was complete by June 1943 for on 4 June a list of the Company's detachments makes no mention of any in Dover.¹⁶³ The closest that the other Canadian Tun. Co., 2nd Canadian Tun. Co., got to Dover would seem to have been some work carried out at Manston Aerodrome in May 1943 by a detachment under Lieutenant Reid.¹⁶⁴ This information on Canadian tunnellers in the Dover area is pertinent because of the rumour, which has become something of a myth, that 'Bastion' was so well sealed up due to the fact that large numbers of Canadian tunnellers had been killed in the collapse of the roof. There is no written evidence available to support this rumour, but it was certainly current among English Heritage staff in 1998.¹⁶⁵ The small numbers of Canadian tunnellers who were ever present in the Dover area, never mind in the castle itself, would seem to preclude against this. However, the fact that Canadian units were indeed present at Dover at least helps to explain why such a rumour may have arisen. The Canadian detachments were only present for relatively short periods of time and were transferred away at short notice. Their disappearance could have been explained by their deaths in a catastrophic cave-in. In fact, given the small numbers of Canadian tunnellers present at any time in Dover, it would seem impossible that such a cave-in had taken many Canadian lives.

In 1943 work continued on the Dover HQ and 172 Tun. Co. was able to report that by the end of January all the work on the Underground Operational HQ and the

¹⁶⁰ PRO Document WO 179/2072 War Diary of No. 1 Special Tun. Co. of RCE

¹⁶¹ *ibid.* 25 April 1943

¹⁶² *ibid.* 8 April 1943

¹⁶³ *ibid.* 4 June 1943

¹⁶⁴ WO 179/2074 War Diary of Number 2 Special Tun. Co. of RCE May 1943

¹⁶⁵ I worked in Dover Castle as a Custodian for six months in 1998 and the history of the tunnels was a subject of much debate amongst the staff.

two underground wireless transmitting stations "was practically completed".¹⁶⁶ Early in February the HQ of the Company transferred to Plymouth to begin work on the underground HQ there, while Number 3 Section and part of the workshop section were left behind in Dover to finish the work there.¹⁶⁷ This situation of the work being "practically completed" continued through March and into April when by the third of the month only ten men were left behind in Dover. Work in Dover was definitely finished by the end of April, which would fit in with the proposed opening date for the CHQ of 1 May 1943. 172 Tun. Co. received its orders to mobilise on 14 April and the members of the company were sent on embarkation leave before they were to be sent abroad on 10 May 1943.¹⁶⁸ This mobilisation order caused some consternation as 172 was the last British tunnelling company still stationed in the British Isles and its presence was integral to the completion of the Plymouth CHQ.¹⁶⁹ The solution found to this problem was to replace 172 with Canadian units. Canadians had been present at Plymouth since January when Lieutenant Ames and ten men were sent there on 27 January to start work on the underground HQ.¹⁷⁰ The work was to consist of 'driving' underground chambers for a HQ and was expected to take three months.¹⁷¹ This particular detachment was seen as having a relatively easy time because "all the mucking out will be done by the English Tunnellers. All our chaps have to do is drill and blast."¹⁷² This enthusiasm for the "mucking out" was no doubt shared by the English Tunnellers!

The RAF's presence in Dover was limited until the beginning of the Second World War. There were several RAF stations in the area, Manston to the northeast and Hawkinge to the west, but Dover itself had no real RAF contingent. The Radar stations, at Swingate, to the east of the castle were of course manned by RAF personnel but it was not until the middle of 1940 that the RAF build-up in Dover began. The RAF's role in Dover was one of co-operating with the other two services but it did not have a lead role. Its main functions were Air Sea Rescue and air support. The RAF initially concentrated its personnel in a new base at Swingate. This was

¹⁶⁶PRO Document WO 166/12075 War Diary of 172 Tun. Co. January 1943

¹⁶⁷*ibid.* 6 February 1943

¹⁶⁸*ibid.* April 1943 & PRO Document WO 199/40

¹⁶⁹*ibid.* Letters.

¹⁷⁰PRO Document WO 179/2072 War Diary of No. 1 Special Tun. Co. of RCE 27 January 1943

¹⁷¹*ibid.* 24 January 1943

¹⁷²*ibid.* 27 January 1943

close to the radar station and had the added benefit of being close to the castle where the other two services were now concentrating their command functions. The RAF did not become a permanent component in the castle until the opening of the CHQ in 1943.¹⁷³ The relative remoteness of the RAF had produced problems in the intervening period, most especially at the time of the 'Channel Dash' when the RAF liaison officer had to summon assistance from Swingate to the castle. It was this particular incident which was most responsible for the creation of the CHQ under Dover castle. Space was always at a premium in the CHQ and the RAF always seemed to be last on the list. The danger to unprotected facilities in the Dover area is well illustrated by the destruction of the RAF's Swingate HQ by shelling in February 1944.¹⁷⁴ The Swingate HQ was also a vital part of Bomber Command's direction finding network.¹⁷⁵ The system as a whole was known as *Oboe*.¹⁷⁶ The Swingate facility would seem to have been a particular favourite target for the German gunners as it was attacked on a number of occasions in 1943; on one of these the shelling continued for twenty-one hours.¹⁷⁷

The surviving military records therefore present a picture of Dover being for most of the war a fortress which might be besieged at any time by German forces. It was also a fortress which was continually being extended and improved. A large percentage of the new accommodation was underground and many of the military personnel in Dover had to serve in this environment for most of the war. Until June 1941 the possibility of a full-scale German invasion of Great Britain through east Kent remained in the forefront of British military thinking.¹⁷⁸ As late as March 1942 General Montgomery felt that Dover might be exposed to very severe assaults and that further tunnelled accommodation should be provided especially for the female personnel stationed in the town.

Churchill shared these fears and as late as July 1943, when the battle of Kursk was beginning, he was very concerned that a German raid was being planned on

¹⁷³ PRO Document Air 29/141 Log of RAF Dover Castle

¹⁷⁴ *ibid.*

¹⁷⁵ PRO document Air 29/168 Log of RAF Station 9000 Swingate

¹⁷⁶ R. Neillands, *The Bomber War* (London, 2001) pp.69-70

¹⁷⁷ PRO document Air 29/168 Log of RAF Station 9000 Swingate 5 April 1943

¹⁷⁸ C. Barnett, *Britain and her Army 1509-1970* (London, 1970) pp.432-4 for a discussion of Britain's strategic priorities at this time

Dover.¹⁷⁹ It may seem incredible that at that late date and with the German military stretched on all fronts that Churchill would express such a concern. However, such was the importance of Dover in the mind of the Prime Minister. His memorandum to the military authorities in Dover expressed his personal concerns about the possibility of a German 'raid' on Dover and the likely consequences should such a raid be successful. The consequences would be on two levels not only would British and Allied prestige be tarnished but also there was the danger of the Germans discovering the extent of allied preparations for what would become Operation 'Overlord'.¹⁸⁰ He was most concerned that the defences of the castle and its HQ should be further strengthened to prevent any such raid penetrating the secrets of the HQ.¹⁸¹ This concern from the highest levels reflected the exposed position which it was felt that Dover occupied. It also demonstrates that German raids on Britain were still considered a likely possibility, even at the very highest level in the summer of 1943.

The military tunnelling projects which were carried out in Dover during the war were undoubtedly well known to the civilian population, the fact that much of the spoil was simply tipped over the cliff did little to hide the fact that tunnelling was being carried out. The details of what went on within these tunnels may not have been known but the fact that the number of military tunnels was increasing was obvious to everyone in Dover. It also would have been obvious to anyone in Calais with a pair of binoculars who looked in the right direction. This set up a very delicate situation within the town during periods of heavy shelling; the town was prohibited from constructing any more deep shelters for civilians while more and more underground accommodation was being constructed deep inside the castle cliff. It also seemed that the military authorities were deliberately advertising Dover's military importance to the Germans and making it even more of a target.

Dover has been, since the time of the Anglo-Saxon kings of England, a very important port. In 1066 it was the next place that William of Normandy took after his victory at Hastings. For the next nine centuries Dover Castle stood as a reminder of

¹⁷⁹ PRO document WO 199/616. Memorandum from Churchill to military authorities in Dover on the dangers of a German raid on the town and harbour.

¹⁸⁰ The plans for Operation 'Overlord' were finalised in July 1943.

¹⁸¹ See below p.54 for reference to Operation "Columbine II" an operation carried out by British commandos to test the castle's defences in February 1944.

the power of the kings of England and also as a warning to other 'would-be' invaders. The castle withstood siege in 1215, was virtually abandoned in the seventeenth century but by the end of the eighteenth century it had been totally remodelled in the most up to date manner to match the cannon of the day. The castle was never totally abandoned throughout its history unlike many contemporary castles. This fact was a testimony to the strategic importance of Dover and the place of the castle within the defences of the port. Dover Castle was to remain an important military base until the 1950s.

Dover was, obviously, a very important naval base since the earliest times, standing as it does such a short distance from the French coast. In the days of sail, vagaries of wind and tide might preclude the direct crossing of the Channel and as the prevailing winds were westerly British ships tended to be stationed to the west in Portsmouth to take advantage of this. In the nineteenth century, with the arrival of the steamship, the crossing became much more direct and fast. This made the need for a strong naval base at Dover all the more imperative as a hostile force might have reached Dover before help could be summoned. An eighty-one ton gun turret was added to the Admiralty Pier in the mid Victorian period to counter the most formidable ships in the French fleet. The harbour was greatly expanded until, it was calculated, that the entire British fleet would have fitted in the harbour, unlikely as the need for this might have seemed. The Castle itself remained the army's responsibility until the start of the twentieth century when the defences of Dover were strengthened yet again. In 1905 a Fire Control (FC) post was added within the castle. This post stands directly above the Napoleonic and Second World War tunnels inside the castle grounds, although it has been much modified from its original 1905 form.

The FC post was used to co-ordinate the fire of the various batteries in and around Dover Harbour for the defence of the harbour from any seaborne attackers. It was constructed on the site of a "former muzzle loader gun emplacement, dating back to the Napoleonic wars."¹⁸² In 1914 the Port War Signal Station (PWSS) was erected over the FC post, having been transferred from the Western Heights. This post was manned twenty-four hours a day for the duration of the Great War. In 1917 its

¹⁸²PRO Document WO 192/192

defences were added to by the addition of a sandbag wall to protect against German air attack. This was about the only type of air raid precaution taken by the military during the Great War. Dover was the home of the Dover Patrol, a vast array of ships of all types, whose purpose was to ensure that the English Channel remained just that. The vessels of the Dover Patrol concentrated on anti-submarine and mine-laying and sweeping operations. This was Dover's prime military function in the war, ensuring that the Channel was kept under allied control. The Naval Headquarters remained in the town itself, and were certainly not relocated to the casemates under the castle at this time.¹⁸³

The FC post was stood down until 1938, when at the height of the 'Munich Crisis', it was put back into service and manned continuously for ten days in September.¹⁸⁴ After the crisis had passed the Navy quickly stood down as many posts as possible and Dover was one victim of this retrenchment. The FC post was called into active service again on 24 August 1939, eleven days before the declaration of war on Germany, which suggested that the Admiralty was not reacting to events in Germany in terms of its mobilisation. The FC post was then manned twenty-four hours a day for the rest of the Second World War. Its defences were improved slowly despite the proximity of the Luftwaffe across the Channel from the summer of 1940 onwards. A concrete blast wall was added to the rear in that year, but only in 1941 was it deemed necessary to place a "large concrete roof over the FC post and PWSS."¹⁸⁵ The PWSS was finally closed down in July 1945. Throughout the Second World War the FC post and the PWSS remained vital cogs in Dover's defences co-ordinating the work of the gun batteries on the cliff tops with that of the HQ within them. Dover became one of the most heavily defended points along the south coast with batteries not just to the east and west of the town but also on the hills directly behind the town.

The Admiralty had no official role within the castle until the twentieth century; prior to this the Naval and Army forces within Dover were kept completely segregated. Troops were kept in barracks and the castle on the high ground

¹⁸³ See below p.45

¹⁸⁴ PRO Document WO 192/192

¹⁸⁵ *ibid.*

surrounding the town. The Navy was concentrated in the port area. This segregation of soldiers and sailors was obviously intended to reduce disciplinary problems in the town. It would seem that until the middle of the twentieth century this segregation continued between the two commands.

It was in 1914 that the PWSS was transferred into the castle and this marked the first direct Admiralty involvement on the site. The FC post was closely tied to the needs of the Admiralty but it was manned by members of the Royal Artillery.¹⁸⁶ Wyborn-Brown suggested that during the First World War the tunnels had been greatly expanded and converted into “a combined Operations Room, mainly in the hands of the R.N. [Royal Navy]; it was from Casemate that the raid on Zeebrugge, under Admiral (later Lord) Keyes, was planned.”¹⁸⁷ In fact no such use was made of the tunnels during the First World War. Apart from the PWSS the Admiralty had no regular presence within the castle. The report compiled by Ramsay, then retired, on the mobilisation of Dover in 1938, included no mention of a need to re-utilise the underground accommodation.¹⁸⁸ The only mention of underground accommodation was for mine storage in caves at the Naval Base.¹⁸⁹ This report was written when the fear of the bomber was at its height and it would seem that at least a mention of an existing bombproof site would have been expected. Instead, Ramsay limited himself to suggesting that a larger house, Arlington House, 11, Eastcliffe, would be needed for the Admiralty's HQ in the town in view of the vast expansion in Dover's naval requirements with the coming of war.¹⁹⁰ This shows clearly naval thinking at the time on the dangers of aerial attack. Despite the advances in aeroplane technology since 1918 the Navy still saw world power in terms of battleships, the aeroplane and submarine were still considered as adjuncts to the ‘ships of the line’ rather than as potent weapons in their own right. As late as 1932 the Royal Navy had supported the complete abolition of the bomber aircraft as the basis of Great Britain's air disarmament plan.¹⁹¹ Ramsay's report was a good example of this orthodox thinking

¹⁸⁶The inclusion of the history of the FC post in the War Office papers suggests that this division continued until after WWII. See PRO document WO 192/192.

¹⁸⁷P. Wyborn-Brown, “The 'Dumpy Complex' at Dover” in *Bygone Kent* Vol. 10 No.8, August 1989. Much of this article is inaccurate and distorts the history of the tunnels.

¹⁸⁸PRO Admiralty (ADM) document 116/4123. Report on Dover Mobilisation 1938

¹⁸⁹*ibid.*

¹⁹⁰*ibid.*

¹⁹¹ PRO Document Adm 116/2826 29 March 1932. This formed part of the Admiralty's submission to the British delegation to the Geneva Peace talks. See above p.23 for discussion of this.

and harked back to the situation which existed in 1914 rather than that which might develop in 1939. The thought that Dover would be bombed, let alone shelled does not seem to have been considered seriously by the Navy.

For those who served in the tunnels during the Second World War the news of the opening of the tunnels to the public in the late 1980s revived many memories and English Heritage received a lot of correspondence relating to people's desires to re-visit the tunnels. The letters of Charles Seyd are particularly interesting as he was on Admiral Ramsay's staff in 1939. He was therefore involved in the setting up of the HQ in the tunnels. He arrived on 28 August 1939 and mentions "the hordes of bats and rats who strongly resented our intrusion".¹⁹² This would seem to suggest that the tunnels had remained unused for sometime prior to that date. He also mentions that the Brown House Hotel was the home of the Admiral in Dover during the early part of the Second World War and it was not until October 1939 that the Admiral actually moved into the castle. He also recalls a direct hit by a shell on the telephone exchange which was at that time located near the cliff face. This certainly belies the story current among Dovorians that the Castle was deliberately spared by German artillery.¹⁹³ This evidence strongly supports the theory that the use of the tunnels as a Headquarters was an evolutionary process. The earliest record that exists showing the layout of a HQ in the tunnels is a map illustrating the "Fortress Headquarters" dated March 1939.¹⁹⁴ As this layout had been revised from a previous drawing of February 1939 it would seem that agreement between the various parties as to the exact division of the accommodation had not been finalised. It is interesting that at this stage that the Brigadier was to have an office in the adjoining tunnel to Ramsay, with a similar view over the Channel. The HQ was therefore intended to be a combined one to the extent that the army and navy were going to be in close proximity to each other. No space was made for the RAF and the other two services operated separately, with no provision for common use of facilities. In early 1939 with military plans for a future war being based on a commitment of land forces to a campaign in Western Europe, it was inconceivable that Dover would be the frontline and that all three services would have to co-operate closely in east Kent.

¹⁹²Charles Seyd letter to Jack Lohman, Exhibitions Officer Dover Castle, 1 May 1990

¹⁹³ That the castle was spared is a truism which still exists amongst Dover's population to this day.

¹⁹⁴Commander Royal Engineers Home Country (East) [CREHC(E)] Drawing no. 1011, March 1939

The first major operation to be planned and conducted from this underground HQ was the evacuation from Dunkirk; Operation "Dynamo". Many reasons have been put forward for the use of the name Dynamo, the favoured English Heritage version, certainly as made clear to custodians in the castle, is that it comes from the dynamo room supposedly located alongside the planning room for the operation. There are two major problems with this proposition the first being that the supposed planning room and dynamo room were not built until 1942 at the earliest.¹⁹⁵ The second is the suggestion that the dynamo room was supposed to be a relic of the tunnels' use in the First World War. As already stated there is no evidence of any use of the tunnels in that war.

As for Operation "Dynamo" itself very little mention is made of the tunnels in any of the official accounts. It has certainly passed into popular mythology that the evacuation was planned inside the White Cliffs of Dover, but there is scant evidence that planning at this stage actually took place inside the Tunnels. Logic would seem to suggest that the Admiral and his staff would have conducted all their duties in the HQ, but unfortunately their written records fail to mention where they were working. Even the Naval War diary for Dover makes no mention of the HQ being located in the tunnels at this time.¹⁹⁶ The diaries are more concerned with actual operations than the running of the HQ itself, as one would expect by their very nature.

Life for those working in the Underground offices and medical facilities in Dover was undoubtedly a new experience and as it was also for the military authorities. Such was the nature of the shift work that many of those working in the tunnels were not able to go out into the sunlight. This became more and more of an issue as the war progressed and the number of staff working in the tunnels increased. By 1942 a sunlight clinic was being considered by the Admiralty because the "General Working Conditions ashore, mostly underground in casemates, cellars and

¹⁹⁵PRO document WO 199/454 shows details on the construction of what is now called the planning room (It is also the room in which the film on Dunkirk is shown during the tunnel tour). They are dated 1942. The National Monuments Record Centre (NMRC) plans, of various dates from the Second World War, only show the supposed dynamo room at the late date of 1945.

¹⁹⁶PRO documents ADM 199/360, ADM 199/405, ADM 199/406, ADM 199/416, ADM 199/417 *et al.*

caves with artificial light cause a certain amount of depression."¹⁹⁷ Sunbeds were eventually laid on for WRNs and ATS by 1944.¹⁹⁸ There is no mention of these being used by WAAF (Women's Auxiliary Air Force) personnel.

Dover was to remain literally in the frontline from the completion of Dynamo until the German batteries in northern France were captured in the late summer of 1944. The underground HQ therefore remained a central part of military life in the port. The tunnels were expanded to include a Hospital ('Annexe' level) in 1941 and in 1943 'DUMPY' level was completed. In early 1942 it was anticipated that the German battle-cruisers *Scharnhorst* and *Gneisenau* would return from Brest to Germany via the English Channel. In such an event the response from Dover would be vital in preventing their passage.

Admiralty records show that the German capital ships had long been expected to make the hazardous passage. Operation "Fuller" was therefore drawn up as a response to this threat.¹⁹⁹ Naval and Air Force units were to be co-ordinated in attacks on the ships. Dover was to be given the task of co-ordinating these attacks. On the day of the passage 12 February 1942 the British forces were taken somewhat by surprise. They had expected the Germans to pass through the Dover Straits under the cover of darkness; in fact the capital ships were to pass Dover close to midday. The British reconnaissance flights missed their departure from Brest and it was not until after the Fairlight radar station picked them up at 00.45 hours that Dover knew they were coming.²⁰⁰ The Vice-Admiral himself was not informed until 11.25am.²⁰¹ Units were hastily moved to their attacking positions but this late warning of the approach of the ships made a successful implementation of Operation 'Fuller' very difficult. The coastal artillery battery at South Foreland was the first unit to engage the enemy at 12.10pm. This action was ordered from Dover HQ in co-ordination with Number 11

¹⁹⁷PRO document ADM 101/610 Medical reports from HMS Lynx in 1942. HMS Lynx was the main naval base at Dover. The coastal force base was called HMS Wasp (ADM 179/515).

¹⁹⁸PRO document WO 244/67 insert dated 21 November 1944, requesting that the ATS staff be accorded access to the X-ray and Sunlight treatment given to the WRNS.

¹⁹⁹PRO document ADM 116/4528 'Fuller' drawn up on 5 November 1941. The original plan was called Operation N.E. (One) and was drawn up by the Office of the Flag Officer Commanding Dover on 14 July 1941.

²⁰⁰PRO document ADM 199/416

²⁰¹PRO document ADM 116/4530

Group, RAF.²⁰² Thirty-three Radar controlled rounds were fired. The Admiralty stated that the results of this action could not be ascertained, while the war diary of the South Foreland battery claimed that “independant (sic) observation from RAF and RN give at least three hits.”²⁰³

The Air Staff Officer Dover, Constable Roberts, was forced to call upon a Flight Officer Kidd from the RAF's Swingate base to assist him in liaising with No.11 Group.²⁰⁴ When the artillery salvoes stopped at 12.45pm, the Fleet Air Arm's Swordfish torpedo aircraft were sent in. This attack was carried out by obsolete aircraft, and without adequate fighter protection.²⁰⁵ The Swordfish attack ended with the complete force being shot down by the defending German fighter. Their commanding officer Lieutenant-Commander Esmonde gained a posthumous Victoria Cross.²⁰⁶ By 13.12 hours the Radar plot in the Dover Operations room faded out and control of the operation passed to the Nore Command. *Scharnhorst*, *Gneisenau* and *Prinz Eugen* avoided the attacks of the British destroyers, which had been ordered into position by Dover earlier in the day, and safely reached port in Germany on the following morning.

The 'Channel Dash' as it became known was a huge propaganda, if not a military, defeat for Britain. As the Royal Navy had proved incapable of defending its own home waters and no really credible attacks had been launched by either it or the RAF, a Board of Enquiry was drawn up.²⁰⁷ The Bucknill Committee, as it became known, took evidence from all the major figures involved in the implementation of the operation, including Ramsay and various members of his staff together with the RAF officers present in the castle operations room on that day. The report concentrated on the air and naval attacks and it was noticeable that no mention was

²⁰²PRP document AIR 15/386- report by Air Staff Officer, Dover J. Constable Roberts on the events of 12/02/42

²⁰³cf. PRO documents ADM 199/416 and WO 192/204

²⁰⁴PRO document AIR 16/899 Kidd's report on the breakout. This essentially provided a negative view of the actions taken on that day. Discussion with Jon Iveson of Dover Museum has revealed that Kidd's negative stance may have been caused by his desire to resign his commission and stand for parliament.

²⁰⁵The six Swordfish aircraft of No 825Squadron of the RNAS were the first aircraft to be made ready to attack the German ships, despite them being elderly biplanes.

²⁰⁶Of the 18 airmen involved in this attack only 4 survived. This represented losses of over 75% in aircrew and 100% in aircraft. During the Second World War losses of over 5% on Bomber Command operations were considered to be unacceptable.

²⁰⁷PRO Document ADM 1/11782

made of the Coastal Artillery's contribution.²⁰⁸ The report was censorious of the actions taken but obviously did nothing to hinder the career of Vice-Admiral (VA) Ramsay who would become Allied Naval Commander for "Overlord".²⁰⁹ King George VI asked for a copy of the report and Churchill in the Commons put a brave face on the events by stating that the three ships were better in Germany than Brest.²¹⁰

In early 1941 the Flag Officer Commanding (FOC) Dover, Bertram Ramsay, had reported that he was quite incapable of stopping enemy forces in the Channel. The naval forces at his disposal were quite inadequate and he was reliant on the RAF. However, there was no organisation between the two services to co-ordinate their activities.²¹¹ This situation was soon remedied as the Dover War Diaries testify.²¹² Ramsay's report on the 'Channel Dash' in particular praised his RAF liaison officer Constable Roberts.²¹³ It may have been that the debacle of 12 February 1942 was the spur to provide more spacious underground accommodation in the Castle HQ, so that the operations of the three services could be properly co-ordinated. Certainly by October 1942 there were "tied land lines from Dover to No.1 Fighter Group, No.16 Coastal Group, HQ Fighter Command and (via 16 Group) HQ Coastal Command."²¹⁴ As late as April 1944 the VA Dover was reporting that he needed "to transfer the Operations Room from the Casemates, Dover Castle to the Dover Combined HQ as the present Operations Room is too small for the purpose."²¹⁵ This illustrates that even a year after the opening of 'DUMPY' the accommodation problems had not been dealt with, such was the demand for underground facilities in the Dover area.

For the rest of the war the Dover HQ became responsible for combined operations which originated in the Dover area. Many of these were commando style raids on the French coast. These raids began as early 1941 when Operation "Chess"

²⁰⁸WO 192/78 reports on the activities of the Coastal Artillery Operations Room. There is supposed to be a trace of fall of shot for the day's firing, unfortunately it is now missing.

²⁰⁹PRO document ADM 116/4528, ADM 116/4529 & ADM 116/4530

²¹⁰PRO document ADM 1/11782

²¹¹PRO document ADM 199/783

²¹²cf. PRO documents ADM 199/405 and ADM 199/406. These two war diaries between them cover 1941 and show evidence of increasing co-operation between the services, even though on the day of the 'Channel Dash' this co-ordination was lacking.

²¹³PRO document ADM 199/416

²¹⁴PRO document AIR 15/220

²¹⁵PRO document ADM 179/471

was launched on Sunday 27 July 1941.²¹⁶ This was the first Combined Operations Department mission to France. This particular operation, in the Amblteteuse area, was a something of a disaster; the landing force was fired upon and the commandos were stopped by barbed wire. This particular type of operation was repeated on 30 August 1941 and was code-named "Acid Drop". This time a force of seventeen men was to be landed in an Assault Landing Craft (ALC), it was marginally more successful than its predecessor. An associated operation was "Gideon" in which German aircraft were to be lured to attack a supposedly disabled destroyer in mid-Channel, only for the German aircraft to be 'bounced' by superior RAF forces. The first "Gideon" was scheduled for 25 July 1941; it was foiled by thunderstorms preventing any flying over the Channel. Operation "Iliad" was to be a repeat of "Gideon" on 30 August 1941.

Such operations continued until at least D-day. Records exist of Operations in November 1943 planned in the "Office of the FOC Dover."²¹⁷ The aim of these raids was to gain information and if possible to bring back prisoners. The raids were repeated in January 1944 by units from Number 10 Commando, Number 4 Commando as well as from the United States Rangers.²¹⁸ As late as May 1944 operations were being planned, the intention of each was, to "obtain a beach mine from the enemy defended coast, to obtain information of the nature of beach defences, and to withdraw unobserved."²¹⁹ These missions were termed "Tarbrush" and on the tenth mission the military force commander Lieutenant Lane of The Buffs and a sapper officer were cut off by a German patrol and were not found despite attempts to locate them.²²⁰ Dover's role in the D-Day operations was necessarily limited by its geographical position. Operation "Neptune" was concerned with the supply of the Normandy landings and it began in May 1944. However, it was from Dover that the covering forces in the eastern Channel were to be controlled. The Vice-Admiral, in command in Dover at this time, was H D Pridham-Wippell. The coastal artillery, directed from the tunnels and the FC post, was also very active against the German evacuation convoys steaming from Boulogne in late summer 1944.²²¹

²¹⁶PRO document ADM 199/406

²¹⁷PRO document ADM 179/317 The raids were code-named "Hardtack", "Easy", "Nan", "Sugar" and "Manacle".

²¹⁸PRO document ADM 179/396

²¹⁹PRO document ADM 179/401

²²⁰*ibid.*

²²¹PRO document WO 192/78

Prior to Dunkirk the underground accommodation at Dover was seen as a useful adjunct to the surface facilities. The army and navy commanders were content with their limited underground accommodation and no plans were made to enlarge it. The summer of 1940 changed all the preceding priorities and extra underground facilities topped all the military shopping lists in Dover. Tunnelling units from all over the British Isles were transferred into Dover to turn the town's military establishments into an underground complex which was unequalled anywhere else in the country. Where other towns might have one underground headquarters and communications centre, Dover had a number of such centres not just in the castle but also on the western heights and also to the east at Swingate. Had the Germans gained air superiority at any stage over the Channel then Dover would have been a most tempting and easy target. Dover was essential as a Headquarters for all three services in the region and as a result it was necessary to take steps to protect the command structure. In the summer of 1940 there were neither the men nor the equipment to be spared for such work as coastal defences had to be created and gun emplacements dug. It was 1941 which saw Dover's underground facilities expand with the excavation of the Underground Dressing Station. This came into operation early in 1942. 1943 saw the creation of the underground Combined Head Quarters within Dover Castle. The expense and the manpower showered on these projects showed how important they were.

In the minds of German military strategists the Pas de Calais area was far more important than the rest of the northern French Coast, and similarly Dover was at the centre of British defensive thinking. The Germans could not conceive of a sustainable attack on *Vestung Europa* at any point other than the Pas de Calais. Dover harbour offered a similar tempting first target for the invaders and so Dover was extremely well defended, by British standards, even in 1940. These defences were improved throughout the war by a military which was conscious that, if a full scale German invasion was becoming increasingly unlikely, the possibility of a raid to disrupt allied invasion preparations remained. Had such a raid on Dover been successful then it would have become apparent that allied preparations were not quite what they seemed and Dover was not the embarkation port for the invasion force. In July 1943 a memorandum on the subject of Dover's defences or lack of them was

issued.²²² The driving force behind this memorandum was none other than Winston Churchill.²²³ Churchill was very concerned that Dover's defences should not be compromised both for reasons of national prestige and also because information 'gleaned' in a raid might compromise the allied invasion plans. In 1943 and 1944 operations designed to test the effectiveness of the defences of the town were carried out. In February 1944 during one such operation, "Columbine II", a small number of Royal Marine Commandos managed to penetrate the defences and gain access to the CHQ Signals Office; the very heart of the HQ.²²⁴ The defences were tightened after this.²²⁵ A raid on Dover would have achieved little militarily but would have alerted the Germans to the allied deception as well as being a morale boost for them. By 1941 Dover was not just concerned with defence and the raids on the Germans in the Pas de Calais were amongst the first offensive actions undertaken from Britain. The raids were small in scale but thought to be extremely useful for morale. The frequency of these raids increased as the war progressed and were useful in maintaining German anxieties about the security of the Pas de Calais. The importance of secure underground accommodation in Dover remained one of the military's priorities even after D-Day, as through operation 'Fortitude' the fear of a second allied invasion force massing in east Kent remained. This fear was enough to prevent the Germans reinforcing their troops in Normandy and thereby greatly speeding the allied consolidation there. Underground accommodation can therefore be seen to have been essential to the military's war in Dover from 1940-1945. It had already been found to be essential by many of Dover's civilian population as long ago as 1917.

The extra underground accommodation provided in Dover during the Second World War was extensive but was unable to cater for all those seeking to use it. The Balloon Barrage units were seeking underground accommodation from the time of their arrival in Dover but were unable to be facilitated. The underground accommodation was indeed being used to its full potential and many of the support staff in Dover were leading lives that cut them off almost completely from sunlight, especially in the winter months. The military authorities had moved from a position in the First World War of treating the tunnels available to them as surplus to

²²² PRO document WO 199/616

²²³ *ibid.*

²²⁴ PRO document WO 244/67. 23 February 1944.

²²⁵ *ibid.* See papers 64, 65 & 66 within this document.

requirements to a situation in 1940 that saw them as indispensable to the running of Dover's defensive and offensive capabilities. Dover was not the only military target for the Germans in east Kent but it was a vital combined HQ where all three services were able to interact with each other. Both Canterbury and Folkestone also had pre-war military bases in or near them. However, Dover's port facilities made it of greater strategic importance and as such it was a vital cog in the military plans of both sides in relation to south east England.

The Second World War saw a flurry of tunnel construction that was unsurpassed in the history of the town and its defences. While medieval tunnellers might have dug a mile of tunnels, and the Napoleonic tunnellers a further two miles throughout the town, their twentieth century counterparts added four miles of underground accommodation. The tunnelling work carried out by the military from 1941 to 1943 saw Dover's military facilities transformed so that all the key centres were located underground and therefore safe from aerial and shelling attack. Dover had initially been termed 'Hellfire Corner', by the British press, in 1940 for the warmth of the welcome given to German aircraft by its anti-aircraft defences. The name would stick because of the level of attacks on Dover, the military had certainly proved how seriously they took the threat to the area but only when the threat had reached the Channel Coast of northern France. The military tunnels in Dover were not a 'white elephant'; they were for the duration of the war a veritable hive of activity safe from German attack. They were also a continuation of a type of military accommodation which had been in use for over one hundred and fifty years. Dover's military personnel had been amongst the first in Britain to use underground accommodation on a large scale, during the twentieth century the people of Dover would learn of the importance of such accommodation at first hand.

Chapter 2: Dover's Caves and Tunnels in World War One: The Genesis of the Town's 'Bunker Mentality'

Dover at the start of the twentieth century was in many ways not very different from descriptions which might be made of the town to-day at the start of the twenty-first century. Michael Winstanley in *Life in Kent; at the turn of the century* stated that Dover "is usually portrayed as a relatively prosperous but not highly industrialised town, with a castle, a military presence, some seaside resort facilities and above all a bustling cross-channel traffic."²²⁶ (See p.65 for a map of the town). All but the first of these criteria are met to-day, though the prosperity or lack of it may be coloured more by the media's portrayal of the refugee problem than the actual situation. However Dover, at the start of the twentieth century, was in a peculiar economic situation in that the cross-Channel traffic brought income. This income was not widely distributed. The cross-Channel traffic was highly sought by all the ports in Kent, as it brought with it not just financial reward but also prestige. Before the coming of air travel everyone journeyed to Europe by ship and the ports vied with each other for the lucrative trade. Any port which could command the cross-channel traffic would be the entry and exit point for the rich and the famous, Dover came the closest of all the ports to achieving this. A 1905 Board of Trade report stated that Dover had the highest retail prices of any town in the country and that included London. Groceries in Dover were seven per cent higher in price and coal a massive seventeen per cent higher than London prices, while meat was the only commodity which was fractionally lower in price.²²⁷ The cost of living in Dover was only brought below London's level by the relatively low rents. This situation would obviously have contributed to the impoverishment of the poorer elements in Dover society and a visitor at the time thought that Dover was "remarkable for the number of soup kitchens" around the town.²²⁸ Therefore even before the outbreak of the First World War the civilian population of Dover was under severe economic pressure, pressure which might tend to fragment society. However, the outbreak of the war was supposed to be a time of national unity and Dover it would seem from the newspaper reports of the time was swept up in this. In this chapter we shall see how this unity

²²⁶M. Winstanley, *Life in Kent; At the turn of the century* (Folkestone, 1978) p.188

²²⁷*ibid.*

²²⁸*ibid.*

fared under the pressures of mounting casualties on the western front, air raids and food shortages. How engrained did Dover's 'bunker mentality' become?

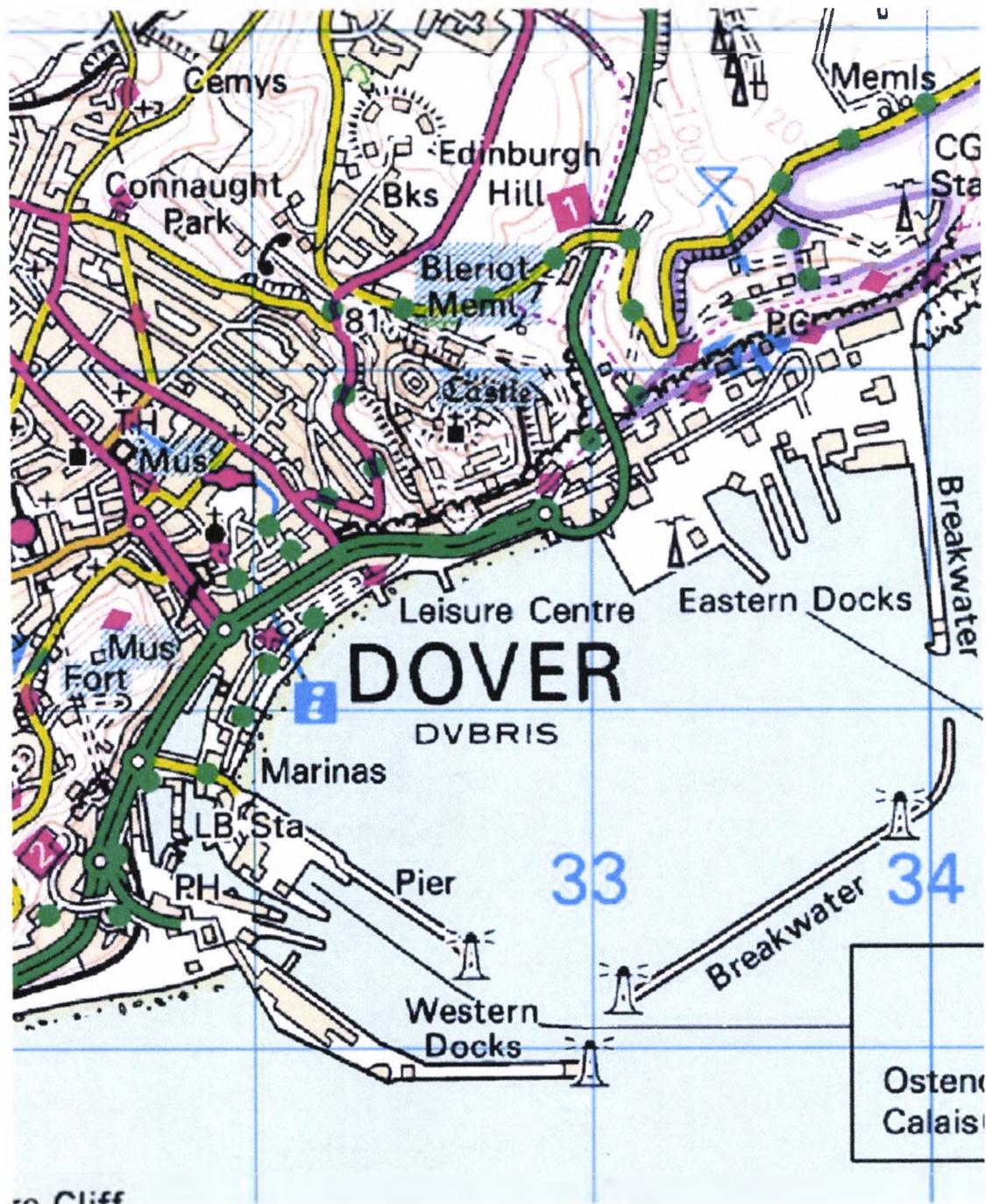


Figure 6: Map of Dover in 2004 (Courtesy of the Ordnance Survey of GB and NI)

Dover in 1914 was the second largest Municipal Borough in Kent with a population of forty-three thousand six hundred and forty-five, ranking only below Gillingham in the county with its population of fifty-two thousand, two hundred and

fifty-two.²²⁹ This population was maintained by the cross-channel traffic as already mentioned and also in supporting roles for the military presence in Dover. Dover as we have seen had since the time of the Norman Conquest been a garrison town. Until the Napoleonic Wars the garrison was concentrated in the castle to the east of the town but the fear of invasion at the start of the nineteenth century caused fortifications and barracks to be built on the high land surrounding the town. The Western Heights came to be dominated by the Citadel, the Drop Redoubt, the Grand Shaft and associated works. While to the north and east the new barracks and batteries completed the defence of the town's landward approaches. The defence of the harbour was obviously of vital importance to the admiralty and to this end a new defensive scheme was drawn up in 1905, no doubt as a result of the increasing strength of the German Imperial Navy and the deteriorating relationship between the two countries. The new enlarged and improved harbour was finished in 1907 and opened by the then Prince of Wales who would later become George V. This harbour was designed to accommodate battleships, destroyers and submarines. Dover was classified as a harbour of refuge and therefore had to be able to take any size of craft irrespective of the weather. The changing political climate, in which the Anglo-French *Entente* had been sealed, had seen the battle squadrons sent north to Scottish bases to face the German fleet across the North Sea. In 1914 therefore Dover was left only with destroyers, there being seemingly no need for any larger vessels to defend the area. Protection for the harbour was offered by batteries mounted on the cliffs to the east and west. During the war more guns would come to be mounted on the harbour walls themselves. Doverians therefore had every right to feel as secure as any British subject, protected as they were by the combined might of their own garrison, the '6th Destroyer Flotilla' under Captain C D Johnson, and these artillery batteries. Unfortunately, the prospect of aerial bombardment was not foreseen and in August 1914 Dover boasted only one anti-aircraft gun, a twelve pounder and no searchlights.²³⁰ These deficiencies were hardly a major concern for the townsfolk of Dover buoyed as they were by the prospect of a short war and the sight of the garrison marching off to war. However, it was from the air that Dover would receive its

²²⁹*Kelly's Directory of Kent, Surrey and Sussex 1915* (London, 1915) p.238 for Dover's population figures and p.317 for Gillingham. All figures were taken from the 1911 Census.

²³⁰*The Dover Express, op. cit.* p.3

greatest trial over the next four years, a trial that would tax every man, woman and child who remained in Dover.

Dover had early connections with man's experiments in powered flight and it was near Dover in 1909 that Bleriot landed after his pioneering cross channel flight. Britain was no longer an island that could be defended by the Royal Navy alone, for now it was possible to reach Britain through the skies. However, the full significance of this change would only become apparent during the First World War. Dover soon gained air stations of its own; the first was Dover's Royal Naval Air Service (RNAS) station adjacent to Marine Parade. Others soon followed; nearby Capel-le-Ferne hosted an airship station and the Guston Road Aerodrome above Dover was equipped with a dozen aircraft. The August Bank Holiday Monday on the eve of war saw crowds gather on the Dover sea front and the sight of aircraft of the Royal Flying Corps overhead en route to Swingate and eventually France must have heartened the crowds below. It would be almost another three years before the Royal Air Force would be able to effectively counter the threat to Dover from aerial raiders. Without any form of early warning system the advantage would remain with the attackers. Dover was so close to the German air bases in Belgium that no indication of an attack would be available until a warning system was put in place.

Throughout the First World War Britain there existed a system of system of state censorship but alongside that there was also a system of voluntary press censorship. This voluntary system dated back to the Crimean War. In that war the press and military had been at odds. The military resented Russell's reports on their handling of the war.²³¹ This mutual mistrust existed between the military and the national press until the First World War. However, the relationship between the local press and the military units based in their towns was generally good.²³² Since the mid-nineteenth century the growing reputation of the military in British life meant that the local relationship between the military and the press was generally positive. From 1914-1918 the actions of the military would impact directly upon the lives of the nation's towns. In the case of Dover this would involve not just issues such as conscription but the physical defence of the town from attack. Local press comment

²³¹ W. H. Russell was the Correspondent for *The Times* in the Crimea.

²³² See above p.21 for an example of this in Dover.

on the success of this might have been expected to change this relationship but as we shall see it remained strong throughout the war with press criticism being directed at local and national politicians who were held to be at fault rather than the military.

The main news in the local newspapers in the last week of July 1914 was that Henry Sullivan, from Lowell, USA was still planning to swim the Channel. By the end of the year, it would be the possibility of Germans crossing the Channel that made the news. Dover would be within the sound of the guns on the Western Front, from the time that the trench lines solidified in late 1914. Most of the Belgium coastline was in German hands along with the ports with which Dover had had regular links in the pre-war years, most notably Zeebrugge and Ostend. Places which had been easily accessible by a day trip from Dover in July 1914 were now in enemy controlled territory and the fear of an invasion became a concern for many of the people of Dover. The hysteria which had grown up around the likelihood of a German invasion force now had a foundation in fact. The Germans now controlled a stretch of coastline close enough to make a surprise attack a possibility.

Dover was not originally an embarkation port for the British Army but as 1914 drew to a close the importance of the port had increased beyond all expectations. The German advance into Belgium had shifted some of the naval focus from the North Sea to the Channel and the need to protect the troop and supply ships which had to cross the Channel on a daily basis meant Dover became a vital cog in the British war machine. This importance led to Dover being classified as a 'fortress area' the announcement being made to the population via the local press and posters within the town. In essence this meant that the entry and egress of civilians were closely monitored and that the town was surrounded by a line of fortifications on the landward side. The entire south coast became a prohibited area for enemy aliens; the fear of espionage was ever present. In fact the British Intelligence services had managed to arrest twenty one of the twenty two known German spies in Britain within a few hours of war being declared.²³³ The defensive line would of course have been a deterrent to any other spies intent on gaining information on Dover.

²³³ L. Sellars, *Shot in the Tower* (Barnsley, 1997) pp.5-7

In the autumn of 1914 the greatest fear in the minds of all eastern and southern coastal towns was not attack from the air but rather bombardment followed by an invasion from the sea. In the years before the war the strength and efficiency of the Germany Navy had become known all over Britain. In part this knowledge was made known to the public by journalists and politicians who were supportive of increased spending on the Royal Navy. The reports made on the strength of the German fleet were sometimes exaggerated in an effort to secure public support. By 1914 the strength of the German fleet had become formidable and attacks and even invasion seemed possible. Novels and articles in the press had popularised these thoughts in the public consciousness before the war began and the possibility of invasion was known to everyone. Fears were obviously strongest along the east coast as this was the area closest to the main German naval base at Wilhelmshaven. The rapid German advances to the Channel coast left Dover in fear of the arrival of naval forces from ports where once Dovorians had awaited the arrival of ferry services. Dovorians, therefore, came to see their position as not being as secure as it seemed in the heady days of August 1914 when the BEF and the Royal Flying Corps (RFC) had left for France. The German raid by the battle-cruisers of the *Hochseeflotte* on Yarmouth on 3 November 1914 showed that almost total surprise could be achieved in such raids. The raids which followed on Scarborough, Whitby and Hartlepool on 15 December all raised the spectre that Dover, only seventy-two miles from Zeebrugge and sixty-two miles from Ostend, both German held, might be next.²³⁴ However, despite the alarm in the local newspapers, in which editors and correspondents railed against the Government's inefficiency, it would be two years before a German naval force of any strength made its appearance in the English Channel.

The December attacks on the Yorkshire towns caused *The Dover Express* to issue a warning to its readers entitled "What to do in case of Bombardment".²³⁵ In the case of a raid civilians were urged to go underground to basements or cellars, and not to follow the example of the inhabitants of Scarborough and Hartlepool and gather on the sea front to watch the raiders. Heavy casualties followed when the shelling

²³⁴ The raid on Hartlepool, the only defended town of the four, showed that the coastal artillery could be effective with four hits being scored on the German battle-cruisers during this particular raid.

²³⁵ *The Dover Express* 25 December 1914

began.²³⁶ The advice was couched in terms likely to appeal to even the most bellicose of Doverians; "There is no cowardice in men, women and children thus acting, for it is only the same thing as all soldiers do during heavy artillery fire".²³⁷ It was the latest news in this edition of the newspaper which heralded the start of Dover's trials. On Christmas Eve 1914, the day before the only occasion on which it would truly be 'all quiet on the western front', Dover received an early Christmas present in the shape of a bomb dropped by a German aircraft.

Dover harbour had been attacked four days previously by a German aircraft but the bombs fell harmlessly into the sea.²³⁸ The raid on Christmas Eve was therefore the first raid in which an air bomb fell on Britain.²³⁹ The damage was not severe as the bomb fell in the back garden of a house in Leyburn Road at 10.45am. It left a hole four or five feet deep and six to ten feet wide according to the reports in the local press.²⁴⁰ A greenhouse was blown down and windows of the St. James' rectory were smashed. Mr J A Banks, a gardener, was blown out of the tree but was not severely hurt; he was Britain's first casualty from this new form of warfare. The German seaplane escaped unmolested. *The Dover Express* stated that "Dover remained cool under the attack, but, as a matter of fact, it was quite a considerable time before it was known what had really happened".²⁴¹

This new form of attack was not bad news for everyone in Dover and the town's insurance companies were quick to take positive action. At the end of 1914 Messrs. Worsfold & Hayward advertisements in the local press promised insurance for all risks, by the first edition of 1915 and the first to go to press after the air raid the wording was now changed to "Insurance of all kinds, including Bomb and Full War Risks".²⁴² Other insurance companies followed suit with their own similar advertisements. By February the rates for this new type of insurance were being

²³⁶ The total civilian casualties suffered by the three towns on 15 December 1914 were one hundred and twenty-two killed and four hundred and forty-three wounded- *ibid*.

²³⁷ *ibid*

²³⁸ The pilot on this occasion, a Lieutenant Caspar, was awarded a bounty of £25 from a Herr Ernst Schafer for his achievement, according to *The Dover Express* 22 October 1915.

²³⁹ This was commemorated by a plaque placed on a building close to the garden on 16 February 2000 by the Dover Society.

²⁴⁰ *The Dover Express* 1 January 1915

²⁴¹ *ibid*.

²⁴² Cf. the advertisements in *The Dover Express* editions 25 December 1914 & 1 January 1915.

published by Messrs. Worsfold & Hayward. A premium of between 5s. and 15s. was charged against the "peril of the air during the period of the war".²⁴³ It was another company of Messrs. Boyton & Son which had the satisfaction, or bad luck, of making the first payment for damage inflicted by hostile aircraft in England. They were proud enough of the fact to make sure that it was made known in *The Dover Express* of 5 February 1915 when an article was carried on the payment.²⁴⁴ As this was a payment made for the damage suffered in the Christmas Eve 1914 air-raid it was not for a particularly large sum. Larger payments would follow.

This raid did cause severe confusion in the town, not because of the extent of the actual damage but because no one was sure what had caused the damage. It was only later that it was established that it was a bombing raid. The single aircraft was seen by relatively few people and the whole event was treated as something new and exciting in the war rather than as a threat to life and limb. The main worry gripping Dover's newspapers in early 1915 was the number of deaths which was occurring due to the darkened conditions then prevalent in the town. A total blackout had not been imposed, as it was simply not thought to be necessary. Lower lighting conditions were advised; most street lights were extinguished and thick curtains and blinds were to be used to obscure all domestic lights. Again it would seem that this was because of fear of attack from the sea and not from the air. The harbour had been the first area to be placed in 'black out' conditions and people were quite simply falling into the sea from the piers. Throughout 1915 newspaper editorials would hammer home this message and eventually the edges were painted white and railings put up and so the Dover press's first battle of the war was won.

It was February 1915 before the official response to the air raids was published; it appeared in the local newspapers in the form of a "Poster for Identification of Planes" and a communiqué from the Mayor and the Garrison Commander. The advice given in the poster stated that "Should hostile aircraft be seen, take shelter immediately in the nearest available house, preferably in a basement and remain there until the aircraft have left the vicinity."²⁴⁵ This advice certainly

²⁴³ *The Dover Express* 5 February 1915.

²⁴⁴ *ibid.*

²⁴⁵ *The Dover Express* 12 February 1915

seems to paint a picture of a united town in which every door was open to passing strangers. It shall be shown that this advice was not followed in either respect for people were unwilling to allow strangers to gain entrance to their homes and many still wanted to see the aircraft above their heads. The various silhouettes shown in the poster set out to identify the differences between British and German aircraft and so obviously one should identify the aircraft when spotted and then decide whether it was appropriate to take cover or not. As we shall see for a long time afterwards it was thought more appropriate to gather and watch the 'action' rather than take cover.

The communiqué of 23 February 1915 presented a different view as it announced the coming of the air raid syren (sic) to Dover and the world.²⁴⁶ A steam driven siren was installed at the electricity works, the warning of an air raid would be four short blasts followed by one long blast.²⁴⁷ It had taken two months to implement this early warning system, and while it gave some warning to the townspeople of impending attack it became more of a call for them to take to the streets rather than the basements and cellars as the official communiqué advised; no doubt with copies of the poster for the identification of planes clutched in their hands. However the communiqué was prefaced with the fateful phrase that a "hostile attack on the town is not anticipated."²⁴⁸ This may have gone some way to calming the anxious inhabitants of Dover but it did not show much thought about future military developments in the first 'total war'. The next aerial 'action' over Dover came on 3 May 1915, and things did not quite go as the authorities might have hoped.

An 'attacker' was spotted off the coast; the siren at the electricity works was sounded and the anti-aircraft guns on shore and in the ships in the harbour opened fire. So far all had gone well, except that the majority of the town's population rushed down to the sea-front to get a better view. In the words of *The Dover Express* "the scene was not unlike that on the day Latham tried to fly the Channel."²⁴⁹ The guns themselves fired for a full five minutes until the aircraft were out of sight and it was fortunate that they were not firing over the town as the casualties from falling

²⁴⁶ The press at the time used the spelling "syren" instead to-day's "siren". I have used the old spelling on this occasion but will return to the modern spelling in future.

²⁴⁷ *The Dover Standard* 25 February 1915

²⁴⁸ Communiqué from the Mayor, Mr Farley, and the Garrison Commander Brigadier-General Crampton in *ibid.*

²⁴⁹ *The Dover Standard* 7 May 1915

shrapnel would have been severe indeed.²⁵⁰ The exhortations to take to the cellars were forgotten in an instant but it didn't really matter because the aircraft was French and had two English officers on board. French aircraft were not illustrated on the official identification poster, which would seem to have been a potentially hazardous omission for those living on the south coast as well as for the French airmen. A certain amount of confusion occurred. It was fortuitous that the gunners in this case did not hit their mark. The local press was heartened by the "promptness with which they [the gunners] got to work."²⁵¹ The hope was that the gunners might hit something when it really mattered.

The excitement aroused by this display obviously carried over for the next two weeks as Dover was about to be attacked by a Zeppelin airship for the first time. In the early hours of Monday 17 May, a cold and clear night according to the press accounts, a Zeppelin came over East Kent after an initial attack on Calais. Ramsgate and Dover were attacked on the English side of the Channel, with Ramsgate suffering the greater damage and the town incurred the one fatality of the attack. John Herbert Smith was killed by a bomb striking the 'Bull & George Hotel' in Ramsgate. A coroner's court later found the Kaiser guilty of murder. A decision which may seem slightly illogical, but which obviously reflected the personal nature which the attacks on one's town engendered in the population. In Dover the attack in fact did no damage at all. The twenty-three bombs dropped which had been intended for the town in fact fell in Oxney Wood. However, the alarm was thought to be so severe that at the electricity works someone took the decision to cut all power to the town. This was the first and only time during the war that such action was taken.²⁵² However, as the town's street lighting was still gas powered the effect of cutting off the electricity would have had only a limited effect on the town's visibility from the air. The danger of an unexploded bomb did not deter souvenir hunters, who removed all the bomb fragments from the wood before the police arrived; the war and bombing were still fun for some.

²⁵⁰In the Second World War British anti-aircraft artillery killed more British civilians than German aircrew. See Calder, *op. cit.* p.168

²⁵¹*The Dover Standard* 7 May 1915

²⁵²*The Dover Express, op. cit.* p.16

The Dover Express of 21 May 1915 was the first edition after this raid and in it there was an article entitled "Reducing the Dover Lighting". The article went to great lengths to reassure the public that this was to do with the need to "economise" rather than being an air raid precaution. The lighting of the town was now to become a major issue. The press moved from their previous stance of worrying about casualties in the harbour caused by low lighting, to one in which the inordinately high level of lighting in the town was the major problem. The reason given always being economic, but this may only have been part of the reason behind the change. Lower levels of lighting would mask Dover more effectively from aerial raiders, but it was believed that the town's people would not react well to the fact that the danger was believed to be so severe that the lighting levels would have to be drastically cut. Throughout the spring and early summer of 1915 the council was forced to engage in discussions with the gas and electric companies to re-negotiate their contracts, so that the lights could be turned out. Prior to these discussions the street lights were still lit but literally blackened out. The townspeople were therefore being forced to pay for lights which they could not see and which might cost them their lives. *The Dover Standard* summed up the situation on 22 May with an editorial piece entitled "Useless Lighting".²⁵³ The main obstacle with respect to getting the street lights extinguished was the town's gas company's reluctance to renegotiate its contract. This was finally resolved in the summer of 1915 when near 'black out' conditions were imposed on Dover. New regulations had been issued by the Secretary of State in early April but Dover had been slow to implement them. Dover would now embrace them wholeheartedly, or at least the town's authorities would, for the number of prosecutions under the lighting restrictions began to rise. On 13 August 1915 a new order was issued by Brigadier-General Grogan, the Fortress Commander, and Mr Farley, the Mayor, on the subject of lighting. All street lights were to be extinguished by 9.30pm; this superseded the earlier order of 25 February 1915. The times for lights out were first published in 3 September 1915 edition of *The Dover Express*. They were to become a feature of Dover life for the next three years, and must have helped to increase the feeling of security of the townspeople but they were also a constant reminder that Dover could not escape the war. Doverians were now involved in a war in a way that past generations could never have been.

²⁵³ *The Dover Standard* 22 May 1915

The first Zeppelin 'airship' raid on England took place on 19 January 1915 and the last on 12 April 1918. Targets ranged from coastal towns on North Sea coast to East Anglia, London and the South East. The first towns to be attacked were King's Lynn and Yarmouth. During this period a total of fifty-one raids were mounted in which 557 people were killed and 1,358 injured. The raids carried out by the Zeppelins were of no real strategic or material importance; they did not effect its outcome. However, they did have a psychological effect on Britain and its people.²⁵⁴ These raids proved that Britain despite being an island was no longer invulnerable to attack. The Gotha bomber raids which followed later in the war served to underline this point. Dover's air defences, to which the presence of the Dover Patrol greatly added, and the proximity of several airbases meant that the town suffered from fewer Zeppelin attacks than would perhaps have been expected. Zeppelins were often reported to have passed by the town but Dover was rarely attacked by them. This would help to explain the shock with which the Gotha raids were met by the town in 1917. The Zeppelins were a known entity before the war began; the Gotha bombers had been developed during the war. The British people had no idea that they existed and their appearance in May 1917 came as great shock since it was widely believed that having defeated the Zeppelins the worst was over.²⁵⁵

The number of lighting summonses remained at relatively high levels throughout the rest of 1915. For instance *The Dover Express* of 12 November 1915 reported twenty-two such summonses in the preceding week.²⁵⁶ This raises two possibilities as to the reasons behind this large number of cases. The first is that the authorities in Dover had decided to clamp down on the offenders as strictly as possible for the good of everyone. Obviously the fact that your house was poorly blacked-out did not mean that it would be hit because of the light visible to the enemy bomber. The other possibility is that the attacks on Dover had been so poorly executed that the townspeople still felt that there was no real danger from aerial attack and that they did not need to take all precautions. The truth is most likely to be found between

²⁵⁴ F. Taylor *Dresden; 13 February 1945* (London, 2004) pp.90-91 for a short introduction to the subject of aerial bombardment in the early twentieth century and the effect that the early Zeppelin raids had on the British people

²⁵⁵ See below pp.87-8

²⁵⁶ *The Dover Express* 15 November 1915

the two extremes, with some people being lax and the authorities determined not to let this laxity spread.

This sense of a 'bunker mentality' existing within the Dover community must have been heightened by two more changes forced upon them in 1915. The first was the tightening of the restrictions on entry and egress from Dover. From the earliest days of the war, entry and exit had been permitted only along the main Canterbury, Deal and Folkestone roads and by means of the three railway lines running into and out of Dover. The restrictions on these routes into the town were lifted briefly in March 1915. These restrictions were replaced by the showing of 'registration cards' when challenged. From 1 April 1915 a 'registration card' was needed to enter the 'Fortress Zone' so designated around Dover. The card had to show that the holder was either a resident within the 'Fortress Area' or provide some supporting documentation from the military or civilian authorities to prove that a visit to Dover was necessary. The 'registration cards' were therefore more prescriptive than the earlier arrangements and by October the restrictions had returned in their most severe form, as 'registration cards' and supporting documentation had to be shown to board a train or to pass the sentries now posted along the main roads.

These checks could not be avoided as in the early days of the war a ring of field fortifications was constructed around Dover. It took approximately six weeks to complete these works and together with the sentries on the main roads they enclosed an area running from St Margaret's Bay in the east to Folkestone pier in the west.²⁵⁷ The need to show cards limited the entry of outsiders to Dover as only those with business in the town might enter and even then only with permission from the military authorities. Dover's tourist trade had come to an end for the duration. The regulations also served to isolate Dover from the rest of England and helped to make it feel closer to the front than ever before. Dover was becoming more like the most westerly extension of the western front than the first town in England. *The Dover Express* in its review of 1915 might state that; "Although nearest of all towns in Great Britain to the war, that has but little affected the inhabitants of Dover."²⁵⁸ In the view of the newspaper's editor it was the lack of social functions and political activity in the town

²⁵⁷*The Dover Express, op. cit.* p.5

²⁵⁸*The Dover Express* 31 December 1915

which were the main disadvantages of 1915.²⁵⁹ The banning of photography and the use of 'telescopes and field glasses' in Dover was introduced during the course of this year. The restrictions on the townspeople were becoming more and more severe. The restrictions on movement were made worse by the events of December 1915 which ended in the total closure of the railway line to Folkestone and thereby the closure of one of the town's three main rail links to the rest of Britain.

The closure of this line was not a military decision to increase the security of Dover but rather it happened because of an act of nature. It still served to heighten the town's feeling of isolation. The cliff at the Warren near Folkestone collapsed on to the line on Sunday 19 December 1914. The extent of the fall was massive being over a mile in width and in places the cutting was filled to a depth of between twenty and thirty feet with spoil. Some warning of the disaster had been given by a smaller fall on 10 December in which a train was partially derailed; no casualties were suffered on this occasion. The re-opening of this line became a major issue in the Dover area but it, like Dover's tourist amenities, was not to see any trade for the duration of the war. The reason given for not re-opening the line was the lack of manpower available to the South East Coast Railway (SECR) due to the needs of the war effort. The restoration of such a strategically important line might have been thought to outweigh other considerations but the line was only re-opened long after the armistice. Dover was now to a large extent dependent on the one remaining main line to London for contact with the outside world; by 1916 Dover's 'bunker mentality' was becoming firmly entrenched.

The feeling of having to 'go it alone' must also have been strengthened by events, elsewhere in the country, at the close of 1915. In December 1915 the government decided to take direct control of the air defence of Greater London. This would have meant that full-time service men were directed to take over the searchlights and anti-aircraft guns around the metropolis which up to then were manned by part-timers. In Dover the searchlights were manned by men who carried out their civilian jobs during the day and then worked four hour shifts on the searchlights three nights per week. *The Dover Express's* angle on all of this was not to

²⁵⁹*ibid.*

complain about the extra pressure it might put on these men but rather to complain about the £10,000 which had been paid to them since the outbreak of the war. *The Dover Express* also accused the council of having a 'charmed circle' as these men were not liable for active service unlike their friends and neighbours.²⁶⁰ Accusations were also levelled at the army who were "'kicking their heels' here for want of something better to do."²⁶¹ By the end of 1915 which had started with such high hopes for victory, hopes that would be dashed at Neuve Chapelle, Ypres and Gallipoli, it is not surprising that recriminations were starting to become apparent among the newspaper editorials. This was coupled to the fact that the government's accounts were no longer trusted because of their obsessive secrecy. This fact was brought home to the people of Dover because of the manner in which official communiqués relating to the bombing attacks on east Kent were announced. Such little detail was given in the official accounts that an atmosphere was created in which the public were led to believe that the attacks were worse than they were in reality. The aerial attacks on Dover and other towns in 1914 and 1915 caused almost no damage and the majority of the towns' populations only found out afterwards what had happened. Unfortunately, references which blandly stated such things as, 'towns in east Kent being bombed last night', served only to make the bombing seem more widespread than was in fact the case.²⁶² The lack of detail in the official reports allowed people to fear the worst. The government's announcements on the air raids certainly raised comment in the local press because they were inaccurate and could easily be checked as being so; it did not generate confidence in the official accounts that were being received from the front.

The changes on the Home Front in 1916 began to bite deeper and deeper into people's lives. The issue of the blackout was now being addressed in special meetings of the Dover Town Council.²⁶³ The outcome of the meetings were that Bills were to be circulated instructing people to keep to the right in darkened streets but no decision was taken on the proposal to paint kerb-sides white. These changes were of a common sense nature and would reduce the chances of accidental injury in the 'black out'. In

²⁶⁰ *The Dover Express* 17 December 1915

²⁶¹ *ibid.*

²⁶² *The Dover Express* 28 January 1916

²⁶³ *The Dover Express* 7 January 1916; a special meeting of the council was held on the issue of air raid precautions on 4 January

1915 the Central Control Board (Liquor Trade) was set up to set limitations on the selling of alcohol. From 1915 convictions for drunkenness decreased across the country in line with the restrictions on the opening hours of public houses.²⁶⁴ From 10 January 1916 alcohol serving times at public houses in the east Kent area were to be cut further. During the week alcohol would only be served between 12pm-2.30pm and 6pm-8pm. On Sundays the drinking time was cut by half an hour to 12.30pm-2.30pm and 6pm-8pm.²⁶⁵ These restrictions as published in the local press only applied to Deal, Dover, Folkestone, Hythe, Lydd, New Romney and Sandwich. These were the main areas in which troops were concentrated along the Kent coast. Trouble was obviously expected with troops returning to the front and by reducing the amount of alcohol which they could consume the authorities were trying to stop more severe situations developing. As the order came down as part of the Defence of the Realm Act (DoRA) (Liquor Control) the problem was viewed as being potentially serious. It also again shifted Dover's position with regards to the war as the conditions now existing there were more like those experienced in rest areas behind the front line rather than what a Tommy might have expected when he was safely home in 'Blighty'. As the war progressed and intensified, the amount of central governmental legislation impacting on the lives of people in Dover can be seen to have increased as a consequence.

However, the changes in the lives of the people of Britain did not have the detrimental effects that are often attributed to the war. Figures of between 292,000 and 400,000 are often cited for the number of 'excess deaths' suffered by Britain's civilian population between 1914 and 1918.²⁶⁶ Winter in his *The Great War and the British People* (London, 1986) strongly refutes this argument and gives compelling evidence that in fact the general health of the civilian population actually improved during the course of the war. This of course took place despite the fact that over half of the nation's medical profession were serving in the armed forces.²⁶⁷ Respiratory diseases, tuberculosis in particular, became more prevalent during the war. The increase in their prevalence was assisted by the concentration of large numbers of people together in armaments factories and the fact that the housing stock was

²⁶⁴ J.M. Winter, *The Great War and the British People* (London, 1986) p.210

²⁶⁵ *The Dover Express* 7 January 1916

²⁶⁶ J.M. Winter, *op. cit.* p.104

²⁶⁷ *ibid.* p.154

allowed to deteriorate during the war. As a counter to this the raising of the wages of the poorest sections of society and the restrictions on alcohol consumption were major factors which added to an improvement in the general standard of the nation's health. Even though food prices rose throughout the war so too did wages and unemployment ceased to be a possibility for the vast majority of the country's population.²⁶⁸ Pre-1914 Dover had suffered from high prices and had a relatively poor population; the war changed this by offering full employment and by 1918 a comprehensive rationing system.²⁶⁹

It was over a year after the first aerial attack on Dover that the solution of what to do after the air raid siren had been sounded was finally spelt out to the townspeople in an official statement from the Garrison Commander Brigadier General E Bickford and the Mayor E W T Farley; this was published in the local press in January 1916.²⁷⁰ The siren warning was to be four short blasts and one long one. People were instructed that they should then take cover in the nearest house preferably in the cellar. There was no all clear signal as in the Second World War but rather "if no guns are fired within fifteen minutes after the warning it may be assumed that there is no longer any immediate danger."²⁷¹ Similarly, the announcement continued that if the guns did start firing the "cessation of firing may practically be taken to signify that danger is past."²⁷² There was still no clear definition of what was considered to be an air raid shelter and as not very much warning could be expected from the siren it was still very much a matter of taking shelter wherever possible. At night Dover was now effectively closed down by 10pm; as by that time the pubs were closed, the trams had stopped running and the last of the darkened street lights extinguished. All these changes had come about after the air raid on 17 May 1915, since that date there had been several scares but no actual raids; on 23 January 1916 the raiders returned to Dover. It is perhaps just as well for Dover that there had been no attacks in the interim as these new warning arrangements had only been issued five days before the renewed attack.

²⁶⁸ *ibid.* pp.213-245. See also G.J. DeGroot, *op.cit.* pp. 210-214

²⁶⁹ See above p.64 for reference to the situation in Dover pre-1914

²⁷⁰ *The Dover Express* 21 January 1916

²⁷¹ *ibid.* Extract from pronouncement of 18 January 1916 by the Mayor and Garrison Commander of Dover

²⁷² *ibid.*

The peacefulness of the early hours of Sunday 23 January 1916 was broken in Dover by the first raid of the new year. During 1916 raids would continue on at least a monthly basis but some comfort was offered by the fact that the bombs dropped by the aircraft, weighing no more than twenty pounds "could be stopped and exploded by a fairly good roof."²⁷³ However, on this occasion Mr Harry Sladen, barman at the 'Red Lion', was not so fortunate. He was killed by one of the nine bombs dropped at around 12.50am and became Dover's first fatality in the air war. Waterloo Crescent, close to the sea-front, was also hit but there were no other serious casualties. In the Inquest that followed the raid the verdict reached was; "that the deceased was killed by shock and injuries from the explosion of a bomb thrown by a hostile aircraft."²⁷⁴ Interestingly the Dover Inquest did not take the same decision as the Ramsgate court and offer a verdict of murder against the Kaiser, a decision for which the editor of *The Dover Express* praised the court. Dover was after all in a fortress area and as such a viable military target. Again, despite all the warnings, the people of Dover gathered together after the bombing no doubt in order to find out the condition of friends and relatives in the bombed area. However, even though this might be a natural reaction the people would have provided a tempting target should any enemy aircraft have been sent over again. It was left to the Mayor to urge the inhabitants to abstain "from their present custom of collecting in crowds during or immediately after air raids."²⁷⁵ Neither this warning nor comments in *The Aeroplane* about the deplorable state of Dover's air defence could dissuade the town's people from acting as they did, and by taking such action the casualty figures were bound to rise. They did so on 19 March 1916.

Sunday 19 March 1916 saw the heaviest raid experienced by Dover up to this time. On this occasion thirty-six bombs were dropped on the town. Damage to buildings and property was again slight but seven civilians died as a result of the raid, this being in the view of the *Dover Express* because "people came out to see the air raid and did not stay indoors."²⁷⁶ What to do with children in the event of a raid also became an issue as the schools in the town had no shelters. What was to happen to children if a raid came in the middle of the day? The solution reached in April 1916

²⁷³ *The Dover Express*, *op. cit.* pp.17-18

²⁷⁴ *The Dover Express* 28 January 1916

²⁷⁵ *ibid.*

²⁷⁶ *The Dover Express* 24 March 1916

was to send them home immediately after the siren was sounded. This must have been one of the more irresponsible and badly thought out ideas of the Dover authorities. It would place children in great danger walking through the streets just as a raid was thought likely. Often the raids in 1916 started just as the siren sounded, and if the bombs did not fall on the town, shell fragments from the anti-aircraft guns often did and these were as much as a hazard as the bombs.

The other action taken after the raid of 19 March 1916 was the launch by St. John's Ambulance's Dover Division of a series of first aid classes. These were to be held in the evening in the Dover Hospital. This was the only advance in Dover's air raid precautions and despite the editorials in the local newspapers no further action was taken by the military or civilian authorities. Perhaps the most effective attack on this lack of progress was the printing of the "Air Raid Precautions at Ramsgate".²⁷⁷ These were categorised as being far superior to anything yet attempted in Dover and readers were exhorted to follow these in instead of those in force in Dover. The number of lighting summonses coming before the courts each week suggests that many of the townsfolk were ambivalent to the dangers of the air raids. However, what is interesting is that many of the summonses were against serving members of His Majesty's forces. One Royal Flying Corps Officer in particular launched an impassioned defence that from sixteen thousand feet no aviator was likely to see his single candle. The judge was not willing to accept this defence and a heavy fine followed.²⁷⁸

Lighting summonses would continue to be a feature of Dover life for the duration of the war, but they remained relatively small in number in relation to the total number of households. This suggests that people were worried or careful enough to avoid taking unnecessary risks with their own lives and those of their families. The correspondence to the newspapers relating to the 'black out' was universally condemnatory in tone, perhaps reflecting more the attitudes of letter writers than the general views of the town. As early as August 1915 a letter entitled "Wake up Dover" was published in *The Dover Standard* stating that "the whole thing as far as Dover

²⁷⁷ *The Dover Express* 14 April 1916

²⁷⁸ *ibid.*

evidently is concerned must be only a farce".²⁷⁹ *The Dover Standard's* closeness to the retail trade in the town was made clear later in the year when it made an appeal for an increase in the lighting permissible to shopkeepers in the run up to Christmas. This was a stance which *The Dover Express* never took, even though it must have had the same reliance on advertising. The entire issue of lighting and its reduction through the First World War was surely a reflection of the growing bunker mentality within Dover, because it did seem to be genuinely believed that by making Dover invisible it would be safer. This was to a greater extent true of course but if German aircraft could be prevented from reaching England then Dover would be safe. The country's anti-aircraft defence was not trusted. Dover had become vulnerable in a way that it had not been, even in the days when the *Grand Armee* waited in Boulogne. Dover's frontier and exposed position had once more been confirmed. Dover reacted as it always had by metaphorically and physically 'digging in'. This was 'digging in' in the sense of using all means available to decrease one's vulnerability to enemy fire. The lighting restrictions were the first part of this 'digging in'; the call for and building of new shelters and dug-outs were the second.

Raids and scares continued through the spring, summer and autumn of 1916 but not on a very large scale. The alarm in Dover was raised on a number of occasions for a single German seaplane or at most a pair of aircraft.²⁸⁰ The last raid of 1916 came on 22 September and it was like its most recent predecessors not serious. In 1916 nine lives had been lost due to German air raids and fifty people injured, the local press categorised them as the first attacks on the town in which lives had been lost since 1294. The memories of Dovorians did stretch far into the past indeed.²⁸¹ The desire to inflict destruction on German towns and their civilian inhabitants came to the fore in 1916. The campaign launched by Mr Pemberton Billing, an Independent Member of Parliament, called for retaliatory air raids on German towns and cities.²⁸²

²⁷⁹ *The Dover Standard* 14 August 1915

²⁸⁰ The raid on 12 August was the most serious, but according to police reports the people remained on the seafront ignoring the danger. *The Dover Express* 18 August 1916

²⁸¹ *The Dover Express* 29 December 1916

²⁸² Pemberton Billing was the so-called 'member for air'. See A.J.P. Taylor, *The First World War* (London, 1963) p.228. The scandal surrounding Pemberton Billing is outlined in M. Kettle, *Salome's last visit: the libel case of the century [Maud Allan versus Noel Pemberton Billing]* (London, 1977)

Pemberton Billing spoke in Dover on two occasions over the next two years. The fact that he spoke the day before rather than the day after a raid somewhat reduced the size of his audience on 19 May 1916 at the Dover town hall.²⁸³ His speech called for air attacks to be launched to teach the Germans a lesson as he put it. Air attacks were categorised as being uncivilised and being a product of the “barbarism of the Hun”. The logic that retaliation would put the British on the same plain as the barbarous Germans was lost on the enthusiastic audience. When he returned in June 1917 the editorials in the local papers were strongly in favour of such action and national support was being sought in the pages of the *London Daily Express*. The retaliatory raids were being promoted by newspapers as an act of support for the people in the ‘air raid zone’.²⁸⁴

The raids of 1916 can therefore be seen as having added materially to the stresses and strains being suffered in Dover. Though little damage was suffered by the town and casualties were not particularly high, the people of Dover were beginning to feel that again they, their families, their homes and their businesses were being put in the most extreme danger and that solutions should be sought. One of these was to strike back so hard at the Germans that they would not dare attack any English town again. The other solutions were to be found inside Dover itself, the most important of these solutions being the town's ‘dug-outs’.²⁸⁵ The calls for more air raid shelters and dug-outs would return with renewed vigour in the local press in 1917. Until leads were given elsewhere it was the Town Council that was expected to provide the necessary accommodation. This would prove very difficult for the Council to achieve, as we shall see, and eventually the army would be called upon to help. By the end 1917 the town's ‘bunker mentality’ would be firmly engrained.

1917 dawned with new hope for the people of Dover, the Generals were convinced that one more ‘big push’ would see the Germans on the run to Berlin, the ‘victory’ at Jutland had left the Royal Navy supreme at sea once more and in the air

²⁸³ *The Dover Express* 26 May 1916. The newspaper cited the fact that as admission to the meeting was charged less people attended than might otherwise have been the case.

²⁸⁴ The raid on Dover on 19 March 1916 was followed by one on German bases in Zeebrugge on 20 March; this was headlined as “Retaliation Big Raid on Zeebrugge” in *The Dover Express* 24 March 1916.

²⁸⁵ The term dug-out in the First World War referred not just to defensive positions, as here, but also to retired or semi-retired officers and officials who were thrust into important roles. See T. Wilson, *op cit* p.111 for an example.

the menace of the Zeppelin had been decisively defeated once and for all. Unfortunately, for Britain and Dover in particular these were illusory images; the next 'big push' would see even more of the nation's youth returning in hospital ships through Dover, the U-Boats were about to be unleashed on a campaign of unrestricted submarine warfare and Germany was putting into service the world's first strategic bomber, the Gotha. It was not however, the German bombers which would first threaten Dover but rather the German navy which in the spring of 1917 was making new efforts to wage a more aggressive war on Britain.

The first sign of this new German naval aggression was an attack on Ramsgate on 25 February 1917; this was followed by a similar attack upon Broadstairs on 1 March.²⁸⁶ On the night of 20-21 April it was to be Dover's turn. Six enemy destroyers steamed to within three miles of Dover and then after sending a star shell over the town, opened fire. Approximately sixty rounds were fired, none of which actually hit the town but rather landed harmlessly in the farm land beyond. Most of the townspeople did not realise they had been attacked, putting the noise down to the anti-aircraft guns, an easy mistake to make as the two sets of guns would have been of a similar calibre.²⁸⁷ Dover's land defences, however, did not fire one shot in reply and most probably did not even realise what was going on and so the raiders were able to begin their escape unhindered. The situation was saved by the actions of two destroyers from the Dover Patrol; His Majesty's Ship (HMS) *Broke* and HMS *Swift*. These two ships having spotted the superior German force did not hesitate to engage it and in the process sank two of the raiders, the destroyers G42 and G85.²⁸⁸ This was most encouraging for the people of Dover; a major military success on their doorstep. What was perhaps more worrying was the way in which the German destroyers had been able to reach the town unopposed and had only been challenged after their attack was completed. This was enough to persuade Dover College to evacuate to the safety of Leamington Spa. The school had until this point been functioning normally and its continued presence in the town must have been a sign that life had not really changed that much.

²⁸⁶ R. Humphreys, *The Dover Patrol 1914-1918* (Stroud, 1998) pp.91-92. This is a factual account of the Dover Patrol and its activities during the First World War.

²⁸⁷ The German destroyers guns were of 4 inch calibre, as were many of those on the British destroyers in Dover harbour. These British destroyers provided much of the town's anti-aircraft fire during air raids.

²⁸⁸ Humphreys, *The Dover Patrol* pp.95-97

The decision to evacuate it was certainly one which did not please the more business conscious elements in Dover society. During the previous two years the coastal towns in south east Kent had been arguing how safe they were in order to maintain their tourist trade, their private schools and hospitals. The area was the home to a number of private schools on which the region's economy was as dependent as it was on its tourism. As early as February 1916 the mayors and chairmen of various Kentish local authorities met to discuss this very subject at Ramsgate. This town had lost most of its tourist business because of the war.²⁸⁹ Dover, of course, had been effectively ruled out as a tourist destination by the declaration of its special military status in the earliest days of the war. The raids did not therefore greatly affect the numbers of visitors to Dover as they had been stopped already. The loss of Dover College was a blow as the staff and pupils would have provided an important source of business for the town's shops. Doverians did not find themselves alone in the middle of the war because they had been placed in that position effectively since 4 August 1914, but the evacuation of the college helped to define this isolation even more sharply.

The representatives at this meeting from the various south-east towns were most concerned that proper warnings of raids should be issued by the authorities. This was so that visitors would feel safe even if the remote danger of an air raid came upon them. The statement issued after the meeting made it obvious that the establishment of military hospitals in the area had been due to the fact that the Government thought "more highly of the health giving properties of the coast than the more remote danger of the air raids."²⁹⁰ By the end of 1917 the situation of self-evacuation by those who could afford it from east Kent had become so bad that Lord Northcliffe, the owner of *The Times* and himself a local resident, felt he had to criticise his friends and neighbours in the East Kent area for leaving their residences for the duration. He made it very clear in his interview with the *Thanet Advertiser* that he was staying and was still receiving guests. He put the blame for the exodus squarely on the shoulders of the vague Government communiqués which mentioned 'South East England' in relation to the air raids rather than being more specific. Panic was therefore being

²⁸⁹ *The Dover Express* 18 February 1916

²⁹⁰ *ibid.*

made worse because people were being allowed to use their imagination being given facts.²⁹¹

The bombers in use over south east England in 1917 were Gotha G. V aircraft. They had a range of over three hundred miles, could reach eighty-seven miles per hour and had a ceiling of twenty thousand feet. Their armament was two machine guns. They could carry a bomb-load of between five hundred kilogrammes depending on the range of the mission being undertaken. If the targets were to be the towns of southeast Kent then a heavier load could be carried than if London was to be the target. The raid on Folkestone on 25 May 1917 was carried out by twenty-three bombers which gave a maximum ordinance load of one and one half tonnes. The casualties from this raid on Folkestone were in proportion to the amount of bombs dropped.²⁹² It was to prove a war might befall Dover as 1917 progressed. The lack of response by the British fighters was the most worrying aspect of this raid. The British fighters were unable to intercept the bombers and the anti-aircraft fire also seemed unable to make any impact. The raid of 25 May 1917 was carried out in broad daylight and the bombers flew over an hour over Kent without any hindrance from any form of British anti-aircraft. Gotha's bomb-load, range and speed offered new possibilities for the strategic use of air power but the bomb-load which could be delivered was still limited. However, it still represented a five hundred per cent per aircraft increase over the first raid on Christmas Eve 1914. When so many aircraft were used together to deliver a concerted attack on a single town the effect was catastrophic, especially if the town was unprepared for the attack.

Air attacks depended on their shock effect to make their impact felt. When the weight of bombs dropped was not in fact that heavy. The Gotha raid of 25 May 1917 provided this shock effect. The British people were unaware that they possessed such bombers, nor did they realise how ineffectual their defence was. After 25 May the knowledge of their defencelessness came home to the British people, those in southeast England and southeast Kent in particular. Folkestone

²⁹¹The interview was reprinted in *The Dover Standard* 8 December 1917

²⁹² Seventy-seven civilians were killed in Folkestone during this raid. Fifty of them were killed by a bomb which fell outside a grocer's in Tontine Street. A total of forty-three bombs were dropped during the raid.

having a large army base at Shorncliffe, was totally without anti-aircraft in May 1917. As well as the casualties suffered in the town eighteen Canadian soldiers on parade were killed and ninety-eight of their comrades were wounded. No warnings being received that the German bombers had crossed the coast no defensive measures were taken in either Folkestone or Dover and the first defensive measures taken over Dover when a single Royal Naval Air Service (RNAS) Sopwith triplane attempted to intercept the raiders.²⁹⁴

1917 had undoubtedly been the worst year for air raids on south east Kent coupled with the destroyer raids the strain on people in the area was considerable. Confidence in the protection being offered by the military was at a low point. Gotha raids began in May and were initially carried out in daylight but the Germans switched to night raids in the early autumn. It was these autumn raids that turned the population of Dover into a group of nocturnal troglodytes. There was no point in going to stop running the tram services beyond 8 o'clock in the evening as no-one was left to see them.²⁹⁶ The owner of the Trevanion Street caves, Mr Grimes, had from July 1916 been urging the Town Council to take over the caves and to employ a Special Constable to regulate the flow of people into the caves.²⁹⁷ (The Trevanion caves are near the area where the Town Leisure Centre now stands. It was a densely populated working class area in both world wars but by the end of World War most of the houses had been destroyed allowing it to be redeveloped for new uses such as the leisure centre.) Negative comparisons with French towns were being made in the Dover press; according to them the French had specially built air raid proof shelters in every street. Dover had none even though the conditions were ideally suited to the building of such shelters.²⁹⁸ In September 1917 the *Express* was calling on the Government to provide £100,000 for the construction of dugouts.²⁹⁹ In local politics the issue of dugouts was becoming an increasingly important one. Councillors Baker and Chitty, at least, were opposed to the construct

²⁹³ *The Dover Express*, *op. cit.* p.30

²⁹⁴ It was later claimed by the Admiralty that this triplane shot down one of the raiders and more were shot down by other RNAS aeroplanes stationed at Dunkirk over the Belgium coast.

²⁹⁵ B. Millman, "British Home Defence Planning and Civil Dissent" in *War in History* Vol. 10, pp. 204-232.

²⁹⁶ *The Dover Standard* 13 October 1917

²⁹⁷ *The Dover Express* 28 July 1916. From a report on the Town Council Meeting 25 July 1916.

²⁹⁸ *The Dover Express* 8 June 1917

²⁹⁹ *The Dover Express* 28 September 1917

shelters; mainly it would seem on the grounds of cost. The discussions in the press are also interesting in that no mention is ever made of whose fault it was. Germans were able to bomb almost without opposition. Most of the local measures made to strengthen the RFC were directed towards its bomber force rather than towards its fighter squadrons.³⁰⁰ The logic was thereby developing in Dover that bombing of their town was only stoppable by inflicting worse damage on towns and cities and that its effects on Dover could only be minimised by dugouts.³⁰¹

This is a reflection on the state of affairs then prevailing at the front despite the scale of the barrages against the German front-lines in the lead-up to the allied offensive, the German defenders were able to survive because of their extensive underground works. The German preparations in this respect were far superior to anything achieved by either the British or French, but as the Germans were relying on a defensive strategy on the western front it, of course, made sense for their defences to be stronger than those of the allies who were trying to hold territory as well as trying to defeat the German army.

The immediate solution taken in the autumn of 1917 by the local authorities in Dover was to increase the fines levied for breaches of the lighting regulations. This came into effect over the weekend of 20-21 October 1917, on the Friday fines were at a level of 30 shillings but on the Monday they were £2 per offence. This was a most palpable form of action; Dover was trying to make itself disappear. The next stage was to build new air raid shelters in the areas of the town which did not have easy access to the existing caves. *The Dover Express* led a campaign in the autumn of 1917 to get them built.³⁰³ The Town Council was criticised in its turn, with some justification it would seem as very little was achieved by the end of the year, and what was done was carried out by army units drafted in. The Doverians had found the task of digging their own shelters beyond their expectations. It was of course the ordinary people who were expected to be urged from the press.

³⁰⁰ N. Jones *The Origins of Strategic Bombing* (London, 1973) pp. 132-141 for a discussion of the debates ongoing within the national military and political authorities.

³⁰¹ This was also the belief of the father of the RAF, Lord Trenchard who wanted to make the main role that of a strategic bombing force.

³⁰² *The Dover Express* 26 October 1917

³⁰³ *The Dover Express* from 26 October to 30 November 1917

the work, in their own free time after a hard day's work. The "well to do leave the town to avoid the tension but poor people cannot and we the Council and all other authorities will do everything possible..." so ran an advertisement in the *Dover Express*.³⁰⁴ Initially, the people were told to dig their own shelters might seem unjust but during the First World War it seemed to have been as a completely logical solution to a difficult problem. The Town Council had numerous debates on the issue in the autumn of 1917, as the minutes of the local press show, but very little came out of these discussions.³⁰⁵ They supported the view of Marwick; rather in Dover there existed a situation where money could buy relief and that was an option which was taken.³⁰⁶

Dover's trial by air in 1917 and the people's attitude to it seem encapsulated by a *Punch* cartoon which was reprinted in *The Dover Chronicle* in 1917.³⁰⁷ Its title was "The Business of the Moment" and showed a defiant Bull looking up into the sky at a number of hostile aircraft and declaring; "I've got to deal with your Zepp Brother, and now I am going to attend to you". (Figure 7 on p.92) It is interesting how this cartoon shows a terrestrial Bull, and makes no mention of the RFC. Very different from the heroic image of the Royal Air Force (RAF) would present and be presented as having in the First World War. The central message was that Britons would overcome all its difficulties and would as usual come through victorious. Wilson has coherently argued in *Faces of War* that the press reporting in Britain represented the feeling of the country and that that there was in the minds of the British public a clear difference between warriors and civilians.³⁰⁹ The decision of the coroner at Ramsgate finding the Kaiser guilty of murder would seem to strongly support this hypothesis.³¹⁰ There does seem to have been a common thread in public opinion as civilians the British people should be exempt from such attacks. Pre-war according to Wilson was a mixture of "distress and indignation" at the a

³⁰⁴ *The Dover Express* 19 October 1917

³⁰⁵ *The Dover Express* from 26 October to 30 November 1917

³⁰⁶ A. Marwick, *op.cit.* p.262

³⁰⁷ *The Dover & County Chronicle* 21 July 1917. *Punch* 18 July 1917

³⁰⁸ *ibid.*

³⁰⁹ T. Wilson, *op cit* pp.509-510

³¹⁰ See above p.71 and p. 79

undeserving public.³¹¹ Dover and its press as has been shown existed ve
within this milieu; Britain should strike back so that the Germans would desis
views expressed on the tunnels and caves also represent another aspect of thi
for if the public was to be in danger it should be properly protected.

³¹¹ T. Wilson, *op cit* p.510

³¹² See above pp.81-2



THE BUSINESS OF THE MOMENT.

JOHN BULL. "I'VE LEARNED HOW TO DEAL WITH YOUR ZEPPEL BROTHER, AND I'M GOING TO ATTEND TO YOU."

Figure 7: 'The Business of the Moment' *Punch* 18 July 1917

As 1917 turned into 1918 there seemed to be no possibility of final victory before 1919 at the earliest even with American help. Diplomats were convinced

they had not yet faced their sorest trial. Air raids on a greater scale were expected throughout the winter and spring of 1918. Some Dover residents even spent Christmas night in the town's caves for fear of an air raid and most of these were mothers with young families.³¹³ Dover truly was a frightened town by 1918. Even on nights when bad weather would seem to have made the idea of a raid impossible to all rational thinking people. Dover it would appear had few enough of those in the difficult days and nights of early 1918. In contrast in January 1918 the East London Advertiser commented "although less terrifying than the air raids, the food scarcity has produced an amount of exasperation which German terrorism never did."³¹⁴ Different newspapers may have put different priorities on the difficulties besetting them as too might their readers. Although air raids were 'terrifying' in East London they were ranked below food shortages; in Dover they were not.

The lull in the raids over the winter of 1917-8 did not suggest to the people of Britain and Dover in particular that the German air force had ended its attacks against British towns and cities. Massive raids were expected in the spring of 1918 as the Germans had by then had several months in which to build more aircraft and train more pilots. In fact Dover was saved from this because German air strength was being gathered to support Ludendorff's 1918 Spring Offensive. More air raid shelters seemed to be everyone's first solution to the possibility of further attacks. Some householders with gardens which backed on to the cliffs began to dig shelters into the cliff, one man digging shelters for his four neighbours who were at sea, along with his own.³¹⁵ Captain Hawke of the Royal Engineers was appointed as Borough Engineer in September 1917 after being invalided to the reserves. It was he who would be responsible for the construction of the new shelters and dugouts thought to be necessary for protection from the attacks which were expected to be renewed with the better weather in the spring. Prior to this the primary shelters had been the big existing caves at the Oil Mill Barracks to the west of the town and the Trevanion Street caves to the east. Public buildings had been sandbagged but by 1917 these were thought to offer little protection against the larger bombs now falling on the town. Thirty feet of

³¹³ *The Dover Express* 4 January 1918

³¹⁴ T. Wilson, *op. cit.* p.519

³¹⁵ W. Hawke, 'Air Raids on Dover' in S. Coxon ed., *Dover During the Dark Days* (London, 1919) p.183

chalk was now believed to be the minimum desirable cover above one's head.³¹⁶ By the end of 1917 spaces for twenty-five thousand people existed in the public shelters. The new shelters were concentrated in the outlying areas of the town which did not have the benefit of caves and tunnels. Both civilian and military personnel worked on these schemes and such was the scarcity of timber and the scale of the works that Dover lost its trees from the parks and roads.

Feelings in the town continued to run high on this issue until the early summer of 1918, by which time the scale of the sudden German collapse was gradually becoming apparent and the chance of any type of attack on the town had receded immensely. This was true to the extent that it was suggested in the local press that the town would do well to adopt the solution supposedly adopted by the Germans to protect their cities and military targets; that was to use German Prisoners of War as a human shield to deter attacks.³¹⁷ Attacks did continue in 1918. The two attacks by German ships early in the year cost the town another young life, with a girl being killed on 16 February.³¹⁸ The first attack which was made in the early hours of 14 February was a fairly half hearted affair but on the following night over thirty shells were fired at the town. The last air raid came on the night of Whit Sunday 1918.³¹⁹ The alert lasted for almost two hours. No casualties were suffered in Dover and only slight damage was caused to the town. This was in fact the last moonlight raid on England; the German bombers suffered heavily in this raid with at least two of their number being shot down by Dover's defences.³²⁰ These were not the last enemy aircraft over Dover for on 18 July a German reconnaissance aircraft was spotted near the town. It was believed by many in Dover that this aircraft was on an artillery spotting duty for a German cross-channel gun, similar to those being employed against Paris.³²¹ Dover had survived its ordeal of fire for one war and the steps taken

³¹⁶ *ibid.* p 173

³¹⁷ *The Dover Express* 4 January 1918

³¹⁸ The girl was called Gertrude Boorman and her father was a stoker on HMS King George V. *The Dover Express* 22 February 1918.

³¹⁹ The night of 18-19 May 1918

³²⁰ *The Dover Express, op. cit.* p.38

³²¹ As the range of the 'Big Berthas' was up to seventy miles it was indeed possible that such an attack could have been employed had the Germans been able to advance along the coast towards Dunkirk. The frontline on the Channel coast remained about twenty miles to the east of Dunkirk from October 1914 to August 1918. The German shelling of Paris in the spring of 1918 resulted in forty four shells landing on the city. Over two hundred and fifty people were killed and six hundred and twenty injured.

in the latter stages of this war would serve the town in very good stead when hostilities began twenty years later.³²²

In 1914, on the outbreak of war, Doverians feared the arrival of the 'High Seas' fleet off the town. As the war progressed the danger posed by German naval aggression was seen to be slight. The three attacks made by the German navy were really only of a nuisance value, little damage was done to the town and only one life was lost. However, what was not foreseen was the coming of age of the aeroplane as a weapon of war. The advances made during World War One in aircraft design were phenomenal. In 1909 Bleriot had just managed to hop across the Channel; in 1919 Alcock and Brown would fly the Atlantic. The RFC and its counterparts were intended as scouts for the armies and their aircraft were initially unarmed. Aircraft in Dover were associated with joyful occasions such as Latham's attempted flight across the Channel and Bleriot's arrival and the first air raids on the town were seen as a diversion from the drudgery of wartime life. 'Business as Usual' may have been the Government's aim in 1914 but in Dover life had become dull, the social life of the town was centred on the army, from parties in the castle to band parades on the sea-front, and all of this stopped when war began. The people of Dover also had to contend with the cut backs in public services, restrictions on leaving and entering the town and reductions in licensing hours. Aeroplanes over the town were therefore a useful distraction, even if they were German.

By 1916 the threat posed by the air raids was becoming more real to the people of Dover; the first fatality from an air raid occurred in January of that year. A further eight lives would be lost in 1916 and fifty others wounded. Dover became a town afraid of what night would bring. Calls for air raid shelters and dugouts became vociferous in 1916 reaching their peak in early 1918. The anti-aircraft artillery and the RFC had proved incapable of guaranteeing the town's safety and so further steps would have to be taken by the townsfolk themselves; they would have to dig in just like the troops in the front-line. Dover's large military presence before the war undoubtedly meant that there was a strong bond between the town and the soldiers at

³²² In fact the last disaster in Dover during the war was the loss of HMS Glatton on 16 September 1918. Only decisive action by the naval authorities prevented the ship from exploding in the harbour and possibly taking much of the seafront with her. The loss of the ship was caused not by enemy action but by carelessness on the part of the crew. See Hasenson, *op. cit.* pp.316-318

the front, strengthened even further by the fact that Dover too had to dig in. The Gotha bomber raids of 1917 came as a huge shock to the civilian population of Dover who thought that having seen the Zeppelin menace overcome they would be safe. This was clearly not the case and the terror felt at the onset of the raids in 1917 must have been heightened by the unexpectedness of these attacks.

Dover had of course been on England's front-line for centuries; it was the first place William the Conqueror fortified after his victory at Hastings. The Castle was besieged by the French in 1215 and raids continued up to 1294. In the early modern period Dover was only spared repetitions of such raids by the growing strength of British sea power. The *Grand Armee* waited impotently at Boulogne in 1805 unable to cross to Dover because of British naval supremacy. At the start of the twentieth century the wealth and security of Dover still depended on the Royal Navy. It was the air raids of the First World War which removed this shield once and for all. It did not matter how supreme Britain was at sea for the Channel had been bypassed in the sky. The one hundred years of peace that Britons had enjoyed in Europe since the battle of Waterloo was no more and Dover had been thrust into the front-line as never before. Doverians could no longer rely on the Royal Navy for their security and so they looked increasingly inwards for their salvation. While other towns sent deputations to London for help, the people of Dover did all they could for themselves and only after that did they turn to outside agencies for help. As the war advanced, and particularly as the dangers the town was exposed to increased, Dover's authorities did have to seek assistance from central government. However, the close relationship between the town and its military contingents remained strong. The military was not blamed for allowing the attacks on the town; rather it was the politicians. National politicians were seen to be at fault because they had not provided Dover with the shelters which the town had required. The distrust which this created would carry over into the Second World War. In the First World War Dover's 'front-line mentality', which had existed for centuries, was honed still further by attack from sea and sky into what can only be described as a 'bunker mentality'. The town as it would do in the Second World War had turned to its own resources rather than wait for help to come to solve its problems. The attacks during the First World War had seen just over two hundred projectiles fired at Dover; it was just a small foretaste of what was to come.

Chapter 3: Dover during the 'Long Weekend'; the Inter-War Years

The inter-war period in British history has variously been described as a carefree time; 'the long weekend' or as a time of poverty and hunger marches.³²³ The divide between northern and southern Britain was never more evident, than it was in the 1930s. However, British society was not completely inward looking, with the upper and middle classes intent on finding enjoyment and pleasure. The working class was intent on surviving, as international issues and the fear of war were present certainly by the early 1930s. It was not that Britain had really been at peace since November 1918. The Irish War of Independence and countless Imperial conflicts followed. It was the solution which was to be adopted to deal with these conflicts which would at least indirectly add to the British people's fears should another European war begin. Britain in an effort to economise turned with great effect to the RAF to police certain of the more 'unruly' frontier areas. The tactics used, including the bombing of more or less defenceless civilian populations with little or no warning of impending attacks, may well have been reprehensible but they were also very effective. The cost of Imperial defence was cut and this helped to ensure the survival of the RAF as an independent service at a time of severe defence cuts. Such stories did not always make the national or local press but other nations did take note. The air forces created by Germany and Italy in the 1930s were based upon their bomber squadrons. Fighter aircraft were given a much lower priority. Experience in the Spanish Civil War reinforced the dominance of the bomber elite as German bombers were faster than the Russian bi-plane fighters used by the Republican forces. It was here over the cities and towns of Republican Spain that the legend of the all-conquering bomber was born. The Germans and Italians seemed capable of striking wherever or whenever they wanted. The damage caused was often not severe but both Republicans and Nationalists, for very different reasons, sought to maximise the damage inflicted. The Republicans wanted to inflame international opinion against their opponents and the Nationalists wanted to show their dominance to all and sundry.³²⁴

³²³ See R. Graves & A Hodge, *The Long Weekend* (London, 1940). Paul Johnson ed., *Twentieth Century Britain: Economic, Social and Cultural Change* (New York, 1994) pp.164-279

³²⁴ P. Brendon, *The Dark Valley* (London, 2000) pp.330-350

Britain between the wars was still the home nation for the world's largest Empire. Keeping the Empire in existence remained a national priority. Britons still held "an imperial world view" which carried with it "a sense of national superiority."³²⁵ The sacrifices of the First World War made it necessary for the population to believe that they had been made in the pursuit of a greater good; to many the British Empire symbolised this greater good. The Empire brought peace and prosperity to the lands within its borders. The peace treaties following the First World War had enlarged the British Empire still further. The national mood was for the Empire and all that it brought with it. In the words of Mackenzie the "jingoistic music hall gave way to the jingoistic cinema".³²⁶ There was no question of Britons seeking to give up their Empire; it was part of their national identity.

For Britain the air raids in Spain and in the Sino-Japanese war were major news stories in the national press. These raids showed how important colonies such as Singapore could be threatened by the Japanese. Raids and casualties were reported in detail and these always portrayed the direst effects on the inhabitants of the bombed towns and cities. It always seemed that the bomber did get through. What would happen to Britain in the event of a new war? This question was particularly important for those areas which had been bombed in the First World War. The raids in the years 1917-1918 had seemed terrifying enough but now when almost every week new advances in aviation technology were being reported the threat from the air seemed to intensify.³²⁷ On 3 January 1939 *The Times* carried an article from "our own correspondent" entitled "Italian Bomber's Records" The three-engined Piaggio Pegna aircraft had "established two new world speed records for weight-carrying machines by flying 1000km at an average speed of 253.4 miles per hour and 2000km at an average speed of 252.4mph, with a load in each case of 5000 kilograms (11,000lbs)."³²⁸ The Italians were apparently very keen to stress the military importance of such a feat and had just prior to the records being set published a list of "objectives which could be reached in a little over two hours by Italian bombers starting from Italian Metropolitan territory with two tons of bombs. The targets

³²⁵ J.M. MacKenzie ed., *Imperialism and Popular Culture* p.254

³²⁶ *ibid.* p. 255

³²⁷ See U. Bialer, *op. cit.* pp.47-8 for a fuller discussion of public opinion in relation to air power in Great Britain at this time.

³²⁸ *The Times* 3 January 1939

included London, Berlin, Warsaw, Angora, Palestine, Cairo, parts of the Anglo-Egyptian Sudan and Algeria.”³²⁹ This article gave the impression that the bomb-load and thereby the destructive power of the bomber had increased by two and a half times what it had been twenty years earlier. By listing London first the correspondent seemed to suggest that it would be the prime target and as there is no mention of Paris one can only assume that the Italians would be able to take the most direct route over France.

Little mention was given to the fact that while the *Luftwaffe* and *Regia Aeronautica* had many bombers, they were not designed to carry payloads large enough to do severe damage to industrial centres. While the Germans and Italians were concentrating on tactical bombing, it was the British who were the adherents of the philosophy of strategic bombing as a means to win a war.³³⁰ Arguments in the leader columns and the letters sections of the national press raged over the best way to defend the country against massed bombing raids. The fact that such raids may not have been planned by a potential enemy was not given much consideration. Let us take the arguments in *The Times* in the winter of 1938 to 1939 as a starting point. The three schools of thought were well summarised by Major-General Louis Jackson in his letter printed in the edition of January 10 1939. The schools of thought were, according to Major-General Jackson, the “Trenchard”, the “splinter-proof shelter” and the “Troglodyte”.³³¹ He does not go into evacuation as a potential solution. Obviously the entire population of London could not be evacuated and it would not therefore be a solution in itself. That such raids by an enemy would take place was the starting point of all the arguments; it was on the question of how to respond that differences of opinion arose. Britain should have its own strong bomber force so that any raids would be able to be repaid with such ferocity that a foe would be deterred from trying anything similar again. This was the view of the supporters of Trenchard.³³² The other options were to increase the level of ARP to minimise any damage either by the construction of splinter-proof shelters or deep troglodytic shelters, evacuation of civilian populations to reduce possible casualties before raids took place and of course

³²⁹ I presume that the ‘Angora’ referred to was in fact Ankara, the capital of Turkey.

³³⁰ See C. Barnett, *The Collapse of British Power* (London, 1972) p.496 for evidence of how the RAF was given priority over the army and Fleet Air Arm.

³³¹ *The Times* 10 January 1939

³³² See F. Taylor *op. cit.* pp.94-7 for a concise summary of Trenchard’s own views.

the avoidance of war in the first place. It was for central government to make the running on four out of five of these options and in most areas it was also central government which had to spur on local authorities to make adequate ARP precautions, Dover was one borough council which balked this trend and while other towns and cities might be advertising their grandiose schemes for the “Troglodyte system” in the national press, it was Dover that forged ahead with the building of such shelters. Sometimes the work was carried out to the amazement and quite often in direct flagrance of central government.

What was central government policy? It was 1936 when work began on a centralised ARP policy. Much work was done in conjunction with local authorities from county council down to district and rural council level. However, though the local authorities were consulted not much attention was paid to what they actually wanted. Government ARP policy eventually came to be based on the ‘Anderson Shelter’. The name ‘Anderson Shelter’ is often thought to refer to the then Lord Privy Seal Sir John Anderson, but in fact it refers to Mr David Anderson LLD BSc MInstCE who was one of the authors of the February 1939 White Paper on ARP.³³³ This White Paper (Cmd 5932) stated that the “provision of an air raid shelter in or on every residential property should be compulsory.”³³⁴ The private “sectional steel shelters” which would become known as ‘Anderson Shelters’ were to be provided free to poor households. In terms of cost these ‘Anderson Shelters’ were a relative bargain for the government. Only the very poorest homes had to be provided with free shelters, everyone else was expected to buy them as well as to organise the erection of the shelters themselves. For a government which prided itself on its financial probity, such a solution to the problem of ARP would seem very attractive when compared to the massive outlay in money, men and materials which would have been necessary to bring any of the troglodytic schemes to fruition.

Letters in the national press reflected people's fears at the time. As so much power was thought to have been vested in bomber aircraft it was evident that a sectional steel shelter covered by only a couple of feet of earth was not the best way to guarantee protection. The letter from a Mr Geoffrey to *The Times* of 19 January 1939

³³³*The Times* 2 February 1939. M. Connelly, *op. cit.* p. 141

³³⁴*ibid.*

is instructive in that he was very much in favour of a troglodytic system, one which “would or could be the beginning of a system of underground dormitories, garages, shops, restaurants and places of amusement, many of which would function profitably even in peacetime.”³³⁵ This may seem like pure fantasy today but cities such as Manchester actually prepared draft schemes for vast underground complexes.³³⁶ The 1939 White Paper which had obviously been some time in preparation shied away from such schemes and deemed that the ‘Anderson Shelters’ were almost as effective as deep shelters in all but the instance of a direct hit. The fact that the shelters were so close to people’s homes meant that they were not exposed to danger as they would be en route to large communal shelters. The difference in cost per shelter place obviously would have had nothing to do with this preference for ‘Anderson Shelters’. The public before the war did seem to place less faith in ‘Anderson Shelters’; but any shelter was better than none.³³⁷ The 1939 White Paper also prescribed that certain types of new building, such as flats, should be provided with their own shelters.³³⁸ Dover certainly did not believe in the efficacy of the ‘Anderson Shelter’ and all through the war the town council strove to provide more deep shelter places for the townsfolk. ‘Anderson Shelters’ were, of course, present in Dover and they did on occasion save people’s lives but deep shelters were thought to be superior, especially as Dover faced the danger of shelling to add to the bombing which other towns and cities had to endure.³³⁹ Dover may not have had the most tonnage of explosives falling on it but suffered more attacks than any other town in England.³⁴⁰

In the aftermath of the First World War Dover had gradually managed to restore some measure of economic prosperity. The rapid run down of the naval base and the slow resumption of civilian passenger traffic saw the town hit by an immediate post-war slump. The Calais services only started operating again in 1920.

³³⁵ Mr Geoffrey lived in Russell Square in London and this may have had something to do with his favouring an underground network of tunnels.

³³⁶ *The Times* 9 September 1938. The scheme which was first promoted by the Manchester branch of the Socialist Party was expected to cost £7.25M and house one hundred and fifty thousand people in tunnel shelters in the centre of the city.

³³⁷ Cf. letters in local Dover press and proceedings of council meetings during which the various shelters were discussed.

³³⁸ *The Times* 2 February 1939

³³⁹ *The Dover Express* 4 April 1941; an article on an Anderson shelter reported how it was compressed four feet by a shell and the occupants survived

³⁴⁰ Dover had over three thousand shelling and bombing alerts during the war and was struck by over two thousand two hundred shells and four hundred and sixty bombs.



The increase in the ferry services and the introduction of a coal export plant in 1932 saw the harbour's and therefore the town's economic performance raised during the inter-war period. As long as people continued to travel to and from continental Europe and there remained a market for Kent coal abroad Dover's position seemed secure. It was only the prospect of war that clouded the economic horizon.

Dover having had first hand experience of aerial bombing less than twenty years before was determined not to be caught unawares as had been the case in 1917 when the first serious raids began on the town. An air raid sub-committee was set up by the town council at a very early date. The sub-committee was operating in 1936. The first meeting from which minutes survived was that of 27 March 1937.³⁴¹ This is the only one of the early meetings from which the minutes have survived. From 23 February 1938 the meetings of the Dover and District Air Raid Precautions Committee became fairly regular until it was superseded by a Civil Defence committee in May 1939.

The instigation of these committees showed either a general sense of unease within the community that the events of 1917 might be repeated or a certain amount of paranoia within the council itself. The earliest mentions of ARP in the local press came in May 1936 when the story of how the nearby town of Deal was buying a new air raid siren was carried in *The Dover Express*.³⁴² The story was a light-hearted one and mention was made of the fact that while Deal might have to buy a new siren, Dover would only have to "take the old one from the museum".³⁴³ In July 1936 Dover Town Council discussed ARP at one of its full meetings.³⁴⁴ The minutes of the council meetings do show that ARP and associated matters were causing a lot of concern amongst members and that the council was prepared to spend to improve the provision. Actually raising the rate was much more controversial with many debates on this subject being reported in the local press. The council did seem to be aware that raising the rate to provide for the eventuality of future air raids would not be universally popular within the community. The debates within the council chambers

³⁴¹Records of Dover Town Council held at Whitfield Office of KAO, Dover Document DO Amd 3/1. 27 March 1937.

³⁴²*The Dover Express* 8 May 1936.

³⁴³*ibid.*

³⁴⁴*The Dover Express* 3 July 1936.

ultimately came down to how the financing of all the facilities was to be met. In 1936 the Town Council was forced to cut education expenditure and reduce the number of teachers on its books.³⁴⁵ Even with this pressure on its budget the council did seem prepared to push ahead with ARP expenditure. The new governmental legislation of 1938 enabled Dover Town Council to forge ahead with its ARP works. The council also tried to claim retrospectively for work carried out which would now be eligible for subsidy but which was not at the time it was undertaken. The importance of ARP to the people of Kent as a whole can be seen in the holding of a county wide meeting in the county town of Maidstone in July 1936. This meeting came only a few months after the German occupation of the Rhineland; the first time that Nazi expansionism was made visible to the world.³⁴⁶

The minutes of Town Council meetings were carried verbatim in *The Dover Express*, while those of the committees were kept from the public as their business was deemed to be secret. The council meetings impinged directly on people's lives as the local rate was set by the council and therefore 'experiments' with air raid precautions would cost local people money. In the period from 1937 to 1939 it was a matter for the council to decide whether to put the town's future safety ahead of the current rate. Dover was one of the towns in the country that was prepared to spend to ensure that security.

As early as February 1938 insurance or the lack of it from air raids was being debated in the letter pages of *The Times*.³⁴⁷ Messrs George Mitcheson, Herbert G Williams and AR Wise wrote on the subject that both insurers and insured needed to address the issue if raids were not to have an even bigger knock on effect than their initial physical damage. Simultaneously, Parliament was debating the prohibition of Civil Bombing.³⁴⁸ As Great Britain had been the most successful proponent of terror bombing to cow civilian populations around the Globe since the cessation of World War One it is not surprising that no further action was taken on even attempting to broker an international agreement. In recognition of this the Central School for Air

³⁴⁵*The Dover Express* 3 January 1936.

³⁴⁶The small German force of twenty-two thousand men marched into the Rhineland on 7 March 1936.

³⁴⁷*The Times* 1 February 1938

³⁴⁸*The Times* 3 February 1938, report on Parliamentary business

Raid Precautions was opened on 4 February 1938.³⁴⁹ There would be no need for such a school if there was to be no further bombing.

Air Raids and their effects had already re-entered the public's consciousness before the Munich crisis. The events in Spain and China were widely publicised and condemned in the British national press. Debates in Parliament were held on the subject with regular calls being made for the prohibition of civil bombing in any future conflicts.³⁵⁰ The reports emanating from Spain and China seem to have overestimated the total numbers of casualties suffered in these raids. The raids were on a very small scale compared with what was to come in the 1940s but they seemed very large and destructive compared with the raids of World War One. Today, it is easy to dismiss an event like the raid on Guernica.³⁵¹ The actual casualty figures were relatively small as were the number of aircraft which took part, but the shock it produced was very real. The news of the raid was published in *The Times* on 28 April 1937. However, there was no mention of the raid in the pages of *The Dover Express* at this time. This did not prevent Dover's authorities from preparing to 'dig in' well before any conflict actually began. On 14 September 1938 the British Broadcasting Corporation (BBC) broadcast the sound of the new air raid siren to the nation at 9.40pm; people were learning fast what was to be expected in the event of an air raid.³⁵² Doverians had been well used to the sound of their own siren during World War One, Dover having had the first air raid siren in Britain. This national siren seemed to presage the start of a new conflict.

Even before Britain went to war in September 1939 Dover remained a potent symbol of national defiance. Songs and poems were published mentioning Dover, a good example is "Guard the Gate-way" by Frederick Mantell.³⁵³ The words and sheet music were available from June 1939 for the price of one shilling, the words alone for only two pence. Buyers were encouraged to "Help your country and help your hospital at the same time". The music sheets were on sale at the Royal Victoria

³⁴⁹*The Times* 4 February 1938

³⁵⁰*The Times* 3 February 1938, report on Parliamentary business.

³⁵¹The raid took place on 26 April 1937 and lasted three hours. Over forty German aircraft, supported by German and Italian fighters took turns to bomb and strafe the defenceless town.

³⁵²*The Times* 15 September 1938

³⁵³According to *The Dover Express* Frederick Mantell was "late of the Royal Carl Rosa Opera Company, Strand and Comedy Theatres, London". Details carried in the 11 August 1939 edition.

Hospital Dover and also 27 Liverpool Street. This may not have been a song which was widely available nationally but it does illustrate the opinion which people of Dover had of themselves and their town before the outbreak of war. Dover was a special place; "the Gate-way" to England no less and as such worthy of a special place in the hearts of all Britons. This was also tied into the campaign to encourage people to enrol for National Service, a large banner was attached to the town hall to encourage the people of Dover to "Guard the Gateway of England by doing your turn and enrol for National Service today".³⁵⁴ In August *The Dover Express* would feature the song and how it was "proving an outstanding success".³⁵⁵ It was featured in Dover's theatres and cinemas including the Regent Picture House, Plaza Cinema, Royal Hippodrome and Granville Gardens Pavilion.³⁵⁶ The song had been "Specially written to Rally the Spirit of Liberty and Defence". June 1939 was a time when international tension was rising inexorably and it seemed inevitable that Dover would once more be on the front-line.³⁵⁷

The first cave which the Dover Town Council took possession of was the Trevanion Street Cave. This had served as one of the major shelters in World War One and would do so again in World War Two. The Town Council took possession on 1st April 1937 from a Mr Henry Crundell of "Uniacke", 110 Maison Dieu Road, Dover for the sum of £20 per annum.³⁵⁸ This was well before any Civil Defence legislation was passed and it would seem that the idea came completely from within the council. It most probably came about as a direct outcome of the meeting held on 27 March 1937 by the Dover and District Air Raid Precautions Committee.³⁵⁹ It was also over three weeks before the devastation of the small Basque town of Guernica. This three hour raid carried by German and Italian aircraft left over two thousand five hundred people dead. Dover had already been acting on ARP before this raid brought the reality of such terror raids home to the shocked British public. Written records of this committee indicate that until February 1938 no more caves or tunnels were taken over by the council and no more meetings were held. However, from 23 February

³⁵⁴*The Dover Express* 12 May 1939

³⁵⁵*The Dover Express* 11 August 1939

³⁵⁶*The Dover Express* 11 August 1939

³⁵⁷ Box 17B World War II ephemera at Dover Museum Library

³⁵⁸Dover Town Council Records in KAO Whitfield, Doc. DO/CD/CP1 "Register of Premises hired under Defence Regulations and Civil Defence Act. 1 April 1937.

³⁵⁹ Dover Town Council Record DO Amd 3/1. 27 March 1937

1938 regular monthly meetings were held until the outbreak of war in September 1939. The first major step was the imposition of an extra half penny on the local rates to finance air raid precautions. This was well in advance of any government moves in this direction and shows how seriously the threat was being taken by Dover's politicians and people. If the town council had been prepared to impose this rate then they must have been certain that the townsfolk would recognise the need for it and support such additional expenditure. At this early date in planning many false starts were made in terms of schemes and plans. The addition of a "Ripper control system to extinguish street lights and leave all other power on", at the handsome cost of £4000, was seriously considered until it was realised that street lights would be permanently extinguished in the event of "an emergency".³⁶⁰

The appointment of an ARP controller, a Captain R P Papillon, as a salaried employee of the council indicated that Dover was taking the potential threat of air raids very seriously indeed. Captain Papillon did not actually commence work until 3 May 1938 but the Czechoslovakian crisis of the autumn soon redoubled the ARP work within Dover. The mobilisation of the fleet and the sending of extra troops to Dover to provide anti aircraft defence to the harbour must have been a salutary lesson to the people of Dover. If such extra defence was being provided then it was certain that Dover, in its double role of garrison town and major port, would be a target. It was therefore an opportune time for the council to provide extra shelters for its citizens. It must be remembered that the 'Anderson Shelter' had not yet been accepted as a standard shelter; deliveries did not begin until the summer of 1939. The most sensible option was to re-open the tunnels and caves which had been used in World War One. Tunnels and Caves at Winchelsea, Snargate Street, and Priory End were requisitioned; they were to remain under the council's control until 1945. Others such as the Oil Mill and East Cliff caves were taken over temporarily before being returned to the previous tenants in October 1938. The rents being paid for these were in many cases very substantial, thus indicating the size of the project being undertaken.³⁶¹

³⁶⁰ *ibid.*

³⁶¹ Kent Archive Office, Whitfield Dover Town Council Records DO/CD/CP1 'Register of Premises taken over under Defence Regulations'. April 1937- October 1938.

Demarcation lines were being drawn for responsibilities; the parish of Ringwould between Dover and Deal seemed to be an area which no one wanted to have assigned to their ARP zone. Ringwould was in fact much closer to Deal than Dover but it was actually within Dover's district. This situation was potentially very serious for the inhabitants of Ringwould. If the parish was bombed then help would take a lot longer to arrive from Dover than from Deal. Dover was also more likely to be attacked than Deal and so the emergency services in Dover would have been expected to have had less spare capacity than their counterparts in Deal. However, from the point of view of the authorities in Deal, Ringwould was simply not in their jurisdiction and it would mean a stretching of their resources to the detriment of the people of Deal. The situation would eventually be resolved but it shows that, with the threat of war growing ever closer, even neighbours could not be relied upon to reach agreement for their mutual benefit.

Fear of air raids and the resulting damage was much greater in the late 1930s than even during the 'Blitz'. Aeroplanes were now capable of carrying bomb-loads unthinkable only twenty years previously. The fear was accentuated by the fact that no attacks had yet been made on Britain by this new generation of bomber. In 1918 a bomb weighing five hundred pounds was thought to be colossal, but during the Second World War single bombs weighing up to ten tons were dropped on targets in Germany by British bombers. However, five hundred pounds remained the standard size used by German bombers throughout the war. The damage which could be caused by these was obviously considerable but not as great as was thought by those who felt qualified to lecture on the subject. Speaking at the height of the Munich Crisis on 23 September 1938 to an audience in Leeds, Professor J B S Haldane outlined the terrors which the new bombs would bring. He stated that a "dozen high explosive five-hundredweight bombs would devastate Leeds much as an earthquake would."³⁶² He gave the example that only one five hundred pound bomb had been dropped on London between 1914 and 1918. People could well remember the scale of the damage and casualties caused in the First World War, but by 1938 bombs of this type "were the standard size."³⁶³ Professor Haldane then went on to outline how the Government needed to spend between £400,000,000 and £600,000,000 to provide

³⁶²*The Times* 24 September 1938

³⁶³*ibid.*

protection for the people of Britain. Haldane felt that if “a poor country like Spain had achieved it in war-time, so surely a rich country like Britain could do it in peacetime.”³⁶⁴ This ‘proper’ protection would be based on tunnels thirty to forty feet below the surface, tunnels which Professor Haldane estimated could be constructed for £19 a yard.³⁶⁵ Effective as this solution might seem in terms of the number of lives that would have been saved, Treasury calculations did not work on this basis but rather on how cheaply could most people be made relatively safe. The solution that squared this circle was the ‘Anderson Shelter’, to which we shall return in due course.

Others were taking the lead in providing air raid shelters. Property developers and estate agents in London were now using air raid shelters as a selling tool. The prestigious Bentinck Close development overlooking Regent's Park was advertised in the national press as having a “Fully Equipped Air Raid Shelter”.³⁶⁶ This part of the advertisement was written in a font second in size only to the name of the development. This theme would be continued in later advertisements for the development with an advertisement on 14 March 1939 stating that “The Specially Constructed Blast and Gas proof Air Raid Shelter in this Building is believed to be the most up to date in existence.”³⁶⁷ As its date coincided exactly with the German occupation of Prague it can be seen that the ‘hard sell’ is not exactly a new idea.

Domestic architecture was also starting to be affected by the fear of bombing as an article in *The Times* of 22 September 1938 showed. The article began by describing how, “The 1938 house, is clearly and unashamedly a refuge from destruction from the air”, however the caveat that “always setting on one side the direct hit by a large explosive bomb” was carefully added.³⁶⁸ Gas proof curtains were provided as was an air filtration system; the kitchen was the room of final resort, and it measured ten feet square by eight feet high. It was covered by forty tons of concrete to a depth of twelve inches all round. It was “designed to withstand the collapse of the house above it and neighbouring buildings.”³⁶⁹ As part of a four bed-roomed house

³⁶⁴ *ibid.* The cost of rearmament and its perceived adverse effect on the economy was of course at the heart of the appeasement policy followed by the government in the 1930s.

³⁶⁵ *ibid.*

³⁶⁶ *The Times* 27 September 1938

³⁶⁷ *The Times* 14 March 1939

³⁶⁸ *The Times* 22 September 1938

³⁶⁹ *ibid.*

costing £1100 it was seen as the latest thing in domestic architecture. The project was overseen by an Ipswich builder Mr P J C West. The house was visited at its unveiling in Ipswich by “members of Parliament, ARP Officials and representatives of the armed forces and was pronounced good.”³⁷⁰ The fact that the house had been built in Ipswich shows how not only the southeast but large swathes of eastern and north-eastern England also felt vulnerable to German attack across the North Sea.

During the Munich Crisis civilians were genuinely afraid of air raids. The people of Britain had witnessed the aftermath of the raids in Spain and China courtesy of the newsreels.³⁷¹ British Cellophane Limited took an advertisement in *The Times* warning that their ARP Window rolls which measured fifty feet long by twenty inches wide were nearly sold out. This ‘panic’ buying of ARP materials has a recent counterpart in Britain. In late 2001 the national press reported how gas masks were “sold-out”.³⁷² In the 1930s people were prepared to wait to be issued with gas masks.³⁷³ This British Cellophane product was recommended by the Home Office for use on large business premises and factories and was priced at ten shillings a roll. It needed only to be immersed in water before being applied to windows. The advertisement was also very careful to point out that “all orders placed are non-cancellable.”³⁷⁴ A sudden lessening of international tension would not necessarily be good for all businesses.

Home Office involvement in the Dover tunnels began at around this time with a Technical Adviser being sent to inspect the works. On 15 September 1938 his report reached the ARP Committee in Dover, the very day on which Neville Chamberlain flew for the first time to meet Hitler in Munich. The report was generally favourable. It stated “that with the exception of certain sections they appear to be safe refuges, especially as there is generally more than one exit, but that consideration should be given to stringent being exercised in regard to their use.” It would seem therefore that the ARP committee had done a relatively efficient job in preparing the tunnels. By the

³⁷⁰ *ibid.*

³⁷¹ The sight of this destruction in the cinemas of Britain invoked a similar anti-war attitude to that experienced in the USA during the Vietnam War because of the extensive TV coverage of the atrocities of that war.

³⁷² *The Times* 26 September 2001

³⁷³ The first gas-masks were issued to the public during the Munich ‘Crisis’ in October 1938.

³⁷⁴ *The Times* 28 September 1938

time of the committee's next meeting on 20 October the crisis was over, Czechoslovakia was no more and Dover could proudly claim that at "the time of the recent emergency the construction of splinter proof trenches had been put in hand and most of the caves earmarked for use as public shelters were gas proofed, fitted with electric lights and prepared for use."³⁷⁵ The Home Office ordered all work on the various projects to be stopped on 30 September. No time had been lost in preventing any further expenditure as a German military invasion of Czechoslovakia had only been avoided on 28 September. What became known as the Munich Agreement was not signed until 30 September 1938.³⁷⁶ The ARP committee was not to be totally thwarted and most of the caves were to be kept on as shelters. Some were returned to the previous tenants including the Oil Mill caves and the East Cliff caves. This was to become an issue with several of the previous tenants who sought compensation for their loss of revenue the caves. Mr Small's claim for £1 for rent for use of the East Cliff cave was dismissed as he was not actually the tenant.³⁷⁷ However, the owner of the Oil Mill Caves was compensated for the loss of a portion of the mushroom crop.³⁷⁸

Until the outbreak of war no new tunnels were to be constructed nor were any other tunnels taken over until the last days of August 1939 as the Polish crisis deepened. The ARP committee continued to meet regularly and the Borough Engineer was commissioned on several occasions to carry out reports on the feasibility of excavating new tunnels as well as improving the existing shelters. A big jolt to the plans of the Dover District ARP Committee was the news received in April 1939 that the Dover Rural Council area was to expect two thousand child evacuees from the Medway towns in the event of war. The two communities would have had little in common when the evacuees arrived. Large attacks on the Medway towns with their naval and aircraft factory facilities were obviously expected. Shorts at Rochester had provided a huge shelter which was tunnelled into the hill beside their factory for the use of its workers.³⁷⁹

³⁷⁵Dover Town Council Records DO Amd 3/1 Minutes of the meeting 20 October 1938

³⁷⁶I. Kershaw, *Hitler: 1936-1945 Nemesis* (London, 2001) p.122 gives the date as 30 October 1938

³⁷⁷Dover Town Council record DO Amd 3/1 minutes 24 November 1938

³⁷⁸*The Dover Express* 6 January 1939

³⁷⁹These tunnels still exist in the hills behind the former factory site.

From the time of the Munich Crisis until the outbreak of war ARP would continue to be a very important issue at national and local level. Increasing pressure was put on central government to give a clear lead. People wanted effective ARP but in most cases they expected to be given instructions as to how this was to be achieved. Not all areas necessarily agreed with the messages emanating from the Home Office. Dover Town Council was certainly one authority which struggled constantly with the Home Office for control of its own ARP policy. This was a struggle which would intensify as the war progressed and Dover's vulnerable position worsened conditions for all in the town. This is moving ahead somewhat and so now it is time to turn to the development of the national and local ARP Policies in the aftermath of Munich.

The publication in *The Times* on 1 October 1938 of Hitler and Chamberlain's joint statement of their desire "to remove possible sources of difference and thus to contribute to assure the peace of Europe" did seem for a short time to be grounds for a new optimism in a lessening of tension.³⁸⁰ It soon became clear that no such change was to take place; rearmament continued apace in Germany, France and Britain. The British people became more and more concerned about the state of ARP. On 11 October the success of the Treforest trading estate in South Wales was put down to its relatively safe location. It was "well off the track of any potential raider and has no embarrassing neighbours like shipyards or big armament factories."³⁸¹ Business too was obviously seeing the threat of future air raids in a new light and a self induced dispersal of industry was beginning. The fact that the steelworks of South Wales might be a major target for any such attacks seems to have been conveniently forgotten. In the same issue of *The Times* there was an advertisement for The Guest Keen Baldwins (GKB) steel shelters; their base operation was at Port Talbot in South Wales. The GKB steel shelters would quickly transform the trenches dug in towns and cities across Britain during the Munich Crisis into permanent shelters; it was implied at a fraction of the cost of any other shelter.

Throughout the autumn of 1938 new air raid schemes both for towns and cities as well as for factories received attention in the national press. Manchester's proposal would seem to have been one of the most expensive; a network of tunnels would

³⁸⁰*The Times* 1 October 1938

³⁸¹*The Times* 11 October 1938

provide shelter for one hundred and fifty thousand people.³⁸² Liverpool intended to build a single shelter that could accommodate between nine thousand and twenty three thousand people.³⁸³ Both this and the Manchester scheme were intended to double up in peace time as underground car parks. The Austin Motor Company scheme for Longbridge was intended to provide shelter for over twenty two thousand employees.³⁸⁴ Others used ARP as a means of selling their services and what would be more natural than for a nation of animal lovers to ensure the safety of their pets in the event of war. Boarding Kennels and Catteries were quick to take up on this idea, especially those in what were considered to be safe rural areas near London. On the front page of *The Times* in the “Kennel, Farm and Aviary” section advertisements for such establishments were rife. The advertisement for Bellmead Kennels, Haslemere 452 Surrey, on 1 October 1938, stands as a very good example. The advertisement promised that “Every care and precaution taken in the case of air raids”.³⁸⁵ The advertisement obviously sought to comfort the inhabitants of London with the knowledge that if bombing began at least their pets would be safe.

11 November 1938 brought the twentieth anniversary of the end of World War One. It acted as a reminder to the British people of the scale of suffering during that war. People did not want a repetition of the Great War but there was a growing certainty that a reckoning with Hitler was inevitable and that the most likely outcome would be war. Numbers of volunteers for essential services and the armed forces increased. The people of Britain did not want war but they recognised that it was coming all the same. Daphne Du Maurier spoke for many in her letter to *The Times* of 26 October 1938.³⁸⁶ She wrote how the children born in 1918 had now come of age and that the sacrifices made in their name did not perhaps seem as real to them as they did to the older generations. She feared that the Armistice Day rituals would become a mockery if more was not done to prevent such a repetition. She also feared that too many were putting their own nationalism before the cause of international good relations. These sentiments might seem naïve today but which at the time were

³⁸² *The Times* 9 September 1938

³⁸³ *The Times* 3 October 1938

³⁸⁴ *The Times* 5 November 1938

³⁸⁵ *The Times* 1 October 1938

³⁸⁶ Du Maurier married Major General Browning in 1932. He would command the 1st Airborne Division during the Second World War. It was she who suggested the Airborne division’s distinctive beret and badge.

obviously heartfelt and sincerely meant. However, in a nation that could have its winning ARP poster withdrawn because the judges were unsure of the nationality of the model used good international relations might not always have been seen to be a priority. The poster by James Davies showed a young woman looking out with a caption "ARP Looks To You"; this poster was chosen as the winner from an entry of nearly one thousand posters.³⁸⁷ The outcry which led to the withdrawal of the poster was caused as Mr Davies had used a photograph from an agency and could not be sure of the nationality of the model involved. The Women's Voluntary Services (WVS) official who issued the statement refused to discuss the nationality of the model.³⁸⁸ This incident clearly shows how nationalistic was the outlook of the WVS as no-one apart from them had any way of knowing that the model may not have been British.³⁸⁹

As criticism of Chamberlain's actions at Munich grew apace it did seem that many were trying to propel Britain into a war whose outcome and events they could not predict. Britons were becoming used to the idea of another war and because it was expected it was so much easier for it to begin.³⁹⁰ With so much attention being placed on what would happen in the event of a war, who had time to think did Britain really need a war? If they did take a moment to do so, then simple jingoistic catchphrases and slogans seemed to suffice. By carrying out ARP work the population was more likely to believe a war policy. If the population believed themselves to be relatively safe they might be more prepared to follow a more bellicose policy. Just witness the 'jitters' within British society in the autumn of 2001. When the war against terrorism was only a few weeks old people did not worry so much about what would happen in an invasion of Afghanistan but rather what will happen to them in retaliation.³⁹¹ Why should the British people in 1938/9 have been any less worried than was the case in late 2001?

³⁸⁷*The Times* 8 September 1938

³⁸⁸*The Times* 9 September 1938

³⁸⁹ It also serves as a reminder that the British people in the 1930s had little solidarity with the peoples of other regions in Europe; no matter what was claimed after the end of World War Two.

³⁹⁰ See A. Marwick, *Britain in the Century of Total War* (Boston, 1968) pp. 250-253 for a discussion of British public opinion from the Munich crisis to the outbreak of the Second World War. Also A. Calder, *op. cit.* p.25

³⁹¹ The British press at the end of September 2001 ran articles as to how Britons were preparing themselves for an expected terrorist attack. See the national press/TV etc for the second half of September 2001.

At the start of 1939 the Government's ARP policy began finally to be co-ordinated nationally and a White Paper was issued. This White Paper on ARP was published on 1 February 1939. The paper was obviously made ready in advance of the new ARP bill which was then in preparation. The report had been prepared by Mr David Anderson LL.D. B.Sc. M.Inst.C.E., Mr B. L. Hurst M.Inst.C.E. and Sir Henry Japp M.Inst.C.E. The recommendations included the clause that it should be compulsory for certain new buildings to have air raid shelters. The government should pay up to fifty per cent of the cost of the provision of air raid shelters and that private "sectional steel shelters" should be provided free to poor households. Their final proposal was the most important. It stated that "the provision of an air raid shelter in or on every residential property should be compulsory."³⁹² The exact nature of such a shelter was not specified and as a consequence the debate on the deep shelters versus the 'Anderson Shelter' grew. The arguments themselves had of course already been well rehearsed. Deep shelters saved lives and were good for morale, whilst surface shelters only offered the minimum of protection and were ineffective in the case of a direct hit. The counter argument was that people would refuse to leave deep shelters and that as a result the war effort would suffer. Surface shelters offered basic protection and even deep shelters could not always guarantee safety in the event of a direct hit. This argument would run and run, but the Home Office became convinced that a shelter place was a shelter place irrespective of its type. The order made for one hundred and twenty thousand tons of steel in January 1939 by the ARP Department of the Home Office was specifically for the construction of four hundred thousand steel shelters. This order would bring extra work to the steel and coal industries as well as to the railways and hauliers.³⁹³ The 'Anderson Shelter' was soon to be on its way to towns and cities across the country.

1939 saw another heightening of the profile of ARP in Dover's Town Council and also in the local press. The Town Council's discussions more often than not, began with the topic of ARP expenditure.³⁹⁴ Mr Stevens finally got his £101 1s. for the "disruption to his mushroom crop in the Oil Mill Caves in the "recent International

³⁹²*The Times* 2 February 1939.

³⁹³*The Times* 17 January 1939

³⁹⁴*The Dover Express* 6 January 1939

crisis".³⁹⁵ The editorial in the same issue of 6 January 1939 lamented the very slow progress on "doing anything to put Dover underground".³⁹⁶ The tunnel schemes of Mr Bennett and the Left Book Club were mentioned as possible solutions to Dover's ARP problems as were Professor Haldane's ideas.³⁹⁷ The editor of *The Dover Express* proposed that an underground car park should be incorporated into the Folkestone Road widening scheme. This would help Dover's traffic and ARP problems at one stroke. The underground car park would of course double in time of war as an air raid shelter.³⁹⁸ The same edition also carried an advertisement to recruit one hundred Anti-Aircraft Gunners for 233rd (Kent) Anti-Aircraft Battery, Royal Artillery. This sort of government advertising would have heightened anxiety in areas as exposed as Dover. However, not all nearby councils were so worried. There was a minority on the Bridge-Blean Rural District Council, between Canterbury and Dover, who opposed spending for ARP. As Councillor Baker of Bekesbourne stated ARP provision was a form of "squandermania" and it was "absurd for rural districts to spend so much".³⁹⁹

The next edition of *The Dover Express* on 13 January 1939 carried the obituary of Sir Edward Farley Member of the British Empire (MBE), Justice of the Peace; Dover's Mayor during the First World War. He was praised particularly for the work which he had done on the town's behalf at that time. The comment made; "During the whole of the war he never slept outside Dover..." obviously showed his personal commitment to the town but it was also an aside at those who had not followed his example. It was also perhaps a warning to this generation of what was to come.⁴⁰⁰ Farley received his MBE in 1918 and his knighthood in 1920. Both were given in recognition of his services to Dover and the country during the war. His funeral was a grand affair showing the regard in which he was still held by the people of Dover.

³⁹⁵ *ibid.*

³⁹⁶ *ibid.*

³⁹⁷ Bennett was a mineworker and a member of the local education committee. He was also the Labour Party's prospective candidate for Dover at the next general election. The Left Book Club was as its name suggests a Communist and Socialist inspired club aimed at improving the public's understanding of political issues. Its membership reached sixty thousand in the period before the war. See P. Brendon, *op. cit.* p.527

³⁹⁸ *ibid.*

³⁹⁹ *ibid.*

⁴⁰⁰ *The Dover Express* 13 January 1939

The new ARP work continued with a test of the siren at 12.45pm on 13 January 1939. The siren used was the one which had been used in the First World War. This demonstrates that *The Dover Express* was correct when it wrote in 1936 that Dover would only have to take its siren out of the museum in the event of a future emergency.⁴⁰¹ However, it was found that the old siren was no longer up to the task and a new one had to be purchased. The 'black out' test to be carried out on 5 February 1939 was announced in 20 January edition.⁴⁰² The news that a large refugee camp to hold "German Jews at Richborough" had been set up received equal prominence in the same edition.⁴⁰³ Neither the ARP test nor the refugee camp it would seem were particularly welcome.

Evacuation was also in the news. The Ministry of Health issued a list of all the towns to be evacuated in the event of war. Dover did not make that list.⁴⁰⁴ This prompted sarcastic comment in *The Dover Express*'s "In the Street" feature. The feature read "They say that it is to be hoped that foreign bombers will be supplied with copies of the list of neutral towns in Great Britain."⁴⁰⁵ It is obvious that the man and woman in Dover's streets did not expect such a list to be supplied. The situation of Dover with regards to evacuation would remain confused through the spring and early summer of 1939. The people and politicians in East Kent remembered the fact that the area had been on the route of German bombers to London in the First World War. They were worried that bomb-loads might again be jettisoned on East Kent if bombers could not find or were prevented from reaching other targets. They campaigned for the area to be classified as one which should be evacuated. By the end of the month it had been confirmed that Dover was not to be classified as neutral but as a reception area for evacuees. There may also have been concern from the more affluent sections of society at the thought of having working class families billeted in their homes⁴⁰⁶. The Ministry of Health ordered a survey of the town to ascertain the amount of suitable accommodation which could be made available to evacuees.⁴⁰⁷ If

⁴⁰¹ *The Dover Express* 20 January 1939 & 8 May 1936

⁴⁰² *The Dover Express* 20 January 1939

⁴⁰³ *ibid.*

⁴⁰⁴ *The Dover Express* 13 January 1939.

⁴⁰⁵ *ibid.*

⁴⁰⁶ See also above p.109 when the decision was taken to billet evacuees in the Dover Rural District area

⁴⁰⁷ The town council refused to undertake any such survey and in March 1939 the Town Clerk wrote to Kent County Council confirming that the council still did not intend to do so. See P. Hayward, *Children into Exile* (Dover, 1997) p.15

Germany, as was now expected, was to be the main enemy its bombers would approach from across the North Sea. Dover would therefore have been a suitable area for evacuation being off the main bombing routes.

This view of course took no account of the likely military situation which would result from another war in the west. No consideration seemed to have been made of a situation arising in which the Germans might attack through neutral Belgium or the Netherlands. Belgium had been unable to put up much effective military resistance in 1914, despite instances of individual gallantry, and since declaring its neutrality in the 1930s it was impossible for the French to arrange any co-operation with their erstwhile ally. This left the, as yet unfinished, extension of the 'Maginot Line' in northern France to prevent Germany from coming as close to capturing the Channel Ports as she did in 1914. Any advance into Holland, Belgium or northern France would again put East Kent directly on the bombing route to London. This possibility was in fact totally ignored by the planners in the Home Office and Ministry of Health. There was also a worry that as Dover would most certainly again become an important military centre, the presence of unknown outsiders might compromise the security of the town. This argument was put forward in the council meeting of 24 January 1939.⁴⁰⁸ As there did not seem to be any way of vetting the outsiders Dover felt itself completely justified in opposing these plans. The Council refused to carry out the required housing survey. Another source of satisfaction was the fact that such a decision would not be welcomed by neighbouring Folkestone which at this time was doing its best to persuade visitors that there was nothing to fear from visiting the town.⁴⁰⁹ Folkestone relied more upon the holiday trade for its livelihood than Dover.⁴¹⁰ Dover's visitors were more often passing through while Folkestone still relied heavily on its amenities to attract visitors. Folkestone in the 1930s was not so removed from its Edwardian hey day when the king and his friends were frequent visitors. It was still an important resort which relied on visitors for its economy.⁴¹¹ Folkestone invested heavily in the town's infrastructure between the wars creating the Kingsnorth Gardens from a clay pit, building the Leas Cliff Hall and the 'Zig-Zag' path linking the sea-front with the Leas Cliff top walk. It

⁴⁰⁸ *The Dover Express* 27 January 1939.

⁴⁰⁹ *ibid.*

⁴¹⁰ F. Stafford & N. Yates, *The Later Kentish Seaside* (Gloucester, 1985) pp.10-12

⁴¹¹ Folkestone had in the Edwardian period earned the epithet 'Fashionable Folkestone'. *ibid.* p.12

did not want to be classified as a town which would need to be evacuated in the event of war. War could begin at any time and visitors might not want to risk coming to east Kent. By June 1939 Dover had been reclassified once more as a "neutral area" thereby neither receiving nor sending out any evacuees.⁴¹²

Another interesting point which became apparent at around this time was the fact that the three letters A, R and P were becoming so recognised that advertisements for goods and services with nothing to do with ARP were being entitled 'ARP'. The examples of boarding kennels and housing have already been cited. An advertisement for Jack Williams Tobacconist of Bench Street, Dover was headed 'ARP'; ARP standing of course for "A Real Pleasure".⁴¹³ Articles on ARP were obviously something which advertisers thought readers were on the look out for and could therefore be used to benefit their advertising clients.

Dover's 'black out' and ARP test made the national news on 6 February being worthy of an article in *The Times*.⁴¹⁴ Their correspondent in Dover reported that all went very well according to the services involved. Tests of this sort would be repeated up and down the country but the test at Dover made the news because it was one of the very first to be staged. Sandringham was subjected to a mock raid on Saturday 28 January 1939 and on the same evening an ARP test in the Paddington area of London involved a three hour 'black out'.⁴¹⁵ February 1939 was to be an important month for ARP in Britain. The Air Raid Defence League's foundation was made public to the nation on 7 February in the shape of a letter to *The Times* from two of its founders Sir Arthur Salter and Sir Ralph Wedgwood (General Manager of the London and North Eastern Railway).⁴¹⁶ Saint Valentine's Day brought the first public test of the 'Anderson Shelter' in Shoeburyness. Ramsgate's scheme for a series of interlinking tunnels using an abandoned railway tunnel as its basis received national attention.⁴¹⁷ Cardiff also launched its plans for public shelters with eight thousand places in the

⁴¹²*The Dover Express* 9 June 1939

⁴¹³*The Dover Express* 27 January 1939

⁴¹⁴*The Times* 6 February 1939

⁴¹⁵*The Times* 30 January 1939

⁴¹⁶*The Times* 6 February 1939

⁴¹⁷*The Times* 17 February 1939

city centre and five thousand places in the castle. The city authority's estimated that twenty thousand "garden shelters" would be required.⁴¹⁸

Meanwhile in Dover the Town Council calculated that twenty-three thousand five hundred and fifty additional shelter places would be needed for the townspeople.⁴¹⁹ The Council had prepared a scheme costing £250,000 to provide deep shelter accommodation for the entire population of the town. This would be achieved by improving the existing caves and tunnels at a cost of £740, excavating new caves and tunnels at a cost of £208,245. Existing basements were to be improved and light bombproof shelters created at a combined cost of a further £24,440. The old deep shelters could accommodate three thousand four hundred and fifty people, the basements and light bombproof shelters a further three thousand eight hundred and fifty. The new tunnels would house the majority of the population being able to hold twenty-two thousand eight hundred and twenty-five persons.⁴²⁰ The cost of the scheme made it likely that it would be rejected by the Home Office; the scheme for Ramsgate was estimated to cost only £80,000 utilising as it did an existing tunnel. A step was taken to provide some improvement to the existing shelters with the issuing of advertisements by the Town Council for tenders for ARP work. These tenders were for the "completion of the excavation of certain existing trenches to finished sizes and for the permanent lining of these trenches in accordance with the Home Office specification".⁴²¹ During the Munich Crisis trenches had been dug in five sites across the town. Similar trenches had been dug in other towns and cities across Britain, usually in open spaces such as parks and playing fields. Regent's and Hyde Parks in London gained such trenches. The trenches were ignored after the crisis had passed and became potential hazards in many areas as they were not filled in. In Dover seven hundred and seventy-five yards were dug and the contractors had until 2 March 1939 to submit their tenders for the completion of the work. The work would obviously increase the effectiveness of the trenches in the event of a raid but it would also mean that no-one would fall into the trenches! Ramsgate's ARP scheme gained the approval of Sir John Anderson in February and funding of £80,000 was granted to carry it out. The report on this in *The Dover Express* suggested not only a feeling of envy towards

⁴¹⁸ *ibid.*

⁴¹⁹ *The Dover Express* 10 February 1939

⁴²⁰ *ibid.*

⁴²¹ *ibid.*

Ramsgate but also a feeling of Dover being slighted.⁴²² This feeling was shared by the people of Dover as well.

Members of the Town Council began to feel that Dover was being ignored by central government in London. This feeling was put forward very strongly by Alderman Powell at a Council meeting, as reported in 10 March edition of *The Dover Express*, “other places in Kent, situated in the same way, went to their member [of parliament], and they had a telephone message the next day giving them everything they wanted.”⁴²³ The implications were clear either Dover's Member of Parliament (MP) was not doing his job or Dover was being slighted by the Home Office or both. The MP during this period, Major Astor, who had been the sitting MP for seventeen years, was planning to retire at the next election.⁴²⁴ He went so far as to introduce the Honourable Peter Beatty as his prospective replacement at the Annual Dinner of the Dover Chamber of Commerce on 15 February 1939.⁴²⁵ As the next General election would not be held until 1945 Major Astor did not retire and remained the MP for the duration of the war. He was also the Chairman of *The Times* newspaper and therefore very well placed to pressurise the government to the advantage of his constituency. The Town Council in its deliberations remained divided as to the extent of his help, usually along party lines.⁴²⁶ Peter Beatty was the son of Admiral Beatty and so was trading more on his family name and naval connections than any link with Dover itself. Admiral Beatty had been one of Britain's greatest naval heroes of the First World War and the people of Dover still remained proud of their town's naval heritage. In the Second World War and as in the First the pages of the local press reflected that it was to their Mayor that Dovorians looked for a lead and not their MP.⁴²⁷ The editorials and letters in the local press refer more to the conduct of the mayor and the council than to that of the MP.

⁴²²*The Dover Express* 17 February 1939

⁴²³*The Dover Express* 10 March 1939

⁴²⁴ Major the Honourable John J. Astor was elected in 1922 as Conservative MP for Dover.

⁴²⁵*The Times* 16 February 1939. Peter Beatty was the younger son of Admiral of the Fleet Earl Beatty. He had some success as a race horse trainer, one of his horses winning the 1938 Derby.

⁴²⁶*The Dover Express* 24 March 1939 carried the minutes of the council meeting of 21 March at which it was decided that a letter be written to Major Astor, so that he should put forward Dover's case to the Home Office with more vigour.

⁴²⁷ During the First World War Dover's MP had been the Conservative Viscount Duncannon. He served with the Suffolk Yeomanry throughout that War. J. Bavington Jones, *Annals of Dover* (Dover, 1936) p. 434-435.

The news in March that Kent County Council (KCC) wanted Dover to simply fill in its trenches rather than carry out the proposed lining work, which had already been put out to tender, was greeted with great hostility in the pages of *The Dover Express* and in Council meetings. It was suggested that questions should be asked in Parliament.⁴²⁸ Dover did not want to see any of its ARP work undone despite calls for this which might be made by outsiders. Even a body such as KCC was treated as an outsider by the people and politicians of Dover in such a situation. The ARP works already carried out ensured that Doverians could be offered some form of protection in the event of an attack. The removal of some of this provision would of course reduce the numbers of those who could be offered protection and thereby made the whole town feel more anxious. These feelings were played on by the firm of Walker & Laurie of 38 Wear Bay Road in Folkestone who ran an advertisement in the 24 March edition of *The Dover Express* headlined "Let us build your ARP shelter". The advertisement advised "Dad don't wait and see - Invest in the fortress" and that as such their ARP shelter was "security for body and mind".⁴²⁹

The anxiety caused by the fear of air raids was growing all the time and the news in the reports from China and Spain were getting worse rather than better. This was exacerbated by the visual images being shown by the Newsreels.⁴³⁰ Examples of raids in early 1939 included a raid on Tarragona, Spain in which thirty people were killed.⁴³¹ Chungking in China was bombed on 10 January 1939; this raid was reported the following day in *The Times*.⁴³² Another Japanese raid, this time on Ichang on 9 March 1939, was reported in *The Times* and casualties on this occasion were given as three thousand persons killed or wounded.⁴³³ This was the largest number of casualties reported in a single raid up to that time. This seemed to demonstrate that bombers were becoming more effective and that if proper shelters were not provided potentially large numbers of people in Britain would be killed or wounded in the event of a war. On 15 March the German occupation of Prague the previous day was

⁴²⁸*The Dover Express* 17 March 1939

⁴²⁹*The Dover Express* 24 March 1939

⁴³⁰N. Pronay, "British Newsreels in the 1930s 2. Their Policies and their Impact" *History* Vol. 57, 1971 pp.63-72

⁴³¹*The Times* 5 January 1939

⁴³²*The Times* 11 January 1939. A later raid on Chungking in May 1939 took the lives of seven thousand civilians.

⁴³³*The Times* 9 March 1939

the main headline in the national press.⁴³⁴ War in Europe had moved another step closer and the importance of ARP to the people of Britain became even greater.

Dover was experiencing the problems of mainland Europe more directly than most other areas of the country. It was through Dover that increasing numbers of refugees entered Britain. These numbered not only German Jews but also Czechs. On 20 February 1939, two hundred and thirty Czechoslovakian refugees landed in Dover *en route* to Norfolk.⁴³⁵ Refugees did not seem to stay in Dover in such large numbers as they do at the start of the twenty-first century and there was no suggestion of anti refugee feeling in the town in the late 1930s. Rather the refugees were to be pitied and it was because of Dover that they were able to come into Britain and start a new life. The 24 March edition of *The Dover Express* featured a photograph of the refugees at Dover Maritime station as they waited for their train to Norfolk. They did not look particularly different from British people and nor did they look threatening. The photographer's and therefore the readers' sympathies were meant to be with the refugees.⁴³⁶ During the inter-war period the official British Government refugee policy was that Britain was not a country of immigration and that a careful policy of restrictive asylum was needed.⁴³⁷ In total between 1933 and 1939 50000 refugees from Germany and 6,000 from Czechoslovakia entered Great Britain.⁴³⁸ Public opinion was in many respects split between those who say it as the country's humanitarian duty to help the refugees and those who worried about the effect that large number of immigrants without independent means would have on a nation still suffering from large scale unemployment.

Not only refugees entered Britain through Dover but also the politicians and diplomats who were deciding Europe's future. Chamberlain did not carry out all his international diplomacy by aeroplane. Munich was in fact an exception to the general transport arrangements for politicians at the time.⁴³⁹ In January he and Lord Halifax

⁴³⁴ *The Times* 15 March 1939

⁴³⁵ *The Dover Express* 24 February 1939

⁴³⁶ *The Dover Express* 24 March 1939

⁴³⁷ A.J. Sherman, *Island Refuge: Britain and Refugees from the Third Reich 1933-1939* (London, 1973) p.259

⁴³⁸ *ibid.* p.264

⁴³⁹ This can be seen with the success of Hitler's election campaigns by aeroplane, this form of travel was something new and exciting even for politicians. Chamberlain's flight to Munich took only 4 hours, the equivalent journey by train and ferry would have taken the best part of a day. Henderson, the

braved the Channel in winter en route to talks with Signor Mussolini in Rome. This of course took them through the Port of Dover. Dover was still as much England's gateway to Europe as Europe's gateway to England. Most of the cross Channel traffic came through Dover and its port welcomed many of Europe's statesmen and royalty in the 1930s. The death of King George V brought many of them through Dover on their way to attend his funeral. The increasing tension as the decade came to an end saw a steady flow of foreign diplomats through the port. In the spring of 1939 Colonel Beck, the Polish foreign minister, joined this number on his way to London on 3 April.⁴⁴⁰ This visit followed Britain's announcement of its guarantee of Polish sovereignty. Dover was the first place in England which these dignitaries saw and it was also Dover which first saw them. The severity of the international situation was often reflected in the number of such visitors. To Dovorians these visitors were not just names which they read about in the national press but people who could be seen in the flesh. Today diplomats and politicians employ aeroplanes for international diplomacy. Airports are conveniently situated close to the capital cities. In the 1930s this was not the case. It was ports such as Dover that were the centres of all international travel. In the years between March 1937 and March 1939 two hundred and twelve ocean liners called into Dover carrying an estimated one million, one hundred and ninety-three thousand, six hundred and twenty passengers.⁴⁴¹ Those who disembarked from the liners at Dover, both passengers and crews, would have brought stories of events in Europe and the rest of the world to the people of Dover in a way that the newspapers would have failed to do. Direct contact with individuals and their experiences would have engaged Dovorians in a manner that the newspapers could not. The realities of the problems being faced in Europe must have been all the more apparent to Dovorians than to people almost anywhere else in Britain. There were other British ports, many larger and even more cosmopolitan than Dover, but Dover was the closest town to mainland Europe and was all too aware of this position. Dover felt threatened by the international tension and the work done on ARP seemed to be one of the most positive steps which could be undertaken by the town to safeguard its inhabitants should the worst happen.

ambassador, left Berlin the night before by train and only arrived at the Munich aerodrome just before Chamberlain's aeroplane; see N. Henderson, *Failure of a Mission* (London, 1940) pp.148-149

⁴⁴⁰*The Times* 4 April 1939 & *The Dover Express* 7 April 1939

⁴⁴¹*The Times* 16 February 1939

April 1939 saw the first stirrings in the town that if the council could not persuade the government to get something done about ARP then the people of Dover should be prepared to do something themselves. W H Bennett of 321 London Road wrote to *The Dover Express* on the subject. He was the prospective Labour party candidate for the constituency in the next general election but he made no mention of his political stance in the letter.⁴⁴² ARP had become such an important issue within Dover that it was the cornerstone of Mr Bennett's attack on the town's political representatives. This letter, while on the one hand praising the Town Council for its work and on the other criticising the government for its lack of activity, went on to exhort the people of Dover to "stir themselves to get something done."⁴⁴³ The council was quoting figures for tunnels costing up to £40 per yard to construct. Mr Bennett felt certain that tunnels could be built for £2 2s. per yard using miners from the East Kent collieries together with the one thousand unemployed men then registered in Dover itself.⁴⁴⁴ Mr Bennett was portraying himself as a man of action who could 'get things done' for the town. He could only lose this argument if he was given the opportunity to construct the tunnels and failed to do so. If the tunnels were constructed he could claim that his pressure had brought this about and if they were not he could cite the incompetence of the sitting MP and the councillors as the reasons why Dover was being disadvantaged with respect to its neighbours.

An ARP exhibition was organised in the town hall on 5 April 1939.⁴⁴⁵ It was intended to show the people of Dover and the surrounding area all aspects of ARP, from shelters to first aid, from gas masks to the effects that might be expected should a bomb land in Biggin Street, one of the town's main shopping areas. The exhibition had been organised by the town's ARP Committee and was intended to show not only what was being done but to reassure the townsfolk as well as to recruit new members for the Civil Defence units in the town. Over one thousand men and women were required to fill all the various positions. The most numerous of these were the positions of the Air Raid Wardens. Over seven hundred were required in Dover; two hundred and eighteen persons were required for First Aid Parties, one hundred and fifty Ambulance drivers, one hundred and thirty-two men to form the Rescue Parties

⁴⁴²*The Dover Express* 7 April 1939

⁴⁴³*ibid.*

⁴⁴⁴*The Dover Express* 7 April 1939- figures quoted by W.H. Bennett.

⁴⁴⁵*The Dover Express* 31 March 1939

and fifty-two for the Decontamination squads which would 'clear up' after any gas attack. These were all voluntary posts and people were expected to undertake the training in their spare time. As late as July over six hundred vacancies still existed.⁴⁴⁶ This poor state of affairs may have been due to the fact that many of the younger men would have been engaged by then on National Service. It demonstrates that if people were worried about ARP they did not necessarily expect to have to do anything about it themselves. *The Dover Express* strongly urged its readers to visit the exhibition just as they advised them to go and see the new ARP film "The Warning" which was to be shown in the town two weeks later.⁴⁴⁷ *The Dover Express* had heartily committed itself to the cause of ARP long before the war started. There was no half heartedness about its stance; the newspaper did not want war but if and when it came Dover would be ready.

There was also a call in the editorial of *The Dover Express* on 7 April for long term loans to finance the council's £250,000 tunnel scheme for the town.⁴⁴⁸ The decision had to be made by the town, *The Dover Express* felt, as to whether it was worth having deep air raid shelters if the Government would not pay for them. If the town decided it wanted the shelters then the townsfolk would have to pay for them. The next edition of *The Dover Express* brought the less than welcome news that, to quote the newspaper's editorial, "It appears to be the case that Dover is on the list to receive Anderson steel shelters."⁴⁴⁹ These shelters were to be free to householders earning less than £5 per week. This was not quite good enough for the local press because "there is something very wrong with a system by which a town like Dover has to rely upon what London will let it do to provide protection."⁴⁵⁰ The situation during World War One had been haphazard but at least something had been done claimed the newspaper; this was obviously not expected to be the case in any future war. In the view of the editorials, London based government departments were going to make the decisions and Dover would have to carry them out.⁴⁵¹ *The Dover Express* did not agree with such a situation as it felt that those on the ground were better placed to decide what was best for Dover. The way around this situation was for

⁴⁴⁶ *The Dover Express* 7 July 1939

⁴⁴⁷ *The Dover Express* 31 March 1939

⁴⁴⁸ *The Dover Express* 7 April 1939

⁴⁴⁹ *The Dover Express* 14 April 1939

⁴⁵⁰ *ibid.*

⁴⁵¹ *ibid.*

Dovorians to take matters into their own hands, in this case literally not figuratively. The editorial encouraged people to volunteer again, as they had done at the time of the Munich Crisis. On this occasion the volunteers should be given specific tasks; revolving around the building of ARP tunnels. Dover had three demands the editor concluded; firstly the right to make tunnels, secondly to be provided with the materials to support the roof and sides of the tunnels and finally a supply of suitable tools to carry out the job.⁴⁵² Dover would be able to do the rest.

Only a week later the news that the Government had confirmed its opposition to Dover's proposed new tunnels was printed in *The Dover Express*.⁴⁵³ The 'Anderson Shelter' had been "perfected and approved by the Government" according to the report of the Dover Town Council Air Raid Precautions Sub Committee and would be the preferred option for Dover's ARP requirements.⁴⁵⁴ "The construction of deep shelters is not in accordance with the policy of the Government." the sub-committee's report continued but the true reason for this objection it would seem was that the deep tunnel schemes would cost too much according to the Home Office.⁴⁵⁵ Dover would find that the schemes would be rendered unnecessary as soon as the 'Anderson' shelters had all been delivered. There is also the fact that in the 1930s the British government was concerned that the "British working class.... [was] susceptible to panic and disillusion in the face of an aerial onslaught".⁴⁵⁶ This view explains why the government did not favour deep shelters; they felt that large numbers of people would retreat into their secure confines and not return to work.

The tunnel schemes would, in any event, not be considered until their cost could be lowered from £10 per person accommodated to £4 per person. While Britain was at peace financial stringency remained paramount and the authorisation of such ARP schemes would not be considered unless the Home Office could be convinced that they were in fact cheaper than the provision of 'Anderson Shelters'. Such had been the case in Ramsgate which, due to the shape of the town and the ready access to the proposed tunnel network, almost removed the need for 'Anderson Shelters' in the

⁴⁵² *ibid.*

⁴⁵³ *The Dover Express* 21 April 1939

⁴⁵⁴ *ibid.*

⁴⁵⁵ *ibid.*

⁴⁵⁶ M. Connelly, *op cit.* p.138

town. The Home Office never denied that deep shelters would save more lives; they merely continued to state that such deep shelters "were not in accordance with the policy of the Government".⁴⁵⁷ 'Anderson Shelters' gave minimal protection for minimal cost. The difficulties experienced in getting the tube stations opened as shelters in east London provides another example of this. The objection that the tube stations were not safe was hardly credible when they were being compared to a steel framework under two feet of earth.⁴⁵⁸

In Dover there was also a refusal, at many levels, to accept that the 'Anderson Shelter' was the best that could be provided for its people. There were two main factors that shaped the decision which air raid shelter a family group or individual would choose. The first and most important in nearly all cases was the location of a shelter in relation to where one was when the siren was sounded. People would invariably choose the nearest available shelter. 'Anderson Shelters' would be, for most home owners, the nearest option and if no suitable deep shelter was available within easy reach then people would use their 'Anderson shelter'. In an interview with a Mr Bob Lawrence who lived in one of the areas of Dover furthest from the tunnels and cave shelters, he stated that his family used their 'Anderson Shelter'; the deep shelters weren't simply an option. Who was going to walk fifteen minutes to one of those after the siren had sounded or the first shell had landed?⁴⁵⁹ However, if a deep shelter was within relatively easy reach then people would choose to use them. People did not object to the deep shelters because they were communal but rather that they were too far away from their houses. This was why there was such strong opposition from the authorities of Dover to the idea of the town having to merely rely on 'Anderson Shelters'. As events unfolded after May 1940, the Government's judgement that 'Anderson Shelters' were sufficient for Dover's needs would be proved increasingly erroneous.

Fears were raised over the state of Dover's medical facilities. Articles in *The Lancet* had suggested the possibility that between twenty and thirty casualties could be expected per ton of bombs dropped. This supposition was taken up by one of

⁴⁵⁷*The Dover Express* 21 April 1939

⁴⁵⁸A. Calder, *op. cit.* pp.183-7

⁴⁵⁹Interview with Mr Bob Lawrence on 24 September 2001

Dover's physicians, Dr J J Cobbe who stated in a letter to the *Dover Express* at the end of March 1939 that air raids on London could result in up to thirty thousand casualties per week. In such a scenario Dover would not be able to rely on help from outside agencies in the event that Dover itself was attacked. Even though Dr Cobbe expected that "Air raids on Dover will be minor event in a big war" unfortunately "other places will be far too busy dealing with their own cases to help us."⁴⁶⁰ In this worst case scenario the damage caused to Britain by enemy aircraft would be so catastrophic that Dover would, like many other places, have to go it alone. Towns and cities across the country would have suffered such casualties that their medical facilities would be stretched and therefore would not be able to help Dover, a town which could be expected to escape the worst. Dr Cobbe thought that Dover would not be "safe" but would at least be a place "where air raids will not have the disastrous effects that might result elsewhere."⁴⁶¹ These ideas were based on the best information available at the time and the experience of the First World War when Dover actually suffered little material damage. The fear produced in the town by the Gotha bomber raids far outweighed the number of casualties or indeed the destruction caused by them. Such fear could have produced as much psychological trauma as actual severe material damage. A crowd or mob, faced by armed police, is often more afraid before it is fired upon than afterwards. The analogy can be stretched to a town which expecting bombing fears the worst but does not know actually what the worst is.⁴⁶² In the case of Dover, the worst would come long after the next war had begun, making Dover a very worried place indeed.

The amount of space devoted to the subject of ARP in the town's only newspaper is testimony to this fact. This is supported by the fact that the debate within Dover on ARP started as early as 1936.⁴⁶³ Even in the spring of 1939 it was by no

⁴⁶⁰*The Dover Express* 31 March 1939

⁴⁶¹*ibid.*

⁴⁶²O. Figes, *A People's Tragedy* (London, 1997) pp.312-313. Writing of the crowds in Petrograd at the start of the February 1917 revolution, Figes noted how they were often more timid before being fired upon than afterwards.

⁴⁶³The issue of ARP was coming to the fore after the war in Ethiopia saw the first mass publicised deliberate use of poison gas from the air on civilians. It was first employed by the Italian airforce in late December 1935. The contemporary estimate was that a quarter of a million Ethiopians were killed or wounded in gas raids. Britain, France and Spain had used it in colonial conflicts in the 1920s. See P. Brendon, *op. cit.* pp.276-277. The wars in Spain and China saw the use of bombers against civilian targets on a scale not before possible, mostly against undefended towns; targets which were likely to suffer heavy damage and severe casualties.

means certain that war would break out in the near future.⁴⁶⁴ The British and French guarantees to Poland, together with the rising tide of shame in British 'public opinion' did make war seem more likely. This together with the record of the Nazi regime and its insatiable expansionist drive made collision seem inevitable but it was hoped that Britain's new found steadfastness would be enough to deter Hitler. Certainly there was a belief held among much of the population that this would be the case. Britain did not seem to be anxious for conflict, and one of the best ways of deterring potential aggressors was to be ready for them. Rearmament played an extensive role in this but so too in many people's minds did ARP. An effective system of ARP would prevent Britain's enemies from being able to 'knock-out' her industrial capacity and her will to fight in a brutal but short series of aerial attacks. The experience on which the ideas of modern bombing were based included the Sino-Japanese War and the Spanish Civil War. Both seemed to reinforce Stanley Baldwin's dictum that "the bomber will always get through".⁴⁶⁵ The Japanese, Italian and German forces were operating against minimal resistance and headlines which read "Nowhere in Spain was Bombed Today" or "Air Raid causes little damage and no casualties" would have generated little response from the public. What were newsworthy were the raids which caused massive damage or major loss of life. Britons as a whole and those who lived in areas which had already experienced bombing were most effected by this news. The great advances in aircraft technology and armaments meant that in 1939 one or two bombers could carry the load of an entire World War One vintage bomber squadron.⁴⁶⁶ The size of high explosive bombs had also increased massively from two pounds in 1914 to five hundred or even one thousand pounds in 1939. There was the expectation that bombers could and would destroy cities and with them their civilian populations. The initial events of World War Two would do little to allay such fears. Terror raids and their consequences became an accepted fact of war after the events at Warsaw and Rotterdam. These raids were not as shocking as the one carried out on Guernica had been, but they showed that in the Second World War any town or city was liable to be considered a legitimate target by the attackers even if those attacked

⁴⁶⁴ For a fuller discussion of GB in the spring of 1939 see A. Marwick *op. cit.* pp. 250-3. Also Calder, *op. cit.* p.25

⁴⁶⁵ This often repeated phrase was an extract from a speech made to Parliament by Prime Minister Baldwin on 10 November 1932. It was a speech which came after the failure of the Geneva Disarmament Conference, where Baldwin had hoped that aerial bombing would be abolished. See H. Hyde, *Baldwin* (London, 1973) pp. 353-355

⁴⁶⁶ A Squadron of twelve 1917 vintage heavy bombers could carry around six tonnes of explosives; the medium bombers of the 1930s could carry about two tonnes each.

did not agree.⁴⁶⁷ These raids had been carried out on defenceless cities, which due to their layout and the types of buildings found within them were more prone to burn than their British equivalents. This fact was overlooked in the headlines in the national press. These articles did more to raise the profile of the Luftwaffe than they did to reassure the people of Britain. Headlines which could outrage could also frighten.⁴⁶⁸ Geographically exposed places such as Dover were left worried and frightened; they had the first stage of the "jitters".

The end of April 1939 brought no resolution to Dover's tunnel problem. The Home Office remained recalcitrant over funding and the necessity for such a scheme.⁴⁶⁹ Dover's press and the council became more adamant in their public pronouncements that such a solution to the ARP issue would have to be funded. Should the truism that "Dover has to rely upon what London will let us do", be allowed to continue?⁴⁷⁰ In Dover the question of ARP was coming to be presented very much as one of 'them and us'. 'Us' meant anyone living in Dover and 'them' anyone outside the borough's boundaries. The civil servants and politicians in London were obviously not prepared to do what Dover considered to be best for Dover. While every other borough, municipal and civic authority in Britain were competing with Dover for the funds and materials which were already considered to be in such short supply. It was up to Dovorians to react to this situation in the only way thought possible by the local newspaper. This was to volunteer to build their own tunnels and for the council to give the people a lead on the issue. A letter published from one of the councillors, Ernest E Chitty dated 25 April 1939, served to underline the fact that whilst the councillor might see the need for tunnels, Dover's arguments for more tunnels were still being couched in terms that were completely at odds with the governmental criteria for their construction. The Home Office did not want tunnels to become dormitories. It was feared that morale would become so low that people

⁴⁶⁷ The British presented the 1940 'Blitz' as an example of German terror bombing but presented their own tactic of area night-bombing as a legitimate tactic.

⁴⁶⁸ Such headlines were to be found in the national press during the 1930s and news of air raids were an important part of the foreign news sections of the main broad sheets. Also witness the headlines and articles on international terrorism in 2002, a parallel emerges in which people know of the effects of such attacks but have not experienced them and fear that if they are attacked then it will be much worse than anything previously carried out.

⁴⁶⁹ It was only as late as 1941 that the Home Office discovered the extent of the ARP work carried out in Dover prior to the 1938 ARP act. See PRO Document HO 207/1099 Inter Departmental letter. 6 April 1941.

⁴⁷⁰ *The Dover Express* 14 April 1939

would refuse to leave the protection of the deep shelters. The 'Anderson Shelter' would give a feeling of security but it would not prompt people to stay within it any longer than was absolutely necessary. However, dormitories were exactly the use that Councillor Chitty envisaged for the deep shelters, they were to be a refuge for people whose nerves might be sapped by constant attack or who simply wanted a good night's sleep. These people would be able to sleep safe in the knowledge that not even a direct hit would harm them or their families. As he put it at the meeting; "the object of tunnels and deep shelters is not only to save lives but also to save nerves."⁴⁷¹ Dover had the natural advantages of the chalk cliffs surrounding it "natural advantages affording as they do," wrote Councillor Chitty, "the opportunity of providing absolute safety at a relatively small cost."⁴⁷² The editorial in the same issue did not completely curb its desire for a tunnel scheme but it was more realistic in only hoping for "at least a modest tunnel scheme".⁴⁷³ The people of Dover had obviously not volunteered *en mass* after *The Dover Express's* appeal in its 21 April issue. It would have been perhaps more surprising if they had. The young and most able were being called up for National Service while no lead other than the calls of Mr Bennett and *The Dover Express* were being given to the unemployed in the town. *The Dover Express* liked to hark back to the First World War and how muddled things had been but at least something had been done. The call for the Town Council to purchase a tunnelling machine "similar to that used in during the war [1914-1918] to cut tunnels between Winchelsea Street Chalk Pit and Priory Hill" casts up visions of councillors madly excavating tunnels all through the cliffs around the town.⁴⁷⁴ The fact remained that without detailed planning and Home Office approval any major scheme was a non starter. This fact was fully realised by the council as their decision to keep secret the failure of their deputation to the Home Office illustrated. Without funding Dover was powerless. The town council did not have the necessary funds to push on alone. It was still very reluctant to pass on the cost directly to its own electorate, better for the town to pay indirectly through a central government grant.

⁴⁷¹ *The Dover Express* 28 April 1939

⁴⁷² *ibid.*

⁴⁷³ *ibid.*

⁴⁷⁴ *The Dover Express* 7 April 1939

The debates on ARP were seen to becoming ever more 'heated' in the council meetings.⁴⁷⁵ Despite constant almost unanimous calls from within the council for vastly improved ARP and the enlistment of the town's MP in this cause, there seemed to be no successes on the horizon. *The Dover Express* was even dragged into the wranglings when Councillor Goodfellow praised the paper's supportive attitude to the tunnels. The Mayor, Mr. Cairns, cut him short to say "Do not let us give any paper an advertisement".⁴⁷⁶ Councillor Goodfellow's retort that while he did not mind giving them an advertisement he did not need to "because they are the only paper in the town", showed that patience was wearing thin at the lack of progress.⁴⁷⁷ *The Dover Express's* attitude towards ARP, amongst other issues, obviously rankled with the Mayor who faced criticism on a number of issues. The fact that the town had only one remaining newspaper did make his comment rather superfluous and showed how sensitive he was to the subject. The fact that councillors were prepared to use the local press to air their own views on ARP, especially the deep tunnels, indicates the council's unity on the subject. What was best for the protection of the town was being undermined by the lack of anything 'concrete' happening. Virtually every council meeting in 1939 had a lengthy debate on ARP. Each week the Town Council minutes reported in *The Dover Express* indicated the decisions taken or not taken on ARP. These were carefully noted under various subheadings. The newspaper's accounts that year had opened with the heading "More ARP expenditure".⁴⁷⁸ Every week brought new ARP issues to be discussed and it was these which *The Dover Express* saw as worthy of being headlined above other issues such as education or the town's transport system. The headline on 21 April 1939 that 'Government say "No Tunnels"' brought the failure of the council to achieve their stated ARP goals into stark relief.⁴⁷⁹ The battle for ARP seemed as good as lost but neither the town council nor *The Dover Express* was ready to 'throw in the towel' just yet. Dover had, at one time, led the country with its ARP work but now it was frustrated at seeing neighbouring towns able to forge ahead with ARP work like Ramsgate or ignoring the threat altogether like Folkestone.

⁴⁷⁵ Full minutes of Town Council minutes were carried in the pages of *The Dover Express*. They allow us a valuable insight to the proceedings, even allowing for editing of the minutes before publication.

⁴⁷⁶ *The Dover Express* 21 April 1939

⁴⁷⁷ *ibid.*

⁴⁷⁸ *The Dover Express* 6 January 1939

⁴⁷⁹ *The Dover Express* 21 April 1939

In May 1939 the editorial of *The Folkestone Herald* "emphasised the harm that is being done to the town by alarmist talk about war and suggested that public speakers should govern their words."⁴⁸⁰ In Folkestone the emphasis seemed to be on the fact that if war was not talked about then it would disappear whereas in Dover it was felt that the more prepared for war the town was then the less likely it was for a war to begin. Folkestone had in fact suffered more casualties in the First World War from air raids than Dover.⁴⁸¹ Its dependence on the fickle tourist trade meant that any signs of ARP preparation might have been interpreted negatively by the very people whom Folkestone was attempting to attract; those who wanted to escape from their worries and get away to the tranquillity of the south coast. Dover's constant claims that the south east of Kent would be a very dangerous place in time of war were obviously not welcome in Folkestone. Within Dover, there was little disagreement on the need for ARP. The disagreement came about over the speed with which the plans were being implemented. The visit of Professor J S Haldane to the town in May 1939 presented an opportunity for the town and its council to regain at least the façade of unity on the issue.

Professor Haldane had been invited to speak in Dover by Mr W L Breeze secretary of the town's branch of the Left Book Club.⁴⁸² The meeting on 27 May was to be chaired by no less a figure than the Mayor of Dover, who was, nevertheless, quick to point out that it was to be a non-political gathering and "not to be a political stunt". To which end he wished that as many councillors as possible would attend and show their support.⁴⁸³ On 18 May in an official announcement from the Minister of Health, Mr Elliot, Dover received the news that it was no longer to be a reception area for refugees. This surely strengthened the argument of Dovorians that the town required a more than basic ARP provision. Professor Haldane, in his address, did as much as he could to strengthen the town's resolve to get the ARP provision which it needed. The meeting was recorded as having a fair attendance in the following week's *Dover Express*. This could suggest a certain lack of interest in ARP matters or indeed being overburdened with information on ARP; but it may have been due as much to

⁴⁸⁰ *The Dover Express* 19 May 1939

⁴⁸¹ Over fifty people were killed in the raid of 25 May 1917 in Folkestone.

⁴⁸² *The Dover Express* 19 May 1939. Professor Haldane was a leading geneticist of the period and also a member of the Communist Party.

⁴⁸³ *The Dover Express* 19 May 1939

the six pence entrance fee as any lack of interest.⁴⁸⁴ *The Dover Express* certainly felt that the meeting had been of great importance; devoting an entire page to its report.⁴⁸⁵ Mr Duff Cooper's speech to the town on behalf of the League of Nations Union received less coverage; approximately one third of a page was given over to it in the local press. However, there was a rather larger turnout in the town hall.⁴⁸⁶ The meeting which he addressed was held on a Tuesday evening with free admission. The ARP meeting was held on a Saturday night, when people might have conceivably had other priorities. In the *Dover Express* the only coverage of any topics which generally exceeded more than one third of a page were the council minutes or if some disaster had befallen the town, such as the tram crash in 1916. ARP was the only news story that was considered worthy of the number of column inches which were being devoted to it.

Professor Haldane began his address by outlining the deficiencies, as he saw them, of the 'Anderson Shelter'. Firstly, he stated that due to its limited size it was not good against gas attack. However, he felt that attack by poison gas would not be the main concern in an air raid nor would the use of incendiary devices. Gas had not been used in Spain and the two pound incendiary bombs dropped by German aircraft had proved singularly ineffective in starting fires. Larger incendiary devices might be able, he thought, to ignite a cargo in Dover harbour and therefore cause a large conflagration or even explosion. He thought that the main danger would in fact be from high explosive bombs.⁴⁸⁷ The 'Anderson Shelter' was not perfect in protecting people against such devices but it did reduce the risk of being injured by seventy-five per cent as compared to remaining inside one's house. The risk was reduced by ninety per cent against being caught outside.⁴⁸⁸ Such figures, obviously, showed that an 'Anderson Shelter' had some value but a direct hit by a five hundred or one thousand pound explosive shell on such a shelter would result in its total destruction and the death of its occupants. The number of casualties which the Government expected in the first air raids of any war was huge. He continued that this was based on the figures for the number of hospital beds which were stated to be necessary. The government

⁴⁸⁴ *ibid.*

⁴⁸⁵ *ibid.*

⁴⁸⁶ *The Dover Express* 3 February 1939

⁴⁸⁷ *The Dover Express* 2 June 1939

⁴⁸⁸ *ibid.*

was calling for an additional fifty thousand beds in London at the outbreak of hostilities. Taking what was the then accepted fact that two people would be killed for everyone wounded in a raid then, according to Professor Haldane one hundred thousand dead would be expected in the first week of air raids on the capital.⁴⁸⁹ Such predictions were widely accepted at the time and were based on the number of deaths caused by the raids of the First World War. In fact there was no way of comparing these figures accurately to the situation in 1939. Casualties in the First World War had been heavy during the raids as there had been little warning and people were caught in the streets. However, bombers could carry much heavier bomb loads in 1939 than had been the case in 1918. Given the conflicting evidence that was available to the general public it was unsurprising that the fear of air raids was prevalent. However, Professor Haldane did see one way out for Dover and that was to provide for itself an ARP system which would prevent the Germans achieving a “knock-out blow” on Britain.⁴⁹⁰ This may have seemed common sense to many in Britain and Germany given the outcome of the First World War. The popular belief was that Germany had been starved into defeat in 1918, but this was not to prove a factor in delaying Hitler's plans for territorial expansion.⁴⁹¹

After Professor Haldane had finished his address questions were taken from the floor. Mr Bennett, the prospective Labour candidate for Dover, used the opportunity to promote once more his tunnel scheme and to attack the council's costing of it. If the cost could be brought under £4 per person then government funding could be secured. The Council's scheme cost £9 1s. per head, a figure, Mr Bennett thought to be astronomically high. The implication being perhaps that some kind of underhand move was taking place to increase the cost. This might imply one of two things either that there was corruption within the Council or that Council did not support the scheme and were trying to “kill it” by raising the predicted cost to such a figure that the tunnels would never be given the go ahead. Mr Bennett did not voice either of these theories but it is obvious that he believed in the scheme and more importantly he believed that it was a scheme which the people of Dover wanted to see implemented. For a politician to be seen supporting a high cost scheme like this there

⁴⁸⁹ *ibid.*

⁴⁹⁰ *ibid.*

⁴⁹¹ See N. Fergusson, *The Pity of War* (London, 1999) for a controversial discussion of the relative successes of the rival First World War economies

was obviously political mileage to be gained. That there was gain to be had can be seen from the remarks of others, who addressed the meeting, the example of Major Cave-Brown can speak for them all and also for the people of Dover. He was an ARP warden in the town and had been carrying out the house to house survey needed to precede the delivery of 'Anderson Shelters'. He had, while engaged in this work carried out a straw poll on whether people would prefer to see Dover supplied with 'Anderson Shelters' or to have tunnels constructed in and around the town. He said that he had found that two thirds of the people whom he had questioned preferred the tunnel scheme to the 'Anderson Shelters'.⁴⁹² After the questioning had finished two sound films were shown bearing the titles "Martyred Towns" and "The Bombing of Canton". Their very titles would seem to suggest to anyone who had not previously been convinced of the importance of ARP that they soon would be after having watched the films. The message with which people left the meeting was that Dover certainly needed more ARP.

As June went on the extent of Dover's ARP work became more and more apparent to everyone in the town including those who might not have taken an interest in the subject previously. The ARP exercises which had been carried out since the Munich Crisis had centred on the sounding of the air raid siren and checking blackout regulations. In June and July the scope of the exercises was extended to practise dealing with 'mock incidents'. The test, on 22 June 1939, was to ascertain how the civil defence workers would cope with several 'incidents' scattered in various areas around the town. The 'incident' in Pencester Gardens was a major fire to which a large proportion of the town's fire services were committed. This 'incident' also attracted a sizeable crowd who gathered to watch the fire brigade at work. In July and August two large 'black out' exercises were scheduled to test not only the effectiveness of the blackout but also how the emergency services would cope with casualties, fires and blocked roads in the event of a nocturnal raid. The exercise on the night of Saturday 8 to Sunday 9 July was the first major nocturnal ARP exercise in Dover and east Kent. A report on the exercise was a major feature in 14 July edition of the *Dover Express*. This exercise involved over one thousand ARP workers in East Kent, most of whom were volunteers. Mock casualties and fires were dealt with satisfactorily. The drivers

⁴⁹²*The Dover Express* 2 June 1939

of the various ambulances, fire engines and trucks were singled out for praise by one of the 'casualties' in a letter to *The Dover Express* Mr D G Voysey-Martin, of 10 Martin Parade, was at pains to point out in his letter how well the drivers had dealt with the blackout conditions.⁴⁹³ However one of the drivers had not done so. An ARP Officer 'lost' his car in Dover; the police recovered the car in Tonbridge. The thieves had made good their escape in the blackout in Tonbridge.⁴⁹⁴ The editorial on 14 July also praised the volunteers, as did the Mayor, the ARP Coordinator and the Chief Constable in their official 'thank you' letter in the same edition of the newspaper.⁴⁹⁵ The only problem with the exercise was the lack of volunteers who had come forward for Dover's Civil Defence. Over one thousand posts existed in Dover for Air Raid Wardens, Decontamination Squad members, Rescue Party workers, Ambulance Drivers and First Aid workers. Nearly five hundred of these posts were still vacant; three hundred and twenty five Wardens were required out of an establishment of seven hundred and fourteen, one hundred and twenty-two for the Rescue Parties out of one hundred and thirty two and eleven for the decontamination squads out of fifty two. Dover's civil defence was under resourced; in particular the number on the rescue parties was only ten per cent of full strength of what was required. This shortage of man and woman power remained a feature of Dover's ARP forces up to the start of the war with the Council advertising for more volunteers at the end of August and the beginning of September. The declaration of war on 3 September did not lead to any mass volunteering from the population of Dover.⁴⁹⁶

The arguments in *The Dover Express* for the construction of more deep shelters for the town became no less insistent as the summer wore on but now they began to incorporate the fact that the government would not pay for any such construction. Prior to the editorial on 21 July 1939 the newspaper had continually called for government funding but after this date it accepted that "we have very little hope of grants from the Government for deep shelters because they object to their use as dormitories."⁴⁹⁷ This is the purpose for which Dover felt they were most suited and

⁴⁹³ *The Dover Express* 14 July 1939

⁴⁹⁴ *ibid.*

⁴⁹⁵ *ibid.*

⁴⁹⁶ See A. Calder, *op. cit.* p.66 for a discussion of the national situation. He states that the full complement of ARP workers had been reached in September 1939. Showing that in this respect Dover was a somewhat atypical example.

⁴⁹⁷ *The Dover Express* 21 July 1939

indeed "that is where they were most useful in the last war. People definitely did not rush towards them when the syren (sic) sounded! They went early..."⁴⁹⁸ Deep shelters were still felt to be vital for the town according to *The Dover Express* and "grant or no grant, Dover should proceed with a scheme for adding to its deep shelter caves."⁴⁹⁹ The debate was fuelled in the previous week by the Council applying to the Government for shelters for Council houses. As *The Dover Express* put it "What about the rest of Dover?" A not unreasonable question given that it was undecided just what sort of shelters Dover was going to get. The first 'Anderson Shelter' arrived in Dover in the middle of August and this was only for display in Pencester Gardens. The first 'Anderson Shelters' for the public arrived on Saturday 26 August 1939, just in time.⁵⁰⁰

Meanwhile the debate on the deep shelters raged in the local press. W.H. Bennett wrote to *The Dover Express* on the subject and his letter was published on 18 August. He made an 'open and shut' case for the construction of the tunnels. He wrote that only W S Gilbert could do justice to the ARP situation in Dover which was becoming increasingly farcical. According to Mr Bennett a very "efficient organisation" had now come into existence to save people's lives once they had been wounded but no means were provided "at all for preventing casualties."⁵⁰¹ By that of course he meant that Dover had a totally inadequate degree of deep shelter protection. Further straw polls in the Hougham and Castle wards had shown that ninety-five per cent of the electorate were in favour of deep shelters according to Mr Bennett. He felt that the blame now must be shared by the government and the local authority for the lack of progress. He concluded with the comment that "the people must impress upon our elected representatives that they are to serve and not to order."⁵⁰² This comment was as much a threat as a reminder given the potential imminence of a general election. The announcement, the previous week, that the delivery of 'Anderson Shelters' was soon to begin was obviously being treated with some scepticism by Mr Bennett. Given the deterioration of the European political landscape through the summer of 1939 it was no wonder that he felt something had to be done quickly. *The*

⁴⁹⁸ *ibid.*

⁴⁹⁹ *ibid.*

⁵⁰⁰ *The Dover Express* 1 September 1939

⁵⁰¹ *The Dover Express* 18 August 1939

⁵⁰² *ibid.*

Dover Express, so long the champion of the deep shelters, on this occasion could not bring itself to wholeheartedly support Mr Bennett's propositions. The newspaper argued that while his costings per head might have been correct, they ignored the fact that when they were multiplied by forty thousand, the town's population, they made a rather large figure which someone had to pay for. It was the middle and upper classes in Dover who would bear the brunt of this financial burden as they were the main rate payers. Was Dover ready for this state of affairs the editorial asked?⁵⁰³

Dover's authorities were anxious not to be caught out during the summer. Each week they printed ARP notices in the local press reminding people that they should bring their civilian respirators with them when they went hop picking. The respirators had been issued in the previous September but even now there were calls for those who had not yet received their respirators to go and claim them.⁵⁰⁴ The danger of air raids and the paucity of ARP provision were brought home to the mining community of Aylesham by the leader of the Communist Party of Great Britain, Harry Pollitt, in a visit on 13 August 1939. As his visit came just before the signing of the Nazi-Soviet Non-Aggression Pact he was free to paint the USSR as a counter to Nazi Germany and as a shining example of how ARP should be implemented.⁵⁰⁵ He claimed that "Russia had got large bomb proof shelters in their cities and their people would feel insulted if you offered them instead a dog kennel in the back garden."⁵⁰⁶ This was a very disparaging verdict on the 'Anderson Shelter' but one which seems to have been held widely in the east Kent area at the very least. A very different view from the romanticised version 'remembered' today of people safe in their back gardens despite the best efforts of the Luftwaffe. The people of Leningrad and Stalingrad amongst others would in two years have been very grateful if such boasts about the USSR's ARP provision had been true. They would prove not to be but there was no way for the people of Aylesham and Dover to check Mr Pollitt's claims.

This open air speech was certainly a call to improve ARP for the ordinary people of Britain; Mr Pollitt was worried that "children were growing up in an

⁵⁰³ *ibid.*

⁵⁰⁴ *The Dover Express* from 4 August to 1 September 1939

⁵⁰⁵ The Nazi-Soviet Pact was sealed on 23 August just before the invasion of Poland on 1 September 1939.

⁵⁰⁶ *The Dover Express* 18 August 1939. The 'dog kennel' was a reference to the 'Anderson shelters' which were designed to be erected in the back garden.

atmosphere of ARP which had become an accepted part of the home life of the people of this country.”⁵⁰⁷ In Dover the summer of 1939 did seem to be the time when the full seriousness and the frightening possibilities of aerial attack were realised by the vast majority of the town's population. Mr Pollitt also dealt with the anticipated morale problems which the Government felt would result from any sustained air raids on towns and cities. It was still believed that people could and would be bombed into submission by the ferocity of the attacks. The statement made by Air Chief Marshal Sir Arthur Harris in 1942 that "There are a lot of people who say that bombing cannot win the war" was certainly not actually the case in the summer of 1939. People did believe that bombing would win a future war unless they and their families could be properly protected.⁵⁰⁸ In 1939 no-one outside very small sections of the scientific and political elites knew of radar but without it the task of finding bombers would have been made very difficult and the resulting destruction of towns and cities so much worse. The proximity of Kent to the German bases in France would mean that for most of the war attacks could be carried out and no warning would be received by the civilian population until just before the bombs started falling. The help that the RAF could give was therefore limited despite the fact that production of two of the world's best single seat interceptors, the Hawker Hurricane and Supermarine Spitfire, was now in full swing. It was because of this perceived lack of defensive capacity that people became obsessive about the quality of air raid shelters. This was especially so in a town like Dover which perceived that it would once again, for the second time in the century, be on the frontline. From the fourteenth to the twentieth century Dover had had the Royal Navy as its first line of defence. That line of oak and later steel had now been rendered obsolete and so Dover had to be prepared to face the nation's foes in the frontline.

That war was coming became almost certain with the news of the signing of the Nazi-Soviet Pact. Hitler had cleared the way for the Wehrmacht to march into Poland and Britain would then have to stand by its obligations or so the majority of people seemed to feel. The editorial in *The Dover Express* for 25 August 1939 called the news of the pact a “real Bombshell” but was confident that “our anti-aircraft defences and our Air Force should in the end prevail.” The suggestion in this

⁵⁰⁷ *ibid.*

⁵⁰⁸ R. Neillands, *op. cit.* p.104

pronouncement was obviously that before Britain prevailed Dover would be in for a rough time. The 25 August 1939 issue was also a landmark because for the first time the locations of the public shelters, caves and trenches which would be used during a war were made known.⁵⁰⁹ A half page map of the town was published with the locations marked clearly on it. Cave shelters were marked with a capital C, trench shelters with a capital T and basement shelters with a capital B (see Figure 8 overleaf).

⁵⁰⁹*The Dover Express* 25 August 1939.



Figure 8: Map from *The Dover Express* 25 August 1939

The advice which accompanied this map called on people to use these shelters if they were caught in the street during an air raid and that those who were not entitled to free shelters should make their own provision. Smoking was also to be prohibited in all

public shelters.⁵¹⁰ This was not, presumably, because of worries of the damage that it might cause to people's health, but rather to try and keep the air as fresh as possible given that it was widely believed that gas would be used. However, Dover Cricket Week continued as the crisis mounted and while the editor of *The Dover Express* might write that "no labour should be wasted on the town's amenities if it is possible to divert it to ARP" it would seem that people were more interested in trying to escape from the grim reality that war was coming.⁵¹¹ Even with war now surely imminent one hundred volunteers were still needed for the town's Rescue, Repair and Decontamination squads, according to the Mayor's appeal in the same edition of *The Dover Express*. Volunteers were also needed for the other branches of the ARP services. Dover would not go to war completely prepared but the town was still more ready than most towns throughout Britain. The next sounding of the town's air raid siren would not be an exercise it was announced in the *The Dover Express*.⁵¹² The next time the siren was heard would be the real thing.⁵¹³

Six hundred 'Anderson Shelters' were delivered to Dover in the last week of August and distribution began on 26 August to the Tower Hamlets area. This was a densely populated area which was not well provided with public cave or basement shelters.⁵¹⁴ The stained glass windows in the Maison Dieu were also removed during the course of this week to prevent them from being damaged in an attack. Instructions were also carried in the local press on the subject of how to erect "Steel Garden Shelters" or 'Anderson Shelters' as they were by now ubiquitously known. Confidence in Britain's preparedness had returned in *The Dover Express's* editorials and the editor was able to claim that the public's nerves were hardening rather than cracking because of the series of international crises that had rocked Europe in quick succession. Now the British people were more confident that their country was ready to face war. The Defence of the Realm Act had just been passed and was proving very popular again in the eyes of *The Dover Express*.⁵¹⁵ However, its editor wanted, if anything, to tighten the restrictions especially with regards to photography in the town. Restrictions banning all photography should be put in place just as they had

⁵¹⁰*The Dover Express* from 25 August to 8 September 1939

⁵¹¹*The Dover Express* 25 August 1939

⁵¹²*ibid.*

⁵¹³*ibid.*

⁵¹⁴*The Dover Express* 1 September 1939

⁵¹⁵*The Dover Express* 25 August 1939

been in World War One according to him.⁵¹⁶ This edition was published on the same day that German tanks began their drive through Poland but the news arrived too late to be reported in it. However, Germany's sixteen demands from Poland were mentioned and so was the news that the evacuation of three million children had begun on the previous day. Dover itself was still classified as a neutral area and would therefore neither receive nor send evacuees. However, two thousand evacuees did arrive in Dover destined for the Dover Rural Council District. They came in two trains which arrived at the town's Priory station at 12.35pm and 5.05pm on 31 August 1939. The evacuees and their carers were marched to the Dover College Gymnasium where they were "sorted" before being placed on their forward transport provided by the East Kent Bus Company.⁵¹⁷

The Southern Railway Company was still advertising, in the same issue of *The Dover Express*, its end of summer excursions to Reading and Windsor Castle which would take place on 10 September 1939.⁵¹⁸ Elsewhere in this edition concerns were raised about what would happen to animals in gas attacks. There was also a report on an anti-Jewish bill posting attack in Capel-le-Ferne. The report stated that "This attack appears to have been particularly directed against persons who are giving hospitality to Jewish refugees."⁵¹⁹ It also shows the diversity of opinion which existed in Britain on the eve of war. There were some who were prepared to help refugees while there were others who preferred to go out in the middle of the night to express their opposition to what they saw as being a Jewish sponsored conflict. The people of Dover were therefore, on the verge of war, being presented with vastly different messages as to what was to occur in the near future. On the one hand there was the possibility that the crisis might pass as others had done. On the other hand there was the possibility that within a few days their town might be assailed from the air.

Channel swimmers were always newsworthy in *The Dover Express*. The last Channel swim before the outbreak of war was completed by the Swedish swimmer Sally Bauer on Sunday 20 August 1939 in a time of fifteen hours and twenty-two

⁵¹⁶ *ibid.*

⁵¹⁷ *The Dover Express* 1 September 1939

⁵¹⁸ *ibid.*

⁵¹⁹ *ibid.*

minutes.⁵²⁰ The final peace-time attempt was made by Fahmy Attallah in the following week; he failed because his support boat broke down. This, according to *The Dover Express*, was a great shame "especially in view of the fact that Channel Swimming is over for the duration of the war."⁵²¹ Peacetime normality was leaving Dover for the second time in just over a quarter of a century. In September 1939 Doverians could see very clearly that the war would directly involve them in a way that had been not envisaged in 1914 when powered flight was still very much in its infancy. Neville Chamberlain's broadcast to the British people at 11.15am on Sunday 3 September 1939 announced that war had been declared on Germany. It was followed less than thirty minutes later by Dover's first air raid warning of the war.⁵²² The second warning followed at 3.07am on Monday morning and the third two days later on Wednesday 6 September. All of these warnings were false alarms and again as in the First World War all of south and east England were alerted on the strength of the sighting of one German aircraft. The third warning was in fact the first occasion when a German aircraft actually came anywhere near Britain. *The Dover Express* gleefully reported how the Germans were driven off by the RAF. However the fact that the RAF fighters had been fired upon by their own anti-aircraft guns was not much of a reason for congratulation.⁵²³ Dover became a closed port in this first week of war. This meant that British subjects could not land or depart from it. Dover was again becoming an increasingly closed community. The international traffic had come to an end for the duration of the war.

Feelings were starting to run high in some of the east Kent towns on the subject of the 'black out'. In Ramsgate, Arthur Nash was fined £15 for having unscreened lights on two occasions. The fine was the least of his worries as a crowd of forty people had gathered and had threatened to smash his windows and "do injury to the defendant" if he did not extinguish the lights.⁵²⁴ Only the intervention of the police prevented this from happening. Meanwhile in Dover advice was given as to what people should do in the event of an air attack. People were advised not to "be upset by pictures of what happened to the poorly built houses in Spain" when they

⁵²⁰*The Dover Express* 25 August 1939

⁵²¹*The Dover Express* 8 September 1939

⁵²²*ibid.*

⁵²³*ibid.*

⁵²⁴*ibid.*

were bombed.⁵²⁵ The same thing could not happen to British houses according to the report in *The Dover Express*.⁵²⁶ The fact that most of the working class housing in Dover had been not been built to a high standard and that the clearance of substandard housing had been one of the town council's priorities in the late 1930s seems to have been conveniently forgotten by the editor. It was felt in the press that a poorly constructed British house would take a lot more punishment than its Spanish equivalent.^{527,528} After less than a week of the war in which the conflict seemed to be confined to Poland; people's worries about aerial attack were already mounting. The local newspaper was trying to soothe the nerves that only a week before it had described as having been hardened.⁵²⁹

Dover and Britain were once more at war. In the years preceding the war Dover's local newspaper and the town council had been very active in promoting the importance of ARP to the townspeople. Dover had remained in the interwar period a very cosmopolitan town, with a very large percentage of Britain's international passenger traffic passing through the port. As the thirties progressed the town became increasingly anxious about what would become of it in the event of war. However, there were still class distinctions at work within the town and the arguments in the council over the billeting of evacuees had a degree of this in their origins; there remained divisions within the town. The First World War had given the town and its people a taste of what aerial warfare was like. From 1914-1918 the town was bombed on a number of occasions but none of these raids, including the two naval shelling attacks were particularly serious. However, the fear that these attacks engendered was very real indeed. Now Dover was faced with the possibility of attack yet again, this time, by an enemy whose air force was vaunted as being the most powerful in the world. In the First World War aircraft had followed railway lines to find their targets a fact that was known during that conflict. It was made more widely known by films based on World War One which showed aircraft following the tracks and then unerringly finding and destroying their targets. Errol Flynn in the 1938 drama *The*

⁵²⁵ *ibid.*

⁵²⁶ *ibid.*

⁵²⁷ *ibid.*

⁵²⁸ *The Dover Express* 3 January 1936 carried an article on slum clearance at St. John's place in the town. The clearance was necessary due to the poor standard of the housing.

⁵²⁹ *The Dover Express* 1 September 1939

Dawn Patrol was a bomber pilot who seldom missed his target.⁵³⁰ This may have been a pacifist drama with a strong message on the horrors of war but this was of small comfort when the British people found themselves in another war and the film showed how much damage aerial bombing could inflict. Dover in 1939 lay, as it still does, at the junction of three railway lines and therefore even 'lost' German aircraft would have been able to find the town. In the early weeks of September 1939 Dover was nervous as were many other towns across the length and breadth of Britain but unlike most of the others Dover had experienced air raids before but this did not give it any comfort. The 'shooting war' for Dover would not begin for another nine months but when it did Dover was to find itself in the frontline in a way that it never had been before.

⁵³⁰ *The Dawn Patrol* also starred David Niven and was directed by Edmund Goulding.

Chapter 4: Dover's 'Bunker Mentality', 1939-1941

With the declaration of war on 3 September 1939 Dover was again placed on the frontline of Britain's defences. The new conflict would come to depend as much on technology, finances and manpower as uniform personnel. This chapter will explore how the advances in technology, most notably that of military aviation, would come to affect the way that Dovorians experienced the Second World War. Dover still had the sea as a bulwark but in 1917 the Germans had flown straight over that particular obstacle. With the great advances in aircraft technology the Channel no longer presented much of an obstacle to attackers. In 1917 the Gotha bombers could barely reach to London at the full extent of their range from bases in Belgium. Now in 1939 German bombers could comfortably reach London and Kent from bases in Germany itself.⁵³¹ They would be able to carry bomb-loads between four and six times that carried by the German bombers only twenty years previously. The casualties inflicted by air raids had been heavy up to 1918 in relation to the actual weight of bombs dropped. In Spain and China the levels of casualties caused by air raids seemed, if anything, to be increasing according to the British newspaper headlines. The raid on Guernica had alerted Western Europe to the dangers of aerial attack on an undefended town. This raid had received extensive coverage in the national press and on the newsreels.⁵³² Folkestone had suffered heavily in 1917, but this had been a relatively small raid compared with what was possible in the late 1930s. Now it could be Dover's turn. A devastating raid on a British town might have had the effect of stiffening people's resolve or it might have demonstrated the futility of fighting a war in which Britain could not properly defend itself. If such a raid had then been followed up by others in quick succession then the willingness of Britain to continue the war might have been put in jeopardy. It is of course likely that such considerations played on the minds of British politicians as they conducted their foreign policy. Who would willingly enter a war against a nation with as powerful an air-force as Germany, especially when the Prime Minister in 1932 declared to parliament that the bomber would always get through?⁵³³

⁵³¹ See R. Neillands, *op.cit.* R. Hougham & D. Richards, *op. cit.*

⁵³² One of the most optimistic newspaper reports carried by the *Times* cited the fact that this would not happen in Britain due to the superior construction of British houses compared with their Spanish equivalents. Reprinted in *The Dover Express* 8 September 1939.

⁵³³ Speech to Parliament 10 November 1932.

In 1939 only a very small number of people knew of the advances made in the detection of enemy aircraft. Experiments had started in the early 1930s with large acoustic mirrors which could hear aircraft many miles away and which would therefore give the military and civilian authorities time to react to the threat. Some advances were made and the experiments undertaken were very useful in helping to improve the co-ordination between such early warning stations and fighter bases. Radar or Radio Direction Finding (RDF) as it was then known by the British was a great breakthrough in the late 1930s. This meant that an effective defence could now be mounted against bomber attack. Without such a tool there was nothing to do but to listen and watch. Warnings might only be of the matter of minutes in advance of a raid. Civilians might have preferred to stay in shelters rather than risk being surprised by squadrons of bombers. The RAF would also have been forced into running 'standing patrols' in which aircraft were kept flying in the hope that they would locate attacking aircraft. Such tactics were incredibly wearing on both men and machines. The Germans could choose their moment to attack while the defenders had to keep their machines in the air as they did not know when or where the attack would occur. Even in its infancy radar made such defensive tactics a thing of the past. Squadrons could be 'scrambled' and quickly directed when and where they were needed. This incredible tool, one which shifted the advantage to the defenders in a most decisive fashion, was however a total secret. The people of Dover who gazed at the radar masts which stood on the cliffs to the east of the castle could only speculate as to their true purpose. Perhaps the government really had developed an aeroplane destroying ray or most likely they had improved radio communications with either France or the rest of the country.⁵³⁴ Did secrecy in this case do more harm than good? The Germans must have had some inkling that radar was being developed by the British. However, by not telling the British public the Government produced a situation in which people expected any German aerial attack to meet with the success that early Gotha raids had achieved. The governmental figures quoted by Professor Haldane indicated that casualties of ten thousand people were expected in the first week of raids in

⁵³⁴ Such ideas on 'death rays' were current in the serialised version of *Flash Gordon* which came to the Big Screen in the 1930s. The existence of RDF or Radar was only made public in 1941 when Sir Philip Joubert of RAF Coastal Command paid tribute to the contribution of Robert Watson-Watt's invention.

London.⁵³⁵ Bombers now travelled three times faster and flew one and one third times higher, the “needles” had begun to shrink while moving ever faster. In the summer of 1940 the radar stations were priority targets for the Germans.

Britain’s air defence also had two of the most modern fighter aircraft in its arsenal: the Hurricane and the Spitfire. Of the two the Spitfire was the more advanced and more agile but it was the Hurricane which was in service in larger numbers and was the mainstay of RAF Fighter Command. Without these two aircraft types all the advances in radar technology would have been for nought as it would have been impossible to shoot down the German bombers. The German bomber crews had flown with impunity over Spain where they had faced Russian biplane fighters. Now against modern fighter aircraft which were the match of Germany’s own fighter arm, the German bombers would be found to be lacking in defensive capabilities.⁵³⁶ Over Poland and France the German bombers were able to attack as they pleased. Warsaw and Rotterdam were both practically defenceless when the bombers struck but the devastation caused by those raids had a severe psychological impact on the civilian populations of Britain and France. The refugees who fled northern France were terrified by the noise of approaching aircraft, while in Britain people were shocked by the devastation of these two ancient and beautiful cities.⁵³⁷ Details of the Rotterdam raid reached the British press in early July, just as the ‘Battle of Britain’ began, as it became apparent that Britain’s towns and cities could be the next targets.⁵³⁸

The first eight months of the war passed peacefully in Dover although not without scares. Such was the worry about air raids on the Channel ports that the BEF was sent to France via Portsmouth and the Brittany/Normandy ports. This was a repetition of the events of World War One. There were other ominous reminders; Dover was closed to merchant shipping and the Royal Navy took command of the harbour facilities for the duration of the hostilities. The German navy was not thought by many in Britain to be the threat which it had been in 1914. The three pocket

⁵³⁵ See above Chapter 3 pp.120-121

⁵³⁶ See R. Hougham & D. Richards, *The Battle of Britain* (London, 1989). A. Calder, *op. cit.*, A. Galland, *The First and the Last* (London, 1955) & L. Deighton, *Fighter* (Bungay, 1978) for examples.

⁵³⁷ See *The Times* 2 September 1939 headline “Germany and Poland: Towns Bombed from the Air”. Also *The Times* 11 May 1940 headline “Hitler Strikes at the Low Countries: Belgian, Dutch and French Towns bombed for examples.

⁵³⁸ R. Hougham & D. Richards, *op. cit.* p.122

battleships, sundry cruisers and destroyers that were available to the Germans in the autumn and winter of 1939 would have been unable to launch any meaningful attacks on the coastal towns of southern and eastern Britain. However, the Luftwaffe was a feared striking force which in September 1939 had again proved its efficiency and striking power in the rapid victory over Poland. The Poles had been expected to offer serious resistance to the Germans but the speed of their defeat made the Germans appear even stronger than was truly the case. The Luftwaffe's raids on undefended Warsaw seemed to underline yet again the superiority of the bomber as an attacking tool. The inhabitants of Dover were advised, in the first week of September, that what had happened to "poorly built houses in Spain" would not happen to their homes, but it had now happened to the inhabitants of Warsaw.⁵³⁹ The devastating effects of air raids on undefended cities were again made apparent and the chance that such a raid might take place was a possibility which every town had to face.

In Dover the air raid alerts in the first week of the war were, to state the obvious, very trying bringing back memories of the Great War air raids on the town. As *The Dover Express* reminded its readers in its "In the Street" column, "They say that those who object to the syren (sic) without bombs have forgotten or did not live in Dover in the last war".⁵⁴⁰ The first warning came on Sunday 3 September within half an hour of Neville Chamberlain's radio announcement of the declaration of war. The second came at 3.07am on Monday 4 September. The third, on Wednesday 6 September, lasted for two hours before the all clear was sounded.⁵⁴¹ This third alert, according to *The Dover Express*, was the first time that German aircraft came close to Britain and if the British fighters had not shot down the German aircraft there was at least the consolation that the nation's anti-aircraft gunners were enthusiastic if not entirely accurate in their aircraft identification. The closing of the port in the first week of the war was another reminder that Dover was again engaged in a serious struggle and that life would not return to normal until the conflict was over.

However, this sense that the country was at war, did not necessarily carry over into the council meetings. As the weeks drew on and no attacks came, disputes over

⁵³⁹ *The Dover Express* 8 September 1939

⁵⁴⁰ *ibid.*

⁵⁴¹ *ibid.*

the ARP provision in the town grew. The Borough Engineer felt empowered to write to the ARP Department in London stating that his council "had decided on the tunnel scheme in preference to the basement one".⁵⁴² The government remained unconvinced and the arguments over the relative merits of the two schemes would become very important once the 'Phoney War' had ended. The first few weeks led to opening of a great deal of public shelters. Extensive work was carried out in getting these shelters 'fit' for the public and the ensuing bills started to mount. Arguments began over the free meal allowances for ARP workers on shifts of twelve hours or more. The arguments against providing the meals were centred on the fact that they were a waste of the nation's resources. However as the chair of the ARP committee pointed out it was unfair to expect men and women to carry out their ARP duties after a day's work for very long hours and then not to receive the meal to which they were entitled. Dover was supposed, by the end of October 1939, to have one hundred full-time paid wardens. However, as the mayor was still advertising for people to fill some of these posts in a council meeting in mid October it seems unlikely that the quota would have been reached in time. The extensive use of incendiary bombs in Poland by the Germans caused another scare and an advertisement for 'Bomb Scoops' supplied by F Morecroft & Sons of 100 High Street, Dover in the 20 October 1939 edition of *The Dover Express* may have provided some comfort to the townsfolk, especially after the town suffered another air raid alert on Tuesday 17 October. The difference that these 'bomb scoops' would have made in a massed incendiary raid on Dover thankfully was never tested.

Sir Auckland Geddes, the Civil Defence Commissioner for the South East, visited Ramsgate in late October and declared that the air raid provision there "was the finest scheme he had ever seen".⁵⁴³ Ramsgate's scheme, as already mentioned, was based primarily on a deep underground shelter in an abandoned railway tunnel. This gave virtually every resident of the town the opportunity to find very quickly the safety of a deep shelter. This was exactly the kind of provision which Dover had been demanding for almost three years and of course the debate as to why Dover did not have such provision and Ramsgate did was reopened with some vigour in *The Dover*

⁵⁴²P. R. O. Document H.O. 207/1100

⁵⁴³*The Dover Express* 27 October 1939. In the First World War Geddes had replaced Neville Chamberlain as Director of National Service in August 1917.

Express.⁵⁴⁴ The war was beginning to hit home in other ways. From November 1939 *The Dover Express* was issued in a smaller format for the first time since the First World War. In 1938 twelve thousand two hundred and seventy six copies of the newspaper were sold weekly. The figure in 1939 had increased to twelve thousand three hundred and fourteen. In 1940 the figure fell to eleven thousand seven hundred and fifty-nine.⁵⁴⁵ This obviously reflected the fact that some self evacuation from Dover had occurred in the second half of the year.⁵⁴⁶ These figures are supported by statistics from the Food Control Committee. The rationing registration records show that removals out of Dover numbered six hundred and forty-nine, while removals into Dover numbered one thousand and thirty-three. Dover's population would therefore seem to have grown in the first four months of war in 1939.⁵⁴⁷ Dover therefore was still operating as a sizeable community, much as it had before the war started.

Dover's tunnels and caves warranted a mention in the national press. They were featured in a letter to *The Times*, dated 27 October and published on 1 November 1939.⁵⁴⁸ The letter was on the subject of ARP but dealt with the topic in a rather unexpected way. The text taken as the basis for this missive was another letter, this one written by William Cobbett from Dover on 3 September 1823. Cobbett wrote with disgust of the miles and miles of fortifications behind Shakespeare's Cliff which were "framed for mere *hiding*... It is a parcel of holes made in a hill to hide Englishmen...".⁵⁴⁹ Ms Whelan intended to pour similar scorn on the idea of extensive ARP for rural areas as being as much a waste of resources as Cobbett had felt Dover's Napoleonic fortifications were then. Ms Whelan was quick to point out that she did not "wish to throw any such onus upon present-day Dover nor indeed upon any town in England at the moment; ARP is obviously essential in crowded areas."⁵⁵⁰ It is interesting how the attitudes to such "bomb-proofs" had changed from the reign of George IV to George VI. Cobbett, in 1823, saw them as being a waste of money;

⁵⁴⁴ *ibid.*

⁵⁴⁵ Net Sales figures as printed on front page of the *Dover Express* during 1939.

⁵⁴⁶ In the later years of the war sales would fall which would seem to reflect a reduction in the population. By 1942 the figure was 10526 and by 1944 it had fallen to 10059. In 1945 circulation would again top the 12000 mark.

⁵⁴⁷ *The Dover Express* 26 January 1940

⁵⁴⁸ The letter came from a Nancy Whelan of Blyth Cottage, Beaconsfield in Buckinghamshire. Beaconsfield was then very much a part of rural England.

⁵⁴⁹ Letter to *The Times* 1 November 1939

⁵⁵⁰ *ibid.*

soldiers should not need such hiding places. In 1939 many Britons saw them as vital to the protection of the nation's towns and cities. The demand for air raid shelters all over the country and the trenches dug in parks and other open spaces in cities shows how desirable it was to "hide Englishmen". Dover, as in the early nineteenth and twentieth centuries, was located in a particularly vulnerable position and Cobbett's hiding places would again be called upon to serve their former purpose and "hide Englishmen" not this time from "Frenchmen" but from Germanmen.⁵⁵¹

The autumn of 1939 was a time of waiting for Dover. After the flurry of activity in September, to finish the deep shelters and erect the 'Anderson Shelters', little more was done. This produced a situation in which comments like those of Ms Whelan became commonplace across the country, ARP was not necessary everywhere but only in large towns and cities. Even so it was felt that only really industrialised or militarised centres would suffer. Dover was certainly not an industrial centre but the harbour and barracks made it a military target. However, such had been the supposed increase in the perceived accuracy of bombers it was felt by many across the country that a town like Dover would be spared the worst of any bombing raids in the vicinity. Despite the terror raids in Spain, China and Poland it was commonly believed that the Germans would only bomb military targets and that British civilians would be respected by the Luftwaffe in the same way that the British were respecting German cities. The RAF only bombed German naval bases at this time, while German cities were only subjected to leaflet drops. *The Dover Express* would continue to rant about waste and inefficiency in all aspects of the war service, most notably ARP but as German bombers did not arrive, people seemed to lose some interest in this threat. In September it had been stated that the siren would only be sounded for actual alerts and there would be no more drills, but by the middle of December a siren test was being organised for Sunday 17 December.⁵⁵² Presumably this was to check that the equipment was in working order whenever it should be needed and also to remind people what it sounded like, the last alert having been in October.

⁵⁵¹Letter to *The Times* 1 November 1939

⁵⁵²This was the first occasion on which *The Dover Express* spelt siren as siren. Previously they had used syren.

The year 1939 for Dover, as for the rest of Britain, ended on a positive note when the news of the scuttling of the *Graf Spee*, on 18 December, was received from Montevideo.⁵⁵³ It seemed almost as if 'normal service' had been restored at sea; the Royal Navy had again proved its superiority and a major threat to the supply of Britain and her allies had been quickly and effectively removed. Dover was doing its bit in this in so much as the Dover Patrol was again restraining the activities of German submarines by closing their exit routes from the North Sea. Even during the 'Phoney War' Dover was seeing war first hand. Boats were being lost to mines (allied as well as German) and submarines. Dover certainly knew it was in a war, as did many other ports. Therefore for Dover the issue of ARP never went away as the town had direct reminders on at least a weekly basis that there was a war on. This war was not as far away as the Rhine and the Siegfried Line. Air attacks had not come as yet and the RAF was still dropping leaflets on German towns and cities. The destruction wrought on Poland could not be put out of Doverians' minds; there was jealousy over the Ramsgate tunnel scheme and the fact that Dover had still not been provided with similar provision.⁵⁵⁴

1940 brought extra hardships almost immediately. Rationing was announced in the 12 January edition of *The Dover Express*. This rationing was, of course, nationwide but it would seem to have been no less felt in Dover for this. Bacon, butter and sugar were among the first items to be rationed but margarine remained unrationed. The 'black out' was still perceived as an annoyance and a "Keep Left" rule was now introduced to reduce accidents between pedestrians. However, the lack of any aerial attacks and the fact that the Germans had made no advances in the west encouraged the Town Council to urge the people of Britain to "Take Holidays in East Kent". The 1939 summer season had almost been played out when war was declared and because the threat of aerial attack would have seemed to have been reduced the council felt justified in trying to revive the tourist trade in 1940. As was stated in a Council meeting in January; "the position was very different to the last war when

⁵⁵³ With the lack of any activity in Western Europe and the campaign in Poland ending so suddenly it was left again to the Royal Navy to provide the country with a good news story. The sinking of the *Graf Spee* which had been presented as being a serious threat to the merchant marine enabled the public to believe that at least the war at sea was going well. The reverse was true for the German people. Goebbels' handling of the affair did much to discredit the veracity of official German reporting. See J. Baird, *The Mythical World of Nazi War Propaganda* (Minneapolis, 1974) pp.61-64

⁵⁵⁴ *The Dover Express* 27 October 1939

Belgium was in the hands of the Germans and east Kent was near to the enemy bases.⁵⁵⁵ The Mayor also expressed confidence in the town's ARP scheme and that "when it was all finished he thought Dover would be fairly secure."⁵⁵⁶ Now to say his town "would be fairly secure" does suggest a slight lack of confidence in what had been provided but also reflects realism with regard to what might happen to Dover. Confidence was still high in the town as, unlike the situation in 1914, there had been no spy rumours. There were still vacancies in the civil defence organisation which if it does not suggest confidence at least shows complacency amongst the townsfolk.

As the winter turned into spring rumours of German offensives began to proliferate the country. The state of military alert was easily demonstrated in Dover by the happenings in the port. These scares all passed over and the town was graced with two visits by King George VI in the spring. On the first occasion, 14 March, the visit was cut short by bad weather and the King only visited the castle. On the second, 10 April, the visit was longer and he saw more of the town and port. This would be Dover's last Royal visit until 18 October 1944 when both King George VI and Queen Elizabeth visited Dover to help the town celebrate the end of German shelling attack. Dover had had no shortage of important visitors up to May 1940. Dover would seem to have been selected as the place to send foreign diplomats and correspondents. This would continue throughout the war. Wendell Wilkie visited the town in February 1941 and was one of a series of influential American visitors who would be taken to Dover to show them how Britain was fighting the war.⁵⁵⁷

The events of May would change all this very quickly. Morale in certain areas of the extreme south east was cited in the daily Civilian Morale Reports as suffering due to grave anxiety about the war situation. The worst affected areas were those closest to the coast.⁵⁵⁸ The German breakthrough in the Ardennes followed by the disintegration of the allied armies led to their reaching Calais in less than two weeks from the start of their assault. Residents on the Isle of Thanet were very worried about the fall of Belgium and rumours spread that the bridges to the mainland had been

⁵⁵⁵ *The Dover Express* 19 January 1940

⁵⁵⁶ *ibid.*

⁵⁵⁷ For information on Wendell Wilkie and his views on the war see D. Kennedy, *Freedom From Fear* (Oxford, 1940) pp.455-456

⁵⁵⁸ INF 1/264 Civilian Morale Reports May/June 1940

mined.⁵⁵⁹ The Germans were closer to Dover than they had been in 1914 and still the BEF was trapped in a pocket with Dunkirk left as the only remaining port open to it. The names of Dover and Dunkirk have become synonymous since the evacuation of the three hundred and thirty-eight thousand allied troops.⁵⁶⁰ Other ports were used but it was into Dover that the majority of these troops came. The state of the men and the ships bringing them into Dover was all too apparent to the townsfolk. The troops were hurried out of the town by special trains. Dover was spared any visits by the Luftwaffe at this time. While the Mayor may have been confident in January that the ARP provision was "fairly secure" the town would have been unable to defend itself against any serious attack. The sheer number of men would have swamped the town's air raid shelters. However, it was Dunkirk to which the Luftwaffe was sent and the men who made it to Dover passed safely through.

The start of hostilities caused a tightening up of black out regulations in Dover. The map showing the location of all the town's air raid shelters was reprinted in the 24 May edition of *The Dover Express* and the next week's edition was reporting that Dover's children were to be evacuated, the news having been announced on 26 May. What *The Dover Express* had called for over a year before when Dover was selected to be a "neutral area" was at last happening. The same fate befell the major coastal towns in East Kent. Margate, Ramsgate, Deal and Folkestone all had their children evacuated at this time. Dover's children were sent to Monmouthshire in Wales. Those children who had been evacuated into the Dover area in September 1939 were now to be evacuated for the second time to the West Country. According to *The Dover Express* this was a victory for common sense but they also wanted the evacuation extended to the town's newest arrivals the "special correspondents".⁵⁶¹

This feeling of antipathy towards journalists increased amongst some sections of Dover society as 1940 went on. The primary complaints against these journalists were inaccurate reporting of events and being able to report events which the local press was not able to cover. These were coupled with the ghoulish way in which the journalists descended on the town to find out the worst. The journalists were able to

⁵⁵⁹ *ibid.* See report for 28 May 1940

⁵⁶⁰ B. Liddell Hart, *The Great War* (London, 1934) pp.61-65. The Germans came within twenty miles of Dunkirk in the autumn of 1914.

⁵⁶¹ *The Dover Express* 31 May 1940

take the best accommodation on offer and were accused of effectively "crowding out" those engaged in war work in Dover.⁵⁶² The American press corps, so vital to the way the war was perceived in the USA, settled themselves into the comfortable surroundings of Dover's Grand Hotel and watched the air battle unfold from Shakespeare Cliff.⁵⁶³ It was contact with the people of Dover, as much as the sights of the air battle above their heads, that convinced many of these journalists that England's cause was the one which they and their country should uphold.⁵⁶⁴ The treatment of the journalists by most Dovorians cannot have been too hostile. However, the extra spending power of the journalists, also stirred up ill feeling in the town, as did the fact that journalists were granted extra telephone lines to London to file their reports. This latter fact would become a major issue when Dover came under direct attack as it was claimed by *The Dover Express* that the Civil Defence services were suffering due to a lack of capacity in their telephone network; capacity which had been 'creamed off' for the press. This love/hate relationship between locals and visitors is common to many coastal/holiday towns but in Dover's case in 1940 the situation was exacerbated by the fact that such journalistic interest was a new phenomenon to the town. When this was added to the negative war situation it was almost inevitable that there would be friction between the two groups. This animosity can also be seen as part of Dover's 'bunker mentality'. The 'bunker mentality' did not only extend merely to the nation's 'enemy' but also to those whom Dover saw as hindering the nation's war effort. The press became a prime example of this by their reporting of and their behaviour within the town. For Dover the reporting of bombing and shelling would mean more accurate attacks in future and when the shelling did begin in earnest *The Dover Express* blamed the reports in the national press and on the BBC for helping the Germans to range their guns.⁵⁶⁵

This reporting would in fact become a regular annoyance to the people of Dover, and indeed to other towns and cities. The Lord Mayor of York wrote to the BBC condemning them for reporting that the Minster was undamaged as he and many

⁵⁶² *The Dover Express* 7 June 1940

⁵⁶³ R. Desmond, *Tides of War: World News Reporting 1940-1945* (Iowa, 1984) pp.132-134. The surroundings of the Grand Hotel became somewhat less salubrious after it was damaged in a raid later in 1940.

⁵⁶⁴ A. Calder, *The Myth of the Blitz* (London, 1992) pp.215-217. See H.L. Smith, *Britain in the Second World War* (Manchester, 1996) for a re-appraisal of Calder's work.

⁵⁶⁵ *The Dover Express* 7 June 1940

of the citizens of York felt that this was an invitation to the Germans to return and finish the job.⁵⁶⁶ Canterbury felt very aggrieved about the manner in which the 'Baedeker' raid on the city was reported in 1942. Dover felt all of this more strongly than other towns and cities because it was shelling which was the greatest danger to the townspeople and shelling could be ranged if the Germans knew where previous salvoes had hit. *The Dover Express* was particularly irked by the fact that photographs of the damage inflicted on Dover were being published on a regular basis in national and foreign newspapers. *The Dover Express* could not take any photographs because it did not have a fulltime accredited photographer.⁵⁶⁷ This seeming discrimination against the local community was very much resented and week after week the newspaper's editorials would return to the subject. The fact was that articles on Dover appeared in not just the British national press but in many other countries and that they published information which could not be printed in *The Dover Express*. This was a situation which really aggravated the local people. If *The Taranaki News* in New Zealand was allowed to publish articles on the subject of Dover, why could *The Dover Express* not do so? In fact *The Dover Express* chose not to have an accredited photographer on its staff and felt that publishing photographs was a way to give information to the Germans; it therefore effectively excluded itself from publishing photographs. However, the editorial comments added to Dover's 'bunker mentality' by increasing Dovorians' distrust of outsiders; the press in particular. Not only was the Town now on the nation's frontline but it was also beset by what it saw as the lies and half truths of the press. The stories in the national press most often sought to emphasis the seriousness of Dover's situation and were termed "stunt journalism" by locals.⁵⁶⁸ A good example of this was *The Daily Sketch* photograph of Dover showing, it was claimed, five German aircraft in flames. It was in fact a photograph of a burning barrage balloon.⁵⁶⁹ Recent concerns about the excesses of the press would seem not to be a new phenomenon.

⁵⁶⁶ *The Dover Express* 1 May 1942

⁵⁶⁷ During the Second World War *The Dover Express*'s journalistic staff was comprised of two men. John Bavington Jones, the owner-editor and Norman Sutton, the main reporter. After the death of Bavington Jones Sutton became the newspaper's editor and managing director. Interview with Terry Sutton 28 August 2003.

⁵⁶⁸ *The Dover Express* 16 August 1940

⁵⁶⁹ *ibid.*

Dover was also being singled out by the government as an area where the world's press could see naked Nazi aggression at first hand. Dover was the place to take foreign dignitaries at this time. Before the 'Blitz' began, Dover was literally the frontline. German activity on the French coast could be seen with the naked eye from Dover and so Dover became the main vantage for reporters. Dover's suffering was a way in which the plight of Britain could be neatly packaged and sold to the Commonwealth and neutral countries around the world, most importantly of course the United States of America. Dover's story became an allegory for what Britain as a whole was going through: 'on the ropes', 'bloody but unbowed', Dover was 'taking it' and the world should see and sympathise.⁵⁷⁰ The price Dover had to pay was therefore not just counted in the damage caused but in the fact that the world's press was actively encouraged to visit the town. In the 'Phoney War' Dover symbolised a strong Britain with a powerful navy, behind whose white cliffs the nation could rest easy.⁵⁷¹ With the arrival overhead of the *Luftwaffe*, Dover took on a new symbolism. It was Britain's town in the frontline. Dover's civilians were sharing an experience which in previous wars had been reserved for the nation's soldiers and sailors, as Dover had come within range of direct gunfire from the enemy. To the horror of aerial bombardment had now been added the further horrors of shelling. Aircraft might be shot down but a shell once fired was unstoppable. For the next four years Dovorians would go about their daily business never knowing when the next shell would arrive.

As the war continued the danger to Dover increased, peaking in 1944, while other towns in Britain after the winter of 1940-1 were in fact in an increasingly secure position. After the *Luftwaffe's* attention was turned eastwards in 1941 no great aerial armada was ever again turned loose on the cities of Britain. For the towns along the south coast the situation remained rather more uncertain as nuisance raids continued and of course for the southeast corner of Kent the threat of shelling was ever prevalent. The so-called 'Baedeker' raids of 1942 did great material damage to some of England's most beautiful cities but they were small compared with those inflicted upon London in the 'Blitz'.⁵⁷² Morale did suffer in these towns which were hit 'out of the blue'. Complaints from these towns following the raids show how much they were

⁵⁷⁰ N. Cull, *Selling War: the British Propaganda Campaign against American "neutrality" in World War II* (Oxford, 1995) for a discussion of how Britain attempted to change public opinion in the USA.

⁵⁷¹ See below pp.167-170 for a discussion on the iconography of the 'White Cliffs of Dover'

⁵⁷² See F. Taylor, *op. cit* pp.24-5

affected by them. Canterbury provides a good example of this. Raids on Britain's architecturally and historically rich cities had been threatened since Bomber Command began targeting German cities at the end of March 1942.

The first such raid was on the port of Lübeck on the night of 28/29 March. Attacks on Rostock followed on four consecutive nights from 23 to 26 April. It was after Rostock had been attacked that the phrase *Terrorangriff* – terror raid- was first used by the German propaganda ministry. It would become increasingly used as the war progressed.⁵⁷³ According to the German Ministry of Propaganda and Popular Enlightenment the raid on Canterbury was a reprisal for the first 'One Thousand Bomber Raid'.⁵⁷⁴ The cathedral city of Cologne had been the target of this raid which took place on the night of 30/31 May. Canterbury was bombed the following night. Canterbury City Council then proceeded to complain to the London press about the dangers presented by their reporting of German threats to the city.⁵⁷⁵ The BBC was also attacked for creating a situation in which rumours were being spread about what had actually happened in the city. For Dover there was to be no let up and reactions were somewhat different. As the war progressed the growing emphasis on London and the way in which the attacks on that metropolis were reported tended to overshadow events elsewhere. In the national consciousness it was the attacks on London which stood out in relief from all others. For those towns and cities which suffered this was a difficult reality to come to terms with; as we shall see below this was a factor in the publication of local histories aimed at telling a non-London-centric version of World War Two.

Dover was placed in the front-line of the Second World War after the withdrawal from France in 1940. The town had seen the fate of the BEF at first hand and realised how perilous the situation was. The BEF troops were hurried on to trains and removed from the town as quickly as possible but even so news of the condition of the troops was soon circulated around the town. This had not been a victorious

⁵⁷³ R. Neillands, *op. cit.* pp.112-114

⁵⁷⁴ In fact, of the one thousand and forty-seven bomber aircraft which took to the air that night, eight hundred and ninety reached Cologne dropping one thousand four hundred and fifty-five tons of bombs. See *ibid.* pp.119-123. See also A. Galland, *op. cit.* pp.132-133

⁵⁷⁵ *The Dover Express* 5 June 1942

army returning home but rather a defeated force of tired, hungry and dejected men.⁵⁷⁶ Evacuation from the town of children was almost total and many others left of their own accord. Dover retained a much higher percentage of its population than most of its coastal neighbours in east Kent. The initial fear on the coast was one of invasion. The area offered invaders the shortest sea crossing from France and while much of its coastline is dominated by cliffs, large beaches at Hythe and Deal offered tempting landing grounds. The port of Dover offered a most tempting port through which the supply needs of the invasion forces could most easily be met. The idea of creating your own harbour, as with the Mulberry harbours in Normandy, was something undreamt of in 1941. An intact harbour was therefore of the greatest necessity to any seaborne invader.⁵⁷⁷ The people of Dover therefore remained very steadfast compared to those in the Folkestone, Margate and Ramsgate areas which ended up almost deserted by the local population for the duration. In these other towns the local authorities encouraged the people to leave whilst in Dover the members of the Town Council remained adamant that they were going to stay and that by extension the people of the town should do the same.

As we have seen circulation of *The Dover Express* actually increased in 1939 but the end of the 'Phoney War' saw this figure drop to a figure of eleven thousand seven hundred and fifty-nine. This illustrated that not just pupils and teachers had left the town. Doverians were more prepared to stay than most of their fellows from neighbouring towns. The main towns on the Isle of Thanet soon became almost ghost towns apart from service personnel. Folkestone too had its population slashed by voluntary evacuation. The invasion scares of the summer of 1940 undoubtedly caused the initial spate of panic, but the arrival of the first shells from France persuaded many people that it was not safe to return to southeast Kent despite the successes of the RAF against the *Luftwaffe*. A report on the educational needs of the borough of Dover dated 3 March 1939 estimated the population of the town to be forty one thousand and

⁵⁷⁶ Bob Lawrence, Admiral Ramsey's chauffeur at the time remembers his visits to the harbour and being shocked at the state of the troops who were so tired that they lay down where they could and this included the admiral's car. Interview with Bob Lawrence 24 September 2001.

⁵⁷⁷ The plans for Operation Sealion prove this necessity; the assaults on Dover and Folkestone being the vital first stage of the German plan. The German defensive plan for northern France was also based on the allies' need to capture a harbour. Without a reliable harbour supplies and reinforcements could not be brought in.

ninety-seven souls.⁵⁷⁸ In 1944 the civilian population of Dover was estimated to have fallen to approximately twenty thousand.⁵⁷⁹ This was at the time of the most severe cross-channel shelling of the entire war and so the population may have been at its lowest level but even so this drop in population obviously had severe financial implications for the businesses in the town. Indeed, these implications extended to the town council which relied upon the business and private rates for the running of the town. As with the other effected towns calls had to be made upon central government to provide funding or else the rates would have reached astronomical levels for those still remaining in Dover. In 1939, according to *The Dover Express*, the penny rate produced in excess of £2,000, by 1940 this had dropped to £1,648 but the drop experienced in 1941 was astonishing; falling to only £625.⁵⁸⁰ This being "on account of the many empty properties" in Dover, but things were worse in nearby towns such as Margate according to *The Dover Express*.⁵⁸¹ Tom Harrison of Mass Observation visited Dover in September 1941 and he estimated that the town's population was only just over ten thousand.⁵⁸² The cost of Dover's services had fallen since the start of the war but only by £60,000. The rate would have had to be 31s. & 9d. for each household to balance the town's budget without some form of financial intervention. This financial intervention was made by the Ministry of Health and enabled the rate to be reduced to a more affordable 13s. & 9d., but this did not make the townspeople or the local council grateful.⁵⁸³ In fact the need to ask for funding seemed to gall Dover's self-reliant streak and the lack of Government funding in other areas, most notably ARP of course, was what was highlighted in the local press and council meetings. There was a definite feeling that Dover was receiving a raw deal compared to its neighbours. It was almost as though Dover was being punished for "carrying on". Dover maintained the largest population of any coastal town in east Kent during the war, despite being the most obvious target. Only Folkestone had comparable military and naval establishments around the town. Folkestone's population in 1939 was forty-

⁵⁷⁸P.R.O. Document Ed 97/726-Report into the Educational Provision required for the Borough of Dover. (no page numbers)

⁵⁷⁹P.R.O Document HO 186/1895-Report into Cross- Channel Shelling of September 1944 (no page numbers)

⁵⁸⁰ *The Dover Express* 4 April 1941. Slightly different figures were published in the 25 April 1941 edition showing that the penny rate in 1940 raised £1,110 while that for 1940 raised only £561.

⁵⁸¹ *ibid.*

⁵⁸² University of Sussex Mass Observation Archive File 883. Visit made to Dover on 25 September 1941 p. 1

⁵⁸³ *The Dover Express* 4 April 1941

seven thousand eight hundred but by 1944 this had fallen to fifteen thousand according to the same Home Office Report on the effects of cross-channel shelling.^{584,585} It was Dover which was able to carry on, regardless of the fact that it suffered the most from the attacks.

Despite the assertion by Professor F G Baily of Edinburgh at the British Association Conference in September 1939 that “the losses suffered by bombing aircraft would be so heavy as to put a rapid end to that type of warfare” there seemed in the Summer of 1940 to be no limits to what the *Luftwaffe* could achieve.⁵⁸⁶ To add to the destruction wrought in Spain and Poland could now be added the firebombing of Rotterdam and the aerial onslaught on Dunkirk. The *Luftwaffe* was not equipped to carry out the strategic bombing role but as a close support arm for the *Wehrmacht* it had proved its worth. The *Luftwaffe* made no attempt during the Dunkirk evacuation to bomb the ports on the English side of the Channel and this allowed the evacuation to be completed more easily than might have been the case. This prevented Britain’s air defence being stretched to breaking point. The bombing of Britain did not start until July 1940 for in the aftermath of Dunkirk the Germans did not turn their full attention on England as France was still undefeated and two Divisions of the BEF were still supporting the French. It was not until after the Armistice of 18 June 1940 that Great Britain stood truly alone. Hitler remained undecided as to what course of action was necessary to neutralise Britain and it was only in the late summer of 1940 that the Germans started their aerial assault on the British Isles. In east Kent the situation became almost panic-stricken; the German army seemed to be poised to strike as no army had threatened since the *Grand Armee* of 1805.⁵⁸⁷ The difference in 1940 was that the Royal Navy did not offer the reassurance about the impossibility of an enemy forcing a crossing of the Straits of Dover. The Norwegian campaign had shown that even with almost complete naval superiority a naval force could not master an air force. Britain would continue to ignore this fact and as a result would incur alarming losses to its naval forces. The warning had been served off Norway and Dunkirk, but heavier losses would follow off Crete and in the Pacific.

⁵⁸⁴P.R.O Document HO 186/1895-Report into Cross-Channel Shelling of September 1944

⁵⁸⁵*Folkestone, Hythe & District Herald* 21 January 1939 reported that forty-three thousand gas mask boxes were being issued to Folkestone which supports the pre-war estimates of its population.

⁵⁸⁶*The Times* 1 September 1939

⁵⁸⁷See below pp.166-7 for a fuller discussion of the situation in east Kent at this time. According to Calder, *The People's War* p.128 two-fifths of the population of the Kentish Towns left at this time.

RAF Fighter Command had been kept in reserve for the defence of Britain by Air Marshal Dowding during the battle for France.⁵⁸⁸ By doing this Dowding made sure that before any invasion the RAF would have to be defeated as an effective fighting force. This would have to be done either by destroying the aircraft on the ground or in the skies above Kent and Sussex.⁵⁸⁹ The security of the British Isles was in the hands of a small number of mostly inexperienced young fighter pilots; Churchill's "few". If the Luftwaffe could gain air superiority then an invasion could conceivably follow. Today the myth of "Fighter Command and the few" is strong but in the early summer of 1940 Fighter Command still stood virtually untested. The RAF's contribution to the French Campaign was minimal and because of this the work of the German bombers was made much easier. The abilities of the British Fighter force would come as a shock to the *Luftwaffe*. Adolf Galland, an experienced pilot in the *Luftwaffe*, made this very apparent to *Reichsmarshal* Göring at the height of the 'Battle of Britain'. When Göring came to visit his fighter commanders Galland was asked what he wanted, his reply that he desired a squadron of Spitfires evoked only a stunned silence from all present.⁵⁹⁰ The victories so far enjoyed by the *Luftwaffe* had been won over air forces flying obsolescent aircraft; Spain, Poland, the Fleet Air Arm (FAA) in Norway, Holland, Belgium and France. The 'Battle of Britain' would see the Luftwaffe at last facing an opponent of equal calibre. Fighter Command also had the advantage that it did not need to win the battle; stalemate would make any invasion impossible. As long as the RAF existed as a viable force the Germans could make no move across the Straits. This was of little comfort to the people of Kent who lived daily under the shadow of the aircrafts' wings and suffered even when the attackers were in retreat. For as the British and Americans would do later in the war German bombers jettisoned their bomb loads before returning to base. Often this was simply done in an effort to escape pursuing fighters by losing weight and therefore gaining speed, but to return to base with a full bombload was dangerous for the crew and the aircraft. Many crews took the decision that to drop their bombs anywhere in Britain was better than bringing them home. In September Churchill would specifically congratulate Bomber Command on their policy of bringing bombs

⁵⁸⁸ Air Marshal Dowding was the Commander of RAF Fighter Command from 1936-November 1940.

⁵⁸⁹ The Battle of Britain memorial is situated in Capel-le-Ferne, approximately at the mid way point between Folkestone and Dover.

⁵⁹⁰ A. Galland, *op. cit.* pp.38-9

home in contrast to the actions of the Luftwaffe pilots; it was not a policy which would outlive the 'Blitz'.⁵⁹¹ The raid which terrorised Margate, during the first week of September 1940, was cited in the same speech as an example of the Nazis at their worst in bombing a defenceless town because they were prevented from reaching their true target.

Even if the towns of east Kent were not primary targets they still received more than their fair share of attention during the battle. The danger seemed very real to the people of east Kent and evacuation soon began. This was countered by an influx of even more reporters into the area. Another of the wartime myths accepted today is that the BBC was a great medium for bringing together the people of the country and that its programming and reporting were universally accepted and praised. This was not true in the case of Dover and other towns. Their experience was not to do with receiving the news; they had become the news and did not like what they had become and how they were being portrayed by the BBC in particular. The anti-BBC line in *The Dover Express* had already become very apparent by the start of June 1940 but the complaints against the BBC would rise in intensity throughout the 'Battle of Britain'.⁵⁹²

In its edition of 7 June 1940 *The Dover Express* articulated concerns at what was happening in neighbouring towns. The evacuation of Folkestone was being carried out to such an extent that even paid members of the ARP were being evacuated. A fact reported with some disgust by *The Dover Express*.⁵⁹³ Deal also had the "jitters" it was reported in the same edition. The inference being to the people of Dover that while the neighbouring towns were panicking those in Dover remained steadfast and were doing the right thing by their attitude. The same view was reported in the Ministry of Information daily reports on civilian morale which reported "grave anxiety" in Margate, Ramsgate and Deal.⁵⁹⁴ Similarly the report for 12 June noted that "Folkestone Depopulated by evacuation."⁵⁹⁵ A report on 4 June noted that on the

⁵⁹¹ *The Dover Express* 6 September 1940

⁵⁹² *The Dover Express* 7 June 1940

⁵⁹³ *ibid.*

⁵⁹⁴ PRO Document INF 1/264 Civilian Morale Report 29 May 1940. Betjeman's poem "Sir John Betjeman on Margate in 1940" beautifully sums up how he saw the town change in wartime. J. Betjeman *Collected Poems* (London, 1958) p. 116-117

⁵⁹⁵ INF 1/264 Civilian Morale Report 12 June 1940

other hand a Dover townsman said “We won’t leave Dover until [the] Channel is full of German seamen.”⁵⁹⁶ The notice by the Regional Commissioner, Auckland Geddes, on 31 May would seem to confirm this. The notice commented on the number of persons who had left east Kent, and while conceding that people could leave it also stated that “it is your personal duty to remain at your post and not to move away unless and until instructions are received from a competent authority.”⁵⁹⁷ It would seem that the relevant authorities in the area could not make up their minds as to what actually was the correct course of action. Dover Town Council debated whether there should be an almost complete evacuation of the town in the first week of July. On one hand it was argued that it would be easier for those involved in essential war work if those not involved in such work were to leave. This view received little support in the meeting and seems to have been brought up because the government was advising such a course of action. The Town Council was firm in its decision that they would stay *en masse* and that they would not advise an evacuation of the town in the manner which had happened in neighbouring towns. Doverians did see themselves as having to set an example to the country as a whole in a manner that did not seem to have occurred to the other towns. Voluntary evacuation from south east towns was estimated to equal twenty per cent of the population but in Folkestone the total reached almost fifty per cent.⁵⁹⁸ The authorities in Dover objected strongly to what they saw as alarmist reports in the *Daily Mail* about unofficial evacuation from the town.⁵⁹⁹ At the same time Folkestone Town Council actually employed a speaker van to urge the town’s inhabitants to leave.⁶⁰⁰ This is not to say that the Council and people of Dover did not recognise the potential danger which they were in. The Dover Town council debated whether to evacuate the entire town again in late October but the resolution was defeated by a huge majority.⁶⁰¹ The nation seemed in some way to be relying upon the inviolability of the ‘White Cliffs of Dover’ as an unbreachable bulwark against invasion; the people of Dover felt that to leave would be a betrayal of this ideal. This might have serious repercussions for national morale. The White Cliffs might just as correctly have been known as the ‘White Cliffs of Folkestone’ because that town lies at the western edge of the geological feature. They are not and the

⁵⁹⁶ *ibid.* 4 June 1940

⁵⁹⁷ “Proclamation to the people of East Kent 31 May 1940”, copy in Dover Museum Library Box XVII

⁵⁹⁸ INF 1/264 Civilian Morale Report 8 June 1940

⁵⁹⁹ *ibid.* 1 June 1940

⁶⁰⁰ *The Dover Express* 5 July 1940

⁶⁰¹ *The Dover Express* 25 October 1940

attitude of Dover in times of calamity seems to be inextricably linked to its relationship with that national icon – ‘The White Cliffs of Dover’. The cartoonists of the day made much use of the powerful imagery of the cliffs rising insurmountably from the Channel. David Low’s famous “Very Well, Alone” cartoon depicted a British Tommy standing on a feature instantly recognisable as the White Cliffs with clenched fist staring defiantly out to sea (see Figure 9 below).⁶⁰² Sidney Strube’s cartoon makes the personification of the cliffs with the British spirit even more apparent by forming the cliff into the shape of the British Lion (see Figure 10 overleaf).⁶⁰³



Figure 9: “Very Well, Alone”, *London Evening Standard* 18 June 1940

⁶⁰² *Evening Standard* 18 June 1940. Cartoon courtesy of The Centre for Study of Cartoons and Caricature, University of Kent. Cartoon Reference LSE 2791.

⁶⁰³ Sidney Strube, “Britain Stands Alone”, *Daily Express* 29 May 1940.

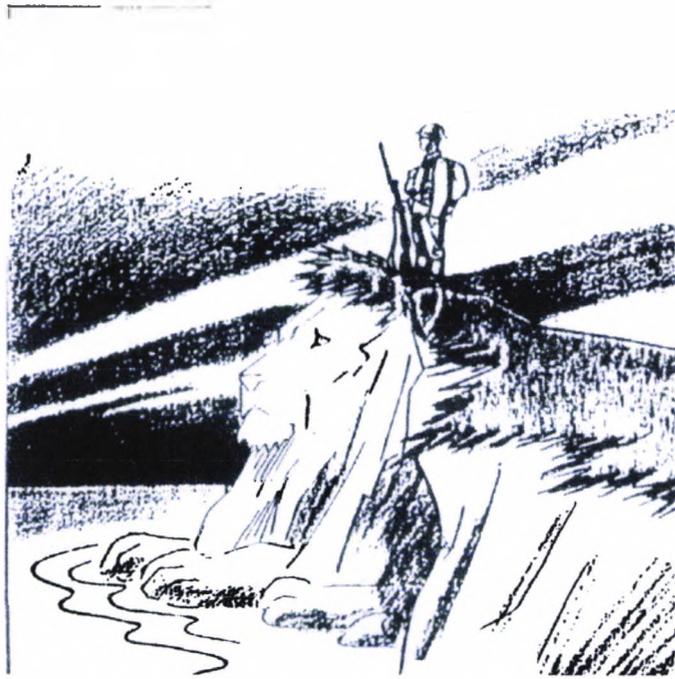


Figure 10: “Britain Stands Alone”, *Daily Express* 29 May 1940

The news that Dover was voluntarily evacuating itself could then have had a severe negative effect on national morale. The area had been inextricably linked with national security in the public consciousness since the time of the Napoleonic Wars and so Dover was prepared to ‘take it’ for as long as was necessary. ‘The White Cliffs’ was the title of a poem written by Alice Duer Miller. It told of an American’s love for England and was published in 1940. It sold a total of thirty thousand copies in the USA and was broadcast and read to millions of other Americans.⁶⁰⁴ The most famous song about Dover and perhaps the most famous song of the Second World War period “There’ll be Blue Birds over the White Cliffs of Dover” was also written by an American, Nat Burton, and appeared in July 1941. The choice of the titles and the subject matter illustrated how potent the image of the White Cliffs was to Americans as well as to Britons. Dover also inspired a poem by Mr H R Geddes of Ilford which echoes these sentiments; it was printed in the *Dover Express* on 11 October 1940.

“Old Dover still is England’s Key,
and grimly guards the narrow sea,
keeps watch and ward on England’s gate,

⁶⁰⁴ N. Cull, *op. cit.* pp.110-111

And faces dauntless, Hitler's hate.'⁶⁰⁵

Dover was not prepared to take what George Bernard Shaw had so eloquently entitled 'Bumbledom'.⁶⁰⁶ 'Bumbledom' was defined as the inappropriate use of resources caused by the inefficiency of the bureaucracy. National examples abounded and Dover itself had a number of projects which fitted neatly into this category. The editorial of *The Dover Express* on 5 July 1940 railed against two of these. The first example was the building of an Infants' School. This did seem to be ridiculous as all the town's children had been evacuated a month earlier and so a new school would not seem to have been a major priority. The second was the laying of a new water main in the town. Serious bombing and shelling of the town had not yet begun and this project could be excused on the grounds that it was improving conditions for people in the town and would presumably make fire-fighting more effective should the town be attacked. *The Dover Express* did not agree and saw it quite simply as a waste of resources and manpower which could be better used in defence of the nation.⁶⁰⁷ Dover's authorities, however, did not want the town's evacuees to return and at this stage of the war most of the remaining adult population of Dover was against any such return. The Mass Observation report from Dover in June 1940 had noted how solidly the population was behind the idea of evacuation unlike other towns, such as Southend.⁶⁰⁸ *The Evening Standard* ran an article entitled "Come Back" in late October. This call reputedly echoed the Mayor's sentiments about those who had left Dover.⁶⁰⁹ The Mayor denied having given any such interview at the next council meeting. This incident stirred up the anti-national press sentiment within the council to an even higher degree. The views of *The Dover Express* were wholeheartedly supported by the entire council and stood, it was felt, in stark contrast to the irresponsible reporting of the national press.⁶¹⁰

The first civilian casualty as far as Dover was concerned was Mr George Knight who was struck in the leg by a splinter in Matthew's Place on Tuesday 9 July

⁶⁰⁵ *The Dover Express* 11 October 1940

⁶⁰⁶ *The Dover Express* 5 July 1940. This gives the local press's interpretation of Shaw's remarks.

⁶⁰⁷ *ibid.*

⁶⁰⁸ University of Sussex, Mass Observation Archive File No. 167 'Atmosphere in Dover' 3 June 1940

⁶⁰⁹ *The Dover Express* 25 October 1940

⁶¹⁰ *The Dover Express* 1 November 1940

1940.⁶¹¹ This was most probably a splinter from an anti-aircraft shell as German attacks at the time were focussed on the harbour and convoys moving in the Channel. The weight of these attacks was so great that the Admiralty withdrew the Destroyer Flotilla from Dover and British shipping was forbidden to enter the Straits of Dover. Daytime convoys were suspended from 26 July. The Germans had effectively closed the Channel to British shipping; an unprecedented event in British naval history and one which did not bode well for an effective response from the Royal Navy should an invasion be attempted. The Royal Navy's destroyers were withdrawn from Dover to a safer anchorage in Portsmouth on 28 July. Now everything rested on the shoulders of RAF Fighter Command. Dover was to be treated not merely to a front row seat but a starring role in the drama which was to unfold to a nation and world, hungry for news. As the editorial of *The Dover Express* on 12 July put it, "Dover is still Dover and Dover Castle stands as sentinel."⁶¹² Despite this high sounding rhetoric there remained a deep fear among local politicians, people and press at the time over the way the region was being portrayed in the national media.

10 July 1940 marked the opening of the Battle of Britain which according to official British records ran from that date until 31 October 1940. On 10 July a BBC correspondent recording a report from Dover found himself observing an attack on a British convoy just off the port. His position on the cliff provided him with a grandstand view of the events. The convoy codenamed 'Bread' passed almost unscathed through the raid and only one small ship was sunk.⁶¹³ This broadcast has become famous and was widely acclaimed at the time one London diarist describing it as "Jolly Good".⁶¹⁴ The correspondent, Charles Gardner, described how RAF fighters beat off an attack by German dive-bombers and their escort on the convoy just off Dover. He did so "with all the gusto of a sportscaster doing play-by-play".⁶¹⁵ This report was broadcast to both the Home and North American services. This was what the Americans longed for "spontaneous running commentaries on raids."⁶¹⁶ It normally receives great praise for the manner in which it allowed the public to learn what was happening first hand from a man on the spot. However, for *The Dover*

⁶¹¹ *The Dover Express* 12 July 1940

⁶¹² *ibid.*

⁶¹³ R. Hougham & D. Richards, *op. cit.* pp.125-6

⁶¹⁴ A. Calder, *The Myth of the Blitz* p.31

⁶¹⁵ N.Cull, *op. cit.* p.102

⁶¹⁶ *ibid.*

Express it was little short of a national disgrace; how could the BBC be so irresponsible as to broadcast live an aerial battle? *The Dover Express* felt that valuable information would be given in this way to the Germans and also that the public could be misled by such reports. *The Dover Express* disagreed with much of what Gardiner said on a factual basis and felt his broadcast did not accurately describe what had taken place.⁶¹⁷ Gardiner's broadcast, in fact, brought home how close the war had come to the majority of Britain's population who could not look up and see the aerial events unfolding.

If this broadcast was unacceptable then J.B. Priestley's monologue on the depopulated coastal town of Margate, broadcast in early July 1940, was the lowest ebb of the BBC's output up to this point according to *The Dover Express*.⁶¹⁸ What good could such a broadcast achieve other than to alert the Germans to the fact that the British people were so worried about an invasion that they had fled the exposed coastal areas? It also had the effect of putting doubt into the minds of those who stayed whether they should now go for their own safety. Priestley's broadcasts were much listened to and very popular with large sections of British society. *The Dover Express*'s editorials were not always representative of the views of the town's people. For the rest of July the military situation was on the whole quiet. The Germans were still basking in the success of the 'Blitzkrieg' and Britain was preparing itself for the onslaught which must follow any refusal to surrender to Hitler or even to come to an 'arrangement' with him. The Ministry of Information could afford at this stage to compare favourably the casualties due to air raids with pre-war road casualties in an internal memorandum.⁶¹⁹ The events in the air war at the end of the month would change this view across the country.

The large raid on Dover Harbour on Monday 29 July 1940 carried out, according to reports at the time, by thirty Ju87 'Stuka' dive-bombers and fifty Messerschmitt fighters, made sensational news in both the national press and radio much to the chagrin of *The Dover Express*.⁶²⁰ In fact fifty Ju87 and eighty

⁶¹⁷ *The Dover Express* 12 July 1940

⁶¹⁸ *ibid.*

⁶¹⁹ PRO Document INF 1/266 'Rumours and Morale 1940'

⁶²⁰ *The Dover Express* 2 August 1940

Messerschmitt Bf109s took part in the attack.⁶²¹ One destroyer was sunk by the German bombers.⁶²² Over two hundred aircraft became involved in the great mêlée over Dover, but only five aircraft were in fact shot down despite appearances from the ground. However, according to the Civilian morale reports compiled by the Ministry of Information, morale in Dover was extremely high after this raid and much satisfaction was noted with the work of civil defence services.⁶²³ This raid marked the beginning of the mass attacks on targets in Britain and it was from this point that the dire predictions of the effects of aerial attacks made before the war would be put to the test.⁶²⁴ The broadcasts made by the BBC regarding this raid led to *The Dover Express* launching its most virulent attack yet against the BBC. The editorial began by making a comparison with the First World War; “The last war was won without broadcasting and we should be better off without it now.”⁶²⁵ In the First World War *The Dover Express* had been able to report with no competition apart from the national and local press. The BBC was able to provide people with very up to date news very quickly, something impossible in a weekly local newspaper. *The Dover Express* also attacked the BBC on its past record which was “not impressive”, “the way in which it [BBC] helped the disarmament madness of not so many years ago is difficult to forget.”⁶²⁶ At the height of the ‘Battle of Britain’ any talk of disarmament was tantamount to defeatism and any association with the appeasement policies of the 1930s was something to be avoided. From the point of view of *The Dover Express* it was obviously difficult to forgive. As in the First World War it was Dover which was again in the frontline of the aerial war, a war now made even more intense by the advances in aviation technology.

The bombing attacks had, up to this point, been limited to high explosive and incendiary devices. There had been no sign that the Germans would use gas against either British troops or civilians, but the fear of gas attack was still very real and

⁶²¹ R. Hougham & D. Richards, *op. cit.* p.133

⁶²² *ibid.* p.358

⁶²³ PRO Document INF 1/264 Civilian Morale Report 31 July 1940

⁶²⁴ It seems odd that Jenkins ignores these raids on the east coast as being the overture to the Battle of Britain proper while concentrating on the more “sporadic” raids on the West Country and Wales. In early August the Germans were clearly challenging British supremacy in the Straits and the raids elsewhere would clearly seem to be part of a strategy to spread British resources as thinly as possible.

See R. Jenkins, *Churchill* (London, 2001) p.630

⁶²⁵ *The Dover Express* 2 August 1940

⁶²⁶ *ibid.*

Dover gained its very own “gas chamber” on the site of the old electricity works. The “gas chamber” was to be used by people so that they could test their gasmasks and get used to wearing them. Everyone was encouraged to go and try the facility through an announcement in *The Dover Express’s* “Town, Port and Garrison” column. The chamber was open every day except Sundays between the hours of 2pm and 5pm and later between 7pm and 8pm. It was of course “necessary to bring one’s gas mask but these days that should always be carried.”⁶²⁷ Despite the fact that no gas had been used in the previous German campaigns it did seem likely that any invasion attempt might be preceded by a gas attack to ‘soften up’ the defenders. Dover lying on the invasion coast had yet another type of warfare to fear.⁶²⁸ The town’s preparedness for this form of attack would not be put to the test but during August Dover would become the first town in Britain ever to be attacked by land-based artillery.⁶²⁹

All of these threats and the ever present danger of invasion added to Dover’s sense of having a ‘bunker mentality’(see above pp.17-18). It was the commencement of the shelling attacks from France which truly cemented this mentality in the minds of Doverians. The rumours of German cross-Channel guns appeared in the national press in the first week of August. *The Times* was chiefly concerned with the “moral effect by shelling objectives in Britain at long range.”⁶³⁰ *The Dover Express* seemed relatively unconcerned with these rumours, another form of ‘scare-mongering’ and instead was more interested in the plight of Folkestone which was now suffering from its lack of inhabitants. An article from the previous week’s *Folkestone Herald* entitled “Folkestone’s Business Plight” was printed verbatim in the 9 August edition of *The Dover Express*. While Folkestone’s businesses were suffering due to the “drastic” measures taken “to impress upon people the urgency of leaving the town...”. These measures included “notices, loudspeaker announcements and the official attitude” in Folkestone; Dover was on the contrary almost normal.⁶³¹ *The Folkestone Express* was

⁶²⁷ *ibid.*

⁶²⁸ The report by a Mass Observation recorder in 1940 noted that virtually everyone in Dover carried their gasmask. Mass Observation File 167 ‘Atmosphere in Dover’ p.3

⁶²⁹ This possibility had been foreseen in the pages of Paul Georg Münch *Hindenburgs Einmarsch in London* (Leipzig, 1915) “For eight days the new giant Krupp guns had felt their way over to Dover and Folkestone, ..., reducing all the work of human hands to nothing”. (Quoted in I.F. Clark, *op. cit.* p.25)

⁶³⁰ *The Dover Express* 9 August 1940. The day after the Battle of Britain officially began.

⁶³¹ *Folkestone, Hythe and District Herald* 3 August 1940 & *The Dover Express* 9 August 1940. These first shells it is believed were fired from two hundred and eighty millimetre ‘K5’ railway guns. The

one of the businesses to suffer. It ceased publication at the start of July. This sort of article probably did wonders for the confidence of Doverians especially as the article ended by stating that “to the present Folkestone is as safe as most other towns in the country and safer than some.”⁶³² Since Dover and Folkestone as well as being near neighbours housed similar military facilities such a comment may have seemed to be applicable to Dover as well. The events of the following week would make Dover and Folkestone arguably the two most unsafe towns in Britain and, by extension in the summer of 1940, Europe.

On Monday August 12 1940 two unexplained explosions occurred in Dover. Folkestone was shelled on the same day and it is typical of the rivalry which exists between the two towns that both claim to have been the first towns to have been shelled during World War Two.⁶³³ In fact Dover’s first shell landed approximately half an hour before the first shell on Folkestone.⁶³⁴ No aircraft were heard overhead and there seemed to be no doubt that the explosions were caused by enemy action. The only solution to the mystery, for mystery it was initially, was that the Germans had in place a long-range gun capable of firing across the Channel.⁶³⁵ The *Daily Telegraph* on 13 August raised this very possibility and *The Dover Express*, still unable to report such matters directly, quoted from the national press on the matter in a piece entitled “The Press and Channel Guns.”⁶³⁶ Dover had now come within range of land based artillery and there was no way to stop the bombardment short of destroying the guns in situ. Bomber Command was fully occupied in trying to destroy the barges being assembled for ‘Operation Sealion’ and so was unable to divert many of its resources to the destruction of the guns. Two civilians were killed in the first shelling attacks on Monday 12 August. In the minds of not just *The Dover Express* staff but many other Doverians it was the BBC which should be held responsible for inviting the Germans to continue their attacks on the town. The broadcast by the BBC on Saturday 10 August which stated that Dover had suffered little or no damage in the

shells from these guns weighed five hundred and sixty one pounds each. See R. Humphreys, *Dover at War* p.43

⁶³² *ibid.*

⁶³³ *Frontline Folkestone* by *The Folkestone, Hythe and District Herald* published in 1945 claimed that the first shell fell on 14 Millfield Road in Folkestone on 12 August, p.33

⁶³⁴ Cf. also R. Humphreys *Dover at War* p.43 & R. Humphreys, *Target Folkestone* (Rainham, 1990) p.45

⁶³⁵ R. Hougham & D. Richards, *op. cit.* pp.143-4.

⁶³⁶ *The Dover Express* 16 August 1940

German air raids up to that date was followed by what were “the most intense raids of the war, now with fatal results”.⁶³⁷ The air raids which followed on 11 and 12 August were indeed the heaviest on the town so far. They were directed against the radar stations which were proving so vital in repelling the German attacks.⁶³⁸ The editorial condemning the BBC also condemned the irresponsible journalists who wrote articles with titles such as “Skywriting Raiders”, together with the editors and censors who allowed the articles to be published. The theme was continued with a comment in the ‘In the Street’ column which stated that “the BBC ought to be prevented from telling the Germans what they do or didn’t do.”⁶³⁹ A letter signed only “Indignant” warmed to the same subject severely criticising the BBC for its manner of reporting the war.⁶⁴⁰ The BBC was clearly becoming very unpopular in Dover and people felt justified in blaming follow-up raids on the BBC’s reporting that little damage had been done. However, if the BBC did not issue such statements then it would have been very difficult for people elsewhere in the country to ascertain what was happening in the air war. In the minds of the people of Dover, however, those elsewhere in the country would be better waiting for their news if it meant that Dover was spared another raid. This sentiment would soon be echoed by many towns and cities across the length and breadth of Britain before the year was out.⁶⁴¹

After 15 August 1940 the air battles grew in intensity. Prior to that in the week beginning 8 August the official British figures given for the numbers of aircraft lost on the British side and numbers believed to have been destroyed on the German side showed an advantage of over four to one for the British. In total four hundred and thirty-two German aircraft were claimed by the British against losses of only one hundred and one aircraft. Twenty-six of these British pilots were reported safe. The British losses seemed small compared to the German but one hundred and one aircraft represented ten per cent of Fighter Command’s aircraft strength and seventy-five pilots five per cent of the RAF’s trained pilots. In fact up to 12 August the Luftwaffe had lost two hundred and eighty-six aircraft and Fighter Command one hundred and

⁶³⁷ Quoted in *The Dover Express* 16 August 1940

⁶³⁸ R. Hougham & D. Richards, *op. cit.* pp.141-143

⁶³⁹ *The Dover Express* 16 August 1940

⁶⁴⁰ *ibid.*

⁶⁴¹ Reports from York, Canterbury etc during and after the ‘Baedeker’ raids quoted in *The Dover Express* 1 May & 5 June 1942.

fifty.⁶⁴² These were losses which could not be long sustained and had the full significance of the losses been known to the public at the time there would have been even more concern than was the case. The official figures gave heart to the public as it seemed that the RAF was winning, but RAF claims vastly overestimated the number of German aircraft destroyed despite being widely believed at the time, the belief in the statistics extending to the highest figures in Government.⁶⁴³ Churchill in his Home Service Broadcast of 11 September 1940 claimed advantages of three to one in machines lost and six to one in pilots to the RAF over the *Luftwaffe*.⁶⁴⁴ On the German side optimism was even higher and the collapse of the RAF was daily expected in the summer of 1940 and with this control of the skies. German Military communiqués suggested that over two thousand RAF aircraft had been shot down during August and the first two weeks of September.⁶⁴⁵ This was in fact twice the strength of Fighter Command at this time. All through the summer the RAF held on grimly despite mounting casualties. On the ground the people of Dover tried to get on with their lives.

The lives of people in the south east of England had changed significantly since the start of August 1940. Daily air raids had become commonplace. For most people this was only another burden to be borne and for others it was an added excitement. *The Dover Express* was urging people, boys small and large in particular one would guess, not to collect spent cannon shells because “Messerschmitt Cannon Shells Too Dangerous as Trophies”.⁶⁴⁶ Helpfully a diagram of the three and one quarter inch shells accompanied the article so that anyone unsure of what one looked like would now know. For others the spectre of danger from the air conjured up different feelings; terror and panic. To *The Dover Express* these people were a disgrace to their town and country and were censured in the strongest terms, “The few people who feel that that they can only rest in these caves and haunt them would be well advised to leave Dover if they cannot pull themselves together.”⁶⁴⁷ This same group was also criticised for trying to introduce what *The Dover Express* termed

⁶⁴² R. Hougham & D. Richards, *op. cit.* p.359

⁶⁴³ R. Jenkins, *op. cit.* p.632-633. W.S. Churchill, *The Second World War Volume II: Their Finest Hour* (London, 1949) pp.298-300

⁶⁴⁴ H. Krabbe, *Voices from Britain: Broadcast History 1939-1945* (London, 1947) p.62

⁶⁴⁵ W.A. Boelcke, *The Secret Conferences of Dr. Goebbels* (New York, 1970) p.93 quotes two thousand and ninety six RAF aircraft as having been destroyed.

⁶⁴⁶ *The Dover Express* 16 August 1940

⁶⁴⁷ *ibid.*

“Cave Law”. This was “staking a claim” to a particular part of a cave by leaving furniture, rugs or other personal items. When such claims had been staked it would be difficult for others to feel able to use that part of the cave even if the owners of the property were not in residence. People behaving like this were obviously felt to be letting their community down and as such would be better not staying in Dover, especially now that the shelling of the town had been repeated. On Thursday 22 August the town was shelled for the second time. On this occasion there were no casualties. Free rubber ear plugs were offered to the people of Dover at the start of October and were available at all Wardens’ posts.⁶⁴⁸ Their usefulness against shelling attacks was doubtful given the lack of effective warning at this point.

Those of a nervous or selfish disposition were not the only ones to be attacked in the pages of *The Dover Express*, a letter from Councillor Ernest E Chitty put the blame for many of the town’s troubles squarely on the shoulders of the BBC. In his opinion “the exaggerated accounts of damage not only mean loss of business for Dover’s hard hit traders but also cause unnecessary distress and anxiety to their friends at a distance.”⁶⁴⁹ This was a different angle to the previous attacks on the BBC as prior to this it had been the BBC’s underplaying of damage that had led to further raids on the town. Now by “exaggerating” the damage the town’s traders and friends and relatives at a distance were suffering. It would seem that the people of Dover truly believed that the BBC was doing its worst for them. It now seemed that the BBC was trying to make an example of Dover to the world as another victim of Nazi outrages. Dover would be the one to suffer because of this policy. The possibility that this might have been an officially inspired policy, given the fame of Dover across the world, never seems to have been seriously considered. The attack was followed up in the next edition by an editorial decrying the fact that BBC broadcasts were costing lives in Dover. It was a widely held belief that the German gunners were able to correct their range by listening to the BBC broadcasts. *The Dover Express* confidently pronounced that; “The BBC’s broadcast was immediately followed by the shelling of Dover with fatal results.”⁶⁵⁰ Until the start of the air raids on London in September Dover was by far the most recognisable town in Britain to have been attacked by the

⁶⁴⁸ *The Dover Express* 4 October 1940

⁶⁴⁹ *The Dover Express* 23 August 1940

⁶⁵⁰ *The Dover Express* 30 August 1940

Germans. As such it was widely reported in the British press not just for domestic consumption but to try and sway public opinion around the world, especially in the USA.

This policy was beginning to have some effect on US public opinion if the letter received by *The Dover Express* from Newark, New Jersey is to be believed. For Lloyd M. Felmly it was *The Dover Express* which spoke for England as “one of those English provincial weeklies that reveal far more of the intimate spirit of England than the great London dailies.”⁶⁵¹ An article on Dover had been published in the *Newark Evening News* on 5 August 1940 relating how the town was coping with life in the frontline. This article was based on the contents of an issue of *The Dover Express* sent to *The Newark Evening News*.

The BBC’s broadcasts and National press reports might be attacked for their inaccuracies but *The Dover Express* relied on the same sources of information and reported on 23 August that on the previous day the Anti-Aircraft gunners around the town had shot down nine German aircraft. This figure probably equalled the entire number of German aircraft lost to all Anti-Aircraft fire that week. Only three Luftwaffe aircraft were lost around the British Isles on that day.⁶⁵² Such reports obviously increased the self-confidence of the town and helped bolster a belief that the town could in some way defend itself against enemy bombers. The transfer of shelter provision to the military was dealt with in the same issue and while not complaining of the loss of public shelter space. *The Dover Express* disliked the way that the military had been able to improve the shelters it had taken over while the public shelters had been allowed to deteriorate.⁶⁵³ There were also calls for the supervision of the caves to be improved due to anti-social behaviour on the part of some of their inhabitants. This behaviour ranged from spitting in the caves to the leaving of piles of rubbish and the ‘booking’ of spaces. The fact that the national press was allowed to photograph the damage in Dover whilst *The Dover Express* was not remained a vexatious issue to that newspaper and its editor. This was especially so when the offices of *The Dover Express* were bombed and then featured in the national

⁶⁵¹ *ibid.*

⁶⁵² R. Hougham & D. Richards, *op. cit.* p.361

⁶⁵³ *The Dover Express* 30 August 1940

newspapers. They could not be featured in the pages of the town's only newspaper. This did seem to be one of the ridiculous restrictions of wartime censorship that only accredited photographers could work in sensitive areas such as Dover. *The Dover Express* had no fulltime photographer and therefore had no accreditation with the Ministry of Information. It therefore had to use photographs taken by the 'hated' London photographers. When these photographers got it wrong as they sometimes did *The Dover Express* was very quick to point out their errors; a good example being the photograph in the *Daily Sketch* which purported to show five burning German aircraft and which in fact showed a burning barrage balloon.⁶⁵⁴

The last week in August 1940 brought two very important visitors. On Sunday 25 the Foreign Secretary, Lord Halifax, visited the town. On Wednesday 28 August the Prime Minister visited Dover and Ramsgate. In Dover he visited the Castle, the Fire Station, the ARP Control Room and several First Aid stations. While he was in Dover two air raids were in progress.⁶⁵⁵ This coincidence was not lost on the people of Dover and the 'In the Street' column carried the following words of advice. "They say that distinguished visits are not so appreciated as supposed if seven reds are the price."⁶⁵⁶ "Seven reds" of course being the name used for the seven bombs which landed on Dover. On this occasion the raids and the Prime Minister's visit were undoubtedly pure coincidence but in a community living under such strain that Dover was it would have been only natural to link the two events. Other towns and cities would link a Churchillian visit to air raids which closely followed on his heels. Dover certainly was one of the first to do so and was possibly the only town to actually host Churchill during a raid, apart of course from London. The report from the Ministry of Information for this week on "Rumours and Morale" reported problems in the "Provinces" due to the way that "London air-raid news had been starred" in the national press and radio.⁶⁵⁷ Dover was one town which would have been quite happy to have missed out on making the headlines. *The Dover Express* would gladly have left this honour to the nation's capital.

⁶⁵⁴ *The Dover Express* 16 August 1940

⁶⁵⁵ *The Dover Express* 30 August 1940- this would seem to contradict R. Jenkins, *op. cit.* p.643 which stated that he witnessed an air raid in Margate and not in Dover.

⁶⁵⁶ *ibid.*

⁶⁵⁷ PRO Document INF 1/264 Daily Summary of Morale Reports. Report 30 August 1940

By the middle of September *The Newspaper World* was citing Dover as being “Britain’s War news centre”.⁶⁵⁸ All of this was duly reported in *The Dover Express* and its reporting was as negative as ever. In the eyes of *The Dover Express* the extended press interest in the town could bring only more bad news. The permission granted by the Ministry of Information and the General Post Office to give the journalists extra telephone lines to London seemed to be unfair when the ARP services in Dover were prevented from gaining similar advantage.⁶⁵⁹ The photographs of the shell damage being published in the London press, photographs which *The Dover Express* was forbidden from taking, were giving valuable information to the Germans on the range of their guns. As usual *The Dover Express* did not mince its words; “Dover has been pestered again, thanks to the help of this sort of thing.”⁶⁶⁰ At the time there was obviously considerable ill-feeling towards the national press about the way that news from Dover was being reported. It was felt that the British national press was making things worse for the people of the town. The first photograph of Dover’s war damage to be published in *The Dover Express* was printed on 20 September 1940 and came originally from *The Daily Express*. The caption in that newspaper read “Hellfire corner...A seaman’s house at Dover is completely wrecked.” This may have been the first use of the term ‘Hellfire Corner’ for the town and surrounding area. *The Dover Express* printed the photograph and pointed out that it was only printing it because it had been featured in the pages of *The Daily Express* and that any information which the Germans might be able to use from it would already have been gleaned. However, there does not appear to be any evidence that this view of the photographs and reports aiding the Germans was widely shared in Dover or elsewhere; the Germans were capable of determining this information for themselves through aerial photographs.

The Dover Express began to alter its reporting of the town’s war news at the start of September. An example of this was the way in which the column “This Week’s Air Raids” became “The War in the Air”.⁶⁶¹ The contents of the columns were identical but the former title obviously gave a very defensive take on what was

⁶⁵⁸ *The Newspaper World* is the trade newspaper for Britain’s press

⁶⁵⁹ *The Dover Express* 13 September 1940

⁶⁶⁰ *ibid.*

⁶⁶¹ Until 30 August 1940 this feature in *The Dover Express* was entitled; “This Week’s Air Raids”. From 6 September 1940 it became known as “The War in the Air”

happening while the second showed that the *Luftwaffe* was not totally dominant and that Britain was capable of striking back. As the War in the air continued the British raids would come to dominate this column but until the early summer of 1941 it was the *Luftwaffe*'s activities which tended to occupy the most column inches. During September the weight of the *Luftwaffe*'s raids increased as did the danger of shelling. This caused *The Dover Express* again to return to its hard line on the question of air raid shelters. The town and its newspaper had always been opponents of the 'Anderson Shelter' schemes and by the middle of September *The Dover Express* could report the "general condemnation of Sir John Anderson's policy" in the country as a whole. The fact that Dover's views were not being reported forcibly enough in parliament were also commented upon. Dover's pre-war MP, Major Astor, still remained in place and as he had wanted to retire before the war was not as active as the town might have liked on its behalf. *The Dover Express* went as far as to say that "if Dover had a live representative in parliament this might be done."⁶⁶² Major Astor was still alive and he held irregular surgeries in the town to prove the fact.

The knowledge that the tube system was opened to the people of London was compared by the residents of Dover to the fact that their town was prevented from getting the deep shelters it desired.⁶⁶³ H Hilton of 13-14 Market Hall, Dover wrote to *The Dover Express* bemoaning this very fact. London now had a network of deep shelters as the government had been unable to prevent the public from in effect taking over the tube system. Dover had been prevented from gaining such a deep shelter network and the one of the reasons cited was that nowhere else in the country had one. Now London had such a network as did Ramsgate. Ramsgate's tunnels were called "probably the finest air raid shelters in the world" by the American journalist Herbert Knickerbocker.⁶⁶⁴ His visit to Dover in late August 1940 warranted a story in *The Dover Express* and his reports published in the US press were reprinted in *The Dover Express*. Large raids on Ramsgate and Folkestone at the end of August caused considerable damage and casualties. Folkestone received casualties of five killed and twenty-four injured, while over four hundred houses were destroyed or damaged on

⁶⁶² *The Dover Express* 20 September 1940

⁶⁶³ *The Dover Express* 4 October 1940

⁶⁶⁴ *The Dover Express* 6 September 1940. Knickerbocker worked for the Hearst chain of newspapers

Monday 26 August.⁶⁶⁵ Ramsgate suffered an even larger raid at the end of the month, a raid which caused the destruction of “the largest number of houses...in any single air raid anywhere in history.”⁶⁶⁶ Five hundred one hundred and ten pound bombs were dropped in just over four minutes from fifty German bombers and one thousand two hundred and twenty-two houses were destroyed.⁶⁶⁷ Such figures today seem miniscule and perhaps even irrelevant compared to the destruction later wrought from the air on the cities of Germany and Japan. In the context of 1940 these were terror raids and merely because the German aircraft did not carry such large bomb-loads did not mean that these air raids represented anything less than the most terrifying aerial attack then imaginable. Even Ramsgate with “probably the best air raid shelters in the world” still only managed to hold on to less than fifty per cent of its population. Fifteen thousand out of a pre-war population of thirty-six thousand remained in the summer of 1940.

The aerial raids on Dover did not reduce its population to the same extent; the people of Dover seem rather to have accepted that this was their lot and stayed. Of course Dover’s population was one of the poorer in the east Kent area being predominantly working class as opposed to the other towns which relied on their more salubrious surroundings to attract a wealthier class of people. This distinction was made by a Mass Observation recorder who visited the town in early June 1941. She recorded that everyone who had money to do so had fled the town.⁶⁶⁸ To this day this distinction exists; house prices in Dover still lag behind the rest of east Kent, which in turn lag behind the rest of the south east.⁶⁶⁹ Dover’s *raison d’être* is as a port and as such a large amount of manpower was needed to ensure the port functioned correctly. During the war much of Dover’s population was engaged on essential war work and as such they could not readily leave the town. This may not have stopped men engaged on similar duties in nearby towns from leaving but the official line from Dover’s town council was to stay. This attitude was supported by the local newspaper and to leave if one was engaged in essential war work was presented as being highly

⁶⁶⁵ R. Foster, *Target Folkestone* p.53

⁶⁶⁶ *The Dover Express* 6 September 1940

⁶⁶⁷ *ibid.*

⁶⁶⁸ University of Sussex, Mass Observation Archive. File no. 167 ‘Atmosphere in Dover’. 3 June 1940

⁶⁶⁹ The property section of *The Dover Express* makes frequent reference to it. See *The Dover Express* 27 March 2003 Homefinder section for examples.

unpatriotic. The Air Raid Wardens in Folkestone who ‘deserted’ their responsibilities received very heavy censure in the Dover press.⁶⁷⁰

As summer turned into autumn the threat of invasion lessened. The figures reported in the local and national press of German losses gave the impression that the *Luftwaffe* had been cut to pieces in the skies over Kent. As the people of Dover knew the *Luftwaffe* kept returning day after day in seemingly equal strength. Dover would be spared the worst of these raids as London and the other major industrial centres became their key targets. Dover was, however, not spared the cross-Channel shelling which became a feature of life in the town until September 1944. Shelling was sporadic and not often heavy in nature but it remained a constant threat. Dover had to introduce its own warning for shelling to differentiate from the normal air raid warning. Initially the siren was sounded twice in quick succession to signify a shell attack.⁶⁷¹ This was changed from 27 October to a warbling signal for one minute, followed by a short pause and then another warbling signal for another minute.⁶⁷² The shelling warning was however not able to be given so much in advance as the air raid warning. A shell only took ninety seconds to cross the Channel before burying itself somewhere in the town with disastrous consequences to any buildings in its path. Folkestone in contrast did not introduce a separate shelling warning until 16 November 1942; over two years after Dover did so.⁶⁷³ Civilian casualties remained relatively light and this fact would cause much friction between the town and central government as the war progressed and conditions in the town worsened reaching their nadir in September 1944.

The simmering quarrel between Dover and the national press again threatened to boil over in the late autumn of 1940. *The Daily Mail* printed an article on 23 November entitled “The Dead End kids of Dover”.⁶⁷⁴ The title of the article was reputedly a quote made by town councillor Goodfellow. He stoutly refuted having made any such comments when questioned about it at the next council meeting.⁶⁷⁵

⁶⁷⁰ *The Dover Express* 7 June 1940

⁶⁷¹ *The Dover Express* 25 October 1940

⁶⁷² *ibid.*

⁶⁷³ Summary of Enemy Actions over Folkestone by Lt. Col. Clark, Folkestone’s Chief Air Raid Warden up to 15 October 1944. Quoted in R. Humphreys, *Target Folkestone* p.183

⁶⁷⁴ *The Daily Mail* 23 November 1940

⁶⁷⁵ *The Dover Express* 29 November 1940

This echoed the incident with the Mayor and the *Evening Standard* in the previous month and added to the distrust of the national press. The issue of the education of Dover's remaining children was an even more serious problem. All of Dover's teachers had accompanied their pupils to South Wales and the town's schools had been closed. The children who did not leave were therefore left with a lot of free time on their hands, time that was not always used to a good purpose.⁶⁷⁶ The fact that these children were thereby endangered by roaming the streets of Dover exacerbated the complaints against the BBC, which was accused at the same time of prompting German bombing and shelling. A BBC broadcast from the Thames in the east end of London reported how busy the docks were and the following day the docks were attacked.⁶⁷⁷ Dover suffered a similar fate after a Saturday night broadcast stated that the Germans were too frightened to shell Dover for fear of British bombing. Dover was, predictably according to *The Dover Express*, shelled twice on the following day.⁶⁷⁸ The national press in Dover's eyes were inclined to invent stories, whilst the national radio station leaked information which was valuable to the enemy.

By February 1941 Dover and the surrounding area were being termed "Hell's Corner" in both the national and local press.⁶⁷⁹ The term itself was introduced for the warm reception given to German aircraft overflying the town, it stuck for different reasons.⁶⁸⁰ Shelling continued throughout the winter and with the damaged properties came the trading in looted goods. There were convictions for this activity in the Limekiln Caves of Dover in early March 1941.⁶⁸¹ Frederick W Shearn, aged seventeen, was one of those convicted for distributing stolen cigarette lighters and cufflinks.⁶⁸² The feeling at the time was that the contents of a destroyed house, scattered as they were, did not really belong to anyone. The authorities did not see it this way and sentences became very heavy for those in positions of trust who carried out such crimes. The shelters were useful centres for selling on stolen goods given the mix of people who occupied them. The town's deep shelters were by now coming under increasing criticism from the Mayor on account of the conditions which existed

⁶⁷⁶ *The Dover Express* 6 December 1940

⁶⁷⁷ *The Dover Express* 27 September 1940

⁶⁷⁸ *ibid.*

⁶⁷⁹ First reference to "Hell's Corner" was in *The Dover Express* 7 February 1941.

⁶⁸⁰ *The Dover Express* 27 December 1940

⁶⁸¹ *The Dover Express* 7 March 1941

⁶⁸² *ibid.*

within them. The town's Emergency Committee took the brunt of the criticism for failing to keep the shelters up to standard. The Emergency Committee in turn blamed the inhabitants of the shelters for the way they treated them. The fact that the conditions within the shelters were bad would seem to suggest that they were still being used extensively by a large percentage of the town's population despite what might be claimed elsewhere. Reports from the Office of the Regional Civil Defence Commissioner clearly stated that the public preferred deep shelters to surface shelters when they had the choice. The reports did not however think much of the public's choices; "the public are apt to be somewhat irrational in their choice of shelter, underground shelters being preferred to surface shelters with the same amount of protection and large shelters to small ones."⁶⁸³ It was only in December 1940 that public shelters were deemed to need any heating, two coal burning stoves to be provided per fifty persons in a compartment. Dover's order for stoves was only approved in early January and so people had to make do without until then. It does show the popularity of the deep shelters with Dover's population as they continued to use them without any heating together with the difficulties of getting blankets and other supplies to the deep shelters.

It was October 1940 before the government finally decided to reimburse councils for all expenditure on shelters, prior to the circular of 19 October 1940 councils were only reimbursed with a percentage of the expenditure.⁶⁸⁴ The idea behind this circular was to speed up the construction of shelters in areas that did not have sufficient capacity. It, however, penalised towns such as Dover which had already made the provision and would not be reimbursed for any previous construction. Dover Town Council campaigned heavily to have the grant made retrospective before the cut off date of 1 October 1940. Others were also campaigning; the MP for Tamworth, Sir J Mellor, asked a question in parliament on the subject, to which Herbert Morrison, the Minister of Home Security, replied that it was not possible to do so at present.⁶⁸⁵ Dover does not seem to have received any support from their own MP despite a letter from the Town Council asking for

⁶⁸³ Memorandum on Shelter Policy from No.12 (S.E.) Region, Tunbridge Wells 8 October 1940. Copy in the Library at Dover Museum.

⁶⁸⁴ Memorandum from W.H Sheepshanks of the Ministry of Home Security to all local authorities in England, Scotland and Wales 19 October 1940. Amongst loose clippings in Box 17B Dover Museum Library.

⁶⁸⁵ *Hansard Parliamentary Debates: House of Commons* 26 November 1940

reimbursement for the outstanding thirty-five per cent of the work carried out before 1 October.⁶⁸⁶ The Dover town council was in the words of the town clerk; “most indignant about this...”⁶⁸⁷ A letter was also sent to the Principal Officer of the South East Region on the same date in a similar vein about the treatment being; “poor reward for having made strenuous efforts for the well being of the inhabitants of their districts.”⁶⁸⁸ On 27 November the Regional Commissioner wrote to Dover’s town clerk to confirm that the grants would not be made retrospectively. On 18 January 1941 Herbert Morrison confirmed that no further money would be made available.

So while the debate over who was to pay for the shelters continued so too did the debate on which type of shelter was best. The public seemed to have decided and voted with their feet; they went to deep shelters whenever possible. The politicians did not think it was so clear cut and a parliamentary debate on 27 November was held to discuss how much information should be given to the public.⁶⁸⁹ No real conclusion was reached but this shows how important the issue of shelters was in the country as a whole in the autumn of 1940. It would continue to be an important issue for Dover for the next four years. By April 1941 it was estimated that the population of Dover had fallen to seventeen thousand three hundred and eighty-two, less than half the pre-war figure.⁶⁹⁰ Given this population it would appear that Dover was more than amply supplied with shelter spaces. There were eighteen thousand eight hundred domestic shelter places; this figure included ‘Anderson Shelters’ and private basements. There were fifteen thousand public shelter places; this figure included trenches and shop and public building basements. Finally there were seven thousand six hundred deep shelter spaces available for the entire population and it was this figure that would cause much argument and anguish between the people of Dover and their representatives and the representatives of central government. For Doverians the fact that each person was not provided with a deep shelter place, given the town’s geographical position, was a disgrace and a failure on the behalf of the government to protect them properly. To the civil service Dover’s forty-one thousand four hundred

⁶⁸⁶ Letter from SRH Loxton, Dover Town Clerk to Col. Astor MP 15 January 1941. Amongst loose clippings in Box 17B Dover Museum Library.

⁶⁸⁷ *ibid.*

⁶⁸⁸ Letter from SRH Loxton, Dover Town Clerk to the Principal Officer, Civil Defence, Tunbridge Wells 15 January 1941. Amongst loose clippings in Box 17B Dover Museum Library.

⁶⁸⁹ *Hansard* 27 November 1940

⁶⁹⁰ PRO Document HO 207/1099 Letter from Shawcross at office of the Regional Commissioner to Hutchinson at the Ministry of Home Security. 26 April 1941

available shelter places were a disgrace and represented a huge over provision. The reply from Hutchinson at the Ministry of Home Security of 2 May 1941 alluded to this in his reference to the fact that the Treasury would not be pleased at this state of affairs.⁶⁹¹

The ideas of the centre and the regions were obviously not in harmony over this matter and this would result in friction as the war continued. Friction which was worsened because Dover had spent so much of its own money on improving its air raid protection facilities. Central government failed to reward the town for being so well prepared by withholding grants which were available to towns and cities that were rather more lackadaisical in their preparations. The fact that Dover had done so much early work in improving the facilities for its townspeople in fact counted against it during the war as the government was able to ignore the town's calls for grants as the work was already paid for. Dover was so enthusiastic in improving its ARP facilities that it often did not wait for funding approval, and this would come back to haunt the town financially as government funding provision tightened. The town still believed that its facilities were not sufficient despite the fact that they possessed some of the best for towns of a similar size in England.

As Britain faced Germany alone in 1941, Dover faced the German shelling feeling increasingly alienated from central government and of course the national media. Articles on how Dover 'was taking it' abounded in the national press throughout the first half of 1941. However, this interest had its negative points and the media scrutiny alarmed *The Dover Express* as it was felt that too much information was being given out to the Germans. Despite all the restrictions placed on the local press the national newspapers were free to print photographs and reports on the situation in Dover. *The Dover Express* had to report the situation in Dover through reprinting stories from the national press. As winter turned into spring the confidence of the people in Dover remained high. The Dover War Weapons week which ran from 21 to 28 May 1941 aimed to raise £11000 the nominal cost of two Motor Torpedo boats (MTB). In fact this total was doubled by Dovorians. MTBs presumably seemed a tangible way to strike back at the Germans and they also offered protection in the

⁶⁹¹ Letter from Hutchinson at Ministry of Home Security to Shawcross at Office of Regional Commissioner at Tunbridge Wells 2 May 1941.

Channel. Dover's Spitfire fund, after a slow start, raised a total of £1307 & 8s. by the time it was closed in late 1940.⁶⁹² Folkestone in the same period also raised over £1000 for their Spitfire fund. Kent became the first county in Britain to gain its own Spitfire squadron just over a year later and while two of the twenty-one aircraft were named "Folkestone and Hythe" and "Canterbury and District" no such recognition was offered to Dover.⁶⁹³

The only way to strike back against the cross-Channel guns was to launch air strikes on their sites in the Pas de Calais but by the time the RAF was in a position to do so the guns were protected in reinforced concrete bunkers. Such attacks were never made an RAF priority given the wide range of other targets against which the RAF was being directed. As summer approached it seemed almost certain that the Germans would be contemplating another invasion and the British military command considered such an eventuality likely.⁶⁹⁴ The preparations to deal with a possible invasion in 1940 had been ad hoc in nature. Those made in the spring of 1941 were rather more ordered. It was only in April 1941 that steps were taken to ensure Dover's Harbour would not be available to the Germans, should they invade, by arranging for the destruction of the eastern arm by explosives.⁶⁹⁵ This meant that the provision of deep shelters for civilians on the invasion coast became an important military issue. The army felt that deep shelters would offer bases for the invaders secure from shelling and bombing. The military was therefore not in favour of towns such as Dover possessing too many such civilian shelters. This very fact was referred to in the correspondence between Hutchinson of the Ministry of Home Security and Shawcross of the Regional Commissioner's Office. On 30 May 1941 Hutchinson wrote to Shawcross that if Dover was to have any more deep shelters then the army would have to be consulted as a first step. Plans had already been made at Ramsgate to "deal with comparable shelter there in a way which I would infer that they might not welcome any addition to the quantity of deep shelter on the coast."⁶⁹⁶ Doverians were therefore correct in their assumptions that they were being discriminated against in

⁶⁹² *The Dover Express* 27 December 1940. The 'Spitfire Funds' were the idea of the *Daily Express*. The value put on an individual aircraft was £5000.

⁶⁹³ *The Dover Express* 9 February 1940

⁶⁹⁴ A. Brooke, *War Diaries 1939-1945* (London, 2001) p.166

⁶⁹⁵ PRO Document WO 166/3537 War Diary 25 April 1941 & ADM 1/17807 on the immobilisation of Dover Harbour

⁶⁹⁶ PRO Document HO 207/1099. Letter dated 30 May 1941

terms of shelter provision but few would have guessed this reason behind the reluctance to build more deep shelters. The other reason was of course the greater cost of deep shelters especially now that Dover had two shelter places for every inhabitant. That 'Anderson Shelters' were in fact proof against anything other than a direct hit was being confirmed all over the country. In Dover itself an 'Anderson Shelter' survived a near miss from a shell, a fact worthy of being reported in *The Dover Express*.⁶⁹⁷ However, for many in Dover it was not a near miss but rather a direct hit which worried them.

This argument between central government and Dover would escalate during 1941. The town demanded more deep shelter provision but central government was not prepared to pay for any more. Within their own frame of reference both sides were correct in what they wanted. For Dover the shelling still produced casualties and this to the town was unacceptable and therefore more shelters were required. For central government the casualty figures for the coastal towns were far less than had been feared before the war and so nothing more needed to be done; there was no need to prioritise scarce manpower and resources in triplicating shelter provision in a town such as Dover. Dover's secret weapon in this battle for shelters was Major Martin the first ARP controller in the war.⁶⁹⁸ He had started a score of projects around the town on his own initiative. These projects were not finished as his department had not the resources to complete them. The Borough Engineer was left to pick up the pieces and finish the work. As the Town Council was unable to pay for this work with its reduced population, central government was forced to provide considerable financial support to Dover in order to prevent the council from either introducing an outrageously high rate on the remaining population and businesses or going bankrupt.

The Dover and District Trades Council got involved in the debate because of its fears for the safety of its members and their families in the autumn of 1941. A letter was sent by their secretary T W Smith to Herbert Morrison, Minister of Home Security.⁶⁹⁹ The letter deplored the lack of deep shelter provision and requested that the areas of the town which did not possess such shelters receive them forthwith.

⁶⁹⁷ *The Dover Express* 4 April 1941

⁶⁹⁸ He was a town councillor and became Chair of Dover's Emergency Committee.

⁶⁹⁹ PRO Document HO 207/1099. 19 October 1941

Those areas were Clarendon, Maxton, Buckland, River and the St. Radigunds estate. It would seem that nothing was done as in the middle of November. The Deputy Principal Officer in the Regional Civil Defence Commissioner's office, Mr D MacFarlane, wrote to the Ministry of Home Security in support of Dover's plans to expand its deep shelter provision. In his view Dover was "in a category entirely different from any other towns" due to the extra danger from shelling.⁷⁰⁰ Dover's shelter provision was undoubtedly of a standard not enjoyed by many provincial towns in Britain during the Second World War but then the danger Dover was exposed to was also of a nature not experienced by many other towns. The deep shelters did do much for the morale of Dover but they were not the only factor in deciding how a town's morale fared. Ramsgate provides a striking example of this. In 1939 its population was thirty four thousand five hundred by 1941 this figure was down to fourteen thousand. The town however had tunnel shelter provision for almost sixty thousand. On this basis the demands from Dover would seem most reasonable. A visit by a minister on 4 February 1941 provided a striking view of a town in crisis. E J Hodsoll, a civil servant who accompanied the minister to Ramsgate was extremely negative in his appraisal of the town's morale.⁷⁰¹ The tunnels had become a "gypsy squatters' camp" filled with several hundred people twenty-four hours a day, some never leaving the safety of the shelters.⁷⁰² In Hodsoll's words "It would appear that the morale of these people is almost non-existent."⁷⁰³ The Chief Constable of Ramsgate had been killed in an air raid and its Mayor was recorded as alternating "between drunken bravado and a high state of jitters- a not unnatural combination."⁷⁰⁴ The town therefore lacked any real leadership and the one positive note on the visit when the minister was cheered as he entered the tunnels was subsequently discovered to have been a deception. Those doing the cheering "had been imported and did not in fact belong to the tunnel at all."⁷⁰⁵

In neighbouring Margate conditions were slightly better. The tunnels were cleared during the day as the tunnel dwellers were lowering the morale of the rest of

⁷⁰⁰ Letter from Mr D. MacFarlane to Ministry of Home Security 14 November 1941

⁷⁰¹ PRO Document HO 207/1101 Report from E J Hodsoll on a visit to Ramsgate and Margate 4 February 1941

⁷⁰² *ibid.*

⁷⁰³ *ibid.*

⁷⁰⁴ *ibid.*

⁷⁰⁵ *ibid.*

the civilian population.⁷⁰⁶ The Mayor of Margate, however, still wanted a complete evacuation of his town to prevent the situation there becoming as bad as it was in Ramsgate.⁷⁰⁷ Folkestone had no tunnel shelter comparable to Ramsgate or Dover and after the initial extremely high levels of voluntary evacuation its population remained relatively static at around fifteen thousand. In Folkestone it was the fear of shelling which kept the population static. A report by Dr J W B Douglas of the Oxford Extra Mural Unit in 1943 endorsed this very fact.⁷⁰⁸ Shelling produced “no warning whine before the explosion took place” and it was therefore much more difficult to predict the arrival of a shell. Shelling was a particular problem for Folkestone because without deep shelters there was no real way to guarantee the population’s safety. According to the report; “It has been estimated that if shelling stopped the population of Folkestone would increase by one third even if bombing still took place.”⁷⁰⁹

In contrast to the mood prevailing in Margate and Folkestone, Tom Harrison of Mass Observation, when he visited Dover in September 1941, found the mood in the town to be one of “cheerful toughness”.⁷¹⁰ In the summer of 1940 the town had been tense with invasion fears but in 1941 there was a sense of camaraderie which Harrison felt was absent in other places he had visited recently.⁷¹¹ Security had also become relatively lax in the town and port, unlike the situation in 1940 when spy mania reigned all over southern England. By 1941 Dover was not so gloomy as the rest of the country because, Harrison felt, the people in Dover could see and hear Britain hitting back.⁷¹² The British cross channel guns could clearly be heard in the town and the Motor Torpedo Boats of Coastal Forces leaving the harbour were a visible reminder that the war was not a matter of one way traffic. In Harrison’s mind this “hitback psychology” was central to the maintenance of Dover’s morale.⁷¹³

⁷⁰⁶ The reasoning for this was that with some people hiding themselves away in this manner, those who did not would gradually become more and more insecure about whether they too should be hiding themselves and their families away.

⁷⁰⁷ An article in *The Times* 3 August 1943 about Margate recorded that of more than five thousand establishments offering accommodation prior to the war only six or seven remained open in 1943.

⁷⁰⁸ PRO Document HO 191/110 Report from Dr. J W B Douglas for the Ministry of Home Security, Research and Experiments Dept. 24 December 1943

⁷⁰⁹ *ibid.*

⁷¹⁰ MO File No. 883 Visit to Dover 25 September 1941, p.2

⁷¹¹ Cf. MO 167 and MO 883 for examples of very different atmospheres between June 1940 and September 1941

⁷¹² MO File No. 883 Visit to Dover 25 September 1941, p.4

⁷¹³ *ibid.*

The cross-Channel shelling did of course play on the minds of Doverians but still the performances at the town's Royal Hippodrome Theatre and cinemas continued. Dover was the only town on the south coast where live performances continued. There were problems encouraging major artists to appear but the Hippodrome survived on a diet of shows appealing mostly to the town's military population. *The Sunday Express* carried an article in February 1941 on "Dover's Blitz Theatre" which focussed on the amazing fact that the theatre remained open, despite the lack of enthusiasm from the major stars to perform in Dover.⁷¹⁴ Striptease was the staple diet of the theatre. The advertisements for the Hippodrome's performances were quite subtle as a rule but occasionally slightly more *risqué* catch-lines would be used such as that in January 1941 advertising "Wine! Women! And Song!"⁷¹⁵ Evelyn Laye "England's Queen of Musical Comedy" was another very popular attraction. The Hippodrome was reliant on light entertainment and titillation; there was no room for serious drama on its bill.⁷¹⁶ The cinemas stayed open as they did all over Britain showing a mix of war and escapist fare. The three cinemas were the Regent, the Granada and the Plaza. The escapist films seem to have had a longer run which indicates that people in Dover wanted to escape the worries of the war rather than be confronted with them especially in their leisure time; just like all other wartime Britons they liked escapist films.⁷¹⁷ The murder of George Roberts, the manager of the Granada and the Plaza cinemas, on 3 July was a drama within Dover's community. When it was discovered that the murderer was eighteen year old Leslie Hammond, the cinema's projectionist, the town was shocked.⁷¹⁸ The very fact such a crime could be carried out by one of the town's own while there was a war on made it doubly shocking.

Throughout 1941 there was a gradual return of the evacuated children to Dover from South Wales despite the increased danger. This drift back was also occurring in neighbouring towns. By August Margate had seven hundred and fifty

⁷¹⁴ *The Dover Express* 14 February 1941

⁷¹⁵ *The Dover Express* 10 January 1941

⁷¹⁶ *The Dover Express* 12 September 1941

⁷¹⁷ *The Dover Express* 1939-1945. The advertisements for the cinemas show that films such as "The Sea Hawk" and "Gone with the Wind" stayed much longer than war films such as "Convoy" and "Target for Tonight". The latter remained on the bill for only four days but had four showings per day.

⁷¹⁸ *The Dover Express* from 11 July to 26 September 1941

children of education age receiving home tuition.⁷¹⁹ The decision to provide home tuition was reached “with great reluctance” as it was felt that the children should not have returned from their evacuation centres.⁷²⁰ A similar situation existed in Ramsgate with ‘home’ tuition being given at closed schools. Dover’s politicians and press remained adamant in their opposition to a similar situation developing in Dover and campaigned very strongly against such a development. Dover’s Education Board opposed any form of organised education for the town’s children on two points. The first was that the children should not be in Dover. Evacuation of school children from Dover had been made compulsory in 1940 and their return would merely increase the difficulties in the front-line town. The 1938 report by the Committee on Evacuation had made it clear that “children of school age... are a liability and not an asset from the standpoint of war-time efficiency.”⁷²¹ The second point was that the provision of education would also signal that Dover was now safe for children or why else would education facilities be re-opening? This would therefore accelerate the return of children and the situation would spiral out of control until all of them had returned. By October, it was proving impossible to ignore the need for education in the town and it was therefore announced that Dover’s schools would re-open.⁷²² The schools re-opened. Eight to fourteen year olds were to receive one and one half hours education per day.⁷²³ The national press seized on this news and headlines such as “Cave kids sent back to school” appeared in *The Daily Express*. This was hotly contested by *The Dover Express* which considered such headlines and reporting to be nonsense.⁷²⁴ The idea that Dover’s children lived in the caves was very popular in the national press but for Dover this suggestion was a slur on the character of the town and therefore was to be refuted. The council at the end of April had voted heavily in favour of a resolution to send the returning children back to South Wales but no practical steps were ever taken.⁷²⁵ The caves were still being well used with many parents making sure that their children were in shelters every night. This resulted in accidents, some fatal. In October 1941 five children were found “gassed” in a cave at

⁷¹⁹ *The Dover Express* 1 August 1941

⁷²⁰ *ibid.*

⁷²¹ *Report of Committee on Evacuation* (HMSO, 1938) p.20

⁷²² *The Dover Express* 17 October 1941

⁷²³ *The Dover Express* 12 June 1942

⁷²⁴ *The Dover Express* 24 October 1941

⁷²⁵ *The Dover Express* 1 May 1941

the rear of their house in New Cottages in Finnis' Hill.⁷²⁶ One of them died, from the inhalation of fumes, from a gas fire which blew out. However, the fact that 1941 ended with Christmas "Kiddies' Cave Parties" would seem to have given the impression that life in Dover did revolve around the caves and that people spent much of their time in them.⁷²⁷

In the summer of 1941 a new Lord Warden of the Cinque Ports was created, with this post also went that of Constable of Dover Castle. The post was given to the Prime Minister; Winston Churchill. According to the *Dover Express* Churchill was reported to be delighted with his appointment.⁷²⁸ His elevation to this post echoed the appointment of many great war leaders of the past. Pitt was made Lord Warden during the Napoleonic Wars, and Wellington was made Lord Warden after his retirement from the premiership. This helped to make the towns feel important having the Prime Minister so closely linked to them and was no doubt intended to be a reward for their perseverance in the war.. Churchill's visits to Dover throughout the war continued on a regular basis; he visited the town on 20 June 1941 just before being made Lord Warden.⁷²⁹ Dover's Mayor was also becoming something of a national celebrity because of his leadership. His photograph was published in *The Daily Herald* on 10 November 1941 and articles on Dover were regular features in the national press.⁷³⁰ The fabric of Dover was changing slowly. Some of the town's major landmarks were becoming casualties. The Burlington Hotel which had stood just to the rear of Waterloo Crescent on the seafront was a casualty of an air raid on 7 September. Shortly afterwards parts of it had to be demolished by the Royal Engineers to make it safe. This was the first major building in Dover to become a casualty and it would not be the last.

The first three years of the Second World War had seen Dover's position transformed. The 'Bore War' period had seen life continue much as before the war began. The chief changes were the 'blackout' and the lack of regular ferry services to

⁷²⁶ *The Dover Express* 31 October 1941

⁷²⁷ *The Dover Express* 2 February 1942

⁷²⁸ *The Dover Express* 26 September 1941 Churchill noted in his history of the Second World War that he regarded being given the post "as a compliment". See W.S. Churchill, *The Second World War Vol. III The Grand Alliance* (London, 1950) p. 737

⁷²⁹ *The Dover Express* 27 June 1941

⁷³⁰ *The Daily Herald* 10 November 1941

France. The 'blitzkrieg' of May 1940 resulted in the withdrawal of British forces from France and Dover became a strong point on the British frontline. The commencement of bombing and shelling attacks left Dover and its people threatened in a way that had not been envisaged in the worst imaginings before the war began. The fact that Dover was on the frontline, meant that the town was as liable to invasion as it had been at any time since the Napoleonic Wars. However, naval superiority alone would not keep the British coast inviolate. Germany needed air superiority to have any chance of successfully invading Britain; the Battle of Britain meant that this would not be achieved. Dover was still threatened from the air. The shelling attacks in particular were unexpected and rendered the town defenceless in a way that it had not been even at the lowest point of the aerial attacks of the First World War. The 'bunker mentality' of this period was therefore more engrained than it had been in 1917 and 1918. As we shall see this 'bunker mentality' would increase in the period up to the end of the shelling in the autumn of 1944.

Chapter 5: The Apogee of the ‘Bunker Mentality’, Dover 1942-1945

In 1942 the lack of a chimney sweep in Dover made the pages of *The Daily Mail*. This newspaper printed the story in an effort to show how difficult conditions in Dover really were. *The Dover Express* was quick to refute this by stating that the town did still have its own chimney sweep.⁷³¹ The triviality of the report and the way in which *The Dover Express* reacted showed how great the antipathy between the national and Dover press remained. It also showed how disparate attitudes in Dover were towards the war. Dovorians could tell the world how bad conditions were on their own terms. However, outsiders were not permitted to express their views on what they thought of conditions in Dover or share them with the rest of the world. So while *The Dover Express* felt justified to write that “if London papers reported each of Dover’s sirens as they do Honolulu’s the telephone lines would be hot”.⁷³² Hawaii was headline news at that time after the attack on Pearl Harbor on 7 December 1941. Dover became less worthy of headlines because of this in the national press. However, while Honolulu’s air raids were treated as something of a joke the state of affairs in Malta was not. Malta was given the honour, in the same issue of *The Dover Express* as Honolulu’s sirens were derided, of being compared to Dover in terms of the number of air raids which the two places had had to endure.⁷³³

February 1942 brought with it one of the biggest wartime blows to British naval pride and the event unfolded less than twenty miles from Dover on 12 February. The so-called ‘Channel Dash’ saw the German Navy, the *Kriegsmarine*, bring three of its main capital ships back from Brest in western France to a safer anchorage in Kiel. The ships would ultimately go on to Norway. The *Scharnhorst*, *Gneisenau*, and *Prinz Eugen*, came safely through the straits of Dover despite the best efforts of the Royal Artillery, RAF, FAA and the Royal Navy. A full enquiry, which became the Bucknill Committee Report, was launched into how this was possible. Everyone in the country, including the King, was dismayed at how the Germans could steam with impunity through the English Channel.⁷³⁴ The fact that this was a strategic withdrawal by the Germans, who now had no capital ships capable of attacking allied convoys to and

⁷³¹ *The Dover Express* 13 February 1942

⁷³² *The Dover Express* 16 January 1942

⁷³³ *The Dover Express* 16 January 1942

⁷³⁴ PRO Document ADM 116/4528, 4529 & 4530 Bucknill Committee Reports. Air 15/386.

from the USA, was completely forgotten in the furore over the lack lustre response in Home waters and skies. Many awards for gallantry were given to those involved in the ferocious but ineffectual attacks launched on the three German ships. The attacks of the six Swordfish Torpedo Bombers from Manston, in particular, ranked as almost suicidal endeavour.⁷³⁵ None of these aircraft made it back to Manston and only five out of eighteen aircrew survived. Lieutenant Commander Esmonde received a posthumous Victoria Cross for leading this attack.⁷³⁶ *The Dover Express* was published on the following day and was able to report on the incident. It could not of course go into so much detail as was included in the report but the fact that there had been the “worst blizzard for many years” on the day chosen by the Germans to make their break in was reported.⁷³⁷ The weather obviously played a major part in the German success but the break through showed clearly to the people of Dover that the Channel was still not fully under British control. The Germans could grasp control of the Straits if they so chose, if only for a limited time. The *Luftwaffe* gained control of the skies for the vital period when the ships were in the Straits of Dover. This was a warning to the south coast towns that German attacks could get worse.⁷³⁸ The Illingworth cartoon (see Figure 11 overleaf) was a good summary of the national mood; Britain looking on, wrapped against the weather, as the German battleships steamed to safety.⁷³⁹

The spring of 1942 was a time of reversals for the allied cause. In the Far East the Japanese advanced unstoppably. Pearl Harbor had been destroyed. The Philippines, Singapore and Hong Kong were lost. HMS *Prince of Wales* and HMS *Repulse*, the Royal Navy’s two most famous capital ships in 1941, were destroyed by Japanese aircraft before making any contribution to the war effort in the Far East. The Russian spring offensive was soon halted and turned into a rout. The German spring offensive was thereby delayed but once their attack began the advances of 1941 were repeated and the Germans swept eastwards to the gates of Stalingrad. In the Atlantic unrestricted U-Boat warfare began and some staggering losses resulted for the allied

⁷³⁵ D. Caldwell, *JG26: Top Guns of the Luftwaffe* (New York, 1991) pp.104-108

⁷³⁶ ADM 1/12460 Naval Awards presented after the ‘Channel Dash’ 12 February 1942

⁷³⁷ *The Dover Express* 13 February 1942

⁷³⁸ D. Caldwell, *op. cit.* pp.104-108

⁷³⁹ Cartoon courtesy of The Centre for Study of Cartoons and Caricature, University of Kent. Cartoon Reference ILW0375.



WEATHER REPORT. Cold wind in the Channel.....

Figure 11: "Weather Report. Cold wind in the Channel" 14 February 1942

merchant marine. In February *The Dover Express* might claim that with the USA entering the war the Battle of the Atlantic was as good as won, but this was far from the truth.⁷⁴⁰ In North Africa the see-saw battle continued but Rommel's *Afrika Korps* had the advantage and the British retreat to El Alamein began. The 'Channel Dash' was, amidst the other calamities, only a minor event, but for British pride it was a severe blow. This was especially true for the people of Dover for whom the events of the day were so close at hand. They had so much to lose should the Germans attempt naval raids on coastal towns as they had in the First World War. Churchill spent almost the entire war fearing 'commando' style raids on British ports and he was especially anxious that such raids might take place in the lead up to D-Day. He issued special orders with regards to the defence of Dover and regularly asked for up dates on the situation there.⁷⁴¹

The spring of 1942 signalled a resumption of German fighter bomber attacks on Britain. The attacks made by such aircraft at the end of the Battle of Britain had met with some success and new units were now being set up to ensure that the fighter strength on the French coast was not diluted. Raids usually took place during daylight and were carried out by approximately three or four single seat aircraft, a formation

⁷⁴⁰ *The Dover Express* 9 February 1942

⁷⁴¹ As late as 19 July 1943 Churchill was writing with regards to the defence of Dover. See PRO Document WO 199/616 for a copy of this letter.

known to the Germans as a *schwaerme*. Initially the small Messerschmitt Bf 109 was used, but this aircraft could carry only one two hundred and fifty kilogramme bomb. The arrival of the Focke-Wulf 190 in June 1942 gave the Germans a much more potent fighter-bomber which could carry up to triple this bomb-load. The Spitfires of Fighter Command could not catch the FW 190 at low level. The FW 190 remained supreme over the skies of southern England until 1943 when the Hawker Typhoon entered service with the RAF and was found to be more than a match for the FW 190s on low level bombing sorties.⁷⁴² This was no consolation to the people of Dover during this period. A night raid on 23 March 1942 claimed sixteen lives.⁷⁴³ This was the most severe, in terms of casualties, yet suffered by Dover but afterwards there was a surge in the number of people talking “big” according to *The Dover Express*.⁷⁴⁴ *The Dover Express* was vehement in its criticism of such behaviour but also of the suggestion that Dover had experienced a “nine month lull” in attacks.⁷⁴⁵ The raid coincided with the first good weather on a full moon for three months and this is why *The Dover Express* and the people of Dover believed that they had been spared bombing raids for this period of time. It was definitely not that Dover did not warrant a raid but rather that the Germans had not launched one. This raid was followed by another on Good Friday, 3 April, in which another sixteen civilians were killed, nine of them by a direct hit on a surface shelter. *The Dover Express* was not permitted to report that this raid was on Dover but rather had to report that the raid took place on a “South East Coast Town”, an euphemism which by many across the country was taken to mean Dover.⁷⁴⁶ However, the fact that two obituaries to victims of “enemy action”, who both lived in Dover appeared in the same edition shows that there was not much point in trying to hide from Dovorians the fact that they had been bombed the previous week.⁷⁴⁷ The lack of activity at this time from the German cross channel guns was also noticed and on 18 April the *Daily Mail* claimed that Dover was no longer a frontline town and that the German guns had been silenced by the British. The Germans would not leave their “caves and tunnels” for fear of air or artillery

⁷⁴² D. Caldwell, *op. cit.* pp.108-109

⁷⁴³ *The Dover Express* 27 March 1942

⁷⁴⁴ *The Dover Express* 3 April 1942

⁷⁴⁵ *ibid.*

⁷⁴⁶ *The Dover Express* 10 April 1942. Most reports on air raids were made about a ‘South East Coast Town’ and many believed that this was always Dover. See also *The Dover Express* 22 May 1942.

⁷⁴⁷ *The Dover Express* 10 April 1942. The obituary for Miss Robson was printed on the same page as the air raid report. The obituary for Miss Goodwin was featured on the previous page.

attacks according to *The Daily Mail*.⁷⁴⁸ This article represented a success story for British arms in preventing German shelling. For those on the receiving end of the shelling such a report seemed to be more of a challenge to the Germans to respond and respond they would.

The BBC attempted to mend some of the bridges with the Dover press at this time by offering the editor of *The Dover Express* the opportunity to broadcast to the nation about the state of affairs in Dover. The intention of the broadcast was not as might have been expected to let the voice of Dover be heard across Britain but to “help promote Anglo-American good feeling.”⁷⁴⁹ Given the fact that the title of that edition’s editorial on the topic of the BBC was “Talk Pest”, it was not surprising that the request for the interview met with “a polite, but definite refusal”.⁷⁵⁰ However, only a week later, the Editor was complaining about reporting in the *Reynold's News* which was a slur on the bravery of the people of Dover.⁷⁵¹ The article merely had the audacity to suggest that most of Dover’s population used the deep shelters during raids. This was in fact something that *The Dover Express* had been encouraging since the raids began. The writer of the article David Raymond, defended his article in a letter to *The Dover Express* in which he asked why should Dover be ashamed of taking cover?⁷⁵² In fact some of the people of Dover had taken to ignoring the shelling warnings and in the same edition *The Dover Express* had an article entitled “Take Cover”.⁷⁵³ This article encouraged people to do just that and suggested that loud speaker vans were needed to make sure people behaved sensibly and took cover. Another prime example of the way that Dover had to make its own decisions and was not prepared to accept any outside judgments on what it was or was not doing.

The same was true for awards for gallantry received by inhabitants of the area. Medals awarded for work in the aftermath of air raids and shelling attacks received no negative comment and it was believed to be right that such men and women should be honoured. However, a farmer from St. Margarets, a village close to Dover, was awarded the George Medal. He received the award because during the Battle of

⁷⁴⁸ *The Daily Mail* 18 April 1942

⁷⁴⁹ *The Dover Express* 8 May 1942

⁷⁵⁰ *ibid.*

⁷⁵¹ *Reynold's News* 10 May 1942

⁷⁵² *The Dover Express* 29 May 1942

⁷⁵³ *ibid.*

Britain, despite his farm being in a very exposed location on the cliff tops, he continued to work and brought in his harvest. Was this a commendable example to the nation as a whole and a propaganda victory showing the indomitable British spirit at its best? Not according to *The Dover Express* which was rather more concerned with whether the award was in fact fair. Thousands of others in Dover and St. Margarets and the surrounding towns had achieved similar feats by carrying on with their lives and their war work despite the German aircraft overhead.⁷⁵⁴ It is interesting to note that the entire population of Malta was honoured with the George Cross, while there was no corresponding award for a community in Britain. Dover did not suffer such intensive air raids as Malta, but it suffered shell attacks for over four years. Air attacks on Dover occurred even more suddenly than they did on the Mediterranean island as Dover was closer to France than Malta was to Italy.⁷⁵⁵ It would obviously have been difficult to single out an individual community in Britain as being especially deserving of such an award. This was the point which *The Dover Express* was making with regard to the award of a George Medal to one member of a community in which everyone suffered and served together.

The lack of any other awards being given to the inhabitants of the town became something of an issue amongst them. This was especially true after the 'Blitz' when awards were showered on the ARP services of London and other cities. Dover was never attacked in such force and did not therefore have such dramatic events to single out for individual awards. The raid on Good Friday 1942 did cause much greater casualties and damage than any other previous raid. The actions of Warden Warren on that occasion were worthy of being singled out as he helped save the life of a woman buried under tons of rubble. He managed to reach her and after making her more comfortable, he stayed with her for four hours before she could be freed. Warren administered two shots of morphine to the woman in that time. His actions were such that K R Smith of Elms Vale Road in Dover wrote to *The Dover Express* expressing dismay that Warden Warren's gallantry had not been recognised. In contrast other towns had received several awards for their ARP personnel.⁷⁵⁶ In fact this was not to be another case of Dover being overlooked. Warden Warren was awarded the George

⁷⁵⁴ *The Dover Express* 29 May 1942

⁷⁵⁵ Malta lies less than sixty miles south of Sicily and its vulnerability to air attack was very apparent. Malta became the first place outside the UK to receive a radar station in March 1939.

⁷⁵⁶ *The Dover Express* 27 November 1942

Medal for his bravery on this occasion; the award was confirmed before the end of 1942.⁷⁵⁷ This is, however, another good example of the way that people in Dover felt that they were being overlooked and ignored by the rest of the country. Dover was an ideal place to write about, photograph and portray as an example to the 'free world' but it was not necessary to reward Dover. Dover believed it was expected to 'take it' with no reward and this was felt to be unfair. The award to Warden Warren went some way to redress the balance but very few awards were given to Doverians. The town's claims on this issue would seem to be justified given the length of time the town was under fire.

During 1942 the spectre of invasion still hung over the south coast of England. It was still an important issue for discussion at Town Council meetings. In April the Regional Commissioner, Viscount Mansell, called a conference of all the newspaper editors of Kent, Sussex and parts of Surrey to discuss what should be done in the event of an invasion.⁷⁵⁸ The press was obviously believed to have an important role to play should anything so calamitous happen. By making the editors feel involved their support could be more readily expected. While the local newspapers were being feted by the Regional Commissioner the Dover Town Council continued to argue about what preparations should be made. The Home Guard was, by this stage, becoming a well organised force. There was pressure from some quarters of the council, most notably Councillor Martin, to train the entire civilian population to use a rifle so that everyone could shoot Germans should the need ever arise.⁷⁵⁹ The fact that such an event was still seriously being considered by local politicians shows how precariously balanced the war situation was at this time; especially for those within range of German guns. Exactly two months after this report appeared in *The Dover Express* the raid on Dieppe took place.⁷⁶⁰ It was now the allied forces who were taking the battle to the other side of the Channel but for the people of Dover the worry remained that the Germans might launch an assault on them.

⁷⁵⁷ *The Dover Express* 25 December 1942

⁷⁵⁸ *The Dover Express* 10 April 1942

⁷⁵⁹ *The Dover Express* 19 June 1942. Councillor Martin was the same Major Martin who was Chair of the town's Emergency Committee

⁷⁶⁰ The Dieppe Raid took place on 19 August 1942

In 1942 the education of the town's children remained a major issue. The town council and its Education Committee were opposed to any of the schools reopening on the basis that to do so would further encourage a return of more children. The Education Committee met monthly throughout the war and 1942 saw an increasing need to manage schools within Dover. The decision had been taken at a national level to provide education for children living in the original 1940 evacuation area. The start of the year saw the school day increase from one and a half hours to half a day per pupil. There were six hundred and eighty-seven children of school age then in Dover, and a further one thousand and seventy-one were still living in South Wales.⁷⁶¹ The school attendance figures were rather better in Wales than in Dover with attendance there averaging almost ninety-three per cent while in Dover the figure was only eighty-five per cent. This was a trend which continued throughout the war with the school children based in Wales achieving a much higher attendance rate. By February there were nine hundred and eighty-two children of school age living in Dover. The number of Dover's children remaining in south Wales had fallen to one thousand one hundred and forty-nine.⁷⁶² All through the spring the number of children in Dover increased. By April the numbers were roughly level with Dover having one thousand and fifty children and south Wales one thousand and eight-two.⁷⁶³ The Education Committee remained convinced that the provision of education in Dover was a mistake and that the return of the children was based on the improved education provision and this was forcing the change rather than vice versa. For the Education Committee quite simply "Dover was no place for children."⁷⁶⁴ However, parents were finding it increasingly difficult to finance their children away from home and this was part of the reason for their return. The Education Committee refused to endorse any proposal for full time education in Dover. The Dover Town Council in fact adopted a resolution at the end of April calling for the return of the town's children to South Wales. Only two members voted against this resolution.⁷⁶⁵ *The Dover Express* joined in the debate and in an editorial in May blamed the Board of Education for re-opening the town's schools and thereby causing the 'drift back' of the children.⁷⁶⁶ The 'drift back' became more of a flood by June when one thousand two hundred and six

⁷⁶¹ *The Dover Express* 16 January 1942

⁷⁶² *The Dover Express* 13 February 1942

⁷⁶³ *The Dover Express* 17 April 1942

⁷⁶⁴ *ibid.*

⁷⁶⁵ *The Dover Express* 1 May 1942

⁷⁶⁶ *The Dover Express* 15 May 1942

children were on the rolls of Dover schools with nine hundred and seventy-eight on the rolls in Wales.⁷⁶⁷ The rise in the number of children returning from the start of the 1941-2 academic year was certainly phenomenal. The Education Committee was forced to accept that full-time education was now necessary and would be introduced from September 1942.

That the Germans had the capacity to strike hard at the towns in south east Kent was illustrated by a raid on Canterbury at the end of October. The raid was timed to strike the city at dusk. Sixty-eight fighter bombers took part together with an escort of sixty-two fighters. Only thirty-one bombs landed on Canterbury yet considerable damage was done and total surprise had been won by the Germans. Such an attack would have been easier and possibly even more devastating if it had been launched on a coastal town such as Dover. Only two German aircraft were shot down.⁷⁶⁸ It was for this reason that Dover's schools were only permitted to allow a maximum of one hundred and fifty children in any building. This was so that if any school received a direct hit from a bomb or a shell casualties would not be too high. With such large numbers of children in the town, full-time education was felt to be necessary to prevent any problems arising from children having too much time on their hands and getting up to mischief. As the town had a further two hundred children aged between five and six who would be ready to attend school in the autumn it was inevitable that the town's schools would re-open on a full-time basis. In the summer of 1942 a Dover Youth Centre was opened by Mrs Winant, wife of the American Ambassador to Britain, for the young people in the town.⁷⁶⁹ The centre had been partly funded by Dover, New Hampshire, USA. This town had formed a Friends of Dover, England fund. Britain's other main ally was represented by three young "Heroes of the Soviet Union" who visited both Canterbury and Dover on 8 November 1942.⁷⁷⁰

Mrs Winant was not the only important American lady to visit Dover in 1942. In November of that year Mrs Eleanor Roosevelt was accompanied by Mrs Churchill on a visit to the town. During this visit Mrs Roosevelt met members of the Women's

⁷⁶⁷ *The Dover Express* 12 June 1942

⁷⁶⁸ D.L Caldwell, *op. cit.* p.129

⁷⁶⁹ Her husband Gilbert Winant had arrived as the replacement to Joseph Kennedy, the US Ambassador, at the beginning of March 1941.

⁷⁷⁰ *The Dover Express* 13 November 1942

Institute in Barham before journeying on the Elham Valley railway line to Dover where she toured various areas of the town and the castle. Dover was also visited in the autumn by Mr Churchill who was accompanied by Averell Harriman, one of Roosevelt's most trusted advisors. Major Clement Attlee, the Deputy Prime Minister, visited Dover on 16 May.⁷⁷¹ The claim by *The Dover Express* that Dover was 'a show place' would thereby seem difficult to refute. As German resources were diverted to eastern Europe air raids on England became intermittent. It was only in South East Kent that any degree of German pressure was applied on the civilian population. This was, of course, mainly due to the capabilities of the German long range artillery rather than the *Luftwaffe*. Dover was shelled on thirty-one days during 1942. This made it the most attacked place in Britain in 1942.⁷⁷² It was therefore deemed worthy of being shown to Very Important Persons (VIPs) and journalists. The residents of Dover appreciated the visits by the VIPs but not so the journalists because of the stories written by them. The Mayor, Mr Cairns, was delighted to meet a group of Brazilian newspaper editors who visited the town on 26 October. Brazil had declared war on Germany on 22 August 1942 as a result of U-Boat attacks on her shipping. These editors were amazed to be greeted by the Mayor in fluent Portuguese. Mr Cairns had spent two years as a young engineer in Rio de Janeiro and it was not too surprising that he was able to greet them in their language.⁷⁷³ Journalists from the USA of course represented the majority of the foreign reporters in Dover and reports on the town were carried in many of the USA's regional newspapers. These ranged from stories claiming that Dover remained virtually undamaged and had missed out on the bombing raids suffered by other towns to those which portrayed Dover as a town under siege with thousands in the 'catacombs' every night. Dovorians were obviously interested in how they were being represented as *The Dover Express* lost no opportunity to reprint them. A story by Ernie Pyle in *The Post* of Cincinnati was a good example of the former; stating that the shelling did little damage and that Dover missed out on most of the bombing raids.⁷⁷⁴ Nat Burrows of *The Chicago Daily News*, on the contrary, reported that being in Dover was more akin to living in a town under

⁷⁷¹ PRO Document ADM 199/417 'Dover War Diary, May-December 1942'

⁷⁷² *The Dover Express* 25 December 1942

⁷⁷³ *The Dover Express* 30 October 1942

⁷⁷⁴ *ibid.* Ernest Taylor Pyle (1900–1945). During World War II Pyle served as a war correspondent in Europe, N Africa, and the Pacific. He was awarded the Pulitzer Prize for distinguished correspondence in 1944. In 1945 he was killed by Japanese machine gun fire on Ie Shima.

siege with five thousand people in the 'catacombs' every night.⁷⁷⁵ These stories along with others were reprinted in *The Dover Express* and were generally accompanied by unfavourable comments. The editorial of 16 July 1943 illustrates this well; complaining how Americans were allowed free access to Dover and were then permitted to write what they wanted. *The Dover Express* felt that this was due to the Ministry of Information's desire to reach the American public, no matter what the stories were about. *The Dover Express* was, of course, particularly galled by these articles due to its inability to print any stories about its own town and the war.

Three years of war from 1914 to 1917 had left Dover able to continue with 'business as usual' wrote the editor of *The Dover Express* in his editorial for 4 September 1942. On comparing it with the situation in 1942 the verdict was not a positive one. Dover in 1942 stood, or rather some of it still stood, in sharp contrast to the town a quarter of a century before. Damage to the town was becoming increasingly severe and occurred inexorably; there was no way to turn back a shell. On the very evening of the publication of this editorial sixteen shells fell on the town between ten minutes past nine and half past nine.⁷⁷⁶ There was only one slight injury on this occasion but the shelling two days later resulted in one death and seven injuries, five of them serious.⁷⁷⁷ Dover was also bombed on the two days between these shelling incidents.⁷⁷⁸ This was undoubtedly not a typical week; there would be only one more shelling incident in September. There remained nowhere else in Britain where so many attacks came in such short a space of time at this stage of the war.

1942 had been a year of doubt for Dover; the threat of invasion lingered long into that year. 1943, on the contrary, was a year of great optimism. The extent of American involvement was becoming apparent. The victories in the USSR and North Africa seemed to herald a German collapse. Stalingrad was followed by Kursk; El Alamein was followed by the complete defeat of the Axis forces in North Africa and the invasion of Italy. The "War in the Air" column in *The Dover Express* was now reporting massive United States Army Air Force (USAAF) and RAF raids on German cities. The column on 8 January 1943 provides a good example of this and set the tone

⁷⁷⁵ *The Dover Express* 2 July 1943, from *The Chicago Daily News* February 1943

⁷⁷⁶ PRO Document HO 207/1099 'Report on Dover Shelters, 1941-3'

⁷⁷⁷ *ibid.*

⁷⁷⁸ *The Dover Express* 11 September 1942

for the year. It reported that raids on Britain had been carried out by four aeroplanes while the U-Boat base at St. Nazaire had been attacked by hundreds of bombers and three hundred supporting fighters. "The War this Week" column also provided examples of allied advances across the globe. After two years of continuous bad news from the various fronts it seemed that the corner had been turned and so towns across Britain began to plan for their new futures after final victory had been achieved. Folkestone set up a Reconstruction Committee in May 1943 and other towns across south east Kent soon followed suit.⁷⁷⁹ By July *The Dover Express* was warning the town to get its priorities in order. The Beveridge Report was not Dover's priority rather it should be "beating the Hun".⁷⁸⁰ It was different for 'safer' areas of the country where according to *The Dover Express* the "war is news and not reality".⁷⁸¹

One of Dover's main concerns for the post-war era was whether the town's harbour would maintain its pre-eminence in cross-channel transport. The harbour had been considerably disrupted by British as well as by enemy action. One of the two harbour mouths had been closed by a 'block ship'. There was also considerable damage to the infrastructure in the harbour area. *The Dover Express* was forced to conclude that "Nobody knows" what would happen in this respect after the war.⁷⁸² It was widely felt that without considerable financial input from the government Dover might lose the lucrative trade to another port or indeed air lines.⁷⁸³ As early as May 1942 the editorial of *The Dover Express* was worried that air travel would replace the cross-Channel ferry services.⁷⁸⁴ Fear of the loss of Dover's core business underwrote all of the town's post war reconstruction plans and the harbour development was central to the town's proposals. These worries would continue until the service was actually re-instated after the war. At the beginning of 1944 the issue raised its head again and became evermore pressing as the town's reconstruction plan was formulated.⁷⁸⁵ One of the main priorities was that a link to the Southern Railway

⁷⁷⁹ *The Dover Express* 28 May 1943

⁷⁸⁰ *The Dover Express* 9 July 1943. The Beveridge Report was published on 1 December 1942. It was intended as a survey of all existing social insurance schemes. See A. Calder, *The People's War* pp.525-536

⁷⁸¹ *ibid.*

⁷⁸² *The Dover Express* 8 October 1943

⁷⁸³ *ibid.*

⁷⁸⁴ *The Dover Express* 22 May 1942

⁷⁸⁵ *The Dover Express* 18 February, 3, 10, 17 & 24 November 1944

should be established from the eastern docks.⁷⁸⁶ This priority was in fact never fulfilled but Dover still remains the pre-eminent cross-channel ferry port. With the demise of Folkestone as a port Dover in 2004 provides Kent's only passenger ferry link to mainland Europe.

Whereas much of Britain's southern and eastern coastlines were within range of German 'tip and run' raiders, Dover considered itself to be threatened in a much more serious way than anywhere else in Britain. This Dover also thought to be true of its neighbours as even though they were within artillery range it was Dover which remained the favoured target. Dover had experienced its two thousandth alert on 27 August 1942 so it did have grounds for believing that it was more at risk than other towns across the country. Indeed by the summer of 1943 the 'tip and run' raids of the *Luftwaffe* were becoming increasingly costly to the Germans. Dover had never been a popular target for these raiders due to the efficiency of the town's anti-aircraft guns. Dover had been one of the first areas to have its anti-aircraft guns linked to radar plotting. This made them particularly effective against faster moving German aircraft.⁷⁸⁷ British figures suggested that in the first half of 1943 ninety such raiders had been destroyed and that the average life expectancy of the German pilots was down to only six sorties.⁷⁸⁸ The introduction of Hawker Typhoons gave the British pilots a much needed advantage at low level over their German opponents who were flying FW 190 fighter-bombers. From then on the German fighter-bombers were gradually transferred to other less heavily defended fronts. Long range artillery remained the only effective means of striking Britain left to the Germans. Their use of this weapon would remain at a level of approximately one or two attacks per month until the end of 1943.⁷⁸⁹ It would only rise to a peak after the success of the Normandy landings and allied forces began their advance towards the Pas de Calais. Shelling was continuing but at a relatively low level and despite the town having had two thousand alerts by the end of August 1942, the three thousandth alert would only come in September 1944.⁷⁹⁰ However, fifteen people were killed in 1943 by shelling as compared to seven in 1942. Eleven of those deaths occurred on two days. *The*

⁷⁸⁶ *The Dover Express* 1 December 1944

⁷⁸⁷ R. Hougham & D. Richards, *op. cit.* p.126

⁷⁸⁸ *The Dover Express* 2 July 1943

⁷⁸⁹ PRO Document HO 207/1099

⁷⁹⁰ *The Dover Express* 6 October 1944

Dover Express, in its end of year review, was able to state that “the most outstanding event of the past year has been the further destruction by enemy action of Dover’s buildings; otherwise the year has been uneventful.”⁷⁹¹ St James’ Church was damaged in the spring. The town’s museum had been hit again in the autumn. The Technical College, Dover College and GPO building were also hit during the year. The attack on the GPO building cost the lives of three telephonists.⁷⁹²

In comparison to the two previous years 1943 was quiet for Dover. One of the main events of the first few months of the year was the acceptance of the freedom of the town by Petty Officer Thomas Gould, VC. He won his Victoria Cross (VC) while serving onboard the submarine HMS *Thrasher* on 16 February 1942.⁷⁹³ Due to his service commitments Petty Officer Gould finally made it to Dover on 11 January 1943 when he received the freedom of the town in the town hall.⁷⁹⁴ He was not the only person so honoured by the town during the war. In September 1944 the Prime Minister was offered the freedom of the town by a unanimous vote of the council.⁷⁹⁵

By the end of 1943 one of the biggest news stories was the banning of the “White Cliff Revels” from the Hippodrome Theatre. The fact that the town had the luxury to concern itself with what was a relatively innocuous event shows that some of the war fears were definitely lifting from people’s minds. The show was organised by soldiers in the town in aid of the Prisoner of War (POW) Relief fund and was meant to be held on Sunday 5 December 1943. The Lord’s Day Observance Society (LDOS) objected to such a performance being held on a Sunday as it contravened the 1933 act on Sunday entertainments.⁷⁹⁶ The council was divided over the matter; Councillor Martin, Chair of the Emergency Committee was a prominent member of the LDOS and was opposed to any such show going ahead. Others felt that they would like to turn a blind eye on this occasion as it was for a good cause but did not want to fall foul of the law. A third group felt that the objection was ridiculous and that the ‘Revels’ should go ahead. In the end the show was prevented from taking

⁷⁹¹ *The Dover Express* 31 December 1943

⁷⁹² R. Humphreys, *Dover at War* pp.155-173

⁷⁹³ Gould was awarded the VC for his actions in removing an unexploded bomb from the submarine’s casing while in action off Crete. *The Dover Express* 25 September 1942

⁷⁹⁴ *The Dover Express* 15 January 1943

⁷⁹⁵ *The Dover Express* 24 September 1944

⁷⁹⁶ *The Dover Express* 3 December 1943

place on that Sunday and was held instead in the soldiers' barracks on the previous night with an audience of over six hundred.⁷⁹⁷ The usually conservative editorials in *The Dover Express* on this occasion failed to support the restrictions placed on the show and indeed criticised the LDOS for objecting to it being held. The presence of many journalists in Dover of course turned this story into a national one, especially as it had been all quiet on the *Kanalfront* since the start of November. The last shell of 1943 fell on Dover on 3 November. This left the journalists with little war news to report from the Dover area. The *Sunday Dispatch* story was entitled the "Fall of Dover" and lamented how the town could have taken such a narrow view. The war did not stop for Sundays and so why should the nation's soldiers be prevented from raising funds for their compatriots in prison camps on a Sunday? This unwelcome national exposure had the extremely beneficial side effect of bringing the show to the attention of a number of famous artistes who then agreed to appear in Dover on 19 December. Tommy Trinder topped the bill and was joined by Sonny Hales and Tessie O'Shea.⁷⁹⁸ *The Dover Express* in the same edition printed a letter and a photograph from a Sergeant McNeir then resident in *Stalag* 383. There were another sixteen Dover men in that camp and the photograph showed them all. Here was proof if it was needed of the senselessness of the LDOS's position over trying to stop a show to raise funds for such prisoners. The publication of the letter and photograph brought home to Dover the direct benefit which was being brought to relatives and friends then in POW camps.

Entertainment of course continued in the Hippodrome theatre. One of the theatre's favourite acts Denise Vane "Daring and Indescribable" returned in April 1944 and was back again in September. Acts such as hers and Marlene D'Orsay's "Art in Nudity" remained staple items on the Hippodrome's bill. The theatre finally closed during the prolonged shelling of September 1944. After being closed since the beginning of that month's heavy shelling, it was due to re-open on 26 September only to be badly damaged by a shell on the previous day. The damage was such that the theatre never re-opened.

⁷⁹⁷ *The Dover Express* 10 December 1943

⁷⁹⁸ *The Dover Express* 10 December 1943

Dover did not have to contend with an influx of American troops in the way that other areas of the country did. At the height of the American 'occupation' of the British Isles there were over one million four hundred thousand American servicemen in Britain but there were only nineteen thousand in Kent.⁷⁹⁹ Dover was therefore spared the social upheavals that often resulted from the American presence and no reports of problems between Americans and British made the pages of *The Dover Express*. The first real American presence came in the summer of 1944 when American anti-aircraft batteries arrived in the Dover area to combat the V-1 menace. There were Canadian units based in south east Kent but Dover did not see many of them apart from a few units of engineers which were engaged in tunnelling work in the area.⁸⁰⁰

Life in Dover was also changed in 1943 by the removal of the restrictions on visitors to the coastal region. The invasion fears of 1940 had led to the restrictions being imposed and they remained in force until the end of 1942. The restrictions would return but for a different reason at the start of April 1944. 1943 was therefore in some ways the most normal year for Dover since the German invasion of France. By September 1943 the town felt able to celebrate Italy's withdrawal from the war by ringing the church bells at St. Mary's.⁸⁰¹ Church bells had previously been meant to signal an invasion of Britain and so this ringing of the bells to signify a success in the war, coupled with the sounding of ships' sirens and the flashing of the news on cinema screens represented a remarkable change in the town's life. It showed that the town was prepared and able to celebrate a victory. The defection of Italy to the allied cause and the overthrow of Mussolini represented the removal of one third of the axis and left only two main opponents to defeat. It was certainly an event which merited the sounding of the church bells.

The physical health of Dover's people was also good. Dover's Medical Officer of Health's report for 1942 indicated that the town's health was as good as it had been in the pre-war period. The campaigns to encourage people to eat potatoes

⁷⁹⁹ D. Reynolds, *Rich Relations: The American Occupation of Britain 1942-1945* (London, 1995) p.111

⁸⁰⁰ See the following documents for details PRO WO 179/469 War Diary of 1st Canadian Tunnelling Company, 1941, WO 179/1296 War Diary of 1st Canadian Tunnelling Company, 1942 & WO 179/1297 War Diary of 2nd Canadian Tunnelling Company, 1942

⁸⁰¹ *The Dover Express* 10 September 1943

instead of bread and to eat more vegetables were obviously having an effect. The diet was healthier during the war than it was to be afterwards. The report on the town's health actually showed surprise that the general health of the townspeople was so good despite evermore stringent rationing being imposed. *The Dover Express's* belief that the Battle of the Atlantic had been won at the start of 1942 was indeed very premature.⁸⁰² At the start of 1942 Dover, together with Hull and London, had been identified in a Board of Trade report as places where it was difficult to conduct profitable business due to the disruption caused by the war.⁸⁰³ Evacuation reduced Dover's population which in turn reduced business for the town's traders. In 1943 there was a definite increase in the town's population as the re-opening of the town's schools saw over two thousand children on the rolls of Dover's schools, with only two hundred and thirty two remaining in Wales.⁸⁰⁴ The average sales of *The Dover Express* increased during 1943 from ten thousand and ninety-two in 1942 to eleven thousand one hundred and ninety-eight. People were definitely returning to the town as Dover was now seen as being safer. This situation would continue into the spring and summer of 1944, but would alter greatly in September.

So as Dovorians looked forward to a swift end to the war, *The Dover Express* took great pains to remind its readers that the war was not yet won. The "War in the English Channel" raged on.⁸⁰⁵ If Dover itself was not being attacked then the Channel was the scene of almost nightly battles between allied coastal forces and the *Kriegsmarine*. Allied air supremacy was becoming more and more apparent and German shipping was restricted to moving by night. British coastal artillery fire was directed against such shipping but invariably the German response was aimed at the British batteries. This resulted in many of their shells landing on the nearby towns and even before the "hate shelling" of 1944 it was generally believed that the Germans were exclusively aiming at the coastal towns. Speculation was rife as to what the British guns were targeting. Very little official communication was made as to what their actual targets were. It was thought, by the public, that the guns were directed against the German gun emplacements. Articles were published in the national press on the supposed British successes in silencing the German guns. *The Daily Mail* on 18

⁸⁰² *The Dover Express* 9 January 1942

⁸⁰³ *The Dover Express* 13 February 1942

⁸⁰⁴ *The Dover Express* 7 January 1944

⁸⁰⁵ *The Dover Express* 12 November 1943

April 1942 had made the very premature claim that Dover was no longer in the frontline as the Germans were afraid of retaliatory air attacks and counter-bombardments.⁸⁰⁶ This was followed up by an article in June entitled “Channel Guns silent for three months” and indeed there was no shelling between 15 March and 8 July 1942.⁸⁰⁷ This was the longest gap in the shelling during the entire period that Dover remained within range of the German guns.⁸⁰⁸ In fact the British long-range artillery made little effort to engage their German counterparts as it was German shipping which remained their main targets. It was not until January 1944 that it was confirmed that the Dover guns had sunk a German ship in the Channel. This event was worthy of a letter of congratulations to the gunners from the Prime Minister.⁸⁰⁹ The reports of cross-Channel artillery duels were therefore one of the war’s more enduring myths as the respective guns were not in fact aiming at each other. The German batteries were also not targeted by the allied air forces; as with the submarine bases at Lorient and St Nazaire no effort was made to impede their construction. By the time their construction was complete the bunkers were virtually impervious to allied bombing. The only serious attacks made on these gun positions were during the lead up to the Normandy Invasion when the full strengths of RAF’s Bomber Command and the USAAF’s Eighth Air Force were brought to bear against defensive and communication targets in France. No serious damage was inflicted on the batteries in the Pas de Calais area; their efficacy up until their capture is proof of this. In September 1944 over five thousand bombs were dropped on or near the German batteries but still their fire continued.⁸¹⁰

It was one of the vagaries of Britain’s wartime censorship laws that nothing could be written or broadcast about bombing attacks without the censor’s approval, but shelling attacks were in fact exempt from any such restrictions. Dover and *The Dover Express* had long been in favour of the introduction of such restrictions and they were finally introduced in June 1944 when the publication of photographs of the damage caused by shelling was banned.⁸¹¹ As this announcement came after the news

⁸⁰⁶ *The Daily Mail* 18 April 1942

⁸⁰⁷ *The Daily Mail* 10 June 1942 and PRO Document HO 207/1099

⁸⁰⁸ The first shell fell on 12 August 1940 and the news that the last German battery had been captured was announced in Dover on 30 September 1944

⁸⁰⁹ *The Dover Express* 21 January 1944

⁸¹⁰ Bob Ogley, *Kent at War* (Westerham, 1994) p.194

⁸¹¹ *The Dover Express* 16 June 1944

of the success of Operation 'Overlord' it now seemed to be only a matter of time before Dover's shelling ordeal would be over and Doverians believed that the worst was behind the town. The arrival of the V-1 "Buzz Bomb" in the skies over Dover was not a trial for the town as only three actually landed within the town's municipal boundary.⁸¹² However, the worst of the shelling was still to come. As the allied troops approached the Pas de Calais area the Germans seemed determined to expend the rest of their ammunition in what was termed "hate shelling" by *The Dover Express*. For the rest of Britain the aftermath to D-Day seemed to spell the end of the war and that it would truly all be over by Christmas. Paris was liberated on 25 August but Dover did not consider itself to be liberated until 30 September when the news arrived that the last German battery in the Pas de Calais had been captured by Canadian troops.⁸¹³ Dover had been planning its liberation service since August.⁸¹⁴ It was scheduled to take place after the capture of the Channel ports. However, in September 1944 Dover suffered the heaviest and most prolonged shelling of the war, coming as it did when the war seemed to be won the ferocity of the shelling shocked the townsfolk. The damage caused in this period certainly transformed the town as much as the attacks of the previous four years.⁸¹⁵

According to a report, by the Regional Civil Defence Training Officer John Osborne, which was issued on 17 November 1944 the damage done to Dover "was by far the most extensive and destructive experienced during the five years of war."⁸¹⁶ Two hundred and twenty-one shells landed in the Dover area between 29 August and 26 September, while Folkestone received sixty-four. Casualties were low and Mr Osborne put this fact down to the "excellent shelter provision which had been made" in the town.⁸¹⁷ The "caves" in Dover were singled out as being "first class shelter accommodation".⁸¹⁸ This was available for the majority of the residents of the

⁸¹² *The Dover Express* 6 October 1944. The term "Buzz Bomb" was that used by the British, see *The Dover Express* 23 June 1944 and it was the Americans who termed them "Doodlebugs"

⁸¹³ The telegram from the commander of the 9th Canadian Infantry Regiment reached the Mayor, Jimmy Cairns at 10.45am on the evening of 30 September and the news was soon broadcast to the entire town.

⁸¹⁴ *The Dover Express* 22 August 1944

⁸¹⁵ The guns being used by the Germans in the fixed batteries were of three hundred and eighty millimetres and four hundred and six millimetres in diameter, considerably out-ranging the British fourteen inch and fifteen inch guns located near St. Margaret's Bay.

⁸¹⁶ PRO Document HO 186/1895 Report on Cross Channel Shelling, September 1944

⁸¹⁷ *ibid.*

⁸¹⁸ *ibid.*

town who were estimated to number at this time about twenty thousand.⁸¹⁹ Folkestone had a population of only fifteen thousand. There was no call for evacuation in either town despite the unprecedented ferocity of the attacks during this period even though Folkestone had only 'standard shelters'. The fact that Folkestone only had 'standard shelters' did not greatly increase the numbers of casualties suffered per shell. It was actually in the numbers of injured that Dover's caves seemed to produce a reduction in the casualty figures. Dover had seventy seriously and eighty slightly injured to Folkestone's thirty-four seriously and seventy-five slightly injured. These casualty figures were despite the fact that four times as many shells landed on Dover as on Folkestone during this period. However, if the towns' relative populations are taken into consideration then Dover's casualties were in fact considerably lighter than those sustained by Folkestone. It would seem therefore in the last analysis before the shelling ended that Dover's caves had been worth the town's fight. They did seem to be more effective in saving lives and preventing injury than the standard provision given to other towns.

The BBC celebrated the end of the shelling by broadcasting from Dover and Folkestone on Sunday 1 October 1944. The broadcast included interviews with people from both towns. Congratulations were received from General Montgomery and Admiral Ramsay on the manner in which Dover had come through its ordeal. The town in turn sent its congratulations to the Canadian troops who captured the German batteries. *The Dover Express* was quick to publish the official figures for the number of raids on the town, as well as those for the neighbouring towns of Folkestone and Deal. Dover was struck by two thousand two hundred and twenty-six shells in one hundred and eighty-seven attacks which meant an average of just under twelve shells per attack. One hundred and seven people died in these attacks. A further four hundred and twenty-one were injured in these shelling attacks. Folkestone had two hundred and nineteen shells land on it, Deal one hundred and twenty and Ramsgate had seven.⁸²⁰ Fifty people were killed in these three towns by shelling.⁸²¹ Dover also had more bombing alerts than its neighbours but Folkestone had fifty-nine more

⁸¹⁹ *ibid.*

⁸²⁰ *The Dover Express* 6 October 1944

⁸²¹ *ibid.*

bombs land on it than Dover.⁸²² These were small amounts of ordinance as compared to the raids on London in the Blitz or on the major German cities. Dover was not a major city and the randomness of the shelling, for which there was no possibility of an adequate warning system, added to the way in which Dovorians felt they were being singled out by the Germans. The lack of support for the town's call for extra shelter provision also added to this perception as it appeared that even one's own side was not being supportive. All of this added to the town's growing 'bunker mentality'.

With the end of the shelling came Dover's 'liberation' and it was truly seen as liberation by Dovorians. Dover had suffered more from the German occupation of France than many French towns. German troops had not stood on the streets of Dover but yet many French towns suffered less damage than Dover from German action between the summer of 1940 and the summer of 1944. Paris was saved from destruction despite the express orders of Adolf Hitler to have it levelled. The German commanders in the Pas de Calais shared none of the qualms which stopped those in command in Paris. Dover was therefore as overjoyed as its neighbours across the Channel to be finally free from German interference. This freedom was recognised by a Royal visit on 18 October 1944. This was the first visit by King George VI or Queen Elizabeth to Dover since the German invasion of France and the Low Countries in May 1940.⁸²³ Many other VIPs had been taken to Dover to see the devastation wrought by the German attacks and to gaze from the Castle balconies across the Channel to Calais and Cap Gris Nez. The King and Queen did not visit the town, as they visited other areas that suffered from bombing. It must have been considered to be too dangerous to risk the lives of their Majesties in Dover. It would seem to have been possible that the view was taken that if an American VIP had been killed by German shelling then such an event have been a great incentive for the USA to join the war on Britain's side. Injury to the King and Queen would have been a great victory for the Germans and a visit was not to be risked in order to boost the morale of Dover. This argument is also supported by the fact that in the aftermath of an air raid there was little likelihood of a follow-up attack but with shelling there would be little or no warning of a resumption of an attack. The Prime Minister, however, was not so

⁸²² Five hundred and twenty-three bombs landed on Folkestone as against four hundred and sixty-four on Dover.

⁸²³ King George VI visited the town on 14 March and 10 April 1940

easily dissuaded from visiting Dover and seemed to enjoy being caught in an air raid there as much as he did in London.⁸²⁴ The King and Queen's visit was announced to the people of Dover on the 17 October 1944 and was an obvious sign that the town's tribulations were over. Folkestone was visited on the same day prior to the Dover visit. The visits to the towns were to honour the bravery of their people. With the visits following so close on the heels of the most severe shelling of the war they were seen by the people of both towns as reward for their fortitude. Never before had a Royal visit to Dover been a purely civic affair; in the past the town had been visited as an adjunct to an inspection of military or naval facilities in the town. In October 1944 the visit was just to the town and the receiving dignitaries were the town's Mayor and council rather than the town's military commanders.

Dover's 'liberation' came at the end of four traumatic years for the town. The commencement of shelling in August 1940 violated the security of the British Isles as for the first time shells from continental Europe were landing on British towns. Dover had suffered the brunt of these attacks and its deep shelters had helped reduce the number of casualties. Dover itself was left in a quandary about its deep shelters. It knew that they were necessary but did not want to be perceived as a town that had spent the war cowering underground. The BBC had implied as much in their broadcast on 1 October 1944 and suggested that Dover had it much easier than Folkestone because of its caves. This was despite the fact that ten times as many shells fell on Dover as Folkestone. Generally the warnings came after the first shell had landed and Dover was most often the first, and usually the only target, of any such attack.⁸²⁵ At the same time the low number of casualties in Dover could be put down to the 'excellent provision' of deep shelters, never as many as the town wanted, but sufficient to prevent casualty figures in the town from escalating.⁸²⁶ The shelters were well used and in September 1944 they were vital in sustaining the town's morale. Even those who did not use them frequently knew that they were there and available if things got worse. *The Dover Express* also had the satisfaction of a final attack on the Ministry of Information as the details which were published about the

⁸²⁴ R. Jenkins, *op. cit.* p.636

⁸²⁵ *The Dover Express* 6 October 1944

⁸²⁶ PRO Document HO 186/1895 Report on Cross Channel Shelling, September 1944

shelling on Dover did actually help the German gunners.⁸²⁷ The editor also took great delight in telling its readers how the newspaper had been correct to criticise the Ministry and how *The Dover Express* was not popular at the Ministry. The feeling of relief in Dover is well illustrated in a Leslie Illingworth cartoon entitled “Congratulations Mutual” which was first published on 2 October 1944. The cartoon shows a Dovorian reaching out from his town to shake hands with a French resistance fighter across the channel. Both stand amongst the battered remains of their towns. Both bring something of their own culture; the Englishman has his brief case, pipe and carries his overcoat on one arm. On his head he wears a steel helmet. His French counterpart wears a beret and holds aloft a rifle. Both are pleased to be able to greet one another, the first time that they have been free to do so in over four years (see Figure 12 overleaf).⁸²⁸

The end of the shelling also coincided with a retirement from public life of several of the leading figures in Dover’s town council. These were the men who had been responsible for formulating Dover’s response to the trials of war from the air. The Mayor, James Cairns, decided to announce his intention to retire after the town’s liberation. He had been Mayor for a record number of terms during the war, outstaying the record of the Great War Mayor, Farley, by two terms. He was expected to stay in the post for the duration of the war but took the opportunity to go when Dover was no longer in any direct danger. This belied the thoughts presented during the war that he intended to stay in the post as long as he possibly could. In the same week occurred the death of Major Martin, the town’s first ARP controller and Chair of the Dover Emergency Committee. It was he who had been so forceful in beginning many of the town’s ARP projects, projects for which there was no funding but for which it had to be found after the work was begun by the ever enthusiastic Major Martin. This made him extremely unpopular with civil servants, both at the regional ARP/Civil Defence HQ in Tunbridge Wells and at the Ministry of Home Security, because they were forced to supply funding for projects felt to be unnecessary but

⁸²⁷ *ibid.*

⁸²⁸ L. Illingworth “Congratulations Mutual”. 2 October 1944. Cartoon courtesy of The Centre for Study of Cartoons and Caricature, University of Kent. Cartoon Reference ILWW0793



Figure 12: Leslie Illingworth, “Congratulations Mutual” 2 October 1944.

which had to be finished as it would have often cost more to undo the work done by Major Martin’s teams.⁸²⁹ Major Martin had been generally popular in the town as he seemed to be standing up for Dover’s rights, but his standing was affected by his involvement in the “White Cliff Revels” fiasco. At that time he earned the epithet ‘Misery Martin’ as he was a long standing member of the Lord’s Day Observance Society and was thought to be behind the calls to get the show cancelled.⁸³⁰ The town’s clerk, Stanley Loxton, had also left in the summer to take over a similar post in Shrewsbury.

⁸²⁹ PRO Document HO 207/1099

⁸³⁰ *The Dover Express* 3 & 10 December 1943

Dover therefore entered its post liberation period with a new set of men, for it was mainly men, who were in charge. The men who had been instrumental in making vocal the town's demands for protection from air raids were no longer in control and the town set its face to look forward and plan for peace. The remaining year of the war was a time to plan for Dover's rebuilding. This would be a massive undertaking given the fact that the cumulative effects of four years of shelling and bombing had to be undone. Many of the buildings still standing were unsafe after the massive bombardment of September 1944. The rebuilding necessary from the after effects of the two thousand two hundred and twenty-six shells, four hundred and sixty four bombs, three parachute mines, three V-1s and numerous incendiaries which fell on the town was still going on in 1947. Dover was therefore chosen as the subject of an information film by the DATA Film Unit. Dover was Britain's most attacked regional town or city. The film claimed that the town had been struck by two thousand two hundred and sixty shells and that over nine thousand people lived in the caves during the war.⁸³¹ It highlighted the devastation still prevalent across some areas of the town and it illustrated the work that was going into its rebuilding. The viewers were left with the following words;

"So we say goodbye to beautiful Dover- No, not 'beautiful' it's been damaged too much for that. But- brave Dover, hard working Dover- and they're better words than Beautiful."⁸³²

These words may be a good summation of the perceived atmosphere of Dover during the war. They do not reflect the feelings within the town during the shelling and air attacks, Dover was brave but this bravery was reinforced by the town's caves. They were refuges and because of them the town was able 'to take it'. Dover did have a 'bunker mentality' but this was not purely directed towards the town's shelters and the German attacks. The town felt that it was being undermined by central government, the national press and the BBC. All three were felt not to consider the special local needs of Dover and thereby made the situation in Dover worse than it needed to be. Dover felt itself to be in special need and a special case, and it was this belief that fuelled the town's 'bunker mentality' for if Dover did not feel that outsiders wanted to attack it then there would have been no need for the town to have withdrawn into itself in the way that it did.

⁸³¹ PRO Document INF 6/1257. Transcript of 1947 film "Dover Report"

⁸³² *ibid.*

With regard to Dover from 1940 to 1944, as with Northern Ireland during the last three decades of the twentieth century, it was only the ‘big events’ which warranted a mention in the national media. The daily trials and tribulations of the town were simply not newsworthy. Dover’s year was 1940. The town will always be associated with that year. Connelly makes a brief but incisive study of Dover in this context in *Britain and the memory of the Second World War*.⁸³³ However, it is highly appropriate in a book which deals with memory and myth that he further enhances Dover’s ‘mythical status’ within this pivotal year. Dover is not mentioned outside this context. It was this prominence that the town ‘enjoyed’ in 1940 followed by three years of being ‘ignored’ which caused the resentment from the town’s population; very much as it did in the population of Northern Ireland. This was further enhanced by the burgeoning mythology surrounding the London ‘blitz’ and the increasing emphasis put on the capital’s travails to the exclusion of all provincial cities and towns. The large number of locally published histories which were written, across Great Britain, in the immediate aftermath of the war indicate a desire to ‘put the record straight’ and to tell ‘their’ local stories. Connelly cites some examples of these histories and points out that they chose to emphasise local heroism against any perceived or apparent shortcomings of their municipal authorities.⁸³⁴ The case of Plymouth is given where he notes that in the written accounts “a perverse pride was found in the trauma”.⁸³⁵ The same was true for Dover and in this case there was very much the element of comparison with London.

In the 1945 General Election Dover elected its first Labour Member of Parliament of the twentieth century. Ten years earlier the Conservatives had enjoyed a majority of 11,000; in 1945 the Labour Majority was 1,682. This massive swing to Labour could be seen as part of the national phenomenon of that year which saw Britain’s first majority Labour government. The Labour candidate J.R. Thomas received 17,373 votes; his Conservative opponent 15,691. During the war the town’s MP had done little to actively support the town and the result can be seen in this local as well as the national context. Smith cites a letter of Harold Nicolson written in May 1945 which supports this idea of the people blaming the conservatives for the ills of

⁸³³ M. Connelly, *op cit* p. 119

⁸³⁴ M. Connelly, *op cit* pp. 145-9

⁸³⁵ M. Connelly, *op cit* p. 146

the war; in the case of Dover the electorate had reasons to feel that their MP had not supported them in their hour of need.⁸³⁶ Major Astor had not been vocal in supporting the calls for further shelters for Dover and given the level of destruction in the town the electorate had moved to supporting what was being portrayed as the progressive party; the party which would rebuild their town. In July 1943 the editor of the *Dover Express* warned the people of Dover not to start thinking about post-war reforms; in July 1945 the electorate of Dover gave their verdict on what they thought should be the future of their town in the post-war world. The electorate did not want a return to how things had been in 1939 the war had changed many things and 1945 signalled the time for a political change.

⁸³⁶ H.L. Smith, *op. cit.* pp.50-1

Conclusion

Dover's 'bunker mentality' was not just confined to a desire for deep underground air raid shelters. The 'bunker mentality' became infused with every aspect of the town's life. During the two world wars of the twentieth century life changed; lights were extinguished at night, schools closed, church bells stopped ringing and the number of recreational pursuits open to the townspeople were seriously curtailed. The main facet of this was, of course, the presence of enemy forces on the other side of the English Channel. Other factors helped to increase this feeling within the town. Politically the town council saw central government as a hindrance. Central government seemed determined to thwart the town's plans by withholding finances and could never be made to see that Dover was a special case. The BBC and the national press were both felt to be acting against the best interests of Dover and Dovorians. The BBC's 'irresponsible' news broadcasts on the town gave the Germans vital information which, it was felt, assisted their attacks. In the eyes of *The Dover Express* 'irresponsible' meant giving any information about the results of attacks on the town. Such information was a bonus to the Germans and did nothing for the town. The newspapers were equally culpable in this respect. Both the national press and the BBC, after a lot of initial interest in Dover's plight, tended to ignore the town as the war progressed. Journalists and members of the armed forces became virtually the only outside visitors allowed into the town.

The scale of the destruction suffered by the town in the two world wars is still visible at the start of the twenty-first century; nearly 11,000 houses were damaged or destroyed in the Second World War. Interspersed with the Victorian and Georgian residences there stand newer dwellings. A street of Victorian semi-detached houses will have a more modern block of flats interspaced on the site of two houses which were demolished by shelling or bombing between 1915 and 1944. The current main shopping street, Biggin Street, contains a veritable cornucopia of eighteenth, nineteenth and twentieth century architecture from the original Georgian buildings still surviving near the town's museum in Market Square to the ultra modern Woolworths built at the start of the twenty-first century. Much of the architecture however dates from the post Second World War period and the rebuilding then carried

out. The main shopping street of the pre-Second World War period, Snargate Street, now only exists as a single row of buildings, the other side of the street having been demolished to make way for the new dual carriageway from the A20 to the town's Eastern Docks. However, the side which does still stand bears the scars of war damage and some architectural interlopers exist there too. The ruins of Old St James' church stand on the edge of the new leisure centre's car park as a further reminder of the damage wrought.⁸³⁷ The large car parks to the west of the leisure centre mark the site of the Burlington Hotel another victim of the Second World War bombing.⁸³⁸ Almost sixty years on the town therefore still bears physical scars of the attacks which ended in September 1944.

For a town which had been in danger of attack for centuries, it was the twentieth century and its technology which saw a threat develop into actuality. The last direct attack on the town before the twentieth century took place in 1294 and it was not until 1914 that the town was attacked once again; Dover had, however, been much threatened in the interim. The threat had built up the town's distinct frontier mentality and for centuries that threat emanated from France. Despite the town relying on trade with the rest of the world for its very existence, fear and resentment of foreigners, and in particular of France, are still very prevalent in Dover to this day.⁸³⁹ The start of the twenty-first century has seen those fears raised once more; this time due to large numbers of refugees and asylum seekers flooding into the town, and thereby it is believed causing increased lawlessness on the streets and a lack of housing for local people as the incomers are given priority.⁸⁴⁰ The air raids and shelling attacks of the twentieth century were in some ways therefore the culmination of Dover's waiting period, a period during which the people of Dover had long believed that the town would be the first target of any invading force. The people of Dover believed that their town would be the first target for the simple reason that their town was at the closest point to France and was the best natural harbour in the Straits.

⁸³⁷ See M. Smith, *Dover in Old Photographs* (Gloucester, 1988) pp.98-99 for how the church looked prior to 1939 and J. Guy, *East Kent from the Air* (Gillingham, 1987) p.34 shows a view of the church after 1945 but before its demolition. The church was built in 1291 and would therefore have one of the town's few buildings to have survived from the last attack in 1294 until the Second World War.

⁸³⁸ It is one of the claims of both Dover and Folkestone that since the Second World War, due to the war damage, neither has been short of empty spaces for car parking.

⁸³⁹ Despite Britain not having been to war with France for almost two hundred years passions in Kent can still run very high.

⁸⁴⁰ See local press for details *The Dover Express* various editions 2000-2002

Any invader or raider would therefore seek to strike Dover first if only to prevent the British from using it. English subjects had not seen enemy soldiers breach their borders since 1745; there had been no enemy troops anywhere in the British Isles since 1798. There were two hundred years of peace, but a peace in which Dover and its people felt particularly vulnerable. The harbour brought prosperity to Dover, but it also brought danger as any invader would need to secure that harbour to ensure a supply route back to bases in France. This threat was at its closest to being realised between 1914 and 1945. The 'race for the Channel' in 1914 saw the Germans occupying all of Belgium's major ports and thus placing German naval units less than three hours steaming from Dover. The First World War saw a watershed in the town's fortunes, for Dover became a target and a target which was attacked through the development of bigger and more powerful aircraft. The departure of the RFC to France across the Channel from the cliffs east of Dover in 1914 was a warning that enemy aircraft might be able to make the crossing in the opposite direction if they could be based close enough to Dover.

At the beginning of the twentieth century aerial bombing attacks were entirely new military phenomena. They had been barely thought practicable before the outbreak of the First World War, except by means of airships. It was not surprising that no contingency plans had been made to deal with this type of warfare. The air raids of the First World War now seem to have been minor in scale but to the people who lived through them they must have been terrifying. There had been literally nothing like them before. There was no precedent but unlike a natural disaster there was no possibility of dismissing the attacks as a one off. The attacks became more regular and possessed vastly more force as the war progressed. The very thought, in the period immediately before 1914, that British subjects would be periodically leaving their homes and having to sleep in caves or fields would have seemed unbelievable. All the nation's pride and confidence in the Royal Navy were now seen to be outdated. The age of the warship and 'gunboat diplomacy' had truly come to an end. For the next quarter of a century it was the potential power of the bomber aircraft and the threat of air raids which would help to guide world politics. This meant a complete re-thinking of Dover's security and how it would deal with this previously unthought-of danger.

The First World War brought to Britain the experience of this new form of warfare. In the case of Dover the air raids had a very profound effect. Nearly two decades after they ended the people of Dover would be facing the possibility of another wave of attacks in the shape of further air raids and a possible invasion. With the experience of the First World War to draw upon the town was united in seeking the provision of the very best ARP that could be provided. Cost and value for money were not the foremost factors in the calculations carried out by Doverians. Rather it was the memory of the raids and the destruction they brought with them. Casualties in Dover from air raids had been light during the First World War. The town's authorities and press were determined to see that this would be the case in any future conflict. This I would argue serves to prove that the First World War did indeed see the birth of Dover's 'Bunker Mentality' in this context. Dover had for centuries been within sight of England's enemies but for centuries an attack on it had proved impossible. Military aviation had made it possible. The attacks had seen the people of Dover react by turning to themselves for solutions. The 'Bunker Mentality' in the First World War was symptomatic of the town's enforced insularity; one of the major rail links was closed for the duration of the war and the town was part of a 'fortress area' which prevented free access to outsiders. This mentality was in an embryonic state within the town during the First World War; however, it was the events of the First World War which paved the way for what happened in the Second.

The bombing in the First World War helped to hasten the demise of east Kent as one of the country's most fashionable resort areas. Edward VII's visits to Folkestone during the latter part of the nineteenth century, when he was Prince of Wales, had made it one of the country's most exclusive resorts. His suite of rooms in the Grand Hotel had helped to make that town's name but after the First World War the rich and well to do stopped coming to south east Kent. During the war to end all wars many of them had sold their properties or had seen them converted for war use. After the war the resort towns had to make serious efforts to attract visitors. Folkestone, 'the Queen of the South Coast', had to completely rejuvenate its facilities. The Leas Cliff Hall was built, the 'Zig-Zag' path from the cliff top to the beach was constructed and a sunken garden was planted, in an abandoned clay pit, which became the Kingsnorth Gardens. Dover was even more affected by this reduction in visitor numbers. The Burlington Hotel was converted into residential use and Dover ceased

to be a holiday resort. Day trippers would still visit the town on occasions: for the town's regatta day or for military events such as parades and concerts. The disappearance of the visitors staying in the town undoubtedly made severe inroads on the town's economy. Most people were now passing through Dover on their way to or from the continent rather than staying in the town itself. This facet of Dover's life has been exacerbated since the end of the Second World War and today, despite the fact that Dover Castle remains one of Europe's finest medieval castles, most visitors only see it from the deck of one of the car ferries.⁸⁴¹

The end of the First World War did not signal an abrupt end to the political values and workings of pre-1914 England. In Dover the political landscape remained unchanged it was not until the 1945 General Election that Dover elected a non-Conservative MP. The local council continued about its business and remained largely composed of local businessmen. The town's councillors were essentially conservative in their outlook and it took an issue such as ARP to radicalise them into taking steps such as setting up their own ARP Committee and then requisitioning caves and tunnels on their own authority. McKibbin's 'Edwardian middle class' of the 1920s remained politically powerful within Dover until after the Second World War.⁸⁴² The Edwardian values of the council were deeply engrained; issues such as Sunday entertainment could bring these to the fore even in the middle of a World War as the furore over the 'White Cliff Revels' showed.⁸⁴³ The issues that this raised are an example of the arguments which could arise between the 'Edwardian and post-Edwardian' middle classes in a town such as Dover.

Marwick listed a number of direct consequences of the First World War. These he argued altered British society in a way that would have been unimaginable without that conflict.⁸⁴⁴ His points on the loss of life and limb are irrefutable. However, his assertion that the immense demand for manpower placed "irresistible pressure for the reorganisation and reorientation of society" would seem in the case of

⁸⁴¹ Visitor numbers at Dover Castle in the late twentieth century were around a quarter of a million per annum, passengers on the car ferries number circa ten million per annum.

⁸⁴² R. McKibbin, *op. cit.* p.67

⁸⁴³ See above p.206

⁸⁴⁴ A. Marwick, *The Deluge; British Society and the Great War.* p.289. Also see above pp.9-11.

Dover to be far from the case.⁸⁴⁵ Dover's society remained comparatively unchanged by the First World War despite the fact that not only did it face the pressures which were exerted on British society as a whole but also experienced direct attacks, events from which the vast majority of the population were spared. Dover's world did not disappear "in the deluge of 1914-1918", rather that world adapted.⁸⁴⁶ The values and principles which existed prior to 1914 remained intact in 1918. In the face of the challenges faced in the 1930s that world would again prove remarkably resilient. In the example of Dover there is more to support DeGroot's theories of continuity than those of change. In Dover and east Kent there was no hint of egalitarianism during the First World War; those who possessed the means to do so left the area and those who remained did so because they had no choice. The council reflected pre-war values; money was as important as the lives of the townspeople and while the local newspapers called for extra shelter spaces no other action was taken by the townspeople or its authorities. The only steps taken to deal with the lack of shelters in the town's schools was to arrange for the children to go straight home after the air raid siren was sounded.⁸⁴⁷

The 1930s saw the British government attempting a policy of co-operation and appeasement with Nazi Germany. The British government and many amongst her population were conscious of the perceived 'wrongs' done to Germany in the 1919 Versailles Peace Treaty.⁸⁴⁸ The hope was that once Germany had restored her borders and incorporated the German speaking peoples of Central Europe within them she would be satiated. After the occupation of Prague in late 1938 it became obvious that this was not going to prove successful and the fears of aerial attack grew. The success of the *Luftwaffe* in Spain and the comments of the Prime Minister in 1932 all helped to increase this fear. The ARP policy which grew out of this was not an all encompassing one. It set out to impose standards across the country but in fact much of the decision making was left to local municipal, borough and town councils. As we have seen with the example of Dover, towns did not always comply with the letter or even the spirit of the act. Regional jealousies came into play if a neighbouring town was seen to be receiving more than its 'fair share' of resources. Dover did not merely

⁸⁴⁵ *ibid.*

⁸⁴⁶ *ibid.* p.313

⁸⁴⁷ See above pp 80-81

⁸⁴⁸ See above pp 8-9

seek a fair sharing of resources it sought the best it could for itself. This was not a time of self-denial rather it was a time to push one's own schemes for local benefit. There was no bureaucratic 'juggernaut' bearing down on Dover. Dover's politicians and its newspaper felt justified in seeking better facilities for their town at a time when it must have been obvious that in so doing resources would be lost to other towns.

The end of hostilities in 1918 did not in the case of Dover see any real difference in the town's governance. By the 1930s when the topic of ARP became an important national issue the town council was able to take the lead and in many ways 'made the running' with central government lagging behind. Dover's ARP Committee took steps which foreshadowed the national ARP acts. It did so not in an effort to change national policy but in order to put in place a local set of procedures for the benefit of Dover and its inhabitants. The Edwardian style of government had not been swept aside in Dover in the aftermath of the First World War. It was not much altered during the Second World War either. The same group of men who had led the town at the start of the war were in place in 1944. It was only when they felt that the town had again entered a period of relative safety that a number of them retired from public life. These men had grown up in the Victorian and Edwardian eras and they did not believe that central government could cater for the needs nor know the needs of their town as well as they did. An issue as important as ARP was one which would cause these men to make decisions and force the pace when they felt it to be necessary.

The sense of place was as important in setting the tone of people's 'spirit' during the Second World War as any sense of national belonging. In addition to a national sense of belonging discussed by Connelly which became part of Britain's collective memory of the war, Dover's local identity became another strong focus for the community. It helped the people to identify with both the local council and newspaper as reliable sources of advice and news during the war. Sales of *The Dover Express* remained at high levels throughout the war and the town council was seen to strongly represent widely held beliefs with regard to ARP. It was also seen to lobby for these beliefs with the highest levels of government. In Dover there were no temporary breakdowns in order as happened in both Folkestone and Ramsgate. There were worries but the stolidity so long associated with the English fighting man was

also present in Dover during the Second World War. Shelling and bombing were the town's lot and the townspeople got on with life as best they could.

Dover, in both world wars, was on the receiving end of aerial and shelling attacks. Prior to the First World War no preparations were made by the town to deal with such an eventuality. Particularly from 1916 to 1918 the issue of how best to protect the town's population from such attacks became the major one of that war. Headlines telling of bombers over Dover outweighed the casualty figures from the Western Front or the increasingly stringent rationing in the pages of the local newspapers. Flights across the Channel had been extravagant and dangerous occurrences before 1914. The flight of the Royal Flying Corps across the Channel was newsworthy because the event was unusual, in a way the news that the RAF had redeployed to the Middle East in 2003 was not. Thousands of people in twenty-first century Britain have flown across the world. In early twentieth century Britain only hundreds had taken to the air. The technological advances which made the bombing of Dover possible from 1914 to 1918 and then again from 1939 to 1945 would help change the shape of passenger travel and thereby end the pre-eminence of the steam ship and the railway in international travel. All of this had potentially profound consequences for Dover. The increase in air traffic, it was felt, could end the need for passenger ships across the Channel and thereby remove Dover's *raison d'être*. From 1940 to 1944 the people of Dover not only saw their town being destroyed building by building but with the increasing pay-load, range and reliability of the aircraft being used the possible extinction of their town's seaborne passenger trade in the post-war era. Events have shown these fears to be very premature and Dover's pre-eminence as a port has if anything grown since 1945, despite the completion of the Channel Tunnel. However, that was not known then and seemed a reasonable and pressing concern to many in the town.

Until the attacks on the town ceased in September 1944 it was not known that the town's casualties would be as light as they were. In 1914 the idea of aerial bombing was science fiction. By 1939 it was deadly reality and a veritable apocalypse was being predicted by the Home Office in the event of a general European War. Casualties were expected to number hundreds of thousands within a week of the commencement of bombing. These figures were based on the casualties suffered per

ton of bombs dropped in the First World War and then simply multiplying the figures up in direct correlation to the tonnage of bombs which it was believed that the Luftwaffe could drop on Britain in a future conflict. No allowance was made for the fact that the air raid arrangements and most importantly the shelters provided were far superior to anything that existed between 1914 and 1918. The 'Anderson' and 'Morrison' shelters, despite the fact that they would not save their inhabitants in the event of a 'direct hit', would save their inhabitants in virtually every other scenario. This gave ordinary members of the public a security within or near their own homes which was completely lacking in the First World War. However, the projected casualty figures showed that the problem had to be taken seriously. Even though the delivery of shelters began just before the outbreak of war the lull between September 1939 and May 1940 gave Britain time to put its air raid precautions strategy into place. Britain should have been ready for the expected onslaught from the skies.

This apocalypse seemed to be imminent after May 1940 when the English Channel became the new 'No-man's land' between Britain and Germany. With German troops in command of the entire French Atlantic coastline, a situation that was scarcely thought possible even in the darkest days of 1914 or 1918, nothing stood between the Kent ports and the invaders except for the Channel. The first raid came on 6 July 1940 and the first casualty four days later. German aircraft in their French bases were less than fifteen minutes away from the town; there was little time to intercept the raiders before they arrived over Dover. The RAF at this time was in no position to launch attacks against the German bases. As the *Luftwaffe* moved into eastern Europe in 1941 the number of raids against Britain decreased. Raids on German air-bases in northern France only became a priority in the period leading up to the invasion of Normandy. The *Luftwaffe* was therefore able to continue its tip and run raids against east Kent into 1944, in a way that it could not against the rest of Britain. German bombers and fighter-bombers were able to cross the Channel 'under' radar coverage, quickly drop their loads and then return to their bases at top speed. These raiders were not seeking a specific target, rather they desired to drop their ordinance on a town and then get away as quickly as possible. This would in fact have added to the fear felt by the people of Dover as the raids were by their very nature random and so one could not feel safe just because one lived nowhere near a military target. In retrospect it is easy to say that the attacks on Dover had no great

significance in terms of the war's outcome; the town's military importance became limited once the Royal Navy withdrew in 1940 and the threat of German invasion diminished in 1941. Dover and the eastern Channel therefore became something of a military sideshow. Dover was, however, a great symbol of Britain and its fighting spirit, particularly in 1940 when the aerial fighting raged over Kent, Sussex and London. Journalists from all over the world flocked to Dover to make their reports from the White Cliffs and tell their public how the prelude to invasion was progressing. This raised Dover's profile not just in Britain but also in North America and all over the British Empire. After the battle Churchill's 'few' came to symbolise the 'Battle of Britain' but at the time the stoicism of the people of Dover meant as much if not more to the English speaking world as it was their story that the journalists related.

Central government seemed to many in Dover to be doing its utmost to prevent the town acquiring adequate shelters. The politicians, press and people of Dover felt that the number of deep shelter spaces was inadequate. Central government on the contrary felt that Dover was if anything over provided with shelter spaces. The argument centred on whether it was proper to use more of Britain's scarce resources to provide further shelters for Dover. The town felt that it was a special case as it was so close to France and presented such a tempting target for the Germans. Central government felt that the casualties in Dover did not warrant any more expenditure on extra shelters. This was never of course made explicit during the war: again and again the same formula of there being more shelter spaces than there were people in the town would be applied. This formula did not take any other circumstances into account. It certainly did not address the effects of shelling on the town.

This interchange between central and local government is of course a good example of the standing struggles within the body polity as to the relative importance of each in the lives of the British people. The period leading up to the Second World War in the context of this thesis is one not in which central government takes on an all powerful role sending its decrees to the regions for them to be carried out without discussion. Rather it was necessary for central government to enter into what can be long drawn out negotiations with individual local authorities. The long tail of the Victorian and Edwardian style of governance can in this issue be seen to extend into

the 1930s. There was no vast central bureaucracy directing local government; the most that central government was able to achieve was to issue memoranda to local authorities in the expectation that they would comply without demur. In the case of ARP and Dover such acquiescence was not forthcoming. To the town of Dover this issue was too important to allow the dictates of the civil service to deflect it from the course of action which it felt to be necessary. Dover in 1939 was much more ready for war than had been the case in 1914. In 1914 aerial attack was not regarded as a serious option, by September 1939 in contrast, the town had held ARP exercises and was able to publish maps listing the location of all public shelters within the town. Adequate ARP became one of the main goals of the town's leadership during the Second World War.

The German long range guns, which first opened fire on 12 August 1940, brought destruction to the town in mere seconds. They also opened a new chapter in warfare for the British people; there was no way to prevent the shells reaching their targets once fired. An air raid could be disrupted by anti-aircraft fire or by fighter aircraft. These initial attacks came from railway mounted guns but the Germans soon situated permanent batteries near the coast-line containing guns of even greater firepower. The full destructive power of the German batteries in the Pas de Calais region was displayed in the final month before their capture when Dover suffered daily shelling attacks. These attacks in September 1944 accounted for much of the damage suffered and showed how right the town's authorities had been when they demanded extra air raid shelter accommodation. Shells had a much greater penetrative power than aerial bombs and were capable of destroying most surface shelters. It was the threat from the cross-Channel guns which persuaded Dover's authorities of the need for as much deep underground accommodation as possible. The forty fatalities suffered in the town could have numbered many more had the town's shelter provision not been kept up to standard.

In 1944 the V-1 flying bomb and the V-2 ballistic missile rejuvenated Germany's attacking potential against Britain and with the V-2 London found itself under attack by a weapon that could not be defended against. For Dover that was nothing new as the German batteries in their reinforced concrete bunkers were virtually impervious to RAF & USAAF attack. The British artillery batteries were

designed not to silence their German counterparts but rather to prevent German shipping from traversing the Channel.⁸⁴⁹ The very fact that if you lived and worked in Dover meant that you became become a target. The same, it could be said, was true for the inhabitants of most of Germany's major cities but Dover of course was not a major city. It was a relatively small port and had no essential military industries. Dover's fate was sealed by its strategic and symbolic position as the closest point in Britain to Hitler's *Vestung Europa*. The town's effectiveness as a military centre had been curtailed by the fear of German air power and much of the military command function took place underground in the existing and new tunnels beneath Dover Castle.

However such military attacks, while potentially devastating in their effects on the town, were not totally unexpected. Although Dover was not a major city it was the most important port in eastern Kent and also an important military centre. Attacks on Dover's infrastructure were justified from a military view point. What were not justified in the eyes of the people of Dover were the reports in the national press and on the BBC which gave useful information to the Germans. These might range from photographs of shelling damage in the press to reports on the nightly BBC news telling how Dover had been shelled again. These reports it was felt did nothing for the British people but were useful for the Germans when they were judging the range and accuracy of their artillery. The people of Dover became wary of journalists and began to distrust the BBC. Again the town seemed to realise that it would have to rely upon itself to get through. This was another facet of the 'bunker mentality', the fear that outsiders were intent on bringing harm to the town. This mentality extended to the fact that the BBC was also held to be responsible for belittling Dover's achievements during the war when the shelling ended.

The sense of being ignored after 1940 was very real in Dover in the years that followed. To some extent this feeling continues today because Dover is seen as having occupied a pivotal position in the events of that year, Dunkirk and the arrival back in Britain of the BEF and of course the Battle of Britain. The image of Spitfires over the White Cliffs of Dover remains a potent one in the minds of many British

⁸⁴⁹ In September 1944 the USAAF dropped more than five thousand, six hundred bombs on the German batteries but their fire was only stopped by their capture by Canadian troops.

people to this day.⁸⁵⁰ The only later major military event in which Dover featured was the 'Channel Dash' of 1942. This was seen as a major blow to the prestige of the Royal Navy as it did not follow in the Nelsonian tradition of naval success. This tradition is also part of the British self-image. As such it does not rank with Dunkirk, the Battle of Britain, the 'Blitz' and D-Day in the collective memory of World War Two.⁸⁵¹ It is therefore easy to see why Dover's defining moment was 1940 and why afterwards the national focus shifted elsewhere. It is also easy to see why Doverians found this difficult to accept as their war time experience worsened between 1940 and 1944 rather than improving.

Dover, until the middle of the twentieth century, had been an important military base for both the army and navy. The keep of Dover Castle has stood as a sign of English power since the reign of Henry II, unbreached for over eight centuries. The port itself was one of the Cinque Ports and was one of the main contributors to the English fleet before a professional navy came into existence. Dover's strategic importance meant that it needed to be heavily defended. Over the centuries the defences surrounding the harbour and port were gradually added to until, by the start of the twentieth century, Dover possessed some of the most comprehensive defences of any town in Britain. The coming of aerial warfare unfortunately negated many of these defences. In the First World War the Dover Patrol had been extremely effective in conjunction with their French counterparts in securing the Channel from German raiders. The effect of air power on this campaign had been negligible, but allied aircraft had proved useful in the observation role. The Second World War would see these roles changed somewhat as now aircraft were not just an adjunct to naval power but could undertake direct attacks themselves. The evacuation from Dunkirk had seen the Royal Navy triumph over the best efforts of the *Luftwaffe* in retrieving over three hundred thousand allied troops from France and bringing them back to Kent. The Royal Navy's losses had been severe and soon all Naval forces would be withdrawn from Dover in the face of the strength of German airpower. Vice-Admiral Ramsey and his successors would remain stationed in Dover. However, no naval vessels larger

⁸⁵⁰ The Channel 4 documentary 'Spitfire Ace: Flying the Battle of Britain' screened in 2004 which trained a selected individual to fly a spitfire. Many of the flight scenes featured chalk cliffs as a back drop; if these were not actually Dover's they certainly would have been seen by the audience as representing them.

⁸⁵¹ M. Connelly *op. cit.* pp 250-1 for his incisive treatment of the surrender at Singapore and the general level of ignorance now shown to what was one of the defining moments of the Second World War.

than Motor Torpedo Boats would be based in Dover until the German artillery in the Pas de Calais area was silenced.

The army's role in Dover was effectively a defensive one. In the year, from June 1940 to June 1941, Britain and its Empire stood against Germany and Italy. Almost daily an invasion force was expected and Dover would undoubtedly have been one of the first targets for the invaders. As such it was vital that the town's defences were as strong as possible. Every effort had to be made to secure the communications between the HQ in Dover Castle and the surrounding units. This was achieved by the vast amount of tunnelling work carried out in Dover and its environs at that time. Underground communications facilities were built for all the major military units in the area and the HQ in Dover has over five miles of tunnels in its various levels. The tunnels in Dover Castle today provide an interesting spectacle for tourists, but many of the other underground communication centres and headquarters in the area now lie forgotten; their entrances are lost under brambles and weeds. These were once an integral part of the military's 'bunker mentality' in the Dover area.

The work on the military tunnels was given priority over the civilian shelters in the town. The lack of official recognition of the need for additional civilian shelter places resulted in many of the struggles between the town's authorities and central government during the war. In the eyes of central government Dover had better provision than virtually any other town in Britain in terms of the number of shelter places per head of population. In the eyes of Dover's council the town was the most attacked in Britain, living daily under the threat of shelling. Extra shelter spaces were nothing less than the townspeople deserved. The fact that casualties in Dover remained low was a major disincentive for central government to invest in any further shelter accommodation; Dover was accused of being too reactionary in its demands for extra shelter accommodation after heavy attacks. As the threat from the *Luftwaffe* receded the idea that a town could possibly need more shelter accommodation began to seem faintly ridiculous. The shelling attacks in the late summer of 1944 showed how justified Dover had been in its continuous pleas for more shelter places.

The V-2 rocket attacks on London in many ways mirrored the shelling attacks on Dover. The payload of the V-2 and the shells were very similar, and neither gave

much advanced warning. The major difference was that the rockets had a range of up to two hundred miles whilst the guns had a range of only forty miles. This meant that the guns were only a threat to east Kent whereas the rockets could easily strike the entire southeast of England and London. There was no question in the minds of the British Government that the V-2 was a weapon to be feared and in August 1943 a huge raid, comprising the entire strength of Bomber Command, was launched on the German's experimental rocket test site at Peenemünde on the Baltic. The cross channel guns on the other hand only threatened a small area of the country and did not endanger any major industries or military operations. Their destruction was not a priority. No raids in such strength were launched against the German gun sites around Calais. In the greater scheme of things the suffering caused by the German guns was not sufficient to divert resources from other targets.

The actions of the town's authorities and the writings in the local press helped to shape the perceptions of the townspeople with regard to the conduct of the war in relation to Dover. The people of Dover were presented not merely with the spectre of Nazi aggression but with the fact that their country's own government seemed determined to prevent the town from acquiring the ARP provision which the town felt to be necessary. When this was put alongside what the people experienced in the bombing and shelling attacks it became difficult to refute these arguments. This had also been the case in the First World War but in the Second World War the fact that Dover's experience was held to be unique amongst Britain's towns was seen to be reason enough to invest in its ARP. The more that the town's authorities struggled to turn this into a reality and the more that *The Dover Express* criticised the BBC and other newspapers the greater became the sense of a 'bunker mentality' within the town. There was a palpable sense of injustice that Dover was not been given fair treatment, and that its sacrifices were not being appreciated. This was not unique; other towns felt in the aftermath of raids that they had suffered unnecessarily. To the people of Dover this feeling was amplified as the raids on the town only ceased with the capture of the cross-Channel guns in late September 1944.

The relations between the town's council and central government also exemplified how even in the Second World War it was possible for a locality to pursue policies related to local as opposed to national strategic need. The arguments over the funding

of Dover's extra shelter places provide a good example of this. Central government could refuse to fund these but it was unable to stop Dover from beginning schemes which the town alone could not fund. The fact that such debate was ongoing during the war, and that it was not confined to the 'corridors of power', illustrated that despite the limitations on people's lives expressed within the Defence of the Realm Act it was still possible for local issues to be raised. Dover's battle with bureaucracy on this issue began in 1937 and only ended with the silencing of the cross-Channel guns in September 1944. Neither side achieved a total victory in this war of attrition but given the size of Dover's population and the number of shelter places available it would seem that the town was closer to achieving what it sought. Equally the intense pressure placed on the inhabitants of Dover did not cause an acute back-lash against authority nor was there much questioning of Britain's place in the wars. There might be concerns raised over local issues but the fact that Britain was in the right and that their society was worth fighting for was not disputed. The sacrifices made victory all the more necessary to justify them. Victory in the First World War saw a continuation in the style and nature of government in keeping with that of pre-war Edwardian society. Victory in the Second represented a change, but this was a change in emphasis for society's priorities rather than a revolution. The example of Dover therefore exhibits a remarkable degree of support for McKibbin's model of social and political stability. In both 1918 and 1945 the town council continued virtually unchanged in its make-up. In the election following the First World War the Conservative candidate successfully defended the seat. In 1945 the M.P. did change with the Conservatives losing the seat for the first time since the First World War. The result in 1945 did not represent any dissension from how the war had been fought but rather dissension from how Dover had had to fight its war and what might be expected from the peace..

Neither the First nor the Second World War brought about a vast degree of social change within Dover. There was no general restructuring of how people lived their lives. Dover's experience of 'total war' did not lead to a recasting of society within the town. The re-emergence of the town's cross- Channel trade after each of the wars gave the town a basis on which its economy is still built at the start of the twenty-first century. The case of Dover would therefore support the arguments made by Smith and Calder that the war did not change society in a revolutionary manner.

The case of Dover also empathises that not everyone in society experienced 'total war' to the same degree, money made a difference. The richest groups could afford to leave the area during the bombing in 1917; the poorest groups had to call their children back from the evacuation areas in 1942 as they could not afford to live separately.⁸⁵² Those who could afford to do so could choose to move to a 'safer' area, those who were not so affluent could not. There were also examples of racial intolerance and intolerance to outsiders. In September 1939 anti-Jewish bills were posted in a neighbouring village.⁸⁵³ The sojourn of journalists, many of them from abroad, was not an undoubted success in 1940. Their extra spending power and their call on scarce resources were all elements for complaint.⁸⁵⁴ As Smith argues different groups experienced the war in different ways and this was true within Dover as it was elsewhere.⁸⁵⁵ The Second War did not bring a commonality of experience to all the people of Dover. However, the nature and the number of the attacks on the town did bring the war sharply into focus for those who lived there.

The thirty years between 1914 and 1944 were some of the most traumatic and formative in the documented two thousand year history of settlement on the site of Dover. It had the dubious honour of being the first town in Britain to be attacked from the air and then the first town to be shelled from Europe. These facts alone placed huge strains on the community and during the Second World War many people chose to leave the town rather than stay. For those who remained bombing and shelling attacks became part of daily life. The destruction of homes and many of the town's finest buildings became the subject of a grim humour rather than despair. The town's worst experiences came after 6 June 1944 at the point when many people felt that the war was almost won. Once Allied troops were able to defeat the German forces in Normandy there seemed to be nothing standing in their way. Paris was liberated on 25 August and Brussels on 8 September 1944. Dover would have to wait a further three weeks before it had news of its own liberation from the German artillery.

The town of Dover suffered much physical damage. Two hundred and thirteen of the townspeople lost their lives and several hundreds of others were injured in their

⁸⁵² See above p.85 & p.200 respectively

⁸⁵³ See above p.141

⁸⁵⁴ See above pp.154-5

⁸⁵⁵ H.L. Smith, *Britain in the Second World War* p.3

town during the two world wars.⁸⁵⁶ Dover which, for centuries, had stood seemingly unassailable on the Kent coast had been battered by enemy fire and this had led to a remarkable strain being put on everyone living there. In the face of this the community did not fragment. Constancy remained in the lives of people, a constancy that amazed visitors and servicemen and women home on leave alike. The efforts of the town council in securing shelter places in the town's caves had saved many lives and given the townspeople a sense of security, in the face of intense danger. This was not possible in many other towns. Dover therefore had natural advantages which it used to their fullest potential. The desire for additional shelter spaces was seen in some quarters as being cowardly and unpatriotic. In 1945 the electorate of Dover gave their verdict on how they had been treated by central government. The Conservative Party saw an 11,000 strong majority turned into a 1,682 vote defeat. Constancy had been part of survival during the war; in victory Dover had made it clear that it wanted change. The Labour Party promised change and social reform, this is also what the electorate of Dover also wanted.

In the final reckoning Dover may have been the most attacked place in Britain but it did not suffer catastrophic levels of casualties and its most outstanding historical buildings remained by and large intact. This is however said with the benefit of hindsight as it was only with the cessation of shelling in late September 1944 that the danger that the town would be totally destroyed receded. For four years the very real danger existed in the minds of the townspeople that they could at any moment come under attack from a devastating bombardment. As it was even the final attacks in 1944 did not achieve this. The important fact was that this could happen; this was why the townspeople felt it so vital to protect its interests and thus the 'bunker mentality' grew both figuratively and literally. Figes' comments on the reaction of a crowd to being fired upon do not quite hold in this situation. He holds that people in a crowd are often more timid before having been fired upon and will react more aggressively after the firing has started. Before the firing begins no-one knows what to expect but by surviving the first attack and seeing likeminded people around them, the confidence to fight back grows. The people of Dover in contrast to such crowds could not see their assailants and could not fight back directly. They also did not know if the attacks

⁸⁵⁶ Fourteen civilians were killed in the First World War and one hundred and ninety-nine in the Second World War. From R. Humphreys, *Dover at War* p.232

being made upon them were the worst which they could expect or merely a foretaste of worse to come.⁸⁵⁷ As such the attacks on the town produced fears about future attacks especially as there was no way to fight back.

Dover in both World Wars was faced with the unfamiliar; it was only natural that the townspeople turned inwards for mutual help. In doing so they found a local consensus that did not necessarily sit well with national opinions. The attacks of the First World War may have been minor in comparison to those of the Second World War but in contrast to the later attacks, those of the First World War came with little or no warning and as such they produced a great deal of panic and fear. Similarly in the Second World War the shelling attacks were unexpected. Both types of attack seemed at first to be indefensible and both produced extreme reactions from the people of Dover. The scale of destruction was much greater in the Second World War but the reactions to the start of the attacks in both wars produced what I have termed Dover's 'bunker mentality'. This mentality was one in which a town turned into itself for support and solutions. Central government had not provided sufficient resources to provide deep shelter places for everyone nor had it provided effective alternatives for the townspeople. There was not so much a sense of overwhelming national unity but rather a sense that Dover and its people were part of a much larger experience, an experience over which the townspeople had no control. They could only manage the situation within their homes and town as well as they could. Air raids in other parts of the country evoked sentiments of sympathy in the local newspaper and in council meetings but the possibility that it would be Dover's turn again always remained. In this context of continual attacks it was an imperative to put themselves and their town first; to all that could be done to solve Dover's problems. The people of Dover could not solve those of other towns and cities.

Dover and the White Cliffs have played important roles in English history for over 2000 years. Matthew Paris and his terming of Dover as the key to England began the sequence of myths surrounding the town. These myths grew inexorably during the Second World War. Dover became inextricably linked with 1940 and Britain's lone defiance in the face of Nazi dominance of Europe. For the people of Dover there was

⁸⁵⁷ See above p.122

much more to their experience of the Second World War than 1940 but it is with this year that Dover is associated. The evacuation from Dunkirk and the Battle of Britain are now projected as defining moments in Britain's history. After 1940 the decisive events of the war shifted away from the English Channel to the Middle East, South East Asia and Eastern Europe. The happenings of one provincial English town could not compete with the wider events of the war and despite the fact that Dover suffered more in 1944 than in 1940 the shelling experienced in that latter year is all but forgotten. The Blitz in late 1940 saw the attention of the nation shift to the capital and the large provincial cities. The myth of the Blitz is centred on the experience of London: people sheltering in the tube, St Paul's Cathedral being saved, bombs falling on Buckingham Palace. There is no place in this for Dover and undoubtedly as the myth surrounding London grew the sense of injustice at being left out grew.⁸⁵⁸ This sense of being ignored and having suffered an injustice became another of the strands of Dover's 'bunker mentality'.

Outside of east Kent nowhere else in the country felt the same immediacy of the German raids. If a German aircraft managed to evade the radar coverage there was scarcely time for the anti-aircraft guns to open fire and no hope of them being intercepted by the RAF. Air raid warnings in east Kent would often be little in advance of the attackers and quite often the German planes would be overhead before the warning sounded. In such circumstances it was natural that the town council would take all the steps that it could to protect its people. As there was no way for them to destroy the German bases and batteries in France all that could be done was to improve Dover's passive defences as best they could. The deep shelter spaces were derided in some quarters as eroding moral fibre. They were to be essential in encouraging the town's confidence, in survival and ultimately victory, as without them there was nowhere that the people could feel safe. Safe in the knowledge that if conditions got worse there were always the 'caves', the people of Dover got on with their lives. Not everyone in the town used them regularly and many people never had cause to use them but the 'caves' were there and could be used. Dover had developed a 'bunker mentality' in the sense that its people had recognised the importance of their shelters and this had seen them through the 'dark days'.

⁸⁵⁸ See above p.218

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Gene-Environment Interactions and the Functional Analysis of Challenging Behaviour
in Children with Intellectual and Developmental Disabilities

Paul D. Langthorne

PhD in Clinical Psychology

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*This thesis is dedicated to the memory of DB who taught me why all of this matters so
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Abstract

Challenging behaviour displayed by people with intellectual and developmental disabilities represents a socially significant problem that severely restricts the quality of life of those who display such behaviours and their families. To date the study and conceptualisation of such behaviours has been characterised by genetic and environmental determinism. It seems likely that gene-environment interactions (GxE) may play a critical role in challenging behaviour displayed by some people with intellectual and developmental disabilities. The current thesis provides a conceptual and empirical examination of GxE as applied to challenging behaviour. The two empirical studies presented in the current thesis aimed to examine the hypothesis that genetic events may function as a type of motivating operation for challenging behaviour. In study one, parents of children with FXS, SMS and of a mixed etiology group of children with intellectual and developmental disabilities were interviewed about the function served by their child's challenging behaviour using the *Questions About Behavioral Function* (QABF; Matson & Vollmer, 1995) scale. Both within- and between-group differences were found. Children with FXS were less likely to display attention-maintained challenging behaviours; children with SMS were more likely to display pain-related challenging behaviours. In study two, experimental functional analysis methods were used to examine this question in a group of eight children with FXS and six children with SMS. No child with FXS displayed an attention-maintained response class of challenging behaviour. In contrast four children with SMS displayed a response class of challenging behaviour that was at least in part attention-maintained. The findings are discussed in light of the research literature on challenging behaviour in FXS and SMS. The findings are related to GxE and it is suggested that a developmental systems model, consistent with the principles of radical behaviourism, may help to move the field beyond the limitations of genetic and environmental determinism.

Chapter I. Challenging Behaviour. Epidemiology, Impact and
Explanatory Models

“Selection is not a metaphor, model, or concept; it is a fact. Arrange a particular kind of consequence, and behaviour changes. Introduce new consequences, and new behaviour will appear and survive or disappear.”

Skinner (1984, p. 503)

Chapter Overview

In the current chapter, challenging behaviour displayed by some people with intellectual and developmental disabilities is established as a socially significant behaviour. Such behaviours are relatively prevalent in this population and, in the absence of effective intervention, appear to be characterised by their chronicity. Challenging behaviour has a pervasive negative impact on the quality of life of both those who display it and others who share their environment. Given the negative consequences of challenging behaviour across the lifespan, it is argued that further research is required to further current understanding of the factors involved in the evocation and maintenance of such behaviour.

A number of psychological models have been used to account for challenging behaviour in people with intellectual and developmental disabilities. Particular emphasis is given to applied behaviour analysis and the behavioural phenotypic approach. The relative contributions of each approach are discussed. Functional analysis is the hallmark of the applied behaviour analytic approach to challenging behaviour and assumes that such behaviours are influenced by their environmental antecedents and consequences. The behavioural phenotype approach has been characterised by the identification of associations between particular genetic syndromes, such as fragile X syndrome and Smith-Magenis syndrome, and various topographies of challenging behaviour. It is argued that each of these two approaches have, with few exceptions, developed in isolation of the other, resulting in an apparent dichotomy between 'nature' and 'nurture' in the study of challenging behaviour.

The developmental systems model, which is drawn on throughout the current thesis, is introduced as a means of bridging this divide. An overview of the remainder of the thesis is provided.

Challenging behaviour, as displayed by some people with intellectual and developmental disabilities, exerts a serious impact; both on the lives of those who display it and on those individuals who share their environment. The physical and social impact of such behaviours demands a systematic response that renders challenging behaviour *inefficient, ineffective and irrelevant* (Horner & Day, 1991). To this end the current thesis aims to further explore the interaction between environmental and genetic factors in the development and subsequent maintenance of challenging behaviour.

In this chapter challenging behaviour is defined as a socially significant problem. Explanatory models that have been used to account for why some people with intellectual and developmental disabilities display challenging behaviour are discussed and particular emphasis is given to applied behaviour analysis, as well as the behavioural phenotype approach. Finally the aims of the current thesis are discussed and justification provided for each subsequent chapter.

Challenging Behaviour. Definitions, Epidemiology and Impact.

As this work is being conducted within a field awash with labels terms that are used throughout are now defined.

Definitions

Intellectual and developmental disability.

The term intellectual and developmental disability is used in preference to other labels, such as mental retardation or learning disability, as it avoids confusion with terms that have acquired disparaging connotations or those that have different meanings in different countries (Emerson, 2001). Intellectual and developmental disability is best understood in terms of functional impairments that result from historic organism-environment interactions (Bijou, 1966). The American Association on Intellectual and

Developmental Disability provide the following definition of intellectual and developmental disability:

A disability characterized by significant limitations both in intellectual functioning and in adaptive behavior as expressed in conceptual, social, and practical adaptive skills. This disability originates before the age of 18.

(Luckasson et al., 2002, p. 3)

Challenging behaviour.

Terms such as ‘abnormal’ and ‘problematic’ are often applied to behaviours displayed by individuals with intellectual and developmental disabilities. Such terms imply that the problem lies within the person. The term challenging behaviour was originally adopted in North America by The Association for Severe Handicaps (TASH) to place an emphasis on the environmental determinants of such behaviours, shifting the focus away from the individual as the locus of the problem. Indeed the term suggests that, “*if services could rise to the challenge then they would cease to be challenges*” (Blunden & Allen, 1987, p. 14).

Emerson (1995) provides a definition of challenging behaviour, which emphasises the inter-play between the topography and consequences of the behaviour as well as the social context in which it occurs:

culturally abnormal behaviour(s) of such an intensity, frequency or duration that the physical safety of the person or others is likely to be placed in serious jeopardy, or behaviour which is likely to seriously limit use of, or result in the person being denied access to ordinary facilities (p. 3).

Challenging behaviour is a label that has been applied to a wide range of behaviours, all of which may vary in their form, frequency, severity and aetiology. It may include aggression, property destruction, self-injurious behaviour, stereotypy, pica, non-compliance, screaming, and sexualised behaviour. Those behaviours that occur

frequently and/or result in serious environmental disruption, such as aggression, are especially likely to be defined as challenging (Lowe & Felce, 1995).

Challenging behaviour is socially defined and whether a behaviour is labelled challenging is dependent on the context in which that behaviour occurs (Hastings & Remington, 1994a, 1994b; Wolfensberger, 1972). The capacity of a service to prevent, detect, support and manage challenging behaviour will also influence the extent to which that behaviour is regarded 'challenging' (Mansell, McGill, & Emerson, 1994; Quereshi, 1994). In addition, the application of such a label, may also be reinforced by some of the consequences that follow its use, such as access to services or funding (McGill, Clare, & Murphy, 1996).

Epidemiology of Challenging Behaviour

Estimates of both the incidence and the prevalence of challenging behaviour have varied, due in part to the difficulty in reaching a consensus over definition. There has been considerable variability between epidemiological studies with regards to the forms of behaviour studied, the size and characteristics of samples and the data collection methods employed (Rojahn & Esbensen, 2002).

A small number of studies have examined the overall prevalence of challenging behaviour within the total population of a given geographical area. Such studies suggest that between 5 - 19% of people with intellectual and developmental disabilities display challenging behaviour (Borthwick-Duffy, 1994; Emerson & Bromley, 1995; Emerson et al., 2001; Joyce, Ditchfield, & Harris, 2001; Kiernan & Quereshi, 1993; Lowe et al., 2007; Quereshi & Alborz, 1992). For example, Lowe and colleagues (2007) report that some 10% of individuals with an intellectual disability in an area of Wales displayed challenging behaviours rated as serious.

More commonly, studies have restricted sampling to specific sub-populations such as children attending special schools (Kiernan & Kiernan, 1994) or have examined

the prevalence of specific topographies or classes of behaviour, such as self-injurious behaviour (Cooper, Smiley, Allan et al., 2009; Maurice & Trudel, 1982; Oliver, Murphy, & Corbett, 1987; Schroeder, Schroeder, Smith, & Dalldorf, 1978) and aggression (Cooper, Smiley, Jackson et al., 2009; Harris & Russell, 1989).

There has been a paucity of research to address the incidence of challenging behaviour. Two recent studies by Cooper and colleagues reported on the incidence of aggression and self-injury in an area of Scotland and reported a two year incidence of 1.8% and .6% respectively (Cooper, Smiley, Allan et al., 2009; Cooper, Smiley, Jackson et al., 2009). Although, findings on this have been somewhat equivocal (Schroeder et al., 1978), it does appear that once established in an individual's repertoire and in the absence of effective intervention, challenging behaviour may be characterised by its chronicity (Green, O'Reilly, Itchonen, & Sigafos, 2005; Murphy et al., 2005).

Impact of Challenging Behaviour

Challenging behaviour can be damaging to the physical and psychological well-being of the individual and those around them. For example, repeated self-injury may lead to the development of calcified haematomas, sensory loss, brain-damage and may increase the risk of mortality (Nissen & Haveman, 1997). Although this relationship is bi-directional, challenging behaviour is a major cause of stress and anxiety for care staff and the family (Hastings, 2002a, 2002b; Jenkins, Rose, & Lovell, 1997). Environmental restriction and abusive practices are unfortunately a relatively common response to those whose behaviour challenges services (Rusch, Hall, & Griffin, 1986; Saloviita, 2002).

Many 'treatments' for challenging behaviour can exert a deleterious impact on the quality of life of individuals who display such behaviours. A number of studies have demonstrated that the use of typical anti-psychotic medication represents the most prevalent treatment for people who display challenging behaviour (e.g., Robertson,

Emerson, Pinkney, Caesar et al., 2005). Not only are such drugs associated with a range of negative side-effects but they are often ineffective in treating challenging behaviour (e.g., Tyrer et al., 2008)¹. Physical interventions appear to be over-used as a response to challenging behaviour, particularly in specialist services for people with intellectual and developmental disabilities who display challenging behaviour (Robertson, Emerson, Pinkney, Caesar et al., 2005). Such physical interventions are associated with pain and distress (Hawkins, Allen, & Jenkins, 2005; Sequeira & Halstead, 2001). Finally, many people with intellectual and developmental disabilities are denied access to evidence-based interventions for challenging behaviour, such as applied behaviour analysis (Emerson et al., 2000; Robertson et al., 2000). When behavioural interventions have been applied there has been a historical tendency for them to be aversive in nature (Scotti, Evans, Meyer, & Walker, 1991).

The social consequences of challenging behaviour can be as debilitating as the sometimes more apparent physical consequences. People with intellectual and developmental disabilities and challenging behaviour are likely to be offered limited opportunities to make choices (Robertson, Emerson, Hatton et al., 2001; Shaddock et al., 1993), have small and restricted social networks (Robertson, Emerson, Gregory et al., 2001), have limited access to community amenities and facilities (Hill & Bruininks, 1984) and tend not to be included in the community (Robertson, Emerson, Pinkney, Caesar et al., 2005). Such individuals are also likely to spend large amounts of time disengaged, receiving minimal contact from care staff (Felce, Lowe, & Blackman, 1995; Mansell, 1995). In addition, people with intellectual and developmental disability who

¹ The authors of a Cochrane review into the use of neuroleptic medication for the management of challenging behaviour concluded that: "*It is debatable whether the use of antipsychotic medication for certain people with intellectual disabilities and challenging behaviour is ethical outside of a randomised controlled trial.*" (Brylewski & Duggan, 1999, p. 369).

display challenging behaviour are often at a heightened risk of placement breakdown (Allen, 1999; Mansell et al., 1994).

Together, these findings demonstrate that challenging behaviour is a socially significant problem, one that exerts a pervasive and enduring negative influence upon the individual's quality of life. Despite the array of negative consequences, challenging behaviour remains characterised by both its prevalence and by its chronicity. An important task for researchers and clinicians alike is to account for this apparent paradox.

Understanding Challenging Behaviour: Explanatory Models

Various approaches have attempted to explain the development and maintenance of challenging behaviour. Typically such approaches have reflected the wider divisions that lie within psychology as a science and as such have been relatively incompatible (Lee, 1992). There have, however, been some attempts to provide an integrated model of challenging behaviour by incorporating variables at the biological, cognitive, environmental and wider social level (see Gardner, Cole, Davidson, & Karan, 1986; Murphy, 1997)². Given that such frameworks have been the exception rather than the rule, however, the following discussion is placed in the context of the radical behavioural critique of 'mentalistic' approaches to challenging behaviour.

Mentalistic Approaches to Challenging Behaviour

The dominant approach to psychology assumes that a person's behaviour is the result of the workings of internal structures, such as cognitions or beliefs, which enable

² The integration of cognitive variables is also possible within the developmental systems model. Whilst not of primary concern in the current thesis, the concept of the '*cognitive endophenotype*' has received considerable attention in recent years and it has been proposed that certain genetic syndromes may have a characteristic cognitive style (Woodcock, Oliver, & Humphreys, in press). See chapter six for further discussion of this issue.

the individual to represent and interpret their external world (e.g., Tolman, 1932). Environment is usually viewed as important only in the extent that it leads to the development of those structures that lie within the individual, which ultimately 'cause' behaviour (Chiesa, 1992; Lee, 1992).

Such models have been used by some to account for challenging behaviour displayed by people with intellectual and developmental disabilities. For example challenging behaviour has been described as an attempt to alleviate guilt (Cain, 1961), as a response to the uncomfortable physical sensation of thinking (Sinason, 1993) and as a means of defending the 'self' from a perceived threat (Jahoda, Trower, Pert, & Finn, 2001). Recent approaches to the treatment of aggression in people with intellectual and developmental disability have emphasised the role of emotional variables, such as anger, and intervention has focused on modifying the 'cognitive scripts' thought to play an important role in such behaviours (Novaco & Taylor, 2008; Taylor, Novaco, Gillmer, & Thorne, 2002).

One of the strongest challenges to such 'mentalistic' accounts comes from radical behaviourism (Skinner, 1953). According to radical behaviourism, mentalistic interpretations are based on a Cartesian division of the individual, in which the body and the mind are held as two separate entities. Skinner argued that such explanations are tautological, in that causality is inferred by reference to the impact of the inferred construct, such as a belief or cognition, on behaviour; which is then taken as evidence for the very existence of the same construct³. As Skinner states:

³ This point was eloquently made by Woodworth (1921) who stated: "*Instead of 'memory', we should say 'remembering'; instead of 'thought' we should say 'thinking'; instead of 'sensation' we should say 'seeing, hearing', etc. But, like other branches, psychology is prone to transform its verbs into nouns. Then what happens. We forget that our nouns are merely substitutes for verbs, and go hunting for the things denoted by the nouns; but there are no such things, there are only the activities that we started with.*" (p.5-6).

The practice confuses the order of events and leads to unfinished causal accounts (Skinner, 1963, p. 278).

Radical behaviourism argues that mentalistic accounts of behaviour are unnecessary as a more parsimonious and complete explanation can be provided without reference to hypothetical variables that lie in the gap between stimulus and response (Skinner, 1953). Mentalistic accounts have also been critiqued on pragmatic grounds (Baum, 1994). If such variables were shown to be capable of predicting and influencing behaviour then they would warrant further analysis (R. Hawkins, 1992; Skinner, 1974). However, there is a lack of data to support the view that behavioural change can be brought about solely by the manipulation of cognitions or other such variables (Sturmeay, 2006).

Applied Behaviour Analysis

Radical Behaviourism

Radical behaviourism is the philosophy that underpins the experimental and applied analysis of behaviour. Methodologically, Skinner established a means of conducting an experimental analysis of behaviour, characterised by the direct observation of changes in the response rate of a single organism over time, within well-specified experimental conditions (Kazdin, 1978). Conceptually, Skinner argued all human behaviour is orderly, developing and altering according to basic universal principles. Radical behaviourism abandons the Cartesian division of man, in favour of a holistic approach, in which the person is seen as an indivisible whole, dynamically interacting with his or her environment (Chiesa, 1992).

Radical behaviourism provides a 'relational' account of human behaviour in that it emphasises the identification and manipulation of functional relationships between behaviour and its environmental determinants. The scientific aim of radical behaviourism lies in the prediction and influence of behaviour (Craighead, 1981; Hayes, Hayes, & Reese, 1988). Therefore the description and explanation of complex patterns of behaviour is achieved by relating identifiable environmental events to behavioural principles whilst avoiding recourse to unobservable and inferred constructs.

Radical behaviourism argues that all forms of behaviour evolve through a history of interaction between the individual and their environment (Baer, Wolf, & Risley, 1968; Bijou & Baer, 1961). Contingencies between behaviour and its consequences and associated antecedents serve both to evoke and maintain such operant behaviour (Skinner, 1953).

Applied Behaviour Analysis

As general principles of behaviour, inductively developed through laboratory experimentation with animals, began to be applied to human behaviour (e.g., Fuller, 1949), there became a need for the development of an appropriate forum for such research, which ultimately led to the publication of the *Journal of Applied Behavior Analysis* in 1968. In their seminal paper Baer, Wolf and Risley (1968) established the cornerstone principles of applied behaviour analysis⁴:

1) Applied. Socially significant behaviours or events should be the primary focus of research.

2) Behavioural. Changes in behaviour are to be the primary dependent variable.

⁴ Baer, Wolf & Risley (1968) described applied behaviour analysis as: "*the process of applying sometimes tentative principles of behavior to the improvement of specific behaviors, and simultaneously evaluating whether or not any changes noted are indeed attributable to the process of application- and if so, to what parts of that process. In short, analytic behavioral application is a self-examining, self-evaluating, discovery-orientated research procedure for studying behavior.*" (p.91).

- 3) Analytic. Studies should provide a 'believable demonstration' that behaviour is related to environmental events.
- 4) Technological. The techniques adopted to change behaviour should be operationalised.
- 5) Conceptually systematic. Procedures and their effects should be related to behavioural principles.
- 6) Effective. Should lead to changes in socially significant behaviour.
- 7) Generalisable. Should generalise over time, individuals and settings.

Functional Analysis

According to the applied behaviour analytic approach, therefore, challenging behaviour, like all behaviour, is a functional and adaptive response to contingencies that prevail in the individual's historic and immediate environment. Early behavioural approaches to challenging behaviour, however, were characterised by the application of powerful contingencies of reinforcement and punishment which aimed to override the contingencies responsible for the maintenance of such behaviours (Mace, 1994). This approach was commonly termed behaviour modification and involved the application of technology in the absence of any clear value-base (Emerson & McGill, 1989).

Punishment-based interventions, such as time out and over-correction were consistently applied to eliminate challenging behaviour (Cataldo, 1989). However reinforcement-based techniques such as the differential reinforcement of other behaviour often resulted in mixed outcomes (Carr, Taylor, Carlson, & Robinson, 1989). The ineffective, and in some cases counter-therapeutic, outcomes of such procedures could have been predicted given that they were applied somewhat prescriptively and without due consideration of the contingencies underlying the development and maintenance of behaviour (Iwata, Vollmer, Zarcone, & Rodgers, 1993). Such practice was somewhat removed from the central aims of behaviour analysis (Mace, 1994). Furthermore the reliance on often

dehumanising and coercive procedures such as punishment received considerable criticism and was the subject of great debate within (e.g., LaVigna & Donnellan, 1986; VanHouten et al., 1988) and outside (Guess, Helmstetter, Turnbull, & Knowlton, 1987; McGee, 1987) the behaviour analytic field.

Strategies for effective behaviour change require an understanding of the variables that underpin behaviour (Carr, 1977; Owens & Ashcroft, 1982). Towards this end, functional analysis has become the hallmark of applied behaviour analysis (Hanley, Iwata, & McCord, 2003). A functional analysis involves the identification of the variables that influence behaviour and the relationships that exist between those variables through experimental manipulation. The antecedents and consequences that evoke and maintain challenging behaviour are the focus of functional analysis and their manipulation is central to effective intervention.

The conceptual paper by Carr (1977) represented a watershed in the applied analysis of challenging behaviour. In this paper Carr argued that self-injurious behaviour could be understood in the same way as any other response (i.e., as an operant behaviour) and provided a number of hypotheses regarding the variables involved in the maintenance of such behaviours. This, and early empirical papers (Carr, Newsom, & Binkoff, 1976; Lovaas, Freitag, Gold, & Kassorla, 1965), acted as a stimulus for the development of a comprehensive functional analysis methodology first reported in a seminal study by Iwata et al. (1982/1994).

Using a multi-element design, Iwata et al exposed nine individuals with severe self-injurious behaviour to four conditions, designed to provide an 'analogue' of the relations originally described by Carr (1977). The study aimed to test whether self-injurious behaviour was maintained by either socially-mediated processes (i.e., positive reinforcement, negative reinforcement) or by its automatic consequences. Experimental conditions included *social disapproval*, in which self-injurious behaviour was followed

by the contingent provision of 10-sec of attention; *social demand*, in which a difficult demand was removed for 30 seconds contingent on self-injurious behaviour; *alone*; in which the person was left alone in a room and no consequences were provided for the behaviour; and a control *play* condition in which the person received non-contingent access to toys and attention. Self-injury was shown to vary both between and within subjects, providing direct empirical evidence that self-injurious behaviour was a function of different socially and non-socially mediated sources of reinforcement. Later studies incorporated additional conditions, such as a *tangible* condition (Day, Horner, & O'Neill, 1994) or *social avoidance* condition (Hagopian, Wilson, & Wilder, 2001) to test for additional functions of challenging behaviour.

Functional analysis promoted a return to the foundations of behaviour analysis and has served to improve the link between basic and applied science (Mace, 1994). Not only has this approach allowed unique behaviour-environment relations to be uncovered but it has also encouraged a greater integration with basic behavioural science (Mace, Lalli, Lalli, & Shea, 1993). The recognition that challenging behaviour serves as a functional response has enhanced the social acceptability of assessment and intervention procedures (Donnellan, Mirenda, Messaros, & Fassbender, 1984). Indeed the advent of functional analysis has been associated with the adoption of more precise antecedent and reinforcement-based interventions and an apparent decrease in the use of punishment (Pelios, Morren, Tesch, & Axelrod, 1999).

Contingencies of Reinforcement

Functional analysis has stimulated increasingly refined and complex questions regarding the personal and environmental variables responsible for the maintenance of challenging behaviour (Carr, 1994). Challenging behaviour has consistently been found to be maintained by four general classes of reinforcement. Multiple studies across a number of different behavioural topographies have shown challenging behaviour may

be maintained by socially or non-socially mediated forms of positive reinforcement and negative reinforcement. The following section briefly summarises research to have investigated each class of reinforcement as it relates to challenging behaviour displayed by people with intellectual and developmental disabilities. Although the conceptual utility of the distinction between positive- and negative reinforcement has been questioned (i.e., Baron, 2005; Michael, 1975)⁵, the following discussion shall, for heuristic purposes, preserve the distinction.

Socially mediated positive reinforcement.

Challenging behaviour may be reinforced by the contingent presentation of socially mediated stimuli (Carr, 1977). When such a stimulus change leads to an increase in a given response this is termed positive reinforcement. The contingent provision of social contact has been found to function as a type of positive reinforcement for challenging behaviour. A number of descriptive studies have shown that attention is a relatively common consequence for challenging behaviour in natural settings (e.g., Emerson et al., 1996; McKerchar & Thompson, 2004; Thompson & Iwata, 2001). Descriptive methods are, however, ill suited to capturing functional relationships that exist between behaviour and its consequences (Iwata et al., 1993).

A more 'believable' demonstration of the role of attention has been provided by studies that involve the experimental manipulation of the antecedents and consequences of behaviour. Iwata et al (1982/1994) reported that the differentiated responding of four participants in their study provided direct evidence that self-injurious behaviour was either exclusively or partially maintained by social attention. This finding has been

⁵ Michael (1975) has recommended that the descriptive terms of 'positive' and 'negative' be abandoned, arguing that it is illogical to describe a stimulus change in terms of the application of (positive) or removal of (negative) stimuli; indeed there are many situations in which it may be relatively unclear whether behaviour is reinforced by access to tangibles, such as food, or by the removal of an aversive state, such as hunger.

consistently replicated across a number of topographies of behaviour and forms of attention. An epidemiological review of such studies showed that of 536 individual data sets, 25.3% revealed patterns consistent with attention-maintained behaviour (Hanley et al., 2003). Recent studies have shown that the type of attention provided during such conditions can alter the probability of attention-maintained behaviour, suggesting that individuals vary as to the types of attention that function as reinforcers (e.g., Kodak, Northup, & Kelley, 2007). Even more conclusive have been those studies that have based an intervention on the results of such an analysis (Lovaas et al., 1965; Lovaas & Simmons, 1969; Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993). For example, functional communication training (FCT) involves the differential reinforcement of an alternative, socially acceptable response that forms part of the same response class as challenging behaviour. Such interventions have been shown to be effective in reducing attention-maintained challenging behaviour (e.g., Carr & Durand, 1985; Durand, 1999; Kurtz et al., 2003).

Although easily confounded with social attention, challenging behaviour may also be positively reinforced by the contingent provision of preferred tangible activities or items (Moore, Mueller, Dubard, Roberts, & Sterling-Turner, 2002). Descriptive studies suggest that the provision of such tangibles may be a relatively common consequence for challenging behaviour in natural settings (McKerchar & Thompson, 2004; Thompson & Iwata, 2001). Experimental analyses have shown challenging behaviour may be maintained by the provision of tangibles (Day, Rea, Scussler, Larsen, & Johnson, 1988). Approximately 10.1% of functional analyses are consistent with positive reinforcement via the provision of tangibles (Hanley et al., 2003). Finally, a number of studies have shown that interventions, such as FCT, that involve the differential reinforcement of behaviours in the same response class as challenging

behaviour can be effective in reducing tangible-maintained challenging behaviour (Day et al., 1988; Durand, 1999; Durand & Kishi, 1987; Hagopian et al., 2001).

Non-socially mediated positive reinforcement.

Some behaviours are positively reinforced by their automatic consequences. Unlike socially mediated stimuli, such types of reinforcement are not typically open to direct observation or manipulation and their presence must therefore be inferred (Hanley et al., 2003). In a functional analysis automatic positive reinforcement is inferred by the occurrence of behaviour in the absence of social stimuli or by heightened levels of responding across all social and non-social conditions (Iwata et al., 1982/1994). Epidemiological reviews of functional analyses reveal that between 15%-21% of individuals show patterns of responding consistent with an automatic reinforcement hypothesis (Derby et al., 1992; Hanley et al., 2003; Iwata et al., 1994). More detailed analyses have added informal components to further elaborate existing hypotheses and to rule out alternative explanations regarding the source of automatic reinforcement (Goh et al., 1995; Kennedy & Souza, 1995; Piazza et al., 1998; Piazza, Hanley, & Fisher, 1996). Interventions that interrupt the contingency between behaviour and its automatic consequences, such as response blocking, and those that involve providing 'matched' forms of stimulation provide greater evidence in support of the automatic reinforcement hypothesis (e.g., Kennedy & Souza, 1995; Rapp, Miltenberger, Galenky, Ellington, & Long, 1999).

Socially-mediated negative reinforcement.

In some instances challenging behaviour may be negatively reinforced by the removal or attenuation of socially-mediated aversive stimuli (Carr, 1977). Behaviour may be a function of negative reinforcement when the response is followed by a) the complete avoidance of aversive stimuli, b) a delay in the presentation of aversive stimuli,

c) the attenuation of the strength of aversive stimuli or d) the alleviation of an aversive condition (Skinner, 1969).

A number of descriptive studies (e.g., Edelson, Taubman, & Lovaas, 1983; Emerson et al., 1996) suggest that socially mediated negative reinforcement may be a relatively common consequence for challenging behaviour.

Studies that involve functional analysis methodology have demonstrated that challenging behaviour may increase when difficult tasks are presented and when escape from task-related demands is provided contingently (e.g., Carr, Newsom, & Binkoff, 1980; Mace & West, 1986). This finding has been replicated across a range of behavioural topographies. Hanley et al. (2003) found that 34.2% of functional analyses showed patterns consistent with a negative reinforcement hypothesis. Challenging behaviours may also be negatively reinforced by variables other than escape from demands, such as the removal of social attention (Hagopian et al., 2001) or social proximity (Oliver, Oxener, Hearn, & Hall, 2001). Interventions that have manipulated the contingency between challenging behaviour and escape (Richman, Wacker, Asmus, & Casey, 1998; Zarcone, Iwata, Vollmer, Smith, & Mazaleski, 1993) and those that have involved the differential reinforcement of socially acceptable behaviours within the same response class as negatively reinforced challenging behaviours (Day et al., 1994; Durand, 1999; Hagopian et al., 2001) have provided further evidence that challenging behaviour may be maintained by a process of negative reinforcement.

Non-socially-mediated negative reinforcement.

Challenging behaviour may also be negatively reinforced by its automatic consequences (Carr, 1977). For example it has been hypothesised that in some cases self-injurious behaviour may be maintained by negative reinforcement, via the relief or attenuation of aversive stimulation, such as pain (Carr, 1977; Lovaas, Newsom, & Hickman, 1987). In such cases, challenging behaviour may serve to automatically

decrease levels of aversive stimulation (DeLissovoy, 1963). Evidence for the existence of such relations in relation to challenging behaviour is scarce. However, there is some evidence to suggest that self-restraint may for some individuals be maintained by the removal of the painful consequences associated with self-injury (Fisher, Grace, & Murphy, 1996; Silverman, Watanabe, Marshall, & Baer, 1984).

Summary

In sum, challenging behaviour has been hypothesised by some to be the external manifestation of internal psychological pathology (e.g., as in psychodynamic and cognitive formulations). Applied behaviour analysis represents an empirical, relational approach to the study of human behaviour and explicitly attends to the environmental determinants of such behaviour. A plethora of evidence exists to suggest that challenging behaviour serves as a functional and adaptive response for the individual. As Durand (1990) states:

Behavior problems...are reasonable behavioral adaptations necessitated by the abilities of our students and the limitations of their environments (p. 6).

Functional analysis provides a model to guide not only the identification of the factors that influence challenging behaviour but also the relations between such factors. Treatment decisions that are based on a functional analysis are likely to be more effective, constructional and thereby socially valid, than those based on alternative rationales.

The Behavioural Phenotype

Crick and Watson's discovery of DNA in 1953 and the subsequent mapping of the human genome transformed the status of genes from the hypothetical to the directly observable. This development has had a dramatic influence on the field of intellectual and developmental disabilities and has ushered in a new wave of research based on the

study of the 'behavioural phenotype'. Certain genetic syndromes associated with intellectual and developmental disability are characterised by the heightened prevalence of challenging behaviour. This suggests that genetic factors may play a role in the causation of challenging behaviour.

The Concept of the Behavioural Phenotype

The term behavioural phenotype refers to a broad array of developmental and behavioural characteristics associated with different genetic syndromes. Most pertinent to the current discussion is the observed association between behavioural problems and particular genetic syndromes. William Nyhan (1972) was the first to apply the term 'behavioural phenotype' to describe the self-mutilative behaviours characteristic of individuals with Lesch-Nyhan syndrome. However, the term also refers to motor, social, linguistic and cognitive abilities observed in individuals with biologically determined syndromes associated with intellectual and developmental disability.

A considerable amount of disagreement exists regarding the use of the term behavioural phenotype and much of this disagreement surrounds the specificity of the relationship between the genetic disorder and behaviour. Some have argued that the gene-behaviour relationship should be totally-specific (i.e., *unique* to the syndrome and *universal* to all people diagnosed with that syndrome) before being termed a behavioural phenotype (Berrini & Kahn, 1987; Flint & Yule, 1996)⁶. Others, such as Dykens (1995), have adopted a more probabilistic definition of the behavioural phenotype:

⁶ Berrini and Kahn (1987) define a phenotype as being the "observable or measurable expression of a gene or genes". Likewise, Flint and Yule (1996) argue that: "A behavioural phenotype should consist of a distinctive behaviour that occurs in almost every case of a genetic or chromosomal disorder, and rarely (if at all) in other conditions" (Flint & Yule, 1996, p. 69).

A phenotype may best be described as the heightened probability or likelihood that people with a given syndrome will exhibit certain behavioural and developmental sequelae relative to those without the syndrome (Dykens, 1995, p. 523)

Whilst Hodapp and Dykens (2001) have noted that both environmental and genetic factors contribute to within-syndrome variability (and presumably consistency); there remains a degree of ambiguity regarding the extent to which such behaviours are considered genetically determined.

Evidence for the behavioural phenotypes associated with fragile X syndrome and Smith-Magenis syndrome is now reviewed to provide an example of the behavioural phenotype approach to challenging behaviour. Both these syndromes are the focus of the empirical work in this thesis.

Fragile X Syndrome and the Behavioural Phenotype

Fragile X syndrome (FXS) is the most common inherited cause of intellectual and developmental disability, with an estimated prevalence of 1 in 4,000 in males and 1 in 8,000 in females (Crawford et al., 1999; Turner, Webb, Wake, & Robinson, 1996). The genetic locus of FXS lies in a single gene on the X chromosome, known as the Fragile X Mental Retardation 1 (*FMR1*) gene located at Xq27.3 (Verkerk et al., 1991). FXS is caused by an increase in the number of trinucleotide repeats of cytosine-guanine-guanine (CGG) on the long arm of the X chromosome in the *FMR1* gene. A full mutation comprises of more than 200 repeats, leading to hypermethylation of the cytosines in the *FMR1* promoter region and thereby preventing the transcription of the *FMR1* gene into mRNA and the translation of the fragile X mental retardation protein (FMRP). Low levels of FMRP have been shown to be associated with poorer developmental outcome (e.g., Bailey, Hatton, Tassone, Skinner, & Taylor, 2001), although the size of this effect is not large, suggesting that other variables may also play

an important role. A number of studies have shown that there are differences in both the brain structure and functioning of individuals with FXS when compared to controls (Gothelf et al., 2008; A. L. Reiss, Aylward, Freund, Joshi, & Bryan, 1991; A. L. Reiss, Patel, Kumar, & Freund, 1988; Rivera, Menon, White, Glaser, & Reiss, 2002).

FXS is associated with a number of physical characteristics; these include a long face, large ears, a prominent jaw and macroorchidism. FXS is also associated with a characteristic pattern of adaptive behaviours, with daily living skills for example representing a relative strength for individuals with FXS (e.g., Dykens et al., 1996). There also appears to be a characteristic pattern of speech in FXS, which is characterised by the use of repetitive speech and tangential language (Belser & Sudhalter, 2001; Sudhalter & Belser, 2001).

Challenging behaviour.

Several studies have investigated the association between FXS and challenging behaviour. Hessel et al (2002) reported that boys and girls with FXS (aged 6-17 years) scored higher on the Child Behavior Checklist (CBCL; Achenbach, 1991) than control siblings without FXS. Likewise, Hatton et al (2002) using the CBCL reported that 49% of their sample of young boys with FXS (aged 4-12 years) scored within the clinical or borderline range for total problem behaviour. A controlled comparison study conducted by Steinhausen et al (2002) using the Developmental Behavior Checklist (DBC; Einfeld & Tonge, 1995) reported that children with FXS (aged 5-16 years) showed higher levels of total problem behaviours than children with Prader-Willi syndrome or Tuberous Sclerosis but lower overall levels than children with Fetal Alcohol Syndrome. These studies suggest that children with FXS, especially males, may be particularly likely to display challenging behaviour but provide little information regarding the topography of these behaviours.

Autism and hyperactivity.

Several studies have investigated the association between FXS and autism. It appears that a relatively high proportion of children with FXS either meet the diagnostic criteria for autism or score highly on autism rating scales. Several studies have used rating scales, such as the Childhood Autism Rating Scale (CARS; Schopler, Reichler, & Renner, 1988) to investigate the prevalence of autism in individuals with FXS (e.g., Bailey, Hatton, Skinner, & Mesibov, 2001; Bailey et al., 1998; Demark, Feldman, & Holden, 2003; Hatton et al., 2006). Other investigators (Budimirovic et al., 2006; Clifford et al., 2007; S. Hall, Lightbody, & Reiss, 2008) have relied on autism diagnostic tools such as the Autism Diagnostic Observation Schedule (ADOS-G; Lord et al., 2000). Hall et al (2008) reported that some 50% of males and 20% of females with FXS (aged 5-20 years) met the diagnostic criteria for autism using the ADOS-G. Children with both FXS and autism appear to have a particularly poor developmental outcome in comparison to those with FXS alone (Bailey, Hatton, Skinner et al., 2001). Other studies, however, have failed to replicate the association between FXS and autism (Einfeld, Molony, & Hall, 1989). Indeed, Einfeld et al suggest that the high levels of gaze avoidance and hand flapping exhibited by children with FXS may lead to a misdiagnosis of autism.

Boys with FXS are also likely to present with attention deficits and/or hyperactivity (Baumgardner, Reiss, Freund, & Abrams, 1995; Sullivan et al., 2006; Turk, 1998). In a controlled study, Sullivan, Hatton et al (2006) reported that there was a higher prevalence of Attention Deficit Hyperactivity Disorder (ADHD) in children with FXS (aged 7-13 years) than in mental age matched controls. Likewise, Baumgardner, Reiss, Freund and Adams (1995) found 73% of their sample of 31 males with FXS met the diagnostic criteria for ADHD.

Gaze aversion and social anxiety.

Gaze aversion appears to be particularly characteristic of both boys and girls with FXS (Cohen, Vietze, Sudhalter, Jenkins, & Brown, 1989; Hall, DeBernadis, & Reiss, 2006; Meerenstein et al., 1996). Meerenstein et al (1996) report that 80-88% of males with FXS exhibit poor eye contact. Cohen, Vietze, Sudhalter, Jenkins and Brown (1989) had children interact for 10 minutes with a stranger and 10 minutes with their mother, and reported that young males with FXS were more likely to engage in escape behaviours (turning body away, running away, looking away from task, not looking at the adult) than were individuals with Down syndrome, autism, and typically developing controls. A recent study by Hall, Maynes and Reiss (2009) demonstrated that a percentile shaping procedure, in which successively greater durations of eye contact were differentially reinforced, was effective in reducing gaze aversion in three boys with FXS, suggesting that such behaviours, although phenotypic, are open to environmental influence.

Self-injurious behaviour.

A relatively large proportion of individuals with FXS display self-injurious behaviours. Hall, Lightbody and Reiss (2008), using the Self-Injury Checklist (SIB-C; Bodfish et al., 1995) reported that self-injury occurred in 58% of boys and 17% of girls with FXS. Likewise, Symons et al (2003), using a bespoke self-injury questionnaire investigated self-injurious behaviours displayed by boys with FXS (aged 1-12 years) and reported that 58% of participants had displayed self-injurious behaviour at some point during their lifetime, 81% of whom continued to self-injure. As part of a larger study Hessel et al (2008) reported the results of the Behavior Problems Inventory (BPI; Rojahn, Matson, Lott, Esbensen, & Smalls, 2001) for a sample of 50 males with FXS (aged 8-24 years). Some 79% of the sample was reported to have displayed some form

of self-injurious behaviour over the preceding two months. The average frequency of these behaviours was reported to be weekly.

Some studies have provided a relatively fine-grained analysis of those topographies of self-injurious behaviour associated with FXS. In their study, Hessel et al (2008) reported that the most common topographies of self-injury were self-hitting (50% of the sample) and self-biting (30%). Meerenstein and colleagues (1996) reported that 63.9% of males with FXS in their sample (aged 3 months-60 years) displayed hand-biting. Hall, Lightbody and Reiss (2008) reported that 45.2% of males and 6.9% of females in the sample displayed self-biting, 16.2% of males and 0% females displayed self-hitting and 22.6% of males and 13.8% of females displayed rubbing or scratching. In their study Symons et al (2003) reported that the most commonly reported form of self-injurious behaviour in boys with FXS was hand- and finger-biting (72%), followed by head hitting (41%) and picking/pulling of the skin and hair (34%). Other reported behaviours included skin rubbing/scratching, head banging, insertion of fingers/objects into body cavities and leg hitting. Over 50% of children displayed multiple forms of self-injurious behaviour. Self-injurious behaviours were most commonly directed to the head (63%), front and back of the hands (50-59%) and the front of the arms (41%). Symons et al reported a correlation between FMRP levels and both the age of onset and location of self-injury. FMRP levels did not, however, differ between those boys with FXS who displayed self-injurious behaviour and those who did not.

Stereotypical behaviours.

It appears that individuals with FXS may also be more likely to display some topographies of stereotypical behaviour. For example, Hessel et al (2008) reported that 98% of their sample had displayed stereotypical behaviours over the preceding two months, with the most commonly reported topographies including repetitive hand movements (50% of the sample), waving or shaking arms (48%), and waving hands

(44%). The average frequency of stereotypical behaviour reported in this sample was daily. Meerenstein (1996) reported that 83.8% of males with FXS engaged in hand-flapping. In a recent large-scale comparison study, Moss Oliver, Arron, Burbidge and Berg (2009) used the Repetitive Behaviour Questionnaire to examine the phenomenology of repetitive behaviours in individuals with FXS, Angelman syndrome, Cornelia De Lange syndrome, Cri du Chat syndrome, Prader-Willi syndrome, Lowe syndrome, Smith-Magenis syndrome and a control group of individuals with intellectual disability of heterogenous causes. In comparison to other groups, individuals with FXS (aged 6–47 years) were more likely to engage in hand stereotypy, lining up of objects, echolalia, and to have restricted conversation and a preference for routine.

Aggressive behaviours.

Very few studies have examined the occurrence of aggressive behaviours in FXS. Hessel et al (2001) compared problem behaviours in boys and girls with FXS using the *CBCL*, which has a specific subscale to measure aggressive behaviours. Whilst over 12% of boys and girls with FXS scored in the clinically significant range for aggressive behaviours there were no significant differences between children with FXS and their siblings on this subscale. Hatton and colleagues (2002) reported that 17% of children in their sample displayed aggressive behaviour that fell in the borderline or clinically significant range on the *CBCL*. Meerenstein and colleagues (1996) reported that 56.3% of males with FXS in their sample displayed aggressive behaviour and 31.9% had been reported to have had a violent outburst.

Using the *BPI*, Hessel et al (2008) reported that some 75% of the sample had displayed aggressive behaviours at some point over the preceding two months, with hitting others (49% of the sample) and kicking others (30%) the most commonly reported topographies. The average frequency of aggressive behaviours was reported to be weekly.

Smith-Magenis Syndrome and the Behavioural Phenotype

Smith-Magenis syndrome (SMS), first described in two infant males by Smith et al (1982), is caused by an interstitial deletion of chromosome 17p11.2. Several candidate genes have been identified in the deleted region of chromosome 17p11.2 (Elsea et al., 1997) suggesting that SMS may be a contiguous genetic syndrome (Greenberg et al., 1991). However, recent research suggests that mutations in *RAI1* (*Retinoic Acid Induced Gene*) are specifically associated with most features of the SMS phenotype in individuals who did not have a detectable 17p11.2 deletion (Slager et al., 2003) and haploinsufficiency of the *RAI1* gene is now thought to be the primary cause of the disorder (Edelman et al., 2007). SMS has a reported prevalence of 1/25,000, although this is likely to be an underestimation. Most cases of SMS are sporadic and there is an equal sex ratio (Greenberg et al., 1991).

SMS is associated with a number of physical abnormalities. In a phenomenological study involving 27 individuals, Greenberg et al (1996) described some of the physical characteristics associated with the syndrome. Common physical features include characteristic facial features (mid-face hypoplasia, prominent forehead, epicanthal folds, broad nasal bridge, down turned mouth with cupid's bow, ocular and ear anomalies), short stature, hoarse and deep voice, speech delay, signs of peripheral neuropathy (including decreased sensitivity to pain and temperature, reduced leg muscle mass, gait disturbance, and muscle weakness), high incidence of myopia (with and without retinal detachment). Less common findings include congenital heart defects, seizures, facial clefts and urinary tract anomalies. In addition, intelligence quotient scores range between 20 and 78, with most lying in the moderate range of intellectual disability (Greenberg et al., 1996). There are relatively few reports of the cognitive abilities of individuals with SMS. At least three studies have reported that daily living skills remain an area of relative weakness in comparison to other areas of adaptive

behaviours and what would be expected given the relatively high intellectual functioning of people with SMS (Greenberg et al., 1996; Madduri et al., 2006; Udwin, Webber, & Horn, 2001).

Smith, Dykens and Greenberg (1998) reported a high level of sleep disturbance in a sample of 39 individuals with SMS (aged 1-32 years); these difficulties included problems falling asleep, frequent night-time awakenings and excessive daytime sleepiness. In a recent meta analysis Edelman et al (2007) reported that 88% of a sample of 50 individuals with SMS had some form of sleep disturbance. The sleep disturbance found in SMS has been associated with a disturbance in the secretion of melatonin (De Leersnyder et al., 2001). Some evidence exists to support the use of night time melatonin alongside beta-blockers (to reduce daytime elevation of melatonin) in the treatment of sleep disturbances in SMS (De Leersnyder et al., 2007).

Challenging behaviour.

Initial case reports of SMS made reference to a number of stereotypical, self-injurious and aggressive behaviours displayed by individuals with the syndrome (e.g., Colley, Leversha, Voullaire, & Rogers, 1990; Finucane, Konar, Haasgivler, Kurtz, & Scott, 1994; Lockwood et al., 1988; Smith et al., 1986; Stratton et al., 1986). For example, Smith et al (1986) noted the presence of self-injurious behaviours in 6 of the 9 cases of SMS. These early case reports suggested that self-squeezing, hand biting, self-pinching, picking at sores, hitting the head or body, and tearing or picking finger/toenails or the skin around the nails and inserting objects into bodily orifices all occurred in people with SMS.

The results of subsequent studies suggest that such behaviours may form part of the behavioural phenotype for SMS.

Between-group comparison studies suggest that individuals with SMS display challenging behaviours of greater severity than that generally seen in other groups. For

example, Clarke and Boer (1998) found that individuals with SMS (aged 5-32 years) had higher scores across all domains of the *Aberrant Behavior Checklist* (ABC; Aman, Singh, Stewart, & Field, 1985) than did individuals with Cri du Chat syndrome or Prader-Willi syndrome. Likewise, Dykens and Smith (1998) reported that children with SMS had higher total scores on the *CBCL* than did children with Prader-Willi syndrome or a mixed control group of children with intellectual disability.

Self-injurious behaviour.

A number of studies have investigated the phenomenology of self-injury associated with SMS (Dykens, Finucane, & Gayley, 1997; Dykens & Smith, 1998; Finucane, Dirrigl, & Simon, 2001; Greenberg et al., 1996; Martin, Wolters, & Smith, 2006); typically these studies have been hampered by relatively low numbers of participants.

Estimates of the prevalence of self-injurious behaviour in SMS vary notably between studies. Greenberg et al (1996), for example, report 67% of their sample of 27 individuals with SMS (aged 1-30 years) as displaying some form of self-injurious behaviour. Martin et al (2006) report that 78.9% of their sample of 19 children with SMS (aged 2-12 years) displayed self-injury, Dykens and Smith (1998) report that 92.2% of their sample of 35 individuals with SMS (aged 4-20 years) displayed at least one form of self-injury. Similarly Finucane et al (2001) report 96.6% of their sample of 29 individuals with SMS (aged 1-49 years) as displaying some form of self-injury. Sloneem (2005) recently reported a study involving some 32 people with SMS, using both the Challenging Behaviour Checklist (Harris, Humphreys, & Thomson, 1994) and the Challenging Behaviour Interview (Oliver et al., 2003), in which 96.9% of the sample (aged 6-39 years) displayed self-injurious behaviour. In a recent meta-analysis Edelman et al (2007) reported that 89.5% of individuals with SMS were reported to have displayed self-injurious behaviours. It appears that the prevalence of self-injury in

SMS is greater than that typically observed in individuals with intellectual and developmental disability (Sloneem, 2005).

A number of studies have reported on the prevalence of specific forms of self-injury displayed by individuals with SMS. For example, Finucane et al (2001), using a measure developed specifically for the study, reported on the prevalence of the following behaviours; head-banging (55.2% of sample), hand/wrist biting (93.1%), skin picking (51.7%), slapping self (62.1%), hairpulling (34.5%) polyembolokomania (inserting objects in ears 31%; nose 17.2%; rectum 3.5%; vagina 21.1%) and onychotillomania (pulling out fingernails 48.3%; pulling out toenails 34.5%). Dykens et al (1998), using a modified version of the SIB-C, reported that self-biting and self-hitting were the most frequent reported topographies of self-injury, occurring in 77% and 71% of their sample respectively. Less common behaviours included nail yanking (29% of sample) and inserting foreign objects into body (25%). A more recent study reported by Martin et al (2006), again using the modified SIB-C, noted the following behaviours in children with SMS; hitting self (93% of sample), self-biting (80%), hitting self against objects or surfaces (53%), inserting fingers or objects into body openings (47%), pulling hair or skin (40%), rubbing/scratching self (33%), pulling hair out (27%), hitting self with object (27%), eye-poking (20%), pulling out finger or toe nails (13%), pulling out teeth (7%).

Stereotypical behaviour.

SMS appears to be associated with a range of stereotypical behaviours, some of which are apparently unique to the syndrome. In their recent meta-analysis, Edelman et al (2007) reported that 89.7% of individuals with SMS were reported to have displayed stereotypical behaviour. Finucane, Konar, Haasgivler, Kurtz and Scott (1994) reported 11 individuals with SMS (aged 7-51 years) who presented with a highly characteristic 'spasmodic upper body squeeze'. Dykens and Smith (1998) using a modified version of

the *Stereotypy Checklist* (Bodfish et al., 1995) reported that their entire sample displayed at least one topography of stereotypical behaviour. The most frequent of which were inserting hands (69% of sample) and objects (54%) into mouth and teeth grinding (54%). Self-hugging and 'lick and flip' repetitive page turning were recorded in 46% and 51% of the sample respectively. Martin et al (2006), using the same measure, reported on the prevalence of various topographies of stereotypical behaviours. Commonly occurring topographies included: inserting hand into mouth (87% of sample), inserting object into mouth (80%), covering ears/eyes (67%), hugs/squeezes upper body (60%), 'lick and flip' repeatedly turning of book pages (60%), hand-flapping/waving (60%), purposefully dropping/throwing objects (60%).

Aggression and property destruction.

There is some evidence to suggest that individuals with SMS may be especially likely to display aggressive behaviours. In their between-group comparison, Dykens and Smith (1998) report that children with SMS scored significantly higher on the aggressive behaviour sub-domain of the *CBCL*, than did children with Prader-Willi syndrome or a mixed intellectual disability control group. Some 57% of their sample was reported to display physical aggression and 86% displayed property destruction. Dykens et al (1997) report that 7 of the 10 individuals in their sample (aged 14-51 years) displayed aggressive behaviours as measured by the *Reiss Screen* (S. Reiss, 1988). Sloneem (2005) reported that 81.3% of individuals with SMS in her sample displayed property destruction and 87.5% physical aggression. Individuals with SMS displayed significantly more pinching, biting, hitting, grabbing, kicking, head-butting, hair-pulling, choking and using objects as weapons than that reported in the literature for people with intellectual and developmental disability generally.

Summary

Behavioural phenotype research has represented a search for associations between genetic syndromes and various topographies of behaviours. Both FXS and SMS appear to be associated with a characteristic pattern of challenging behaviour. The extent to which such behaviours can be considered genetically determined remains somewhat contentious. Whilst such behaviours are often considered 'phenotypic' of these syndromes, it should be noted that environmental factors, such as the quality of home environments and the effectiveness of therapeutic interventions, have been shown to influence the occurrence of such behaviours (Hall et al., 2009; Hessel et al., 2001). In addition, secondary genes may also be an important contribution to behaviours displayed by individuals with single gene disorders, such as FXS and SMS. For example Hessel et al (2008) reported that a functional polymorphism in the serotonin transporter 5-HTTLPR influenced the extent to which males with FXS were reported to display stereotypical, aggressive and destructive behaviours. In light of this evidence the proposition that a single genetic abnormality determines challenging behaviour in either syndrome appears to be difficult to uphold.

Chapter Summary and Thesis Overview

Challenging behaviour has been introduced as a socially significant problem. Given the pervasive negative impact of challenging behaviour on the quality of life of those who display it, as well as its prevalence and relative persistence in the absence of effective intervention, it would seem to merit continued investigation. Applied behaviour analysis has led to the development of methods specifically designed to identify the environmental factors that influence the occurrence of challenging behaviour. Challenging behaviour has been consistently shown to belong to at least one of four functional classes. In contrast, the behavioural phenotype approach has

emphasised the importance of genetic factors in the causation of challenging behaviour. Studies have reported associations of varying specificity between genetic syndromes, such as FXS and SMS, and certain topographies of challenging behaviour.

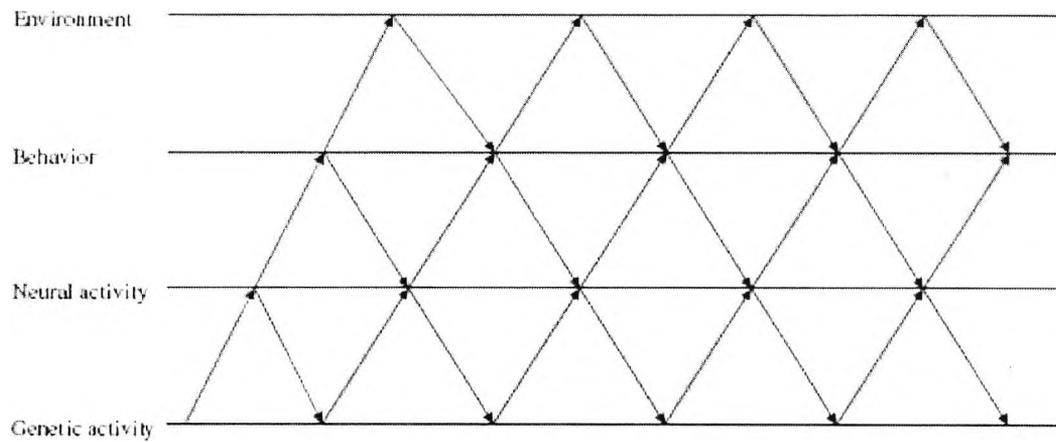
The analysis of the role of genes and environment in challenging behaviour has, with only a few exceptions, taken place in relative isolation of the other. There has been scant attention paid to potential interactions between genetic and environmental sources of variability. The aim of this thesis is to provide both a conceptual and empirical examination of the interaction between such variables in the development and maintenance of challenging behaviour.

The overarching position of the current thesis is that as with all behaviour, challenging behaviour forms part of a developmental system (Gottlieb, 1992, 2003; Johnston & Edwards, 2002). That is, challenging behaviour occurs within a biological and environmental context (Morris & Midgley, 1990; Thompson, 2007). Such a system, as depicted in Figure 1.1, is comprised by multiple bi-directional relations between variables at different levels of analysis, in which each influences and is influenced by the other. The exclusion of certain variables, whether they are genetic or environmental, fails to provide a complete account of behavioural development as it occurs within the developmental system. The primary focus of the current thesis is on how such bi-directional influences serve to establish the motivation for those consequences that maintain challenging behaviour.

Chapters 2-5 provide both a conceptual and empirical examination of this hypothesis. It is proposed that gene-environment interactions (GxE) may hold important implications for the understanding of challenging behaviour in people with intellectual and developmental disabilities. Evidence is provided to suggest that one role of GxE may be to alter the value of certain socially- and non-socially mediated events as types of reinforcement or punishment.

Figure 1.1. A developmental systems model (from Gottlieb, 1992, p. 186).

Bidirectional influences



Chapter 2 provides a systematic review of the concept of the 'motivating operation' (Laraway, Snyckerski, Michael, & Poling, 2003). The review provides a critical analysis of the literature on motivating operations as applied to the functional analysis of challenging behaviour from 1998-2007. The review functioned as a scoping exercise with which to identify potential areas for future research and to inform subsequent conceptual and empirical work. One area that is suggested as requiring further research lies in the interaction between genetic and environmental variables.

Chapter 3 narrows the focus to the analysis of GxE and specifically examines how such relations influence the early development of self-injurious behaviour, as well as other challenging behaviours. The chapter aims to provide an account of why certain genetic syndromes are associated with particular 'phenotypic' behaviours. This analysis extends existing accounts of the genesis of challenging behaviours and argues that further research is required to investigate the nature of such interactions.

Chapters 2 and 3 both postulate that genetic factors may influence challenging behaviour by altering the reinforcing or punishing value of certain stimuli. The empirical part of this thesis aimed to provide an examination of this hypothesis by

determining whether there were both within- and between-syndrome differences in the function served by challenging behaviour.

Chapter 4 provides an indirect examination of this question. Parents of children with FXS and SMS were interviewed, as was a 'mixed etiology' control group using an indirect measure of behavioural function. The groups were shown to differ in the probability of children being reported as displaying challenging behaviours that served particular functions.

In chapter 5, experimental analogue methodology was used to address this same question. Using a subset of participants from the previous study, this involved comparing the results of functional analyses conducted with a group of children with FXS against those conducted with a group of children with SMS. The groups appeared to differ in a manner consistent with that found in the indirect study.

Finally, in chapter 6 the findings of the current thesis are related to the underlying literature and the implications for future research and the understanding, assessment and treatment of challenging behaviour are discussed.

Chapter II. Motivating Operations and Challenging Behaviour. A Systematic Review⁷

“It seems likely that clinically significant, long-term, generalized change in problem behaviour can occur only if the EOs that evoke problem behaviour are, directly or indirectly, addressed in treatment.” (McGill, 1999, pp.

406-407)

⁷ Adapted portions of this chapter have been submitted to the *Journal of Applied Behavior Analysis* and *Behavior Analysis in Practice* for review.

Chapter Overview

Motivating operations (MOs) refer to antecedent events that alter the *value* of those consequences that serve to maintain or punish operant behaviour and alters the probability of *behaviour* occurring that has been previously associated with those consequences. Such variables have notable implications for the understanding of challenging behaviour. The current chapter provides a systematic review of the literature on MOs and the functional analysis of challenging behaviour from 1998-2007. The literature related to MOs for social positively reinforced, social negatively reinforced and automatically reinforced challenging behaviours is reviewed. The chapter provides a synthesis of developments in the literature on MOs and functional analysis since 1998. A number of areas in which future research on MOs is required are identified. This process functioned as a scoping exercise to guide the remainder of the thesis. Of particular relevance is the suggestion that further work be conducted that delineates the motivative influence of genetic events on challenging behaviour.

Introduction

The original emphasis of functional analysis lay on the role of behaviour-consequence relations. Over the past fifteen years there has been an increased appreciation of the role that antecedent events can have on challenging behaviour. Indeed, antecedent variables, such as motivating operations (MOs), must be incorporated into functional analysis in order to fully understand the influence of behaviour-consequence relations. MOs refer to antecedent events that alter the value of those consequences that maintain or punish operant behaviour, and alter the probability of associated behaviours occurring. The current chapter provides a systematic review of the literature on MOs as applied to the assessment of challenging behaviour from 1998-2007. The aim of this process is to act as a scoping exercise to identify avenues for future research. Areas that merit further investigation are proposed. Most importantly for the current thesis is the suggestion that further work is required to explore interactions between behaviour-environment relations and various biological influences. A number of suggestions along these lines are proposed.

Almost a decade ago McGill (1999) examined the implications that the concept of the establishing operation (EO) held for the assessment, treatment and prevention of challenging behaviour. This paper, together with the more general review of antecedent events by Smith and Iwata (1997), reflected a shift in emphasis for the applied analysis of challenging behaviour. This shift has led to a greater appreciation of the role played by motivative variables in challenging behaviour (J. Michael, 2000). In the years since the publication of these papers, there have been considerable advances in our understanding of such variables. These advances have been multifaceted, occurring at both the conceptual and empirical level. For example, the term MO has now subsumed that of the EO. The concept of the MO has been successfully applied to areas as diverse as organizational behaviour management (Olson, Laraway, & Austin, 2001), eating

disorders (Tapper, 2005), and basic research on bio-behavioural relations (Kennedy, 2002).

These advances are perhaps best characterised by the increase in the number of papers to include the discussion of MOs within the pages of the *Journal of Applied Behaviour Analysis* (JABA). Figure 2.1 shows the number of papers within JABA to have cited one of the four main papers on MOs by Michael and colleagues (Laraway, Snyckerski, Michael, & Poling, 2003; Michael, 1982, 1993, 2000), as well as all papers within JABA published since 1982 which have included the terms “establishing operation”, “abolishing operation” or “motivating operation”⁸. Figure 2.1 shows that there has been continued exponential growth in the number of papers that relate to MOs. Over 60% of these papers have been published in the last 10 years.

Given the substantial developments that have taken place since the publication of the Smith and Iwata (1997) and McGill (1999) reviews it seems that a quantitative and qualitative synthesis of this work as applied to the functional analysis of challenging behaviour is warranted. This process will serve three purposes. First, it will prompt some reflection on how far the science has come in incorporating once neglected variables into the functional analysis of challenging behaviour. Second, in accordance with one of the founding principles of applied behaviour analysis (Baer, Wolf, & Risley, 1968), it will aim to provide a conceptual synthesis of a broad range of research on the MO, relating diverse empirical findings to potential underlying behavioural principles. Finally, it will serve to identify areas where future research can begin to shed new light on our understanding of MOs and challenging behaviour and thereby identify potential areas of research for the current thesis.

⁸ Papers that used terms other than these i.e., “disestablishing operations”, “establishing conditions” were excluded from this analysis, as were papers for whom the terms were only found in the reference list.

Motivating Operations

Within the operant model it has been long established that the value of a given consequence as a type of reinforcement or punishment is in constant flux, as is the probability of behaviour occurring that has previously been associated with such consequences (Fuller, 1949; Skinner, 1953). A systematic approach to the analysis of such events was absent however leaving “a gap in our understanding of operant functional relations” (Michael, 1993, p. 191). This gap was addressed by Jack Michael (1982; , 1993) who cogently argued for a distinction to be made between antecedent stimuli that were correlated with the availability of reinforcement or punishment (discriminative stimuli) and antecedent stimuli that altered the value of such consequent events (EOs).

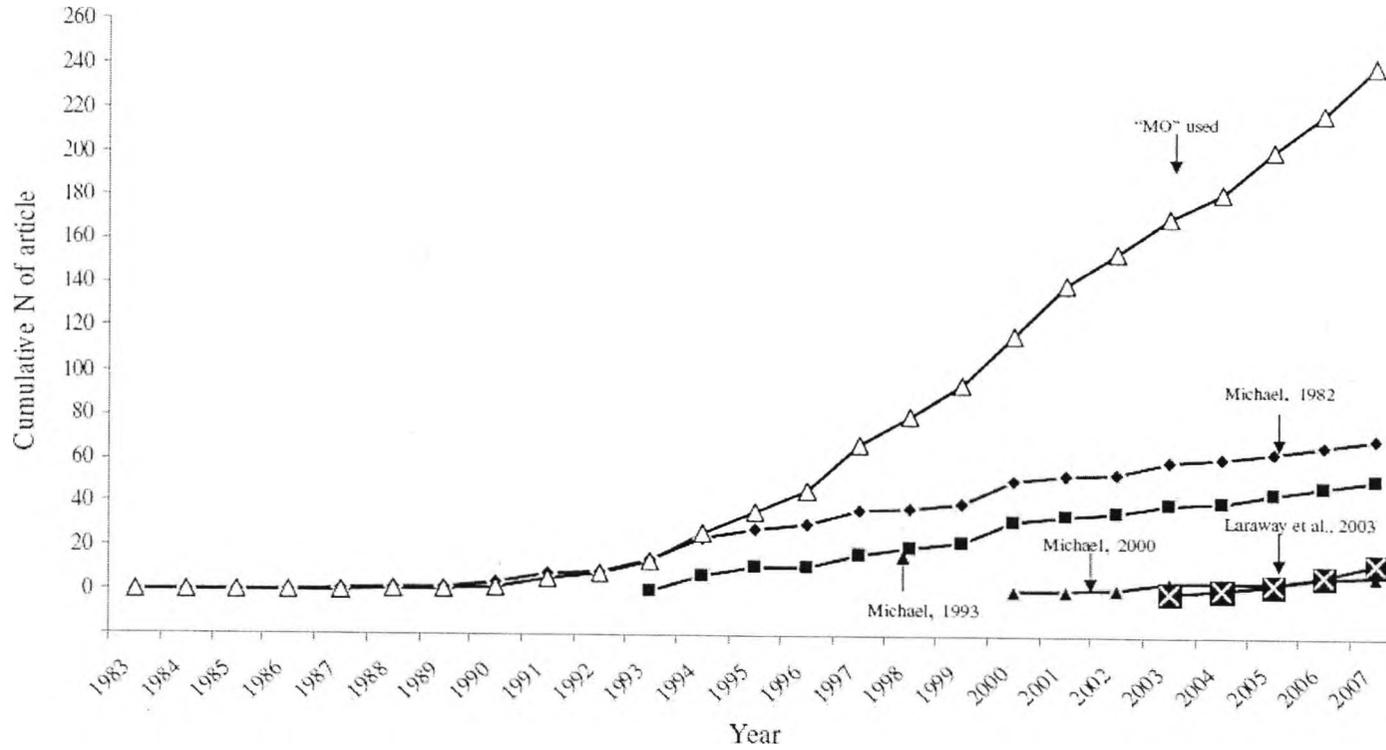
Laraway et al. (2003) recently refined the concept, proposing that the omnibus term of the *motivating operation* replace that of the EO. The term MO is the product of an evolution in operant terminology. Michael (1982) originally used the term *establishing operation* to refer to antecedent events that momentarily alter a) the effectiveness of consequent events that function as reinforcers or punishers (termed the *reinforcer-establishing effect*) and b) the frequency of responses that have been associated with those consequences in the past (termed the *evocative-effect*). For convenience, movements in the opposite direction were subsumed within the rubric term of the EO. As Michael (1982) states “‘establishing’ should be taken to be short for ‘establishing or abolishing’.” (p.151). The use of the term EO in this manner, however, did not adequately capture the bidirectional effects of motivating events potentially restricting our ability to predict and control behaviour (Laraway, Snyderski, Michael, & Poling, 2003).

MOs refer to antecedent events that share two main properties. The first property termed the *value-altering effect*, refers to the effect of an antecedent event on the

effectiveness of other stimuli that function as types of reinforcement or punishment (Laraway, Snyckerski, Michael, & Poling, 2003). An EO establishes the effectiveness of a particular type of reinforcement or punishment, whereas an AO abolishes the effectiveness of a particular form of reinforcement or punishment. For example, for an athlete the value of a drink is established as an effective reinforcer following a long run; whereas it is abolished after he has consumed a large quantity of water.

The second property of the MO is referred to as the *behaviour-altering effect* (Laraway, Snyckerski, Michael, & Poling, 2003). Thus an EO evokes behaviour that has been previously associated with the events it establishes as reinforcers (and vice-versa for behaviours associated with punishment), whereas an AO abates behaviour that has been associated with events it abolishes as reinforcers (and vice-versa for behaviours associated with punishment). Taking the same example, an athlete following a long run will be more likely to display behaviours that have in the past been associated with a drink, such as walking to the drinks machine. Likewise, after drinking a large quantity of the same drink the probability of the athlete displaying the same behaviour abates. Michael (1982) notes that the MO may alter behaviour either directly, or indirectly for example, by altering the evocative effect of discriminative stimuli or by influencing the value of conditioned reinforcers or punishers. Descriptions of the MO have typically been restricted to changes in frequency however, as Michael (2007) notes, the MO may alter other dimensions of behaviour such as response latency, magnitude or relative frequency.

Figure 2.1. Cumulative number of articles published in *JABA* in which the term MO, EO or AO have been used or in which citation to Michael's (1982, 1993, 2000) articles or Laraway et al's (2003) article has appeared.



Laraway et al (2003) did not include a discussion of the subtypes of the MO in their review. As such a description of each subtype of MO will be provided in light of terminological changes that have occurred since the recommendations made by Laraway et al (see also Michael, 2007).

Unconditioned MOs

Certain events may acquire their value- and behaviour-altering effects as a result of the organism's phylogenic history and such events are termed unconditioned MOs (UMOs). Deprivation of primary types of reinforcement, such as food, drink, or sexual activity, establishes the value of these stimuli as reinforcers and exerts an evocative effect on associated behaviours, just as satiation of these types of stimuli abolishes their reinforcing value and abates associated behaviours. Deprivation and satiation also influence the extent to which the contingent removal of primary types of reinforcement will function as a type of punishment. Thus, a person must be deprived of food (or in common parlance be 'hungry') in order for the contingent removal of food to act as an effective type of punishment. The onset of certain forms of aversive stimulation, such as pain or temperature changes above or below a comfortable level, similarly acts as a UMO for negatively reinforced behaviour. Whilst the behaviours that these events alter the frequency of are often learnt the source of 'motivation' for the consequences that they maintain is not.

Conditioned MOs

Other events acquire their value-altering effects as a result of the organism's ontogenic history. Such events are termed conditioned motivating operations (CMOs). Previously neutral events may acquire the status of a CMO after having systematically preceded or having been paired with a UMO, another CMO, or particular types of reinforcement or punishment. Three forms of CMO have been proposed; *surrogate CMOs*, *reflexive CMOs* and *transitive CMOs*.

A surrogate CMO (CMO-S) is a previously neutral stimulus that following temporal association with a UMO or other CMO independently alters the effectiveness of other stimuli as reinforcers or punishers and alters the probability of associated behaviours. Take for example, a person who always has their lunch at midday, the time on the clock in addition to having discriminative properties (such as signalling the opening of the canteen) may also exert a motivative influence. Following the repeated pairing of food deprivation (the UEO) and the time of 12pm on a clock, the time on the clock may itself establish the reinforcing value of food and evoke food-related behaviour independent of actual levels of food deprivation. The time on the clock may also establish the punishing value of food unavailability and abate behaviours that have been associated with such delays in the past, such as answering the telephone. Similar effects could occur in the opposite direction. Take for example, stimuli that are temporally associated with being awake (such as it being light outside, birds singing, the smell of coffee being brewed downstairs etc). The onset of such stimuli may abolish the reinforcing value of continued sleep and abate sleep-related behaviours independent of actual levels of sleep deprivation. Sleep is no less or more available in such a situation, but is less reinforcing.

Michael described the reflexive CMO (CMO-R) as constituting a 'promise' or 'threat' CMO. That is, the onset of a CMO-R is associated with either the *improvement* or *worsening* of the organism's condition. Therefore, its onset alters the value of its own removal (or continued presence) as a type of reinforcement (or punishment) and alters the probability of behaviours occurring that have previously been associated with these consequences. The CMO-R therefore acts on its own reinforcing value and not on that of another stimulus (as in the surrogate CMO). Take an amateur runner for whom the onset of certain stimuli (such as a large-looking hill in the near distance) is correlated with the onset of physical discomfort, such as a stitch or cramp, and thus the

'worsening' of his condition. The sight of the hill may establish its own offset as an effective form of reinforcement and evoke behaviours that have been associated with its removal in the past, such as taking a different route that avoids the hill (acting therefore as a CEO-R). In contrast, for a more experienced runner, (for whom physical discomfort functions as a conditioned reinforcer) the onset of the hill may be correlated with the release of endorphins and therefore the 'improvement' of his condition. The onset of the hill therefore establishes its continued presence as an effective type of reinforcement and evokes behaviours that have led to this in the past, such as continuing to run in the direction of the hill. Similar effects may apply with punishment. For example, for the more experienced runner the onset of the hill would be likely to establish its offset as an effective type of punishment. When would an event or stimulus change constitute a CAO-R? Take the amateur runner for whom the onset of the hill acts as a CEO-R and evokes behaviour that is successful in avoiding the hill. As the presence of the hill acts on its own reinforcing value, it is the absence of the hill (for example, the disappearing sight of the hill or the sight of flat ground) that functions as a CAO-R.

A transitive CMO (CMO-T) refers to stimuli in whose context the value of existing conditioned reinforcers or punishers is altered, as is the likelihood of behaviours occurring that have been associated with such consequences in the past. Think of an individual with intellectual and developmental disabilities who lives in a residential home where access to food in the fridge is restricted by a lock on the fridge door. In such a situation, the response of independently opening the fridge door and subsequent reinforcement, in the form of access to food, is unavailable. This may establish the presence of someone who can open the fridge door (i.e., a member of staff with the key) as an effective source of reinforcement and evoke behaviours that have led to this in the past (i.e., manding or aggression). The member of staff and the key are no more available in the presence of the locked fridge but are more reinforcing. In the

absence of the lock on the fridge the reinforcing value of the member of staff with a key is abolished and behaviours, such as manding or aggression, abate. Similar effects may occur for conditioned types of punishment. For example, think of a school child for whom time-out is imposed contingent on disruptive behaviours during class. The value of time out as a type of punishment is more likely to be established in the presence of certain stimuli, such as the lesson involving a highly preferred activity, than in the presence of others, such as the lesson involving a non-preferred activity.

One benefit to have emerged from the recent developments in terminology surrounding motivative events has been the explicit recognition that MOs may have multiple and simultaneous effects (Laraway, Snyckerski, Michael, & Poling, 2003). That is, the abolishing and abative effects of the AO are of equal importance as are the establishing and evocative effects of the EO. As implied in some of the examples above a single event may function as both an EO and an AO for different behavioural consequences. For example, providing high levels of noncontingent attention may abolish the reinforcing value of attention, but may also establish the reinforcing value of toys used for solitary play. Likewise a single behaviour may be influenced by more than one MO. For example, the *abolishing* and *abative* effects of non-contingent escape may also be influenced by other MOs such as the amount of sleep the individual has had, the difficulty of the request and so on. Such complexity is perhaps better encapsulated by the term MO. Michael (2007) also notes that a single stimulus change may exert not only value- and behaviour-altering effects but also function-altering effects (i.e., by operating as a type of reinforcement or punishment). The deprivation of attention, for example, will function as an EO for subsequent attention-maintained behaviour but will also function as a type of punishment for the behaviour that precedes the onset of deprivation. Likewise, providing access to a food tangible will reinforce food-maintained behaviours but may also serve to abolish the effectiveness of the food

tangibles and abate subsequent behaviour maintained by access to food. It is important that such relations are applied to the study of challenging behaviour and it would seem that the term MO better encapsulates such complex relations than that of the EO.

Method

Studies relevant to MOs were identified using a three-stage process. First, papers that were published between 1998-2007 which cited at least one of the four main papers by Michael and colleagues (Laraway, Snyckerski, Michael, & Poling, 2003; Michael, 1982, 1993, 2000) were identified via the database *Web of Science*. The four journals that had the highest number of citations in this initial search (*Journal of Applied Behaviour Analysis*, *Research in Developmental Disabilities*, *Behavioural Interventions* and *American Journal on Mental Retardation*) were then hand-searched for the years 1998-2007. The reference section of each article was then examined to identify any additional MO studies. Finally all studies were reviewed to see if they met criteria for inclusion in the present review.

Inclusion and Exclusion Criteria

All studies were empirical and involved the assessment of MOs as applied to challenging behaviour. All studies involved some form of functional assessment, including indirect assessments (Cuvo, May, & Post, 2001), AB functional analyses (e.g., Carr & Durand, 1985) and ABC functional analyses (e.g., Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994). Studies on automatically reinforced challenging behaviour were included that examined challenging behaviour which persisted in the absence of social consequences (e.g., Goh, Iwata, & Kahng, 1999). All studies relied on the direct observation of target behaviours. All studies involved experimental manipulation and purely descriptive studies were excluded from analysis. Studies predominantly included participants with intellectual and developmental disabilities;

however all studies that met the inclusion criteria and had participants of typical intellectual functioning were also included. Studies that solely involved an evaluation of treatments that have been previously analysed in terms of the MO (such as behavioural momentum or instructional fading) and that did not have additional implications for the assessment of challenging behaviour were generally excluded from review. Where there were clear implications for the role of MOs in the assessment of challenging behaviour then the study was included. Papers were excluded if they did not include the assessment or manipulation of MOs or were not focused on challenging behaviour. The papers allow, therefore, for a systematic review of research over the last 10 years on the role of MOs in the functional analysis of challenging behaviour.

Results

Using this method a total of 95 empirical studies were identified that met the inclusion criteria.

Table 2.1 shows the journals to have published empirical studies that met the inclusion criteria. A total of 11 journals published at least one study that met the inclusion criteria. Only five journals have published more than two papers that met the inclusion criteria. The largest number of studies involving MO manipulations was published in the *Journal of Applied Behaviour Analysis*. The four journals that were hand searched (*Journal of Applied Behaviour Analysis*, *Research in Developmental Disabilities*, *Behavioural Interventions* and *American Journal on Mental Retardation*) provided some 91% of the total sample of studies included in the review.

Table 2.1.

Number and Percentage of MO Studies that Met Inclusion Criteria by Journal Name

Journal name	No. of studies	% of sample
<i>Journal of Applied Behavior Analysis</i>	55	57.9%
<i>Behavioral Interventions</i>	17	17.8%
<i>Research in Developmental Disabilities</i>	11	11.5%
<i>American Journal on Mental Retardation</i>	3	3.1%
<i>Behavior Modification</i>	3	3.1%
<i>Journal of Positive Behavioral Interventions</i>	1	1%
<i>Education and Treatment of Children</i>	1	1%
<i>Journal of Developmental and Physical Disabilities</i>	1	1%
<i>Journal of Early and Intensive Behavior Intervention</i>	1	1%
<i>School Psychology Quarterly</i>	1	1%
<i>School Psychology Review</i>	1	1%

Motivating Operations and Functional Analysis

Functional analysis provides a powerful means of identifying the consequences that maintain challenging behaviour (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994). The variables that maintain challenging behaviour are typically categorised into four general classes of reinforcement; *social-positive reinforcement*, *social-negative reinforcement*, *positive automatic reinforcement* and *negative automatic reinforcement*. For each consequence that maintains challenging behaviour there is a parallel MO which alters the value of that consequence as a type of reinforcement (McGill, 1999). The experimental literature to have examined the influence of MOs on the occurrence of challenging behaviour maintained by each reinforcement contingency

is now systematically reviewed. For each general class of reinforcement⁹ an analysis of how the research literature has evolved over the past decade is provided. Important areas for future research are subsequently discussed.

Social-Positive Reinforcement

Attention.

Challenging behaviour, such as self-injury or aggression, may be maintained by the contingent provision of social attention (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994). Of the 536 functional analyses included in a recent review of the literature, 25.3% were interpreted as showing a pattern of responding consistent with such a hypothesis (Hanley, Iwata, & McCord, 2003). Whilst such behaviours are maintained by attention, the value of attention varies across different environmental contexts. It seems likely that the environments in which many individuals with intellectual and developmental disabilities reside are replete with characteristics that serve to establish attention as an effective reinforcer and as such an analysis of MOs is likely to shed important light on current understanding of attention-maintained challenging behaviour.

A decade ago the evidence base for the influence of MOs on attention-maintained challenging behaviour was relatively sparse. In his review McGill (1999) suggested that challenging behaviour maintained by access to attention was particularly likely to occur in situations characterised by low levels of social contact. A series of studies that supported this interpretation were cited. These studies relied on either within-session antecedent manipulations, such as that found in the standard attention-condition of a functional analysis (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994), or descriptive analysis (Hall & Oliver, 1992; Taylor & Carr, 1992). Several

⁹ Due to the lack of research on behaviours that serve a non-socially mediated (automatic) negatively reinforced function, the following considers only the following classes of reinforcement: *social-positive reinforcement*, *social-negative reinforcement*, and *automatic reinforcement*.

studies were also cited which reported the abolishing and abative effects of providing dense levels of social contact on a fixed time schedule (e.g., Hagopian, Fisher, & Legacy, 1994; Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993). It was also recognised that other variables, such as providing non-contingent access to arbitrary reinforcers, such as toys, altered the probability of attention-maintained challenging behaviour (e.g., Fischer, Iwata, & Mazaleski, 1997).

Thus, it was well established that momentary changes in the level of social contact could influence attention-maintained challenging behaviour. The majority of these studies relied on either descriptive or within-session experimental manipulations. Whilst it was recognised that other variables could exert value- and behaviour-altering effects on attention-maintained challenging behaviour, their examination remained at a preliminary stage.

Great strides have been made in the past decade regarding our understanding of the variables that evoke attention-maintained challenging behaviour. The current review identified some 21 studies published since 1998, which involved the assessment of MOs for attention-maintained challenging behaviour (see Appendix 1).

Investigators have continued to demonstrate that within-session variation in levels of social contact may act on the value of attention as a type of reinforcement (Roane, Lerman, Kelley, & Van Camp, 1999; Worsdell, Iwata, Connors, Kahng, & Thompson, 2000). Worsdell et al (2000) found that the attention- or tangible-maintained self-injury of six individuals occurred at consistently high rates only in those conditions in which both an EO (e.g., within-session deprivation of attention) and reinforcement contingency were present. Such findings suggest that momentary changes in the levels of attention during a functional analysis exert value- and behaviour-altering effects, and that this is particularly likely to be observed when a reinforcement contingency is also present.

A total of eight studies were identified that examined the influence of systematic manipulation of pre-session levels of social contact for attention-maintained challenging behaviour (Berg et al., 2000; McComas, Thompson, & Johnson, 2003; O'Reilly, 1999; O'Reilly, Edrisinha, Sigafos, Lancioni, & Andrews, 2006; O'Reilly, Edrisinha, Sigafos, Lancioni, Machalicek et al., 2007; O'Reilly, Lancioni, & Emerson, 1999; O'Reilly et al., 2006; Roantree & Kennedy, 2006). McComas et al (2003), for example, demonstrated that providing continuous pre-session social contact reduced subsequent challenging behaviour in the attention condition of a functional analysis, whereas challenging behaviour increased following pre-session conditions in which social contact was unavailable. Interestingly, manipulating pre-session levels of social contact had no influence on the escape-maintained challenging behaviour of two children. These methodological developments, in which prior access to putative maintaining variables are systematically manipulated, have allowed for a greater degree of experimental control over 'third variables' than has previously been the case and have provided a foundation on which more complex relations can begin to be investigated.

These studies hold important implications for the assessment of attention-maintained challenging behaviour and specifically in relation to the sequencing of experimental conditions during a functional analysis. It seems likely that attention-maintained challenging behaviour will occur at higher rates following an alone condition and at substantially lower rates following a play or demand condition which are typically characterised by high rates of attention, providing some empirical support for the Iwata et al (1994) recommendation that functional analyses be sequenced in a semi-random manner. Such findings also imply that pre-existing environmental conditions can exert a powerful influence over behaviour in a subsequent functional analysis. Thus, it is possible that responding within a functional analysis tells us as much about pre-existing environmental factors as about the influence of behaviour-

environment contingencies within the functional analysis. This highlights the importance of establishing control over pre-session events that may influence subsequent behaviour-environment relations in a functional analysis.

The MO has often been treated as a dichotomous variable, whereby an EO is judged as being either present or absent based on a given experimental manipulation (e.g., Worsdell, Iwata, Conners, Kahng, & Thompson, 2000). In the case of attention-maintained challenging behaviour the absence of social contact is typically referred to as an EO and access to social contact as an AO. A recent study by Roantree and Kennedy (2006), however, highlights the importance of providing a functional, as opposed to a procedural definition of the MO. Providing access to pre-session attention revealed a clear attention function for the stereotypical behaviour of a boy after stereotypy appeared undifferentiated in an initial analysis. The authors suggest that providing access to attention in pre-session conditions served as an EO rather than as has typically been demonstrated, an AO. Such an effect may parallel 'reinforcer sampling' procedures which are used to establish 'motivation' for tangible items (Ayllon & Azrin, 1968; Mueller, Wilczynski, Moore, Fusilier, & Trahan, 2001). Such findings, whilst in need of experimental replication, indicate that the MO rather than being a dichotomous variable, as is sometimes implied, may be better conceptualised on a continuous scale, the definitions of which should be based on observed changes in behaviour as opposed to procedural manipulations.

The manipulation of variables other than social contact may also act as an MO for attention-maintained challenging behaviour. For example, the availability of preferred tangibles in the attention condition of a functional analysis may act as an AO for attention-maintained challenging behaviour (e.g., Fisher, O'Connor, Kurtz, DeLeon, & Gotjen, 2000; Ringdahl, Winborn, Andelman, & Kitsukawa, 2002)¹⁰. The relative

¹⁰ See McCord and Neef (2005) for a discussion of the implications of such effects for functional analyses.

preference for tangibles appears to be a particularly important variable, with high preferred items more likely to reduce the occurrence of attention-maintained challenging behaviour than are less preferred items (Fisher, O'Connor, Kurtz, DeLeon, & Gotjen, 2000). It has been proposed that the presence of highly preferred items abolishes the reinforcing value of attention and abates attention maintained challenging behaviour. Given that the attention condition of a standard functional analysis involves providing access to toys/activities it would seem an important step to ensure that such toys are not so highly preferred that they reduce the value of attention below a level that would be typically expected in the absence of the toy/activity. One could also envisage a situation whereby the presence of certain toys functions as an EO for attention-maintained challenging behaviour. For example, the presence of a toy that cannot be independently operated may heighten the reinforcing value of attention and evoke challenging behaviour, by acting as a transitive CEO. However, no studies were identified in the current review that demonstrated such relations for attention-maintained challenging behaviour.

Approximately 4.1% of functional analyses result in an undifferentiated pattern of responding (Hanley, Iwata, & McCord, 2003), making a judgement about behavioural function difficult to ascertain. In some cases such behaviours may be socially mediated but the functional analysis fails to capture this, resulting in a false negative result (Carr, Yarbrough, & Langdon, 1997). Changes made to *whom*, *where* and *how* a functional analysis is conducted may all act as MOs and exert a significant influence over attention-maintained challenging behaviour.

The use of reversal designs with an embedded multi-element component has facilitated the investigation of such idiosyncratic variables. Indeed 40% of the studies presented in Appendix 1 utilised this form of experimental design. The advantages of such a design are relatively apparent, not only do they enable an analysis of the *main*

effects of aspects of the current context (e.g., the influence of location on the overall occurrence of challenging behaviour) but also the *simple effects* of the functional analysis (e.g., attention-maintained behaviour across locations) and where present *interaction effects* between the two (e.g., a change in function across different locations).

Studies have shown that the occurrence of attention-maintained challenging behaviour may be influenced by the person who is running the functional analysis (English & Anderson, 2004; LeBlanc, Hagopian, Marhefka, & Wilke, 2001; Ringdahl & Sellers, 2000). Ringdahl and Sellers (2000) demonstrated that the attention-maintained behaviour of two individuals only became apparent when the functional analysis was run by the child's caregiver and was not apparent when sessions were run by clinic staff. Other variables such as the gender of the therapist have been shown to exert similar effects (LeBlanc, Hagopian, Marhefka, & Wilke, 2001). The presence/absence of specific individuals may act on the reinforcing value of attention and evoke or abate attention-maintained behaviour accordingly. For example, parental attention may hold a greater reinforcing value than that of other individuals. An alternative account could be that the presence of certain individuals (such as caregivers) is discriminative for the contingent provision of attention due to the history of reinforcement associated with that person¹¹. It would be of interest for further research to begin to examine the mechanisms that underpin such relations.

The location in which a functional analysis is conducted can influence the occurrence of challenging behaviour and judgements that are made about the function served by that behaviour. For example, Harding, Wacker, Berg, Barretto, and Ringdahl (2005) reported that changing the location in which a functional analysis was conducted

¹¹ It could also be argued that these manipulations refer to different types of reinforcement (i.e., the attention of a parent is a different stimulus than the attention of another individual) and that these effects refer to changes in the type of reinforcement rather than the effects of MOs per se.

revealed a social function to challenging behaviour that had previously appeared undifferentiated across all conditions. Again it remains unclear what mechanism underpins such relations and whether location acted on the reinforcing value of social consequences or whether certain locations were simply discriminative for subsequent reinforcement. It seems important, however that this information be elucidated. A component analysis in which different aspects of a location are manipulated may enable further investigation of such variables. Identifying the specific aspects of a location that are associated with low rates of challenging behaviour would provide an obvious first step for subsequent intervention.

The EO in a standard attention condition of a functional analysis involves the within-session deprivation of attention, typically with the therapist withholding social contact by pretending to do some work. However, this arrangement is not always sufficient to precipitate challenging behaviour maintained by social attention and in some cases alternative antecedent manipulations are required (Call, Wacker, Ringdahl, & Boelter, 2005; O'Reilly, Lancioni, King, Lally, & Dhomhnaill, 2000; Ringdahl, Winborn, Andelman, & Kitsukawa, 2002). Call et al (2005) demonstrated that the attention-maintained challenging behaviour of one individual was evoked at consistently high levels only when a diverted attention condition was combined with a demand whilst challenging behaviour was reinforced by the contingent provision of attention. It may be that the presence of the demand established the reinforcing value of attention by functioning as a transitive CEO. As a parallel to Michael's (1982, 1993) slotted screw example, one could envisage that the onset of a demand that an individual cannot independently complete (= the sight of the slotted screw), establishes social contact (= the screwdriver) as an effective type of reinforcement and evokes challenging behaviour that has led to attention in the past (= asking his assistant for the screwdriver). Indeed McGill (1999, p. 402) suggested that if demands were to function as a transitive

CEO for attention-maintained challenging behaviour then one would expect higher levels of such behaviour in the presence of demands than in the standard attention condition, a pattern of responding which corresponds to that reported by Call et al.

Other antecedent conditions have been shown to influence attention-maintained challenging behaviour, including the presence of toys in the attention condition of a functional analysis (Ringdahl, Winborn, Andelman, & Kitsukawa, 2002) and the use of a diverted attention condition (O'Reilly, Lancioni, King, Lally, & Dhomhnaill, 2000). Diverted attention may function as a form of surrogate CEO. One could imagine that situations that involve a caregiver interacting with another person are associated with momentary reductions in the level of social contact received by the child. Over time this event would be expected to acquire establishing and evocative properties, independent of actual levels of social contact. If diverted attention were to function as a surrogate CEO for attention-maintained behaviour, one would expect there to be higher rates of challenging behaviour occurring in the diverted attention condition than in the standard attention condition even if actual levels of attention were the same. Providing non-contingent attention during the diverted attention condition would be expected to reduce the occurrence of such behaviours, presumably through extinction of the CMO-S. This corresponds to the pattern of responding found in the O'Reilly et al (2000) study.

The consequences provided for one response class during a functional analysis may also act as an MO for challenging behaviours that are members of alternative response classes. Piazza, Hanley, Fisher, Ruyter, and Gulotta (1998) investigated the multiply controlled challenging behaviour of two individuals. Whilst the onset of demands evoked negatively reinforced challenging behaviour, the break (and resulting deprivation of attention that it imposed) evoked attention-maintained behaviour. Thus, high rates of challenging behaviour during a demand condition may reflect not only an escape function but also an attention-function. The analysis of challenging behaviour

across within-session variations in MOs appears to provide one means of clarifying the function of apparently undifferentiated challenging behaviour (Roane, Lerman, Kelley, & Van Camp, 1999). For example if challenging behaviour is at least in part maintained by access to attention, one would expect a higher proportion of challenging behaviours to occur at times when demands (and social contact) are absent relative to when present, a pattern of responding consistent with that reported by LeBlanc, Hagopian, Marhefka and Wilke (2001).

Several different types of attention, aside from social disapproval, have been shown to influence attention-maintained challenging behaviour (e.g., DeLeon, Arnold, Rodriguez-Catter, & Uy, 2003; Kodak, Northup, & Kelley, 2007; LeBlanc, Hagopian, Marhefka, & Wilke, 2001; Piazza et al., 1999; Richman & Hagopian, 1999). Richman and Hagopian (1999) found that reprimands failed to function as an effective type of reinforcement for the attention-maintained challenging behaviour of two participants, whilst exaggerated attention and physical contact did. Such manipulations act on the value of attention as a type of reinforcement and deprivation or satiation of these specific forms of attention presumably functions as an MO for attention-maintained challenging behaviour. This suggests that not all forms of attention are of equal reinforcing value and that the type of attention provided during a functional analysis should be based on careful assessment and not an arbitrary 'one-size fits all' decision.

Over the past decade various biological influences have begun to be incorporated into the functional analysis of challenging behaviour (Langthorne, McGill, & O'Reilly, 2007). Such factors form part of the context in which challenging behaviour occurs and may influence the value of attention and the likelihood of attention-maintained challenging behaviour. Two studies were identified that investigated the influence of the drug *methylphenidate* (MPH) on attention-maintained challenging behaviour (Dicesare, McAdam, Toner, & Varrell, 2005; Northup et al., 1999). Both

studies revealed interactions between MPH and specific analogue conditions. Dicesare et al (2005) reported that the attention-maintained challenging behaviour of a young man with intellectual and developmental disabilities reduced notably in conditions in which MPH was administered in comparison to placebo conditions. Such findings suggest both that the results of a functional analysis may help to guide the prescription of certain psychoactive medications in the treatment of challenging behaviour and also suggest that functional analyses may provide a means of testing the effectiveness of certain pharmacological interventions (Matson & Wilkins, 2008).

Our understanding of the influence of MOs for attention-maintained challenging behaviour has progressed significantly over the past decade, as have methods for the investigation of such effects. Investigators have successfully gone beyond within-session manipulations to isolate the effects of pre-session manipulations on attention-maintained challenging behaviour. This has facilitated the investigation of the mechanisms by which the MO influences challenging behaviour, such as the potential 'priming' effect of brief pre-session access to attention (e.g., Roantree & Kennedy, 2006). The value- and behaviour-altering influence of variables other than social contact, such as the presence of toys, has also been well documented. A number of parameters surrounding the implementation of a functional analysis have been shown to act as MOs for attention-maintained challenging behaviour. For example, the person conducting the analysis, the location where it is conducted and how it is conducted have all been shown to influence attention-maintained challenging behaviour. Finally, certain biological variables have been shown to act as MOs for attention-maintained challenging behaviour.

Tangibles.

Whilst potentially confounded by the provision of attention, it appears that some 10% of cases of challenging behaviour are maintained by access to preferred items or

activities (Hanley, Iwata, & McCord, 2003). The value of tangibles fluctuates across environmental conditions and is clearly influenced by MOs. Given that many individuals with intellectual and developmental disabilities live in settings where access to tangibles is controlled by others it seems likely that MOs hold important implications for our understanding of tangible-maintained challenging behaviour.

A decade ago, McGill (1999) argued that variations in the availability of tangible items or activities altered their value as a type of reinforcement and the probability of tangibly maintained challenging behaviour. A small number of studies were cited that had shown the deprivation of tangibles could influence both tangible-maintained adaptive (Vollmer & Iwata, 1991) and challenging behaviour (Wacker et al., 1996). The non-contingent provision of tangible items was also known to reduce tangible-maintained challenging behaviour, most probably by acting as an AO (Marcus & Vollmer, 1996). Thus, whilst the evidence base remained relatively small, it had been demonstrated that the deprivation and satiation of tangibles could influence the subsequent occurrence of tangible-maintained challenging behaviours.

In comparison to attention-maintained behaviour the development in the experimental literature for tangible-maintained challenging behaviour has been relatively lean. The current review identified 16 studies that involved the investigation of MOs for challenging behaviour that was at least in part maintained by access to tangibles (see Appendix 2).

Momentary changes in within-session access to tangibles have been investigated in two studies as an MO for tangible-maintained challenging behaviour (Roane, Lerman, Kelley, & Van Camp, 1999; Worsdell, Iwata, Connors, Kahng, & Thompson, 2000), with both studies revealing higher levels of challenging behaviour following the within-session deprivation of the putative tangible maintaining variable, suggesting that this functioned as an EO for subsequent tangible-maintained behaviour.

Only two studies were identified that adopted pre-session manipulations to investigate tangible-maintained challenging behaviour (O'Reilly, Edrisinha, Sigafos, Lancioni, Cannella et al., 2007; O'Reilly et al., 2006). As part of a wider study, O'Reilly, Sigafos et al (2006) reported that the tangible maintained challenging behaviour of one young man occurred at higher rates following pre-session conditions in which there was no access to tangibles than in pre-session conditions in which the individual had free access to tangible items. Other studies have shown that such manipulations can exert powerful effects on an individual's preference for tangible items (e.g., Gottschalk, Libby, & Graff, 2000; McAdam et al., 2005) and the occurrence of tangible-maintained adaptive behaviours (e.g., Zhou, Iwata, & Shore, 2002).

Such findings hold important implications for the implementation of the tangible condition in a functional analysis. One would expect higher rates of tangible-maintained challenging behaviour following an alone or demand condition (in which access to tangibles are typically restricted) and lower rates following an attention or play condition (in which the individual typically has had non-contingent access to at least moderately preferred toys/activities). It is also likely that the amount of access an individual has had in their natural environment to preferred tangibles may influence the occurrence of tangible-maintained challenging behaviour within a functional analysis. As with attention-maintained challenging behaviour, this would suggest that prior access to tangibles should be controlled prior to conducting a functional analysis. Further studies are required that utilise pre-session manipulations in order to investigate the influence of the MO on tangible-maintained challenging behaviour.

Variables other than pre-session access to tangibles have been shown to influence tangible-maintained challenging behaviour, however. In their study, Ray and Watson (2001) investigated correlations between challenging behaviour and a series of 'temporally distant events'. The initially undifferentiated functional analyses of three

school-age boys revealed a tangible function when analysed according to whether certain antecedent events, such as having less than 5 hours sleep, being woken late and nocturnal enuresis had occurred earlier in the day or not¹². Such correlational evidence, whilst falling short of providing a 'believable demonstration' (Baer, Wolf, & Risley, 1968), may be important in generating hypotheses to account for otherwise unexplained variability in challenging behaviour during a functional analysis. For example, descriptive assessments may help in the identification of idiosyncratic variables that would not necessarily be detected using more formal experimental methods (Mace, Lalli, & Lalli, 1991).

As with attention-maintained challenging behaviour, it has been shown that relatively idiosyncratic contextual variables, such as the nature of the person running the functional analysis (McAdam, DiCesare, Murphy, & Marshall, 2004), as well as the location in which the analysis is conducted (Harding, Wacker, Berg, Barretto, & Ringdahl, 2005) can influence the occurrence of tangible-maintained challenging behaviour. Whether such effects are a function of the discriminative or motivative properties of such stimuli remains unclear, however, and further studies are required to elucidate such relations.

One critically important variable that has been shown to influence tangible-maintained challenging behaviour is the individual's preference for the tangibles withheld during a functional analysis (McLaughlin et al., 2003; Mueller, Wilczynski, Moore, Fusilier, & Trahan, 2001). In their study, Mueller et al (2001) reported tangible-maintained challenging behaviour as being more likely to occur in conditions in which access to higher-preferred stimuli was withheld, than when access to less

¹² Due to the correlative nature of this evidence it is not clear as to whether these events served any motivational function. Getting up late for example, may have been correlated with other events (such as an increased rate of demands, restricted access to tangibles) that actually functioned as EOs.

preferred stimuli was withheld. Interestingly aggression still occurred in conditions in which highly preferred items were freely available and only less preferred items were restricted. This may reflect within-session changes in preference during the course of a functional analysis condition or may be a discriminative effect. Alternatively it may be that restriction per se acts on the value of tangible items.

Consequences that are provided in a functional analysis for members of an alternative response class may act as an MO for tangible maintained challenging behaviour. Asmus, Franzese, Conroy, and Dozier (2003) provided some evidence to suggest that the consequences provided for stereotypical behaviour during a functional analysis served as an AO for the tangible-maintained destructive behaviour of one individual. Although this was not replicated, when stereotypy was ignored in a subsequent functional analysis then tangible-maintained destructive behaviour occurred at higher rates than had previously been the case. Such findings draw attention to the problems associated with including multiple topographies of challenging behaviour in a functional analysis.

Six studies were identified that examined the role of the onset of demands as an EO for tangible-maintained challenging behaviour (Adelinis & Hagopian, 1999; Fisher, Adelinis, Thompson, Worsdell, & Zarcone, 1998; Fritz, DeLeon, & Lazarchick, 2004; Hagopian, Bruzek, Bowman, & Jennett, 2007; Murphy, Macdonald, Hall, & Oliver, 2000; Wilder, Chen, Atwell, Pritchard, & Weinstein, 2006). These studies suggest that in some cases, challenging behaviour may occur in the presence of demands, not necessarily because the demand is aversive per se, but because the demand interrupts ongoing free operant behaviour and the removal of the demand allows for the reinstatement of the preferred activity. Hagopian et al (2007) found that the challenging behaviour of three individuals that occurred in demand contexts was occasioned by a request that led to the termination of a preferred activity with which the participant had

been engaged. A prior functional analysis for all three participants had failed to evoke similar levels of challenging behaviour as that which occurred in their natural environment. Subsequent analysis for one participant showed that challenging behaviour was not only evoked by 'do' requests (i.e., when the child was asked to complete a task) but also 'don't' requests (i.e., when the child was told directly not to engage in the activity). Thus high rates of challenging behaviour occurring in the demand condition of a functional analysis may at times be indicative of a tangible function *either* as opposed to *or* as well as an escape function. It would seem possible that such a situation could over time lead to the demand acquiring aversive properties by functioning as a reflexive CEO. For example, repeated pairing of a previously neutral demand with the subsequent unavailability of certain preferred items, would lead to the demand itself acquiring evocative properties independent of the availability of preferred tangibles. That is, the onset of the demand would signal the subsequent 'worsening' of the individual's condition (in the form of interruptions to ongoing activities) and would establish its own offset as an effective source of reinforcement.

The past decade has seen considerable advancement in our understanding of the influence of MOs on tangible-maintained challenging behaviour. A handful of studies have gone beyond within-session manipulations, to examine the influence of pre-session access to tangibles as well as other variables, on tangible-maintained challenging behaviour. Parameters surrounding the implementation of the tangible condition in a functional analysis have also been examined. For example, consequences provided for alternative response classes and the relative preference for tangible items have all been shown to influence tangible-maintained challenging behaviour. Studies have also highlighted the role that the onset of demands may have as a MO for tangible-maintained challenging behaviour.

Social-Negative Reinforcement

Epidemiological studies suggest that, in some 34.2% of cases, challenging behaviour may be maintained by the contingent removal of aversive stimuli, such as academic demands (Hanley, Iwata, & McCord, 2003). From an MO perspective, the onset of an aversive stimulus establishes its own offset as an effective form of reinforcement and evokes negatively reinforced behaviour (J. Michael, 1982, 1993). Such MOs may have a *phylogenic* basis and function as a UMO, for example as with the onset of pain, or may have an *ontogenic* basis and function as a type of CMO, whereby a previously neutral stimulus has acquired similar value- and behaviour-altering properties to that of the UMO or other CMO with which it has been associated.

A decade ago understanding of the influence of MOs for negatively reinforced challenging behaviour was, in comparison to other functions, relatively well developed. In his paper McGill argued that the onset and offset of demands functioned as an MO for challenging behaviour maintained by negative reinforcement. A number of studies that had examined such relations were cited (e.g., Vollmer, Marcus, & Ringdahl, 1995). Several studies had by this stage begun to investigate the specific stimulus properties of demands that functioned as MOs for negatively reinforced challenging behaviour, such as the rate of demand presentation (Smith, Iwata, Goh, & Shore, 1995), difficulty of demands (Weeks & Gaylord-Ross, 1981) and the novelty of demands (Mace, Browder, & Lin, 1987). Other studies had demonstrated the *abolishing* and *abative* effects of certain antecedent manipulations, such as providing advanced notice of transition (Tustin, 1995) or embedding demands in preferred activities (Carr, Newsom, & Binkoff, 1976). It was also acknowledged that other stimulus changes, such as the onset of social attention (Taylor & Carr, 1992) or ambient noise (O'Reilly, 1997), could evoke negatively reinforced challenging behaviour. Thus relatively idiosyncratic stimulus parameters had been identified as MOs for negatively reinforced challenging behaviour.

Research over the past decade on MOs for negatively reinforced challenging behaviour has progressed along these same lines. The current review identified 31 studies published from 1998-2007 to have investigated MOs for negatively reinforced challenging behaviour (see Appendix 3).

Investigators have continued to demonstrate that the onset of demands within a functional analysis may evoke escape maintained challenging behaviour (e.g., Roane, Lerman, Kelley, & Van Camp, 1999). That is, the onset of a demand acts as an EO establishing its own removal as an effective type of reinforcement.

Specific stimulus parameters of demands appear to act as an MO for escape-maintained challenging behaviour and the extent to which these parameters evoke challenging behaviour varies across individuals. The following variables have been manipulated within a demand context and been shown to influence escape-maintained challenging behaviour; choice over the task (McComas, Hoch, Paone, & El-Roy, 2000; Romaniuk et al., 2002), task familiarity (Asmus et al., 1999), use of an instructional strategy (McComas, Hoch, Paone, & El-Roy, 2000), noise (O'Reilly, Lacey, & Lancioni, 2000), task preference (Boelter et al., 2007), task repetition (McComas, Hoch, Paone, & El-Roy, 2000), presence of preferred stimuli (Long, Hagopian, DeLeon, Marhefka, & Resau, 2005) and the type and timing of prompting procedures (Borrero, Vollmer, & Borrero, 2004; Crockett & Hagopian, 2006; Ebanks & Fisher, 2003; Peyton, Lindauer, & Richman, 2005). These studies have built on the line of research exemplified by Smith, Iwata, Goh and Shore (1995) to demonstrate that relatively idiosyncratic aspects of academic demands can influence the occurrence of escape-maintained challenging behaviour. In order to effectively incorporate such variables it would seem important that indirect and/or descriptive assessments be conducted prior to a functional analysis (e.g., Borrero, Vollmer, & Borrero, 2004), so that the MOs that operate in the

individual's natural environment can be successfully included in the demand condition of the functional analysis.

Michael (1993) distinguished between the surrogate and reflexive CEO in relation to negatively reinforced behaviour. The onset of a surrogate CEO establishes the effectiveness of the removal of some other stimulus event as an effective type of reinforcement, whereas a reflexive CEO relation establishes its own removal, as opposed to that of another stimulus as an effective source of reinforcement. Although a subtle distinction, it may be important to determine whether such relations apply to escape-maintained challenging behaviour. Conceptually, it appears that they may. For example, for some individuals the presence of specific stimuli, such as the use of certain prompts, appears to act as a type of *surrogate CEO*, in that it alters the aversiveness of the demand and thereby establishes escape from the demand as an effective source of reinforcement. In such a situation one would expect that not only is challenging behaviour higher in those conditions in which the prompt is present than when not, but also that task completion (presumably an indicator of the aversiveness of the task) is also differentially influenced by the presence of the prompt (e.g., Crockett & Hagopian, 2006). This type of relation certainly appears analogous to Michael's description of the surrogate CEO relation. Prompts may also act as a type of reflexive CEO (i.e., their onset may establish their own off-set as an effective reinforcer). In such a situation one would expect higher rates of challenging behaviour in conditions in which the prompt is present than when not, however one would not expect task completion (if it represents an indicator of the aversiveness of the demand itself) to be influenced (e.g., Peyton, Lindauer, & Richman, 2005). One would also expect challenging behaviour to maintain in conditions in which the prompt remains but the demand is no longer removed contingent on the behaviour (Peyton, Lindauer, & Richman, 2005).

The probability of escape-maintained behaviour may also vary as a function of the individual presenting the demand (Magito-McLaughlin & Carr, 2005; McAdam, DiCesare, Murphy, & Marshall, 2004). In a recent study, Magito-McLaughlin and Carr (2005) investigated the influence of 'rapport' on escape-maintained challenging behaviour¹³. Following a descriptive assessment staff members were assigned either to good 'rapport' or poor 'rapport' groups for each of three individuals with intellectual and developmental disabilities. For all three individuals challenging behaviour occurred exclusively in demand contexts, and was much more likely to occur in the poor 'rapport' dyads. Task completion was high in the good 'rapport' dyads but extremely low in the poor 'rapport' dyads. A multi-component intervention was introduced designed to improve the quality of 'rapport' between the poor 'rapport' dyads. Results showed that the intervention led to an increase in task completion and reduction in the likelihood of escape-maintained challenging behaviour. Thus, the nature of the person introducing a demand, and specifically how they go about doing it, may influence the occurrence of escape-maintained challenging behaviour.

Interestingly, some studies have gone beyond the examination of the onset of single antecedents (e.g., a demand) to begin to examine the influence that a combination of antecedent events may have on escape-maintained challenging behaviour (Call, Wacker, Ringdahl, & Boelter, 2005; Call, Wacker, Ringdahl, Cooper-Brown, & Boelter, 2004; Carey & Halle, 2002). Call et al (2004) for example reported that the escape-maintained challenging behaviour of three individuals only occurred in situations in which attention was not available. When non-contingent attention was provided during demand sessions, escape-maintained challenging behaviour occurred at relatively low

¹³ 'Rapport' is likely to describe more specific dimensions of the interactions. For example, 'rapport' may simply describe a reinforcement history involving a high number of aversive events or a low number of reinforcing events.

levels. In a subsequent study Call (2005) found, for one individual, high rates of challenging behaviour occurring in the demand condition of a functional analysis only when access to tangibles was also restricted. Interestingly, neither the standard demand condition nor tangible condition consistently evoked challenging behaviour. These studies suggest that alternative sources of reinforcement may have an influence on the probability of escape-maintained behaviour occurring during demands. That is, providing non-contingent access to certain forms of positive reinforcement, such as attention or tangibles, may serve to abolish escape from demands as an effective type of reinforcement and thereby abate escape-maintained challenging behaviour. It seems important that descriptive assessments be conducted prior to beginning a functional analysis in order to identify such potential idiosyncratic relations.

The majority of studies to have investigated MOs for negatively reinforced challenging behaviour have relied on the systematic manipulation of within- as opposed to pre-session variables. However, pre-session variables are likely to influence the occurrence of such behaviour. For example Carr, McLaughlin, Giacobbe-Grieco and Smith (2003) reported that pre-session ratings of 'mood' predicted the subsequent occurrence of escape-maintained challenging behaviour¹⁴. Using a reversal design, Ducharme and Rushford (2001) found that child compliance with demands made by a brain-injured parent increased following pre-session play conditions. Such findings may have implications for the sequencing of functional analysis conditions. For example, the findings above suggest that for some individuals escape-maintained challenging behaviour may be less likely to occur following the play condition than following other conditions. Relations between pre-session events and negatively reinforced challenging behaviour clearly merit further investigation and appear to have been a relatively understudied area. One would expect that pre-session influences are likely to influence

¹⁴ 'Mood' may simply reflect the inability to tact certain environmental events.

escape-maintained challenging behaviour. Failure to control for such influences would represent a threat to the internal validity of the functional analysis being conducted. For this reason it would seem important that such influences be monitored and where possible experimentally controlled.

There have been a number of studies to have investigated the influence of neurobiological variables, such as *naltrexone* (Garcia & Smith, 1999)¹⁵ and *amphetamine* (Kelley, Fisher, Lomas, & Sanders, 2006) and physiological variables, such as menses (Carr, Smith, Giacini, Whelan, & Pancari, 2003), and sleep deprivation (O'Reilly & Lancioni, 2000) on escape-maintained challenging behaviour. For example, Kelley (2006) investigated the influence of amphetamine on the response allocation of a young boy with intellectual and developmental disabilities and ADHD between challenging behaviour and compliance within a demand context. When administered a placebo drug the boy allocated a greater percentage of responses to challenging behaviour than compliance. When amphetamine was administered there was a higher proportion of responses allocated to compliance. The influence of other medications, such as *risperidone* have also been investigated but without clear effects (e.g., Zarcone et al., 2004). Physiological factors may also influence escape-maintained challenging behaviour. O'Reilly and Lancioni (2000) reported that missing afternoon naps increased the occurrence of a young girl's escape-maintained challenging behaviour. Interestingly, it was also found that sleep deprivation influenced within-class response allocation, with aggression more likely to occur on days with an afternoon nap and self-injury more likely to occur on days without a nap. Thus escape-maintained challenging behaviour is clearly influenced by the biological context in which it occurs. As well as demonstrating the influence of biological variables on escape-maintained challenging behaviour, both

¹⁵ An alternative account for the effects of naltrexone in this instance is that it serves to establish a punishment contingency for challenging behaviours.

of these studies included response allocation as a dependent variable, suggesting that the MO may independently influence response allocation. Further research should begin to attend to the influence of the MO on response allocation.

Other studies have investigated the onset of stimulus events, other than demands, that may act as EOs for escape-maintained challenging behaviour. For example, the onset of attention (Hagopian, Wilson, & Wilder, 2001; Moore & Edwards, 2003; Moore, Edwards, Wilczynski, & Olmi, 2001), social proximity (Oliver, Oxener, Hearn, & Hall, 2001), ambient noise (Buckley & Newchok, 2006; McCord, Iwata, Galensky, Ellingson, & Thomson, 2001), specific food textures (Patel, Piazza, Layer, Coleman, & Swartzwelder, 2005), and transitions (McCord, Thomson, & Iwata, 2001) have all been shown to evoke negatively reinforced challenging behaviour.

This body of research holds important implications for the design of conditions within a functional analysis (see Table 2.2). The play condition is designed to provide an analogue of the 'enriched' environment and represents a control condition. If high rates of challenging behaviour occur in this condition a judgment regarding behavioural function may be difficult to make. However, the play condition may contain potential EOs for negatively reinforced challenging behaviour, such as high levels of social attention, noise, social proximity. High levels of challenging behaviour occurring in the play condition of a functional analysis should prompt further investigation and it may be necessary to implement a modified condition in order to test whether a particular aspect of the play condition, such as social attention, evokes negatively reinforced challenging behaviour (cf., Hagopian, Wilson, & Wilder, 2001).

As already stated, several studies have examined the specific properties of demands that function as EOs for negatively reinforced challenging behaviour. Similar studies have now begun to be conducted for other sub-categories of negatively reinforced challenging behaviour. For example, Buckley and Newchok (2006)

conducted a component analysis which revealed that the specific source of music was the critical variable that operated as an MO for challenging behaviour maintained by the removal of music. That is, high rates of challenging behaviour occurred when music was played on a tape but low rates when the same music was played via a CD.

Likewise, Patel et al (2005) examined the specific textures of food that were associated with food packing, with higher levels of food packing occurring in conditions that involved higher textured foods. One possible account for this may be that higher textured foods require a greater response effort than do lower textured foods and as such are more aversive (Patel, Piazza, Layer, Coleman, & Swartzwelder, 2005). It seems important that research continues to investigate such stimulus parameters for all categories of negatively reinforced challenging behaviour.

The specific parameters of demands that exert value- and behaviour-altering effects over negatively reinforced challenging behaviour have continued to form a predominant theme in the MO literature. However, there have been several notable developments over the last 10 years. Studies have begun to examine the influence that combined antecedents may exert on negatively reinforced challenging behaviour. A handful of studies have investigated the influence of pre-session manipulations on negatively reinforced challenging behaviour, although further research along these lines is required. A host of biological factors have now been shown to influence escape-maintained challenging behaviour. Perhaps the most significant development has been in the investigation of negatively reinforced challenging behaviour evoked by stimuli other than demands, such as the onset of attention. This may have important implications for the design of specific functional analysis conditions and should prompt further investigation.

Automatic Reinforcement

In some 15.8 % of cases, challenging behaviour occurs independent of its social consequences and is automatically reinforced (Hanley, Iwata, & McCord, 2003).

Challenging behaviour may at times be maintained by automatic negative reinforcement, such as the removal or attenuation of pain (DeLissovoy, 1963; Symons, 2002), however such relations have rarely been examined in the literature. As such the current section shall focus exclusively on evidence for the influence of MOs on challenging behaviour maintained by automatic positive reinforcement.

In his review McGill (1999) discussed research that indicated a role for MOs in automatically reinforced challenging behaviour. The deprivation of environmental stimulation was cited as a likely EO for automatically reinforced challenging behaviour (e.g., Berkson & Mason, 1964). Likewise the non-contingent provision of environmental stimulation was recognised as most likely operating as an AO for such behaviours (e.g., Kennedy & Souza, 1995). One study was also cited which suggested that providing access to stimulation that was matched to that which maintained challenging behaviour was more effective in reducing such behaviours than providing access to unmatched stimuli (Piazza et al., 1998). Fluctuations in specific, as opposed to general, sources of stimulation may function as an MO for automatically reinforced challenging behaviour.

There have been some notable developments over the past decade in our understanding of the variables that exert a *motivative* influence over automatically reinforced challenging behaviour, as well as in the methods used to investigate such variables. The current review identified some 36 studies carried out from 1998-2007 which involved the assessment of MOs for automatically reinforced challenging behaviour (see Appendix 4).

It has been suggested that *response deprivation* and *satiation* may function as an MO for challenging behaviour (Klatt & Morris, 2001). That is, the restricted opportunity to engage in a free operant behaviour may establish engagement in that behaviour as an effective source of reinforcement and evoke associated responses. Likewise, the value of the consequences that maintain a response that is forced above its free-operant baseline rate will abolish and associated behaviours will abate. There is some evidence to suggest that such relations may influence automatically reinforced challenging behaviour (Rapp, 2004, 2006; Rapp, Vollmer, St Peter, Dozier, & Cotnoir, 2004). For example Rapp (2004) found that the stereotypy of a young boy with intellectual and developmental disabilities occurred at lower rates after having had prior access to the response earlier in the day; in contrast Rapp (2006) found that one individual's stereotypy increased immediately following a response blocking intervention. Thus the opportunity to engage in automatically reinforced challenging behaviour may function as an MO for future occurrences of the same response.

A number of studies have demonstrated that providing access to competing sources of stimulation, that are not necessarily matched to that which maintains challenging behaviour, may act as an AO for automatically reinforced challenging behaviour (e.g., Cuvo, May, & Post, 2001; Healey, Ahearn, Graff, & Libby, 2001; Long, Hagopian, DeLeon, Marhefka, & Resau, 2005; O'Reilly, Murray, Lancioni, Sigafos, & Lacey, 2003; Rapp, Vollmer, St Peter, Dozier, & Cotnoir, 2004; Roane, Kelly, & Fisher, 2003; Roscoe, Iwata, & Goh, 1998; Wilder, Kellum, & James, 2000). O'Reilly et al (2003) found, for example, that providing non-contingent access to vibrating stimuli reduced the attempted self-injury and agitation of a man with intellectual and developmental disabilities that appeared to be automatically reinforced.

One concern associated with providing non-contingent access to competing sources of stimulation for automatically reinforced challenging behaviour is that with

repeated exposure the value of the unmatched stimulus is abolished; whilst leaving intact the EO for challenging behaviour. One would expect therefore that over time challenging behaviour would re-emerge as the reinforcing value of the unmatched stimuli is abolished. In their study, Lindberg, Iwata, Roscoe, Worsdell, and Hanley (2003) found that increasing the length of experimental sessions to 120 mins, led to the re-emergence of automatically reinforced self-injury in two individuals, when providing access to unmatched stimuli had previously been effective in reducing self-injury during brief experimental sessions. A number of parameters may be important in ensuring that competing sources of stimulation maintain their effectiveness over time, such as ensuring the alternative stimuli are preferred (Ahearn, Clark, DeBar, & Florentino, 2005), providing access to multiple as opposed to single sets of stimuli (DeLeon, Anders, Rodriguez-Catter, & Neidert, 2000; Lindberg, Iwata, Roscoe, Worsdell, & Hanley, 2003) and combining the provision of unmatched stimuli with other procedures such as response blocking (Carr, Dozier, Patel, Adams, & Martin, 2002). Thus providing non-contingent access to competing sources of stimulation may act as an AO for automatically-reinforced challenging behaviour, however there are concerns regarding the extent to which such interventions can successfully maintain over time without additional procedures.

Some studies have compared the effectiveness of providing access to matched against unmatched sources of stimulation for automatically reinforced challenging behaviour with conflicting results. The hypothesis here is that providing access to matched sources of stimulation is more likely to act as an AO for challenging behaviour. Six studies were identified which found that providing access to matched stimuli led to greater reductions in automatically reinforced challenging behaviour than did providing access to unmatched stimuli (Fisher, Lindauer, Alterson, & Thompson, 1998; Higbee, Chang, & Endicott, 2005; Piazza, Adelinis, Hanley, Goh, & Delia, 2000; Piazza et al.,

1998; Rapp, 2007; Taylor, Hoch, & Weissman, 2005). In contrast, however, Ahearn et al (2005) reported that the automatically reinforced challenging behaviour of two children with intellectual and developmental disabilities showed greater reductions when they were given access to highly preferred unmatched rather than matched stimuli. Likewise Carr et al (2002) failed to find any benefits of matched over unmatched stimuli. Given the results of the Lindberg et al study it would seem important that such comparisons involve analyses over extended periods of time. One would expect that the effectiveness of matched sources of stimulation in reducing automatically reinforced challenging behaviour would maintain over extended periods of time, whereas the effectiveness of unmatched sources of stimulation would not.

Deprivation of certain specific, as opposed to general, forms of stimulation therefore appears to act as an EO for automatically reinforced challenging behaviour and the non-contingent provision of matched sources of stimulation acts as an AO for such behaviours. As the response-reinforcement relation is typically covert in challenging behaviour maintained by its automatic consequences (Vollmer, 1994), investigators have had to rely on indirect assessments in order to inform hypotheses regarding the source of stimulation that maintains challenging behaviour.

Several studies have derived hypotheses regarding the specific maintaining variable for automatically reinforced challenging behaviour from the likely sensory products of certain topographies of challenging behaviour and provided access to matched sources of stimuli accordingly (Ahearn, Clark, DeBar, & Florentino, 2005; Carr, Dozier, Patel, Adams, & Martin, 2002; Fisher, Lindauer, Alterson, & Thompson, 1998; Kenzer & Wallace, 2007; Piazza, Adelinis, Hanley, Goh, & Delia, 2000; Piazza et al., 1998; Sidener, Carr, & Firth, 2005; Thompson, Fisher, Piazza, & Kuhn, 1998). Thompson Fisher, Piazza, and Kuhn (1998), for example, hypothesised that the automatically reinforced chin-grinding of a child with intellectual and developmental

disabilities was maintained, specifically, by tactile stimulation to the chin and found that providing access to a source of stimulation matched to this hypothesis was effective in reducing the occurrence of chin-grinding. Deriving clear hypotheses from the topography of challenging behaviour may not always be possible however, particularly in cases where there are several potential sensory products to a response.

As such other studies have based such hypotheses on the results of indirect assessments, such as sensory extinction procedures (Rapp, Dozier, Carr, Patel, & Enloe, 2000; Rapp, Miltenberger, Galensky, Ellingson, & Long, 1999; Tang, Patterson, & Kennedy, 2003), antecedent 'sensory class' assessments (Britton, Carr, Landaburu, & Romick, 2002; Patel, Carr, Kim, Robles, & Eastridge, 2000; Taylor et al., 2005), and preference assessments (Goh, Iwata, & Kahng, 1999; Patel, Carr, Kim, Robles, & Eastridge, 2000; B. A. Taylor, Hoch, & Weissman, 2005). Rapp et al (1999) used a sensory extinction procedure in order to demonstrate that the hair pulling of a woman with intellectual and developmental disabilities was specifically reinforced by the digital-tactile stimulation it produced. Sensory extinction (i.e., the wearing of a rubber glove) led to a reduction in the amount of time spent manipulating hair. The non-contingent provision of hair that had been previously pulled out led to an increase in the amount of time spent manipulating hair and a notable reduction in hair pulling. Various types of preference assessments have also been used to help inform such hypotheses. Goh et al (1999), for example, conducted a preference assessment to identify the specific components of cigarettes that served to reinforce the pica behaviour of four individuals with intellectual and developmental disabilities. Other studies have relied on antecedent 'sensory class' assessments in order to identify potential matched sources of stimulation, for example Taylor et al (2005) reported that the automatically reinforced vocal stereotypy of one child occurred at lower rates in the presence of auditory toys than non-auditory toys. However, such indirect methods still do not allow for a

definitive statement about whether a given source of stimulation is matched to or merely competes with that which maintains automatically reinforced challenging behaviour.

Given these problems investigators have begun to explore alternative methods to empirically identify sources of stimulation that are matched to that which maintains automatically reinforced challenging behaviour. Three studies were identified which utilised multiple-schedules in order to investigate sources of stimulation that may be matched to that which maintains automatically reinforced challenging behaviour (Rapp, 2006, 2007; Simmons, Smith, & Kliethermes, 2003). In line with the response deprivation hypothesis, if a source of stimulation provided during NCR matches that which maintains challenging behaviour one would expect there to be a decrease in the amount of time allocated to automatically reinforced behaviour after the intervention in comparison to before (i.e., due to reinforcer satiation). If however the stimulation competes with (rather than substitutes for) the maintaining variable then one would expect an increase in the amount of time allocated to the automatically reinforced response after the intervention. Rapp (2006) investigated the relative influence of providing non-contingent access to 'matched' stimulation and response blocking on the stereotypical behaviours of one individual. Relatively lower post-intervention levels of stereotypy were observed following non-contingent access to matched stimulation (suggesting it functioned as an AO), whereas there were relatively higher post-intervention levels of stereotypy following a response blocking component (suggesting it functioned as an EO). The results of both Simmons et al (2003) and Rapp (2007) also show consistent reductions in automatically reinforced challenging behaviour immediately following NCR involving 'matched' sources of stimulation. It would seem that the use of multiple-schedules may constitute an important methodological development in the investigation of MOs for automatically reinforced challenging behaviour. Future research is required that utilises such schedules in comparing the

relative effectiveness of providing access to matched and unmatched sources of stimulation. One would expect there to be higher levels of automatically reinforced challenging behaviour in the period following access to unmatched than matched stimulation.

The alone condition of a functional analysis typically involves the deprivation of stimulation, which is hypothesised to act as an EO for automatically reinforced behaviour. However, in some cases it appears that this may not be the relevant EO for automatically reinforced challenging behaviour. Several studies have demonstrated that such behaviours may be evoked by the presence as opposed to the absence of certain stimuli (Carter, Devlin, Doggett, Harber, & Barr, 2004; Friman, 2000; Rapp, 2004, 2005; Van Camp et al., 2000). For example, Friman (2000) reported that the thumb sucking of a young boy with intellectual and developmental disabilities occurred only in the presence of a cloth and not in its absence. The automatic consequences of thumb-sucking were no more available in the presence of the cloth suggesting that it acted not as a discriminative stimulus but as an EO. Likewise, Van Camp et al (2000) found that the inclusion of a vibrating ball in the alone condition of a functional analysis led to an increase in automatically reinforced hand biting. A component analysis demonstrated that it was the vibrations made by the toy (as opposed to the sound or protrusions) that were associated with an increase in hand biting in the no-interaction conditions. Again the automatic consequences of hand-biting were no more available in the presence of the toy, suggesting that it may have exerted a motivative influence over challenging behaviour. Such findings appear to have important implications for the functional analysis of challenging behaviour (see Table 2.2). Low rates of challenging behaviour that occur in the alone condition may not necessarily indicate the absence of automatically reinforced challenging behaviour if the stimuli that occasion such behaviours are not present. Equally, high rates of challenging behaviour that occur in

conditions in which the child has access to various stimuli (such as the attention, play and tangible conditions) may not necessarily be indicative of socially-maintained challenging behaviour. To protect against making such Type I or Type II errors it seems that indirect and descriptive assessments should be used to identify potential idiosyncratic sources of variability for automatically reinforced challenging behaviour. In addition within-session analyses have been shown to be useful in identifying an automatically reinforced function following an unclear initial functional analysis (Roane, Lerman, Kelley, & Van Camp, 1999).

Automatically reinforced challenging behaviour has also been shown to be influenced by certain biological variables, which may exert both value- and behaviour-altering effects (Carter, 2005; Garcia & Smith, 1999). Naltrexone is an opiate antagonist that has been shown to be relatively successful in reducing certain topographies of challenging behaviour in some individuals (Thompson, Hackenberg, Cerutti, Baker, & Axtell, 1994). Garcia and Smith (1999) reported that naltrexone successfully reduced the occurrence of automatically reinforced head-banging of one individual. It may be that naltrexone acted as a MO by either abolishing the reinforcing value of the automatic consequences of head-banging or alternatively by establishing the punishing value of the response itself¹⁶. It seems important that there is further investigation of the influence of neurobiological variables on automatically reinforced challenging behaviour.

There have been significant developments in our understanding of automatically reinforced challenging behaviour over the past decade. The results of several studies suggest that the restricted opportunity to engage in automatically reinforced challenging behaviour acts as an EO for subsequent engagement in that behaviour. Providing access to unmatched sources of stimulation has also been shown to act as an AO for

¹⁶ The extinction of the response-reinforcement contingency is another possible interpretation here.

automatically reinforced challenging behaviour. The literature has placed a particular emphasis on the identification of matched sources of stimulation for automatically reinforced challenging behaviour and the majority of developments have taken place along these lines. However, there have also been important developments in other areas, particularly in the recognition that the presence of idiosyncratic variables may evoke automatically reinforced challenging behaviour and that biological variables may also play an important role in altering the reinforcing value of automatically reinforced challenging behaviour.

The Behaviour-Altering Effect of the MO

Michael and colleagues argue that the value- and behaviour-altering effects of the MO, whilst often related are in fact independent of one another (e.g., Laraway, Snyckerski, Michael, & Poling, 2003). Thus an operative contingency of reinforcement is not a *necessary* condition for the MO to influence behaviour. Given a sufficient level of water deprivation one would be expected to search for water in places where reinforcement has historically been absent and no discernable discriminative stimuli are present. Therefore, the behaviour-altering effect of the MO can be isolated by demonstrating changes in behaviour that result from MO manipulations under conditions of extinction. Such relations may hold important implications for our understanding of challenging behaviour.

A recent body of work has attempted to isolate the behaviour-altering effect of the MO for both attention- and tangible-maintained challenging behaviour (O'Reilly, Edrisinha, Sigafos, Lancioni, & Andrews, 2006; O'Reilly, Edrisinha, Sigafos, Lancioni, Cannella et al., 2007; O'Reilly, Edrisinha, Sigafos, Lancioni, Machalicek et al., 2007; O'Reilly et al., 2006). O'Reilly, Sigafos et al. (2006) demonstrated that manipulating pre-session access to tangibles and attention respectively, influenced the tangible-maintained challenging behaviour of one individual and the attention-

maintained challenging behaviour of another in subsequent test conditions, with higher levels of challenging behaviour occurring after deprivation conditions than after satiation conditions. These effects were found both when challenging behaviour was reinforced in test conditions and more importantly when the behaviour was placed on extinction, thereby providing evidence for the behaviour-altering effect of the MO independent of its value-altering effect. Other evidence would seem to support these findings, for example, NCR has been shown to be effective in attenuating the side-effects of extinction (Vollmer et al., 1998). It seems likely that NCR achieves such effects by exerting an abative effect on challenging behaviour in the absence of any reinforcement contingency.

However, an alternative account for these findings may exist. Perhaps the *value-altering* effect remains intact even when reinforcing consequences are removed. That is, the higher rates of challenging behaviour in EO conditions may be the result of an extinction burst. In contrast in AO conditions the 'extinction' procedure may not genuinely constitute extinction, as the event no longer contingent on challenging behaviour is not currently operative as a reinforcer and as such there is no extinction burst. This second interpretation implies that the removal of the reinforcement contingency may fail to isolate the behaviour-altering effect of the MO. Examination of within-session patterns may more readily enable the identification of an extinction burst, and would enable each of these alternative accounts to be empirically examined.

Whilst promising, there are some studies which appear to contradict these recent findings on the behaviour-altering effect of the MO. Two studies have failed to evoke consistently high levels of challenging behaviour in conditions in which an EO has been operative but challenging behaviour has been placed on extinction (Potoczak, Carr, & Michael, 2007; Worsdell, Iwata, Connors, Kahng, & Thompson, 2000). For example, Potoczak et al (2007) found that the challenging behaviour of four individuals occurred

at consistently high rates in demand conditions in which both an EO (demand) and escape contingency were present. AB functional analyses (Carr & Durand, 1985), in which an EO but no reinforcement contingency was present, produced much more variable and less differentiated patterns of responding. However, the fact that challenging behaviour still occurred in the absence of an escape-contingency would seem to provide some tentative evidence for the behaviour-altering effect of the MO for escape-maintained challenging behaviour, in isolation of its value-altering effect. There are important differences between these studies, which both relied on within-session MO manipulation and those conducted by O'Reilly and colleagues, which involved pre-session manipulations. Conceptually, it would seem likely that pre-session experimental manipulations have a greater power (i.e., are more likely to exert an influence on behaviour-environment relations) and thereby are likely to function as a more potent EO than within-session manipulations¹⁷.

Michael and colleagues suggest that the behaviour-altering effect of the MO may occur 1) directly, 2) by interacting with discriminative stimuli or 3) by influencing behaviours maintained by conditioned reinforcers (Laraway, Snyckerski, Michael, & Poling, 2003; Michael, 1982, 1993). O'Reilly, Edrisinha, Sigafos, Lancioni, Machalicek et al (2007) provided some evidence that the behaviour-altering effect of the MO may occur directly in the absence of any discernable discriminative stimuli. Following the pre-session deprivation of attention, the attention-maintained behaviour of one individual was shown to occur when they were alone and no discernable discriminative stimuli for attention were present. It seems important that further

¹⁷ For example, being deprived of attention for an hour would seem likely to exert a greater influence on attention-maintained behaviour, than would the within-session deprivation of attention within the attention condition of a functional analysis (O'Reilly, 1999).

research begin to explore the other mechanisms by which the MO exerts its behaviour-altering effect.

These findings on the behaviour-altering effect would appear to hold several implications for our understanding of challenging behaviour, as well as our interpretation of the results of a functional analysis. If an EO can evoke challenging behaviour in the absence of a S^d or a reinforcement contingency then it would seem possible at least that the behaviour-altering effect may precipitate challenging behaviour in conditions of a functional analysis that are seemingly irrelevant to the function served by challenging behaviour (see Table 2.2). For example, given a sufficient level of tangible deprivation, an individual could display high levels of tangible-maintained challenging behaviour in the demand, attention, or alone condition of a functional analysis even in the absence of a relevant reinforcement contingency or any discriminative stimuli. Such a possibility, whilst speculative, would constitute a significant threat to the internal validity of functional analysis methods and in some cases may lead to the adoption of behavioural interventions that would otherwise be contraindicated. An MO analysis helps to identify potential threats to the integrity of a functional analysis and it would seem that these threats can be minimised by relatively simple modifications made to the standard functional analysis conditions (see Table 2.2). Taking the example of tangible-maintained challenging behaviour, one could take steps (by controlling pre-session and within-session access to tangibles) to ensure that the EO for tangible-maintained challenging behaviour is only in place in the tangible condition of the functional analysis and not in other irrelevant conditions. Examination of within-session patterns of responding would also help to clarify potential ambiguities that may arise when conducting a functional analysis. Given recent developments in our understanding of the behaviour-altering influence of the MO, it seems critical to ensure

that the EO for a given behavioural function is present only in its relevant functional analysis condition and not in alternative, irrelevant conditions.

Table 2.2.

Implications of the Behaviour-Altering Effect for Functional Analysis

Condition with high CB	Probable function	Possible function	Unlikely function	Resolution
Attention	Attention	Tangible, Automatic	Escape	Provide access to tangibles (pre-session/within-session), remove stimuli that may evoke automatically reinforced challenging behaviour. Examine within-session responding.
Tangible	Tangible	Attention, Automatic	Escape	Provide access to attention (pre-session/within-session), remove stimuli that may evoke automatically reinforced challenging behaviour. Examine within-session responding.
Demand	Escape	Tangible, Attention, Automatic		Provide access to tangibles/attention, remove stimuli that may evoke automatically reinforced challenging behaviour. Examine within session responding.
Alone	Automatic	Tangible, Attention,	Escape	Provide access to tangibles/attention (pre-session only)
Play		Automatic, Escape	Tangible Attention	Remove stimuli that may evoke automatically reinforced challenging behaviour. Test potential EOs for negatively reinforced challenging behaviour

Suggestions for Future Research

There has over the past decade been a tremendous development in our understanding of the conditions that establish or abolish the motivation for the variables which maintain challenging behaviour. There are several areas where future research is

clearly required to further enhance current understanding of the influence of MOs on challenging behaviour.

Currently, research has, with few exceptions, focused on the influence of the MO on a single response. However MO manipulations may influence response allocation between a number of concurrent operants. It seems possible, at least, that the MO may interact with aspects of the response-consequence relationship that have already been shown to influence response allocation (e.g., Horner & Day, 1991). Only three studies were identified in the current review that examined the influence of the MO on response allocation (Kelley, Fisher, Lomas, & Sanders, 2006; O'Reilly, Edrisinha, Sigafos, Lancioni, Cannella et al., 2007; O'Reilly & Lancioni, 2000). It would seem important that future research begin to identify the extent to which the MO influences response allocation.

Related to this, the primary dependent variable used in MO research has typically been frequency. However, it has been suggested that the MO exerts an influence on other aspects of behaviour, such as response latency, relative frequency, response magnitude and so on (Michael, 2007). The demonstration that the MO alters the magnitude of a response or its latency would hold important implications for our understanding of the MO itself as well as for the development of treatment strategies. As such, applied studies should begin to examine the influence of the MO across a range of measurable dimensions of challenging behaviour.

A focus of many studies to date has been on the single effect of a particular antecedent manipulation as either an EO or AO. However, it seems possible that a single antecedent manipulation may have multiple value- and behaviour-altering effects on an array of reinforcers and punishers across different response classes. For example, providing high levels of social contact may abolish the reinforcing value of attention (acting as an AO for attention-maintained behaviour), whilst at the same time

establishing the reinforcing value of a preferred toy (acting as an EO for tangible-maintained behaviour). Indeed Berg et al (2000) demonstrated that providing pre-session access to attention in a free play condition reduced the probability of a child choosing to interact with her mother (acting as an AO for attention-maintained behaviour), and increased the probability of choosing to play with preferred toys (acting as an EO for tangibly-maintained behaviour). This relation reversed following pre-session alone conditions. Applied research on challenging behaviour has to date, however, failed to take account of the multiple effects of MOs on challenging behaviour (Michael, 2007). Further studies should begin to address such relations.

The MO is a continuous variable¹⁸ and it would seem important that future research reflect this complexity. Three studies have been conducted that have involved parametric analyses of the MO in relation to preference or adaptive behaviour maintained by tangibles (Gottschalk, Libby, & Graff, 2000; Klatt, Sherman, & Sheldon, 2000; McAdam et al., 2005). In their study, Gottschalk et al manipulated pre-session access to food tangibles between deprivation, control and satiation conditions, demonstrating that deprivation resulted in increased preference and satiation resulted in decreased preference in comparison to control conditions. It would seem important that such parametric analyses begin to be applied to the study of MOs for challenging behaviour.

The repeated presentation of a reinforcer is, over time, likely to exert abolishing effects on its current reinforcing value and abate those behaviours it currently maintains. There may be certain situations in relation to challenging behaviour when we wish to mitigate such effects, for example if teaching a functionally equivalent response. In a recent study, North and Iwata (2005) investigated the effects of various procedures

¹⁸ Although there are situations in which its effects are relatively discrete. See Michael's (1982) discussion of transitive CEOs for example.

designed to mitigate the abolishing effects of repeated reinforcer presentation on tangible maintained adaptive behaviours. Providing pre-session choice was shown to mitigate AO effects for two participants and within-session variations in the items used as reinforcers was shown to mitigate AO effects for another participant. It seems that further such studies are required that begin to investigate the influence of such manipulations on challenging behaviour.

There are a diverse range of biological influences that have, over the past decade, been shown to influence the occurrence of challenging behaviour. For example, genetic, physiological and neurobiological variables have all been shown to influence challenging behaviour. The MO provides a means of incorporating such influences into the functional analysis of challenging behaviour whilst retaining a conceptually systematic approach to their analysis. Further research is required to continue the developments that have been made in the integration of the behavioural and biological sciences in relation to the investigation of challenging behaviour.

Functional analysis provides an important tool with which to assess challenging behaviour as it develops in young children (Kurtz et al., 2003; Richman & Lindauer, 2005). It seems likely that at both phylogenic and ontogenic level MOs play a crucial role in the development of challenging behaviour and further empirical investigation in this understudied area is clearly required. Furthering current understanding of the role of the MO in the development of challenging behaviour would hold important implications for refining approaches to the early intervention and prevention of challenging behaviour in young children at risk of developing challenging behaviour.

A decade ago, McGill (1999) discussed the relevance CMOs held for our understanding of challenging behaviour. Whilst there have been several studies to have investigated the effects of CMOs on the occurrence of adaptive behaviours (e.g., Kuhn, Lerman, Vorndran, & Addison, 2006; Rosales & Rehfeldt, 2007) there have been no

studies to explicitly address such mechanisms in relation to challenging behaviour. As already discussed, such relations may be relatively prevalent in precipitating challenging behaviour and it seems important that they begin to be empirically examined. Such studies would need to control for fluctuations in the UMO in order to demonstrate the presence of a CEO relation. Investigation of the procedures by which McGill (1999) has suggested that CEOs can be addressed in treatment, such as the extinction of CEOs, also seems to be important for future research. For example, if the presentation of a demand acts as a transitive CEO for attention-maintained challenging behaviour then the CEO relation could be extinguished by providing non-contingent attention during demand presentation, and by extinguishing the relation between challenging behaviour and attention.

Central to applied behaviour analysis has been the development of 'theory' inductively derived from the basic data it describes (Skinner, 1950). Providing a conceptual system within which empirical findings can be effectively described is an important goal for applied behaviour analysis (Baer, Wolf, & Risley, 1968) and one that is more likely to further our understanding of functional relations than an approach that relies on the empirical findings alone. Investigators studying the influence of the MO should continue to rely on the conceptual system provided by Michael in order to describe the functional relations they uncover. Some elements of this system (such as the 'CMO'), have not been utilised on occasions when it would seem that they provide a more accurate description of the facts than do alternative terms. Future research should rely on the full conceptual system provided by Michael, as opposed to select parts, when relating findings to basic principles of behaviour.

The list above is by no means exhaustive and there may be other areas that warrant further investigation, such as the value- and behaviour-altering influence of derived relational responding (Dymond, Roche, Forsyth, Whelan, & Rhoden, 2007;

Whelan, Barnes-Holmes, & Dymond, 2006) and the further investigation of the mechanisms by which the MO exerts its influence. A number of studies also seem to require systematic replication and extension, for example those that have focused on the behaviour-altering effect of the MO (e.g., O'Reilly et al., 2006) and the 'priming' effect of brief pre-session access to social positive types of reinforcement (Roantree & Kennedy, 2006).

Concluding Comments

Over the past decade there have been considerable developments in the investigation of MOs and the role played by such variables in challenging behaviour. The terms used to describe motivative events have evolved, as have the methods used to investigate their effects. This endeavour has served to facilitate the incorporation of MOs into the functional analysis of challenging behaviour and as such has been beneficial in developing our understanding of challenging behaviour.

There are several areas where future research is needed in order to continue this advancement. Of particular relevance to the remainder of the thesis is the emphasis given to the interaction between genetic variables and behaviour-environment relations.

The developments that have taken place over the past decade provide a firm foundation on which such developments can be built. The close connections between basic and applied research encouraged by the advent of functional analysis (Mace, 1994), will continue to be of critical importance in the future investigation of the effects of the MO on challenging behaviour.

Chapter III. A Functional Analysis of the Early
Development of Self-Injurious Behaviour. Incorporating Gene-
Environment Interactions¹⁹

“It is a mistake to ask which traits are hereditary and which are learned. Similarly it is a mistake even to ask how much hereditary and environment contribute respectively to any specified pattern of development. The correct question, as always, is how development takes place, in detail, step by step through the causal chains found operating in a specific individual under study.” (Bijou & Baer, 1967, p. 111)

¹⁹ An adapted version of this chapter was published in the American Journal on Mental Retardation. Langthorne, P. & McGill, P. (2008). A functional analysis of the early development of self-injurious behavior: Incorporating gene-environment interactions. American Journal on Mental Retardation, 113, 403-417.

Chapter Overview

The conceptualisation and study of the development of self-injurious behaviour has to date been characterised by genetic and environmental determinism. In the current chapter it is argued that gene-environment interactions may play an important role in the development of such behaviours for some children with intellectual and developmental disabilities. It is argued that genetic events may alter an individual's susceptibility to the environmental causes of such behaviours by: 1) altering the initial uncommitted behaviours displayed by the young child, 2) altering the child's ability to discriminate certain stimulus events, 3) enduringly altering the reinforcing (and punishing) value of certain behavioural consequences. The applied implications of this expanded approach are discussed and a number of suggestions for future research are made. It is suggested that research be conducted that examines the motivative role of genetic events.

Introduction

The previous chapter provided a systematic review of the concept of the MO as applied to the functional analysis challenging behaviour. In the current chapter the focus is narrowed to provide an analysis of the implications of gene-environment interactions (GxE) for models of the development of self-injurious behaviour.²⁰

The analysis of the early development of self-injurious behaviour has to date reflected the wider distinction between 'nature' and 'nurture'. Despite the status of genetic factors as risk markers for the later development of self-injurious behaviour, a model that accounts for their influence on early behaviour-environment relations is lacking. In the current chapter it is argued that the investigation of GxE and other forms of gene-environment interplay could potentially enhance current approaches to the study of self-injury. A conceptual model of the early development of self-injurious behaviour based explicitly on such relations is presented. The model is consistent with the basic tenets of functional analysis. Implications for research and the assessment, treatment and prevention of self-injurious behaviour are discussed.

Self-injurious behaviour is one of the most challenging forms of behaviour displayed by individuals with intellectual and developmental disabilities. Self-injurious behaviour refers to behaviours, such as head-hitting or scratching, that people direct towards themselves and which results in tissue damage (Tate & Baroff, 1966). Such behaviours have a pervasive impact on the quality of life of the individual, exerting not only negative physical but also negative social consequences (Robertson et al., 2004), and therefore represent a significant barrier to child development. Given its devastating

²⁰ To maintain consistency with the existing literature the chapter primarily considers self-injurious behaviour. Although this has received less attention, the same relations (i.e., the differential reinforcement of early child behaviour) are likely to apply to other forms of challenging behaviour, such as aggression or destructive behaviours. As such, the thesis of the current chapter is likely to also apply to other forms of challenging behaviour.

impact, intervening before self-injurious behaviour becomes an established part of the child's repertoire holds many apparent benefits. The advantages of early intervention for children with autism have been well documented (McEachin, Smith, & Lovaas, 1993), however with only a few exceptions (e.g., Wacker et al., 1998), the same cannot be said of early intervention for self-injurious behaviour. In part, this may be due to a limited understanding of the factors that lead to the genesis of self-injurious behaviour (Symons, Sperry, Holditch-Davis, & Miles, 2003).

Existing conceptual models of the early development of self-injurious behaviour have focused almost exclusively on the role of environmental factors (Guess & Carr, 1991; Kennedy, 2002b; Richman, 2008). Guess and Carr (1991), for example, argued that initially automatically reinforced stereotypical behaviours are shaped into increasingly severe topographies of self-injurious behaviour, as they begin to contact socially and non-socially mediated contingencies of reinforcement. Whilst a growing literature exists to support this model (e.g., Oliver, Hall, & Murphy, 2005; Richman & Lindauer, 2005) the influence of biological and genetic factors on early behaviour-environment relations remains poorly understood.

GxE have been investigated and shown to exert powerful effects in the development of several physical and mental health disorders (see Rutter, Moffitt, & Caspi, 2006 for a review). The GxE approach has developed from the observations that many behavioural disorders are causally influenced by environmental pathogens but with wide individual differences in response to such pathogens (Caspi & Moffitt, 2006). In these fields it is now recognised that the traditional view of there being additive, and non-interactive effects between genes and environment is somewhat misplaced. However the distinction has to some extent remained intact in the investigation of self-injurious behaviour. The investigation of GxE is one component of a more general approach towards the study of gene-environment interplay; an approach which also

comprises examination of the effects of environment on gene expression, the effects of environment on genetic heritability and correlations between genes and environment (Rutter et al., 2006). In what follows the consequences of maintaining the false dichotomy between 'nature' and 'nurture' are discussed, before an expanded model of the early development and maintenance of self-injurious behaviour is proposed. The model presents a functional analysis of self-injurious behaviour based explicitly upon GxE and other forms of gene-environment interplay.

Genes and Self-Injurious Behaviour

Self-injurious behaviour in certain cases is clearly influenced by genetic sources of variability. Evidence suggests that certain forms of self-injurious behaviour may constitute part of the behavioural phenotype of a number of genetic syndromes. Gene to behaviour associations of varying specificity have been repeatedly demonstrated across a number of syndromes; including Lesch-Nyhan syndrome (Nyhan, 1972), fragile X syndrome (Symons, Clark, Hatton, Skinner, & Bailey, 2003), and Smith-Magenis syndrome (Finucane, Dirrigl, & Simon, 2001).

Few would subscribe to the view that genes 'cause' such behaviours. There is considerable within-syndrome variability in the extent to which individuals with a given syndrome go on to develop behaviours considered 'phenotypic' (Hodapp & Dykens, 2001). Environmental factors have been shown to contribute to such variability (Hessl et al., 2001). Even in cases where strong gene-behaviour associations do exist it does not necessarily follow that these occur independent of environmental influence. For example, even at the molecular level the environment has been shown to alter gene expression. For example, Restivo et al (2005) showed that environmental enrichment was associated with a number of changes at the behavioural and neurological level in FMR1-knockout (FMR1-KO) mice. Indeed, exposure to enriched environments was

shown to alter gene expression in the visual cortex for both FMR1-KO mice and a wild strain of mice. Environmental influences, such as smoking, have been shown to alter the extent to which genes are expressed in humans (Spira et al., 2004). Gene-behaviour associations reflect not only the direct effect of genes but also the effects of environment and, where present, the effects of gene-environment interplay. It is not necessarily the case, therefore, that a strong gene-behaviour association indicates the absence of environmental influence. Despite the apparent ubiquity of gene-environment interplay, however, most behavioural phenotype research has failed to go beyond the demonstration of simple gene-behaviour associations (Hodapp & Dykens, 2001).

The continued neglect of environmental influences in behavioural phenotype research may limit our understanding of the development of self-injurious behaviour and paradoxically the role that genes play in this process. As Moffitt, Caspi and Rutter (2005) state:

Ignoring nurture may have handicapped the field's ability to understand nature
(p.478).

The functional effects of genes upon behavioural development remain poorly understood. There is a need for behavioural phenotype researchers to go beyond gene-behaviour association and to begin to incorporate GxE relations and other forms of gene-environment interplay into the study of self-injurious behaviour.

Environment and Self-Injurious Behaviour

Others have focused exclusively on the environmental determinants of self-injurious behaviour. Functional analysis is the hallmark of the applied behaviour analytic approach to the assessment and treatment of self-injurious behaviour (Hanley, Iwata, & McCord, 2003). Over the past decade, investigators have begun to incorporate an individual's biological functioning into the analysis of such behaviours (Langthorne,

McGill, & O'Reilly, 2007). This has had a profound impact on the assessment and treatment of self-injurious behaviour displayed by people with intellectual and developmental disabilities.

However, the influence of genetic and other biological variables has not yet been integrated with models of the early development of self-injurious behaviour. Despite the status of genetic syndromes as significant 'risk markers' for the later development of self-injurious behaviour (McClintock, Hall, & Oliver, 2003), a conceptual model that accounts for their influence on early behaviour-environment relations is lacking. Secondly, the focus of behaviour analysis on behavioural function has led to a neglect of form. As has been repeatedly demonstrated there are highly specific relationships between certain genetic syndromes and particular topographies of self-injurious behaviour which current 'operant' models say little about.

The omission of genetic influences from functional analysis stems from a 'misunderstanding' of the relations between biological and behavioural events and an assumption that such factors are private, inaccessible and in some cases hypothetical (Thompson, 2007). Such an omission is particularly striking given that central to the operant model, from which the functional analysis of self-injurious behaviour has itself evolved, is the phylogenic and ontogenic selection of behaviour (Skinner, 1966). Behaviour analysis as a philosophy and a science is contextual (Morris, 1988), and the occurrence of any response can only be understood in regard to the historical and current context (both genetic and environmental) in which that act is embedded. Paradoxically, despite the prominence Skinner gave to genetic influences, their analysis has remained largely outside the realm of applied behaviour analysis.

GxE Interactions and the Early Development of Self-Injurious Behaviour

A GxE approach is based on the assertion that environmental 'pathogens' cause behavioural disorders and genes influence susceptibility to these 'pathogens' (Caspi & Moffitt, 2006). Several studies have recently demonstrated that the effects of exposure to an environmental 'pathogen' may be conditional on a person's genotype. In the first such study, Caspi et al. (2002) demonstrated that a functional polymorphism in the gene encoding the neurotransmitter-metabolizing enzyme monoamineoxidase A (MAOA) served to moderate the effects of child maltreatment on the later development of anti-social behaviour. Specifically, individuals who had low levels of MAOA and experienced childhood maltreatment were more likely to develop anti-social behaviours than were individuals with a high-activity MAOA genotype exposed to the same 'pathogen'. Similar GxE relations have been shown to influence the development of psychosis in adolescent cannabis users (Caspi et al., 2005), and the development of ADHD symptoms (Brookes et al., 2006).

Genes do not code for specific behaviours, rather the effects of genes upon behaviour-environment relations are by virtue of their effects on the organism as a whole developmental system (Johnston & Edwards, 2002). This system comprises of bidirectional relations between environmental, behavioural, physiological, neural and genetic sources of variability (Gottlieb, 2003). The role of DNA is to specify the production of mRNA, which then in turn determines the production of the polypeptides that form proteins. It is these proteins that act upon the development of the individual. This process is epigenetic and is itself influenced by environmental factors. The role of genes therefore is to influence the development of the organism as a whole (across neural, physiological, and behavioural pathways); it is this whole organism which then interacts with the environment.

The model proposed in the current chapter is based on the thesis that in some cases genes influence susceptibility to known environmental 'pathogens' for the development of self-injurious behaviour. To date researchers have typically examined either genetic or environmental factors whilst overlooking the interaction between the two. A conceptual framework is needed to examine the influence of such interactions as they apply to self-injurious behaviour. The chapter provides an operant analysis of GxE and other forms of gene-environment interplay and suggest that genes may alter basic behaviour-environment relations by virtue of their effect on the developmental system as a whole. The implications of such a model for the study, treatment and prevention of self-injurious behaviour are discussed.

A Functional Analysis of the Early Development of Self-Injurious Behaviour

How do genes influence the development of the organism in a way that has specific effects on subsequent behaviour-environment relations? It has been postulated that genes may influence behaviour-environment relations in a number of ways (e.g., Moore, 2002; Skinner, 1966). Conceptually, at least, such factors may alter the developmental system in a way that influences; (1) the stream of 'uncommitted' behaviour from which an operant response evolves, that is they may contribute to initial behavioural variation. (2) the sensitivity of the individual to changes in environmental stimulation, that is they may either facilitate or inhibit the discrimination of stimulus events and (3) the value of certain environmental consequences that serve to reinforce or punish behaviour, that is they may establish or abolish the 'motivation' for the consequences that maintain self-injurious behaviour. These effects are likely to be achieved by the influence of genes on neurobiological and physiological pathways.

Figure 3.1. A model of the early development of self-injurious behaviour.

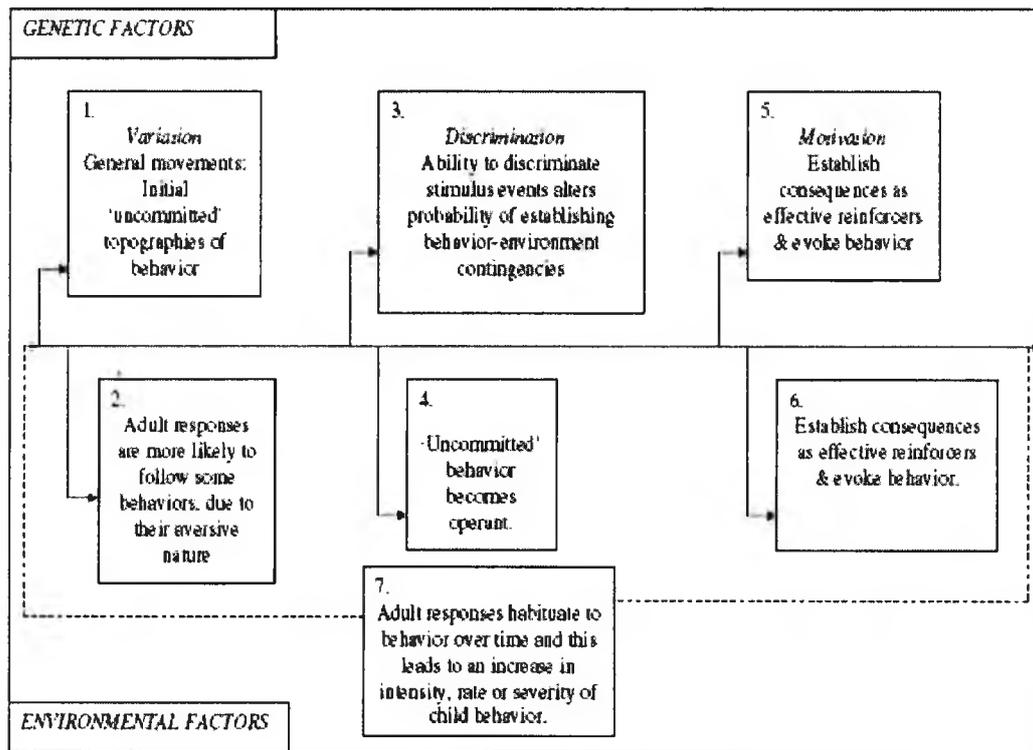


Figure 3.1 provides a schematic representation of a model of the early development of self-injurious behaviour based on the relations discussed above. Many of the environmental elements to this model have been comprehensively addressed in previous accounts of the development of self-injurious behaviour (Guess & Carr, 1991; Oliver, 1993). The influence of genetic factors and the role of certain other biological factors (such as health conditions), however, have to date escaped systematic appraisal. The model consists of seven stages, which for schematic purposes are presented in a linear fashion; this is not to imply that the model necessarily follows a linear path of causation or that all stages are necessary for the development of self-injurious behaviour.

In stage 1, genetic events alter the development of the individual in a way that influences the emission of 'uncommitted' topographies of behaviour from which an operant response evolves. The analysis of general movements may hold particular clues for our understanding of the later development of self-injurious behaviour (Symons,

Sperry et al., 2003). Thus, genes contribute to initial behavioural variation, albeit pre and post-natal environmental factors may also influence this. In stage 2 it is recognized that some forms of uncommitted behaviour are more likely to elicit a social response than are others and this waxes and wanes over time as the environment itself adapts to the behaviour of the child. This stage is critical in the evolution from uncommitted behaviour to self-injurious behaviour. In stage 3 genetic events (in addition to pre- and post-natal environmental factors) alter individual development in such a way that determines the discrimination of stimuli. Thus genetic factors may in part determine the discrimination of certain stimulus events and thereby alter the likelihood with which certain contingencies are formed. In stage 4 self-injurious behaviour contacts socially and non-socially mediated contingencies of reinforcement to become operant. Both genetic (stage 5) and environmental (stage 6) events establish these contingencies as effective forms of reinforcement and evoke self-injurious behaviour by functioning as motivating operations. Finally in stage 7, the process of habituation shapes increasingly severe topographies of child behaviour.

Stage 1. Genetic Events Supply Uncommitted Topographies of Behaviour

A response must be first emitted 'for some other reason' before it can become operant. As Skinner noted:

Ontogenic contingencies remain ineffective until a response has occurred. In a familiar experimental arrangement, the rat must press the lever at least once 'for other reasons' before it presses it 'for food' (1966 p. 1206).

It seems that genetic factors may play an important role in helping to determine the initial stream of 'uncommitted' behaviour, out of which increasingly complex operant responses evolve (MacLean, Ellis, Galbreath, Halpern, & Baumeister, 1991). In some cases such uncommitted behaviours may be of initial survival value to the



organism, for example as in the rooting reflex of a newborn baby, and are the building blocks out of which complex behaviour, such as *manding* for food, are shaped.

Evidence from animal models suggests that genetic manipulations influence the emission of motor activity (such as the degree of environmental 'exploration') which facilitates or inhibits the subsequent development of behaviour-environment relations (McKerchar, Zarcone, & Fowler, 2005). Both genetic and environmental factors alter the developmental system in such a way as to influence the initial uncommitted behaviours that an individual emits.

Newborn infants display prominent and complex movement patterns, termed general movements, which follow a predictable developmental course (Einspieler & Prechtl, 2005). Whilst general movements may be influenced by environmental factors, such as pre- or postnatal injury or exposure to toxins, there is a large genetic contribution to such movements. General movements have been observed both in vitro and post-natally and are thought to antecede the development of 'voluntary' (or rather operant) behaviour. Thelen (1979) noted the importance of early rhythmic motor behaviour for motor development in typically-developing infants. Qualitative differences in general movements have been shown to differentiate between low-risk and high-risk pre-term infants (Prechtl, 1990). In addition early patterns of general movements predict later problems in child development, such as cerebral palsy (Cioni et al., 1997).

It has been suggested that the analysis of general movements may hold some 'clues' for the later development of self-injurious behaviour (Symons, Sperry et al., 2003). However to date there have been no attempts to integrate this with existing conceptual accounts of self-injurious behaviour. The initial occurrence of general movements may represent the building blocks out of which self-injurious behaviour evolves. There are some parallels here with the motor control hypothesis of

stereotypical and self-injurious behaviour. For example, evidence suggests that the motor control of individuals who display stereotypy differs from controls (Bodfish, Parker, Lewis, Sprague, & Newell, 2001). It has been suggested that the root of such differences in motor control may lie in a dopamine deficiency in basal ganglia functioning (Turner & Lewis, 2002). Work with deer mice has shown that the prevention or attenuation of stereotypical behaviours through environmental enrichment occurs only for mice who show enrichment-related differences in cortical-basal ganglia circuitry (Lewis, Tanimura, Lee, & Bodfish, 2007).

Rett syndrome and Down syndrome are two of the few genetic syndromes for which general movements have been empirically investigated (Einspieler, Kerr, & Prechtel, 2005; Mazzone, Mugno, & Mazzone, 2004). In a retrospective study, Einspieler et al. (2005) found that the quality of general movements in 26 infants, who had been diagnosed with Rett syndrome, was considerably impaired. By 4 months of age all of the infants had impaired 'fidgety' general movements, which were topographically different from those observed in infants with acquired brain lesions. Four of the infants with Rett syndrome were observed to have tremulous movements in the arms. The chromosomal basis of Rett syndrome lies in a mutation of the MeCP2 gene, a mutation which has pervasive effects on brain development. The disorder is associated with structural reductions in the basal ganglia and the decreased production of dopamine transporters, leading to the altered pattern of motor development associated with the syndrome (Schroeder et al., 2001). The effect of the MeCP2 gene mutation on brain development is likely to give rise to a pattern of impaired general movements that quickly contact contingencies of reinforcement. Indeed the stereotypical and self-injurious behaviours associated with Rett syndrome have been shown to be influenced by both automatic and socially mediated consequences (e.g., Oliver, Murphy, Crayton, & Corbett, 1993).

Such relations may hold relevance for the later development of self-injurious behaviour in other genetic syndromes. Lesch-Nyhan syndrome, for example, is characterized by a particular movement disorder (Nyhan, 1972). Early movements characteristic of this syndrome include involuntary spasmodic, wild, and violent movements of the face, shoulders and hips, which are present at 8-12 months of age. This precedes the development of self-injurious behaviour, which has a typical onset at between 2 and 3 ^{1/2} years of age. The movement disorder associated with Lesch-Nyhan syndrome has been associated with the impaired functioning of the dopaminergic system (Wong et al., 1996). The concentration of dopamine transporters does not, however, differentiate between individuals with Lesch-Nyhan syndrome who have both the movement disorder and self-injurious behaviour and those with only the movement disorder (Harris et al., 1999), suggesting that dopamine depletion is not sufficient to account for the development of self-injurious behaviour (Schroeder et al., 2001). There may be a GxE relationship underpinning this observation. For example, the HPRT deficiency results in changes in brain structure and function which leads to the emission of certain 'uncommitted' behaviours which are likely to expose a child with Lesch-Nyhan syndrome to environmental 'pathogens' for self-injurious behaviour. Hypothetically, a child with Lesch-Nyhan syndrome may accidentally bang their head as a result of reflex extension, part of the movement disorder associated with the syndrome, before that response comes under social control (Hall, Oliver, & Murphy, 2001). In the absence of differential social reinforcement (the environmental pathogen) SIB would not be expected to develop.

Smith-Magenis syndrome is a genetic syndrome associated with severe self-injurious behaviour, which includes the removal of finger- and toenails. Empirical evidence on the origin and function of this behaviour is scarce. However, Finucane et al (2001) speculate that its origin may lie in the altered neuropathy associated with the

syndrome. Clinical signs of peripheral neuropathy have been reported in approximately 75% of SMS patients (Greenberg et al., 1996). Specifically, it has been hypothesized that abnormal sensations in peripheral nerves lead the child to pull at his or her toenails. Such 'uncommitted' behaviour is likely to quickly be selected by its environmental consequences (e.g., social contact from parents) and acquire operant status. Again, the hypothesis here is that the interstitial deletion of chromosome 17p11.2 in Smith-Magenis syndrome leads to damage of the peripheral nervous system, resulting in behaviour which exposes the child to known 'pathogens' for the development of self-injurious behaviour.

It has been argued that genes (in addition to pre- and post-natal environmental factors) influence the emission of uncommitted behaviours by acting on the individual at a neurobiological and physiological level. Specific examples of how and why this may occur have been provided for three different syndromes. It would seem that the assessment of general movements in children with genetic syndromes associated with self-injurious behaviour as well as the neurobiology underpinning such movements may be an important avenue for future research. This pattern of development, in which general movements precede the development of self-injurious behaviour, complements existing models and empirical evidence on the development of self-injurious behaviour.

Stage 2. The Environment is More Sensitive to Certain Topographies of Child Behaviour

Evidence suggests that one way in which genetic factors interact with the environment may be to indirectly influence the extent to which an individual is exposed to environmental 'pathogens' for a behavioural disorder (Rutter et al., 2006). Several studies have demonstrated the impact of such gene-environment correlations on the development of a range of disorders (Ge et al., 1996). In the context of the current

discussion 'uncommitted' child behaviour, such as the reflex extension associated with Lesch-Nyhan syndrome, is likely to evoke a particular response from parents and caregivers. Once evoked these adult responses are likely to lead to the child being exposed to known environmental 'pathogens'.

It is the differential responsiveness of the environment to certain topographies of behaviour that is so critical for the environmental selection of operant behaviour (Bijou, 1966). To the extent that certain forms of child behaviour serve as aversive stimuli their onset may function as motivating operations (Laraway, Snyckerski, Michael, & Poling, 2003) for the removal or attenuation of that behaviour. In the context of the current model parents and caregivers may be more likely to respond to particular 'uncommitted' behaviours (such as the wild and violent movements associated with Lesch-Nyhan syndrome) than they are to others. This is likely to be essential in the evolution from uncommitted behaviour to self-injurious behaviour. Parental responses that are successful in removing such behaviours are then more likely to occur in the future (Oliver, 1993). A broad range of contextual variables, such as parental stress (Hastings, 2002), may influence the degree to which parents are differentially responsive to atypical child motor movements.

There is a body of evidence to suggest that (a) particular topographies of child behaviour function as an aversive stimulus for parents and caregivers (e.g., Hastings, 2002), (b) child behaviour functions as a *motivating operation* for adult responses to that behaviour (e.g., Taylor & Carr, 1992) and (c) that the responses of adults serve to reinforce self-injurious behaviour (e.g., Richman & Lindauer, 2005). Thus adult responses to self-injurious behaviour are themselves shaped by the behaviour of the child. The role of genes in this process is to influence the likelihood of the child's exposure to such 'risky' environments.

Stage 3. Genetic Events Determine the Sensitivity of the Nervous System to Changes in Environmental Stimulation

Genetic events may help determine the sensitivity of the individual to various forms of environmental stimulation (Moore, 2002; Skinner, 1966). The ability to discriminate stimulus events is critical for the development of behaviour-environment relations. Someone who is congenitally blind is unlikely to be sensitive to a change in visual stimulation; conversely an individual with 20/20 vision is likely to be particularly sensitive to such a change. The result of such genetically (and environmentally) determined changes may be to enhance, or conversely diminish, an individual's susceptibility to the discrimination of certain stimulus events.

Some genetic influences may *restrict* the sensitivity of the individual to a stimulus event, whereas other genetic influences may *enhance* sensitivity to particular stimulus events. This is likely to be achieved by the influence of genes on the development of the individual at a neurobiological and physiological level. Reiss et al (2004) provided evidence that the impaired visual-spatial abilities and enhanced face processing and emotionality associated with Williams syndrome had specific neuroanatomical correlates. Magnetic resonance imaging scans showed that participants with Williams syndrome had reduced thalamic and occipital lobe grey matter volumes and reduced grey matter density in subcortical and cortical regions comprising the visual-spatial system, in comparison to controls. The Williams syndrome group also showed increases in volume and grey matter density in areas known to be involved in emotion and face processing. Thus, a specific genetic event (interstitial deletion of chromosome 7) was shown to be related to neuroanatomical changes, which themselves are related to the ability to discriminate specific stimuli. Clearly environmental factors may also contribute to such individual differences in brain development. Given that the ability to discriminate a stimulus change is a

necessary pre-requisite for the establishment of behaviour-environment contingencies then such differences may hold an important function for the early development of self-injurious behaviour. It is surprising therefore, that such factors have not, to date, received attention in existing models of the early development of self-injurious behaviour.

A number of genetic syndromes may be associated with the altered ability to discriminate certain stimulus events. For example, individuals with fragile X syndrome (FXS) appear to be particularly sensitive to changes in social and sensory stimulation (Kau et al., 2004), perhaps potentiating the establishment of contingencies between their behaviour and social/sensory consequences. Hyperacusis (sensitivity to sound) is present in as many as 95% of individuals with Williams syndrome (Klein, Armstrong, Greer, & Brown, 1990). Genetic events may also reduce sensitivity to certain stimulus events. Cornelia de Lange syndrome, for example, is associated with minimal responsiveness to sound or pain (Johnson, Ekman, Freisen, Nyhan, & Shear, 1976). A reduced sensitivity to pain may prevent the establishment of a contingency between self-injurious behaviour and its painful automatic consequences.

Whilst the degree to which autism can be regarded to be a genetic disorder is of some controversy, what has been repeatedly demonstrated is that many individuals diagnosed with autism show an altered ability to discriminate certain stimuli. For example, autism is associated with an enhanced response and slower habituation rate to the repeated presentation of a tactile stimulus (Baranek & Berkson, 1994). Likewise, autism is associated with an enhanced auditory discrimination (O'Riordan & Passetti, 2006) whereas certain visual stimuli are less likely to be discriminated (Bertone, Mottron, Jelenic, & Faubert, 2003). Although the source of such variability (i.e., genetic or environmental) is of some debate, it does seem possible that the altered ability to

discriminate changes in stimulation may influence the later development of behaviour-environment relations.

In sum, both genetic and environmental events may influence the extent to which changes in environmental stimulation are discriminated; a necessary pre-requisite for the development of an operant response, such as self-injurious behaviour. Such relations may alter the individual's responsiveness to known environmental 'pathogens' for the development of self-injurious behaviour, and thereby constitutes a potential GxE.

Stage 4. Child Behaviour Meets Contingencies of Reinforcement & Forms Part of a Response Class

A primary aim of functional analysis is to identify those consequences that maintain self-injurious behaviour. It is beyond the scope of this chapter to provide a review of this area; however, three areas of research are of particular relevance.

Firstly, research spanning three decades has shown that self-injurious behaviour displayed by people with intellectual and developmental disabilities may be evoked and maintained by its environmental antecedents and consequences (Hanley et al., 2003). Secondly, it has been demonstrated that self-injurious behaviour displayed by individuals with genetic syndromes may be influenced by environmental events. For example, Hall, Oliver and Murphy (2001) demonstrated that patterns of self-injurious behaviour displayed by three boys with Lesch-Nyhan syndrome were consistent with a positive reinforcement hypothesis. Such evidence demonstrates that self-injurious behaviours displayed by individuals with genetic syndromes may be influenced by environmental contingencies. Thirdly, empirical evidence shows that social and non-social reinforcement is critical in the early development of self-injurious behaviour (e.g., Oliver et al., 2005; Richman & Lindauer, 2005). In sum, a body of evidence exists to suggest environmental factors are critical in the development and maintenance of self-

injurious behaviour, even when that behaviour is specifically associated with genetic syndromes. Such factors represent known 'pathogens' for the development of self-injurious behaviour and it may be that genetic variables influence the extent to which an individual exposed to such environmental events goes on to develop self-injurious behaviour.

Stage 5. Genetic Events Function as Motivating Operations

The variables of which behaviour is a function comprise of more than the contingency between response and consequence. One important contextual variable is the motivating operation. Motivating operations refer to stimuli, stimulus conditions or operations that alter the value of consequences as reinforcers and the probability of behaviours being evoked that have historically been associated with those consequences (Laraway et al., 2003). The analysis of such events has been typically restricted to environmental events, such as the deprivation of attention or onset of aversive stimuli (McGill, 1999). However, genetic events may also alter the value of those consequences that maintain self-injurious behaviour (Kennedy, Caruso, & Thompson, 2001). Evidence from animal models exists to suggest that specific genetic manipulations may exert motivative effects on the reinforcing value of certain forms of reinforcement (Couppez, Kennedy, & Stanwood, 2008; Hayward & Low, 2007; Thomsen & Caine, 2006).

Although the evidence-base is small and somewhat limited, individuals with certain genetic syndromes may be more likely to display behaviours that serve specific functions. A number of single-case studies have shown that stereotypical and self-injurious behaviours associated with Rett syndrome may be especially likely to be maintained by either escape from aversive stimuli and/or automatic reinforcement (Iwata, Pace, Willis, Gamache, & Hyman, 1986; Oliver et al., 1993; Roane, Piazza, Sgro, Volkert, & Anderson, 2001; Wales, Charman, & Mount, 2004; Wehmeyer,

Bourland, & Ingram, 1993). Likewise, two studies have reported on socially avoidant behaviours, including self-injury, in Cornelia De Lange syndrome (Oliver et al., 2006; Richards, Moss, O'Farrell, Kaur, & Oliver, in press).

Prader-Willi syndrome (PWS) appears to be related to tangible-maintained challenging behaviours. A small number of studies have examined the relation between PWS and tangible-maintained behaviour. For example, Joseph, Egli, Koppekin, and Thompson (2002) reported people with PWS were more likely to wait for a longer delay in order to access a larger magnitude of food than were controls. Other studies have reported the effectiveness of reinforcing exercise with food for people with PWS (Caldwell, Taylor, & Bloom, 1986; Keefer, Jackson, & Pennypacker, 2000). Few have addressed the impact of PWS on the function served by challenging behaviour, although it would seem possible that the effects of this genetic event may serve as a MO for challenging behaviours maintained by access to food (Kennedy et al., 2001). Challenging behaviours in PWS may also serve additional functions, for example, Didden, Korzilius and Curfs (2007) examined the function of skin picking in PWS and reported that for 70% of individuals, skin picking served an automatic function. Woodcock, Oliver and Humphreys (2009) recently reported that over 80% of individuals with PWS were reported to display challenging behaviours following disruptions in routine or expectations.

Finally, studies which have relied on indirect functional assessment or antecedent manipulations suggest that FXS may be specifically associated with challenging behaviour, including self-injurious behaviour, that is maintained by the contingent removal of aversive stimuli (Hall, DeBernadis, & Reiss, 2006; Symons, Clark et al., 2003; Woodcock et al., 2009). A postal survey study conducted by Symons, Clark et al. (2003) found that parents reported 87% of participants with FXS displayed such behaviours in response to routine changes, and 65% in response to task demands. In

contrast only 3% of participants were reported to display such behaviours to access attention. Hall et al (2006) recently reported a relatively large-scale study, involving some 114 children with FXS in which patterns of responding were directly observed during antecedent manipulation of environmental conditions. Challenging behaviours were more likely to occur in conditions characterized by high social or performance demands. Other studies have noted high levels of 'anxiety' in individuals with FXS in situations characterised by high social or performance-related demands (Hessl, Glaser, Dyer-Friedman, & Reiss, 2006; Lesniak-Karpiak, Mazzocco, & Ross, 2003).

Genes do not directly influence behaviour, and the relations discussed are likely to be influenced by the impact of genetic events upon the developmental system as a whole (Gottlieb, 2003). Some genetic syndromes are associated with certain physiological conditions, and it may be that such conditions play an important role in establishing the 'motivation' for self-injurious behaviour. For example, sleep disturbance is reported to be present in 65-100% cases of Smith-Magenis syndrome (Greenberg et al., 1996). In cases, in which sleep disturbance associated with Smith-Magenis syndrome is shown to influence self-injurious behaviour, then treatment of the sleep disturbance may be one possible early intervention. (De Leersnyder et al., 2007). Such relations may be important in regards to the function served by self-injurious behaviour associated with other genetic syndromes. For example, FXS is thought to be associated with the abnormal activation of the limbic-hypothalamic-pituitary-adrenal (L-HPA) axis, a system primarily involved in the human stress response, the activation of which leads to the secretion of cortisol (Hessl et al., 2002). Hessl et al (2002) found higher cortisol levels to be positively associated with parental reports of the severity of problem behaviours displayed by males and females with FXS. It may be that the absence of the FMR1 protein leads to changes in the development of the L-HPA axis which enduringly heightens the probability of negatively reinforced behaviour. In

regards to PWS, Holland, Whittington and Hinton (2003) have suggested that the genetic abnormality underlying PWS leads to the impaired functioning of the hypothalamic pathways and the absence of metabolic and psychological changes that normally follow food intake. People with PWS have been shown to have an abnormally high blood level of the hormone ghrelin which serves to enduringly heighten the reinforcing value of food (Del Parigi et al., 2002).

In sum, self-injurious behaviour is unlikely to develop unless there exists some 'motivation' for the consequences that are responsible for its maintenance. It seems that genetic factors may in some cases be the source of such 'motivation'. Evidence for this remains at a preliminary stage and few studies have met the standards of an experimental functional analysis (Hanley et al., 2003). Further studies based on the group comparison of individual data sets from individuals with different genetic syndromes are required. In cases in which genetically based motivating operations are present it would seem likely that these effects are enduring, rather than momentary. In such cases, there may be a particular 'sensitivity' to small fluctuations in environmental levels of the reinforcer that maintains the behaviour. This is likely to form a GxE that potentiates known 'pathogens' for the development of self-injurious behaviour. Such influences are likely to have important implications for the early assessment and intervention of self-injurious behaviour and are not currently integrated with any existing conceptual model of the early development of self-injurious behaviour.

Stage 6. Ontogenic Factors (Physiological, Neurobiological and Environmental)

Function as Motivating Operations

Ontogenic factors may also exert a momentary or more enduring influence on the reinforcing value of certain behavioural consequences by functioning as MOs.

Environmental, neurobiological and physiological factors may all serve to establish the

motivation for some of the consequences that maintain challenging behaviours (see Langthorne et al., 2007).

Environmental influences.

The environments in which many people with intellectual and developmental disabilities spend a large proportion of their time are replete with characteristics that establish the 'motivation' for self-injurious behaviour. Such behaviours may be more likely to develop in environments that are austere or barren of stimulation, lacking in attention and access to preferred items and activities, high in aversive stimuli and social control (e.g., Berg et al., 2000; O'Reilly, 1999). The implications of environmentally based MOs (challenging environments) have been comprehensively reviewed in the previous chapter. As such the following section places greater emphasis on neurobiological and physiological influences.

Neurobiological influences.

The interaction between neurobiological and environmental events has attracted increased attention in recent years (e.g., Jewett, Cleary, Levine, Schaal, & Thompson, 1995). The direct effects of some psychotropic drugs may function as MOs, by exerting value- and behaviour-altering effects. For example the stimulant drug *methylphenidate* (MPH) acts on dopaminergic neurotransmitters and has been used widely in the pharmacological treatment of behavioural problems associated with attention deficit hyperactive disorder (ADHD). MPH has been shown to alter the occurrence of challenging behaviour in specific environmental conditions (Dicesare, McAdam, Toner, & Varrell, 2005; Kelley, Fisher, Lomas, & Sanders, 2006; Mace et al., 2009; Northup et al., 1999; Northup, Fusilier, Swanson, Roane, & Borrero, 1997). Similar evidence exists for the opiate antagonist *naltrexone* (Garcia & Smith, 1999; Symons et al., 2001) as well as drugs whose effects are more gradual and less discrete such as *risperidone* (Yoo et al., 2003; Zarcone et al., 2004).

Psychotropic drugs may have a number of indirect and unintended effects. Such side effects may influence unintended classes of behaviour (Singh & Aman, 1990) and in some cases such side-effects function as MOs (Valdovinos & Kennedy, 2004). For example, a notable side effect of anti-epileptics is to increase levels of 'appetite' leading to increased food consumption and weight gain. This may have not only value-altering properties (i.e. establish food as an effective reinforcer) but also behaviour-altering effects (such as evoking aggression or self-injury that have led to access to food in the past).²¹

Neurological conditions, such as epilepsy, may have a similar effect. For example, Roberts, Yoder and Kennedy (2005) demonstrated that epileptic seizures experienced by three individuals were temporally associated with the occurrence of challenging behaviour as recorded by care staff. Such conditions could potentially exert a momentary motivative influence on challenging behaviour.

Physiological influences.

A child's physical and mental well-being may be directly related to the occurrence and non-occurrence of challenging behaviour (Carr & Smith, 1995).

A number of prevalence studies have suggested a link between psychiatric conditions and the presence of challenging behaviour (e.g., Reiss & Rojahn, 1993; Rojahn, Matson, Naglieri, & Mayville, 2004). Conceptually, at least, it appears plausible that psychiatric conditions may function in some contexts as MOs (Emerson, Moss, & Kiernan, 1999). For example, the onset of depression may have both establishing and abolishing effects. Depression is associated with a number of physical, cognitive and emotional symptoms, including fatigue, loss of energy, insomnia and hypersomnia. Such symptoms may serve as MOs for negatively reinforced behaviour; momentarily establishing the removal of a social demand as an effective type of

²¹ See Roberts et al (2008) for a recent empirical examination of this hypothesis.

reinforcement and evoking those behaviours that have previously been negatively reinforced by its contingent removal.

Studies suggest a relatively high prevalence of sleep abnormalities in children with intellectual and developmental disabilities (Brylewski & Wiggs, 1999). Sleep deprivation may function as a MO for challenging behaviour displayed by children with intellectual and developmental disabilities (Horner, Day, & Day, 1997; Kennedy & Meyer, 1996; O'Reilly, 1995; O'Reilly & Lancioni, 2000). O'Reilly (1995) examined the interaction between sleep disruption and environmental factors in the aggressive behaviour displayed by a young man with intellectual and developmental disabilities. Aggression occurred at higher rates in demand conditions of a functional analysis when the young man had less than 5 hours sleep. Therefore the deprivation of sleep appeared to function as a MO for negatively reinforced aggressive behaviour.²² Other physiological conditions, such as otitis media (O'Reilly, 1997), allergy symptoms (Carter, 2005; Kennedy & Meyer, 1996), menstrual discomfort (Carr, Smith, Giacini, Whelan, & Pancari, 2003), gastro-intestinal problems (Wacker et al., 1996), and intra-cranial pressure (Hartman, Gilles, McComas, Danov, & Symons, 2006) may exert a similar effect on challenging behaviour.

Prevalence studies have established that an association exists between the presence of physical and sensory impairments and challenging behaviour (Emerson et al., 2001). Conceptually at least such events may serve as MOs. For example, mobility and sensory impairments may restrict the extent to which an individual is able to independently navigate around their environment. In such circumstances access to certain classes of reinforcement, such as the provision of attention or preferred tangibles,

²² See Kennedy (2002a) and Harvey et al (2004) for further experimental analysis of the association between sleep disruption and negatively reinforced behaviour.

may be restricted; establishing access to those stimuli as an effective form of reinforcement and evoking behaviour, such as aggression, that has led to this in the past.

In sum, a range of environmental, neurobiological and physiological influences have been shown to act as MOs for challenging behaviour. Children with intellectual and developmental disabilities may be at a heightened risk of experiencing such influences. It seems likely that these ontogenic factors may influence the development of self-injurious behaviours in such children.

Stage 7. Increasingly Severe Topographies of Self-Injurious Behaviour are Shaped Via a Process of Habituation

The final stage of the model functions as a feedback mechanism to account for the selection of increasingly severe topographies of self-injurious behaviour over time. Adult responses *habituate* to the repeated presentation of aversive stimuli, such as early forms of self-injurious behaviour. A number of empirical studies have shown that the repeated presentation of a reinforcer leads to habituation, which may bring about changes in operant responding (Murphy, McSweeney, Smith, & McComas, 2003).

For the parent, habituation may over time have an abolishing effect on the reinforcing value of reductions in early child self injury (Oliver, 1993). This may, for example, lead to the parent no longer providing attention or removing a demand contingent on the child's behaviour. For the child, this change in parent behaviour may lead to an extinction burst, characterised by changes to the topography of self-injury (e.g., an increase in the rate, intensity, or variability of the response). Such changes in child behaviour are likely to re-evoke the parental response that maintains child self-injury (e.g., the provision of attention or removal of demand). This final stage accounts for how initially uncommitted behaviours are transformed into increasingly severe topographies of self-injury.

Implications for the Study, Treatment, and Prevention of Self-Injurious Behaviour

In the current chapter existing models of the genesis of self-injurious behaviour have been extended by incorporating GxE relations and other forms of gene-environment interplay. It is argued that exposure to environmental 'pathogens' is necessary for the development of self-injury. An account of why certain genetic syndromes are a risk marker for the development of self-injury (McClintock et al., 2003) has been provided, suggesting that genes may alter susceptibility to such 'pathogens'. Specifically genes may influence the development of self-injurious behaviour by acting on the individual in a way that; (1) provides uncommitted behaviour out of which self-injurious behaviour later develops, (2) influences the discrimination of certain stimulus events (3) enduringly alters the value of certain consequences that function as reinforcers. However, self-injury would not be expected to develop in the absence of exposure to environmental 'pathogens'.

Such a conceptual expansion may hold important implications for the assessment, treatment and prevention of such behaviours. One of the benefits of this analysis is that it may enable the development of environmental modifications that provide a better fit to the needs of the individual. For example, knowledge of GxE relations and other forms of gene-environment interplay may facilitate environmental changes that serve to prevent or remediate self-injurious behaviour. In addition, adopting a more integrated perspective may have consequences for the study of self-injurious behaviour. Some of the applied and research implications of this expanded model shall therefore be discussed in greater detail.

Stage 1 suggests that uncommitted behaviours are the building blocks out of which self-injurious behaviour evolves. The comprehensive assessment of uncommitted behaviour may also hold implications for attempts at prevention. If a particular genetic syndrome is associated with general movements that are likely to evoke a caregiver

response then a prevention-based approach, targeting parental responses to such behaviours may hold some promise in reducing the adventitious reinforcement of such behaviour. In addition, the absence of certain general movements could spur the development of a prosthetic environment, which facilitates the development of alternative behavioural sets.

As suggested in stage 3 of the model, genetic influences may also determine the discrimination of certain stimulus events. This may have a number of implications for the early prevention of self-injurious behaviour. Environmental or neurobiological modifications could be introduced to reduce the sensitivity of the individual to particular stimulus events. For example, earplugs could be offered to children with Williams syndrome to reduce the sensitivity of the individual to changes in noise levels (O'Reilly, Lacey, & Lancioni, 2000). In other cases environmental or neurobiological interventions may be required to improve the individual's ability to form certain behaviour-environment contingencies. For example, the use of the opiate antagonist *naltrexone* may enhance the development of a contingency between self-injurious behaviour and its automatic aversive consequences (Sandman, Barron, & Colman, 1990). This would have all the elements of a punishment procedure albeit with the aim of establishing a typical rather than atypical experience of pain.

In stage 5 it is suggested that genetic events may function as enduring motivating operations for self-injurious behaviour. This holds an array of implications for the treatment and prevention of self-injury. Early functionally equivalent responses could be reinforced using consequences for which 'susceptibility' is thought to exist at a time before a clear function for self-injurious behaviour is apparent. Such an approach would seem to be particularly necessary given the reported difficulty in ascribing function to self-injurious behaviour displayed by very young children (Kurtz et al., 2003). This area has been subject to only a small amount of research and a systematic approach is now

required that develops our knowledge of the value- and behaviour-altering influences of certain genetic influences. Further investigation of the pathways underlying such relations may provide an additional point of intervention.

The enthusiasm surrounding gene-environment interplay has been dampened by legitimate concerns surrounding the pragmatic difficulties of conducting such research. In order for this conceptualisation to influence the behaviour of researchers these concerns need to be addressed. Moffitt et al (2005) have proposed a seven-step strategy for the identification of GxE interactions and, in comparison to other fields, investigators of self-injurious behaviour are in a relative position of strength to begin the search for GxE and other forms of gene-environment interplay. First, it is well established that there are certain syndromes associated with the heightened prevalence of self-injurious behaviour, but that there exists considerable within-syndrome variability. Second, there is clear empirical evidence of the causal status of environmental 'pathogens' for the development of self-injurious behaviour. Third, we have established methods of measuring the influence of such 'pathogens' over time. Fourth, behavioural phenotype research has led to the identification of several candidate 'susceptibility' genes for self-injurious behaviour. In short we know enough about environmental and genetic influences to begin to construct specific and testable hypotheses about relations between genes and the environment and their role in the development of self-injurious behaviour.

How can such interactions begin to be examined? Large scale, longitudinal, prospective cohort studies in which the individual acts as his or her own control are the most powerful means of testing specific GxE hypotheses (Moffitt et al., 2005). Studying self-injurious behaviour as it develops already forms an important research agenda (e.g., Richman & Lindauer, 2005); future studies could examine whether individuals with specific genetic syndromes differ in terms of their susceptibility to the known

environmental 'pathogens' measured in such studies. Existing developmental studies could also be retrospectively examined to see whether differences exist in regards to the developmental pattern of individuals with certain genetic syndromes in comparison to others.

Specific hypotheses based on some of the postulations made in the current chapter would seem to warrant further examination. For example, the assessment of early movements displayed by infants with certain genetic syndromes, such as Lesch-Nyhan syndrome, may provide a fruitful source of research. The extent to which such differences predict the actual development of self-injurious behaviour, and whether the presence of environmental 'pathogens' are necessary for this to occur, would form an important research agenda. Further study of the potential motivative effects of genes upon behaviour-environment relations also seems to be an important research question. Group control studies that followed the methodology used in current behavioural phenotype research, except with an emphasis on function rather than form, may constitute one means of testing such hypotheses. In addition further investigation of the neurobiological and physiological pathways that underpin such relations would seem to be of considerable importance (Turner & Lewis, 2002). A focus on the proximal effects of genes on the developing organism (i.e., the endophenotype) may hold important implications for our understanding of gene-environment interplay (Gottesman & Gould, 2003). Animal models, which allow for a greater degree of experimental control, may provide an important tool in this quest, indeed empirical examples of gene-brain-behaviour-environment relations already exist in the experimental literature (e.g., Couppis et al., 2008; Hayward & Low, 2007).

In general, the analysis of GxE relations and other forms of gene-environment interplay has the potential to contribute to a more comprehensive approach to the understanding of self-injurious behaviour. Indeed if genetic effects operate through

influencing susceptibility to environmental 'pathogens' then a reduction in such 'pathogens' will decrease the likelihood of the development of self-injurious behaviour. At a molar level this could contribute to effective environmental manipulations that prevent the development of self-injurious behaviour when an otherwise high risk for their development exists. Such an approach would be analogous to the prevention of the deleterious effects of phenylketonuria through dietary control.

Conclusion

The development of any operant response is embedded in a context of gene-environment interplay. As Gottlieb (2003) states:

There can be no genetic effects on behavior independent of the environment and there are probably no environmental effects on behavior independent of genetic activity (p. 351).

This context is likely to involve mutual interactions between variables at the genetic, neurological, physiological, behavioural and environmental level (Johnston & Edwards, 2002). Such relations have not been integrated with existing models of the early development of self-injurious behaviour. In the current chapter a conceptual model of self-injurious behaviour has been provided, one that remains compatible with the basic tenets of functional analysis. GxE relations and other forms of gene-environment interplay may be critically important, particularly when self-injurious behaviour is correlated with genetic syndromes. The evidence reviewed suggests that genetic influences are an important source of variability; one that applied behaviour analysis may need to begin to come to terms with. The experimental tactic of demonstrating functional relationships between dependent and independent variables provides one means of uncovering the nature of this interaction.

Chapter IV.

Gene-Environment Interactions. An Indirect Examination

“Genetic variables may be assessed either by studying organisms upon which the environment has had little opportunity to act (because they are newborn or have been reared in a controlled environment) or by comparing groups subject to extensive, but on the average probably similar, environmental histories.” (Skinner, 1966, p. 1209)

Chapter Overview

Gene-environment interactions (GxE) are likely to play an important role in the genesis of challenging behaviour, such as self-injury and aggression. The literature discussed in the previous two chapters suggests that one way in which genes influence the occurrence of challenging behaviour may be to enduringly alter the reinforcing value of the consequences that maintain such behaviours. The study reported in the current chapter aimed to provide an indirect examination of this question.

Both fragile X syndrome (FXS) and Smith-Magenis syndrome (SMS) are genetically determined causes of intellectual and developmental disability that are associated with a number of specific topographies of challenging behaviour. Previous work suggests that the function served by challenging behaviours in these groups may be very different. Using an indirect measure of behavioural function (*Questions About Behavioral Function scale*; Matson & Vollmer, 1995) the current study examined within- and between-group differences in challenging behaviour displayed by children with FXS and SMS, in comparison to a mixed etiology control group of children with intellectual and developmental disabilities. Both between- and within-group differences were found in the form and function of challenging behaviour. The implications of these findings for future research, as well as for the assessment and treatment of challenging behaviour are discussed.

Introduction

A number of researchers have suggested that one way in which genes influence the occurrence of challenging behaviour may be to enduringly alter the reinforcing value of the consequences that maintain such behaviours (Kennedy, Caruso, & Thompson, 2001; Langthorne & McGill, 2008; Oliver, 1993). For example, food appears to be enduringly established as an effective type of reinforcement for individuals with Prader-Willi syndrome (Holland, Whittington, & Hinton, 2003; Kennedy et al., 2001). If genetic events provide some of the 'motivation' for challenging behaviour then one would expect there to be differences (both between- and within-syndrome) in the function served by challenging behaviour across certain syndrome groups.

There is some evidence to suggest that such relations may apply to challenging behaviour in FXS and SMS. For example, evidence from recent studies suggests that individuals with FXS may be less likely to display challenging behaviour that is maintained by the provision of social attention and more likely to be maintained by the removal of aversive stimuli, and/or the provision of tangibles (Hall, DeBernadis, & Reiss, 2006; Symons, Clark, Hatton, Skinner, & Bailey, 2003; Woodcock, Oliver, & Humphreys, 2009). Symons et al for example, using an indirect measure of behavioural function reported that only 3% of children with FXS displayed attention-maintained self-injurious behaviour. Whereas 65-87% were reported to display self-injurious behaviour (SIB) in response to task demands and changes in routine. In contrast several clinical reports suggest that SMS may be associated with challenging behaviour that is particularly likely to be influenced by social attention (Dykens & Smith, 1998; Smith, Dykens, & Greenberg, 1998). A recent descriptive study by Taylor and Oliver (2008) reported that for four out of five children with SMS, challenging behaviour was more likely to occur following periods of low adult attention or following reduced levels of demands and was likely to lead to an increase in attention or demands.

The identification and delineation of behavioural phenotypes has gained considerable momentum over the last decade. During this time there have been several methodological developments that have taken place in this area. The following section describes and reviews some of the methodological issues that currently characterise behavioural phenotype research and how they relate to the design of the current study.

Experimental Design

The aim of behavioural phenotype research is to examine characteristic patterns of behaviour that are consistently associated with particular genetically-caused disorders. Researchers have adopted several different experimental designs in order to attempt to identify any such relationships.

Several studies have conducted within-syndrome comparisons in order to describe the 'phenotype' associated with a specific genetic syndrome. Sloneem (2005), for example, utilised a number of measures to describe the form and function of challenging behaviours displayed by a sample of 32 individuals with SMS. The study demonstrated that aggressive behaviours displayed by individuals with SMS frequently serve a communicative function. Such a strategy also holds particular benefits in identifying relative areas of within-syndrome strengths and weakness. For example, within-syndrome studies have demonstrated that individuals with FXS may have relative strengths in simultaneous information processing in comparison to sequential processing (Dykens, Hodapp, & Leckman, 1987). Whilst such studies hold considerable value in adding to existing knowledge of behavioural phenotypes, there are some notable disadvantages in relying upon within-syndrome comparisons. Primarily, this centres on the absence of an appropriate control group against which the performance of a target group can be compared.

Other approaches have involved between-group comparisons contrasting the performance of individuals with a specific syndrome against controls. Such an approach

enables an assessment of whether the behaviours associated with a syndrome are different from what would 'typically' be expected. Agreement, however, about what constitutes 'typical' performance differs between studies (Hodapp & Dykens, 2001, 2004). Identifying an appropriate control group, against which the performance of the target group can be compared, is one of the most significant issues affecting between-group research in this field. Researchers have used several different types of control groups and each of these strategies has particular advantages and disadvantages.

Firstly, some studies have included a control group consisting of individuals without intellectual and developmental disabilities who are either of the same chronological age (CA) or mental age (MA) as the experimental group. Such an approach allows strengths or weaknesses in performance to be contrasted against typically developing controls. However, as Hodapp and Dykens (2004) note it is only comparisons with CA controls that can demonstrate whether certain behavioural repertoires are 'spared' in specific syndrome groups. For example, Majerus, Glaser, Van der Linden, and Eliez (2006) investigated verbal short term memory (STM) functioning in Velo-Cardio-Facial syndrome (VCFS) by comparing the performance of eight children with VCFS to CA matched controls on verbal STM tasks. The study demonstrated that retention of verbal item information was 'spared' in VCFS children with impairments specific to serial-order information. Whilst such studies are of use in identifying strengths and weaknesses for individuals with specific syndromes relative to MA or CA matched controls they do not necessarily demonstrate a behavioural phenotype. For example, it may be that differences in performance may be a function of having an intellectual and developmental disability *per se* as opposed to being related to a specific syndrome. For this reason researchers have tended to use control groups composed of individuals with intellectual and developmental disabilities.

There are several ways in which control groups composed of individuals with intellectual and developmental disabilities can be established. The first such strategy involves identifying a 'mixed etiology' group who are equated both for CA and MA. For example, Summers and Feldman (1999) investigated the behavioural functioning of 27 individuals with Angelman syndrome by comparing scores on the *Aberrant Behavior Checklist* to those of a mixed etiology group matched for MA and CA. The study demonstrated that individuals with Angelman syndrome had significantly lower scores on measures of irritability and lethargy. On face value at least this would appear to provide an appropriate comparison between those with and those without a specific syndrome. Hodapp and Dykens (2001, 2004) note several problems with this approach, however. Specifically, they note the difficulty in identifying a 'mixed etiology' sample that accurately reflects the population of people with intellectual and developmental disabilities, a process which is further hampered by a lack of epidemiological research and disagreements regarding the definition of intellectual disability.

In the final approach individuals with a specific syndrome are compared to specific groups either with or without intellectual and developmental disabilities. For example, Dykens, Leckman, and Cassidy (1996) compared the nature and severity of non-food obsessions and compulsions in 91 individuals with Prader-Willi syndrome (PWS) with a group of individuals with a diagnosis of OCD without intellectual and developmental disabilities. The PWS and OCD groups showed similar levels of symptom severity and numbers of compulsions; they also showed more areas of symptom similarity than difference. Other studies have sought to compare groups of individuals with specific syndromes to examine between-syndrome differences; some such studies have also included an additional 'mixed etiology' control group. Such studies enable researchers to examine the relative 'uniqueness' of behavioural phenotypes. Dykens and Kasari (1997) for example examined challenging behaviour displayed by 43 children with PWS in

comparison to a group of children with Down syndrome and a 'mixed etiology' group of children with intellectual and developmental disability. This analysis demonstrated that 12 behaviours from the Child Behavior Checklist were significantly more likely to be reported for individuals with PWS in comparison to the other two groups.

In sum, a range of experimental designs have been used in order to investigate behavioural phenotypes associated with specific genetic syndromes. The strength of each specific design is a function of the particular research question, and certain designs are clearly not appropriate to answer certain research questions.

In the current study a between-group analysis was adopted, this involved an indirect comparison of the function of challenging behaviour between children with FXS and SMS and a 'mixed etiology' control group. This design allowed any differences in behavioural function between the two syndrome groups to be examined, whilst also enabling a judgement as to whether this was any different from what would typically be expected in the population of children with intellectual and developmental disabilities as a whole.

Participant Identification and Recruitment

The 'gold standard' for group-design studies requires the random assignment of participants to experimental conditions in order to control for extraneous subject variables. Due to the focus on etiology in behavioural phenotype research, however, participants cannot be randomly allocated to experimental groups; rather group assignment is determined by the presence or absence of a specific syndrome. This removes an element of experimental control and it is always possible for subject-variables other than the putative independent variable to exert a confounding influence. For example, environmental factors may contribute to between-group commonalities and differences.

One additional concern in behavioural phenotype research lies in the way participants are recruited. Convenience sampling is usually required in such research,

especially when investigating a genetic syndrome with a relatively low prevalence such as SMS. Such sampling techniques may lead to the identification of samples of participants that do not accurately reflect the underlying target population. In behavioural phenotype research the most efficient form of recruiting participants is typically to contact the relevant parental support group for a particular syndrome. Parent groups have an interest in promoting research and are in a position to contact a relatively large number of families. This strategy holds several advantages to the researcher, and is especially efficient in terms of time and costs. Hodapp and Dykens (2004) note, however, that members of parental support groups may not be necessarily representative of underlying target populations. It is likely that such parent groups hold a greater proportion of white, English-speaking, middle-class and well- educated parents than would be expected in the underlying population.

Alternative methods of recruitment do exist which may help to overcome such problems. For example researchers can attempt to recruit participants through regional genetics centres or through special schools located in a specific area. Whilst such methods are likely to yield a more representative sample, they are considerably less efficient in terms of the financial and time costs involved. The primary means of participant recruitment in the current study was for this reason through convenience sampling.

Measuring Behavioural Phenotypes

A final concern for behavioural phenotype research lies in the methods used to measure behaviours associated with specific syndromes (Hodapp & Dykens, 2004). There are various *indirect* and *direct* methods, which can be utilised in order to measure behavioural phenotypes.

Indirect measurement tools rely on informants to provide information about behaviours associated with a specific syndrome. One of the benefits of indirect methods

lies in their ease of use. Large numbers of participants can be used in such research in a relatively time-efficient manner.

Various indirect methods have been employed in behavioural phenotype studies. Some studies for example have used comprehensive checklists to identify behaviours associated with a specific syndrome. Finucane, Dirrigl and Simon (2001) developed a bespoke checklist to investigate self-injurious behaviours displayed by individuals with SMS. Using such scales enables the investigation of specific behaviours known to be associated with a specific syndrome. In cases where such behaviours are not already known, the use of such checklists may result in highly idiosyncratic behaviours (such as the *polyembolokomania* associated with SMS) being missed. Checklists are also of little use in identifying qualitative differences within- or between- syndrome groups or in the investigation of more complex repertoires of behaviour (Hodapp & Dykens, 2004).

Another common indirect method to have been used includes the use of standardised psychometric tools, such as the *Aberrant Behavior Checklist* (Aman, Singh, Stewart, & Field, 1985). The benefits of such scales are that they have demonstrated validity and reliability; they also allow a reference to norms, allowing an assessment of whether individuals with a specific syndrome show higher or lower levels of a specific behaviour than typically found.

There are some notable problems associated with indirect methods, however. Indirect tools measure what informants say about the behaviours of interest rather than the behaviours themselves. There is not necessarily a correspondence between these two things, which requires an inference to be made about the relationship between the event that was measured and the behaviour of interest. As Johnston and Pennypacker (1993) note:

It is incumbent on anyone who uses indirect measurement to provide scientific evidence that the data obtained from the measurement system precisely reflect in some way the subject matter about which conclusions are drawn. (p. 114).

Although direct measurement places a greater demand on the researcher, it provides a more valid means of assessing the target behaviour of interest than do indirect measures. Direct measurement helps to ensure that "*the phenomenon that is the focus of the experiment is exactly the same as the phenomenon being measured*" (Johnston & Pennypacker, 1993, p. 113).

In the current study, which aimed to include a large number of participants, indirect methods were used to collect information on the sample. Indirect methods enabled an examination of the primary research question for a relatively large number of individuals.

In sum, the effects of genetic events on behavioural function has attracted increased attention in recent years. The current study aimed to extend this line of work by examining both between- and within-syndrome differences in the function served by challenging behaviour displayed by children with FXS and SMS, in comparison to one another and to a control group of children with intellectual and developmental disabilities of a mixed etiology. To the author's knowledge this is the first study to conduct such a between-group comparison using an indirect measure of behavioural function. Data were also collected on between-group differences in the form of adaptive and challenging behaviours.

Method

Experimental Design

A between-group comparison design was employed to examine the primary research question. Two experimental groups were used, parents of children with a confirmed diagnosis of FXS and parents of children with a confirmed diagnosis of SMS. A group of parents of children with intellectual and developmental disabilities of a mixed etiology were included as a control group.

Research Ethics

The current study received ethical approval from the Tizard Centre Ethics Committee. For participants from the SMS group recruited via Regional Genetics Centres ethical approval was also granted by a multi-site NHS Research Ethics Committee and the study also received local R&D approval from each individual NHS Trust who agreed to support the research.

Participants

All participants were parents of children with intellectual and developmental disabilities who displayed challenging behaviour. All children were between 5-21 years of age and had a confirmed diagnosis of FXS, SMS or intellectual and developmental disabilities of a mixed etiology. Allocation to groups was dependent on the genetic status of each participant's child or children. Parents of children with SMS and FXS were requested to provide confirmation of their child's genetic status or to provide consent for the investigator to request this information from the family's local Regional Genetics Centre where the initial diagnosis had been made or failing that from the family's paediatrician or GP. Independent verification of each child's genetic syndrome was received for all but six participants (4 participants with SMS and 2 participants with FXS). Some participants from the mixed etiology control group had a genetic syndrome other than SMS or FXS, although independent evidence of this was not requested. This was deemed acceptable as the aim of including a non-specific group was to provide a heterogeneous sample of individuals with intellectual and developmental disability.

Convenience sampling was used to recruit participants from each group. Participants from the FXS group and from the mixed etiology control group were contacted via the relevant parental support group. *The Fragile X Society*, a UK-based parent support group for families with a child or children with FXS agreed to contact families of children with a diagnosis of FXS who had previously indicated a willingness to

take part in research. A total of 174 information packs were sent out. Consent forms were returned for a total of 46 participants of whom 34 took part in the study. Participants for the mixed etiology control groups were recruited through *The Challenging Behaviour Foundation*, a parent support group for families of children with intellectual and developmental disabilities who display challenging behaviour. Information packs and consent letters were sent to a randomly selected sample of 115 families from the *Challenging Behaviour Foundation* mailing list. A total of 35 individuals returned consent forms of whom 30 took part in the study.

Participants for the SMS group could not be recruited via the *Smith-Magenis Foundation*, a parent support group for families of children with SMS. The study received an unfavourable review from the Foundation's professional advisory group. The specific reasons as to why the study was rejected were never disclosed despite repeated requests and no opportunity was afforded to respond formally to any concerns. As such alternative methods of participant recruitment were pursued for this group. These included contacting potential participants via the *Challenging Behaviour Foundation* mailing list and newsletter, through the *Unique* (a parent support group for rare chromosome disorders) database, letters to all 52-week-a-year residential schools throughout the UK, letters to all special education schools in Kent, advertisements in the November 2007 *Contact a Family* newsletter and on the *Yahoo! SMS group*. In addition, a snowballing technique was adopted whereby all families who took part in the research were asked if they knew of anyone with a child with SMS who may be interested in taking part in the study. These methods led to a total of 18 participants with a child with SMS being identified. As such, NHS Regional Genetics Centres across the United Kingdom were then contacted with information about the study and were asked whether they would be willing to forward information about the study to families of children with SMS who had received services from their centre. Following ethical approval Regional Genetics Centres from the

following NHS Trusts agreed to support the study and send out information to potential participants. The number of participants recruited via each NHS Trust is shown in brackets: Birmingham Women’s Health Care NHS Trust (1), Belfast City Hospital Trust (2), Greater Glasgow-Yorkhill Division NHS Trust (1), Liverpool Women’s Hospital NHS Trust (1), and Oxford Radcliffe Hospitals NHS Trust (1). This resulted in a total of 24 participants being included in the research who had a child with a diagnosis of SMS.

An initial power analysis using the conventions suggested by Cohen (1992) suggested that in order to achieve an acceptable level of power (0.8) each group would require a minimum of $N = 21$ for a large effect size ($d = .4$) at $\alpha = .05$. Participant recruitment continued up until sufficient N had been reached for each group or a statistical difference between the groups in the direction hypothesised had been found, whichever occurred first. There was a total of 34 participants in the FXS group, 24 in the SMS group and 30 in the mixed etiology control group. Descriptive statistics for participant characteristics are presented below in Table 4.1.

Table 4.1

Participant Characteristics

	FXS	SMS	Mixed Etiology
Chronological Age (months).			
Mean (SD)	133.5 (36.3)	141.4 (44.6)	121.3 (34.7)
Gender (%)			
Male	91.4	54.2	80
Female	8.6	45.8	20

There were no significant differences between the groups for chronological age. The one-way ANOVA showed F to be non-significant at the 0.05 level: $F(2, 85) = 1.195$; $p > 0.05$. Therefore the groups appeared to be matched for CA.

There were significant differences between the groups in the gender of participants. A chi square test of the null hypothesis that there were no gender differences between the groups showed significance beyond the .05 level: $\chi^2(2) = 11.505$; exact $p = 0.003$.

Measurement Instruments

Participants were asked to complete the following measures: *Aberrant Behavior Checklist-Community version* (ABC-C; Aman, Burrow, & Wolford, 1995), the *Vineland Screener* (Sparrow, 2000), and the *Questions About Behavioral Function* scale (QABF; Matson & Vollmer, 1995). The *Self-Injurious Behavior* subscale of the *Behavior Problems Inventory* (Rojahn, Matson, Lott, Esbensen, & Smalls, 2001) was also used for those participants who had endorsed self-injurious behaviour items in the ABC-C. Each measure took approximately 15 mins to complete.

The *Aberrant Behavior Checklist* (ABC) was originally designed to measure challenging behaviour displayed by individuals in institutionalised settings. The ABC is an informant-based problem behaviour rating scale that was developed by factor analysis using a large number of individuals in institutional settings (Aman et al., 1985). The ABC consists of 58 items, each scored on a 4-point scale (0: not a problem, through to 3: problem is severe in degree). The items fall into five subscales: (1) *Irritability, Agitation, Crying* (15 items), (2) *Lethargy, Social Withdrawal* (16 items), (3) *Stereotypic Behavior* (7 items), (4) *Hyperactivity, Non-Compliance* (16 items), and (5) *Inappropriate Speech* (4 items). A number of psychometric studies have shown that the ABC is a reliable and valid behaviour rating instrument (see Aman, 2002). The ABC was modified for use with community-based individuals and the original factor structure of the ABC has been shown to be valid for the ABC-C (Aman et al., 1995).

The *Vineland Screener (VSC)* is a tool to assess domains of adaptive behaviour derived from the full Vineland and is intended for research purposes only. The VSC consists of 15 items in each of the following three domains: *Communication*, *Daily Living Skills*, and *Socialization*. There are also a smaller number of items for the *Motor Skills* domain. Respondents are asked several probe questions to explore their perception of the child's ability for each item. Items are scored on a Likert-type scale from 0-2; an N can also be scored if the individual does not have the opportunity to engage in certain behaviours. Age equivalent scores for each sub-domain can be derived from the Vineland Screener. A mean age equivalent score across the Communication, Daily Living Skills and Socialization subdomains has been used in prior research to have used the VSC in order to provide a global measure of intellectual functioning (e.g., Chadwick, Kusel, Cuddy, & Taylor, 2005; Charman, Howlin, Berry, & Prince, 2004). Sparrow (2000) reports that the VSC has high inter-rater reliability and each domain has high convergent validity with the respective domains on the full Vineland.

The *Questions About Behavioral Function* scale (*QABF*) is a 25-item questionnaire designed to identify the variables that maintain challenging behaviour. The QABF is scored on a 4 point Likert scale from never (0) to often (3). If an item does not apply then the N/A option may be endorsed. Its five subscales (*escape*, *attention*, *non-social*, *tangible*, *physical discomfort*) have been confirmed via factor analysis and the scale has good reliability (Paclawskyj, Matson, Rush, Smalls, & Vollmer, 2000). Paclawskyj, Matson, Rush, Smalls, and Vollmer (2001) assessed the convergent validity of the *QABF*, reporting moderate agreement between the *QABF* and the *Motivation Assessment Scale* (Durand & Crimmins, 1988) and the *QABF* and the results of analogue assessments. Evidence also supports the predictive validity of the *QABF*. Matson, Bamburg, Cherry and Paclawskyj (1999) for example, demonstrated that the *QABF* successfully identified behavioural antecedents for 84% of individuals in their sample of 398 individuals with intellectual and

developmental disabilities. Treatment based on a QABF-based functional assessment was more likely to lead to reductions in challenging behaviour than treatments that were not based on functional assessment.

Independent researchers have reported discrepant results for the psychometric properties of the QABF. Shogren and Rojahn (2003) failed to find any advantage of the QABF over the MAS, reporting comparable inter-rater reliability and test-retest reliability scores for both. Likewise Nicholson, Konstantinidi and Furniss (2006) reported reliability scores that were substantially lower than those reported by Paclawskyj et al. (2000).

The *Self-Injurious Behavior* subscale of the *Behavior Problems Inventory (BPI)* was also completed for those participants, who had endorsed self-injurious behaviour items on the *ABC-C*. The *BPI* has been found to be a reasonably reliable and valid measure (Rojahn et al., 2001). The *Self-Injurious Behavior* subscale consists of 14 items which are rated for frequency on a 5 point frequency scale (never to hourly).

Procedure

Participants for the FXS and mixed etiology sample were contacted via the *Fragile X Society* and the *Challenging Behavior Foundation* respectively. All parents were provided with an information sheet describing the aims of the study, a consent form, a copy of the *ABC-C* together with a glossary of terms and a pre-paid envelope. Each participant also received a covering letter from the relevant parental support group detailing their support for the research.

Potential participants from the SMS group were contacted via a number of different means (see above). The procedure above was followed for those parents who were recruited via parental support groups (*Challenging Behavior Foundation* and *Unique*) and Regional Genetics Centres. All other participants contacted the primary researcher independently. Once these participants had established contact then the procedure described above was followed.

All participants were asked to return a completed copy of the *ABC-C*, a completed consent form indicating a convenient time for the interviews to be conducted and for the FXS and SMS groups either confirmation of their child's genetic diagnosis or consent for the researchers to seek this information from relevant agencies. On receipt of this participants were then sent a confirmation of the scheduled interview time together with copies of the remaining measures that were to be completed over the phone. Parents were advised to have the questionnaires to hand for the telephone interview.

All phone calls began with the researcher introducing himself and establishing whether this was a convenient time for the interview. If necessary, interviews were rearranged for an alternative time. All interviews began with a brief description of the aims and structure of the interview. At the end of each measure, participants were offered the opportunity to take a break and resume the interview at a later date. For participants who had indicated in the *ABC-C* that their child displayed self-injurious behaviour the Self-Injurious Behavior subscale of the *BPI* was completed to gain more detailed information on the form of self-injury displayed by each child. On some occasions parents had not endorsed self-injurious behaviour items in the *ABC-C* when it would have been appropriate to do so. In these cases the *BPI* was also completed for these individuals. The *QABF* was then completed for each general topographical category of behaviour that had been rated as problematic in the *ABC-C* (aggression, self-injury, destructive behaviour). The *VSC* was then administered. The *VSC* consists of several age ranges (0-2yrs, 3-5yrs, 6-12yrs, and 13-18yrs). All participants were assigned to the age range immediately beneath their child's chronological age. For example, if their child was 15 years old then the participant was asked to complete the 6-12 yrs old age range. The appropriateness of this age range was then assessed, using the following protocol. If the participant achieved a score of 9 or 10 (max score = 10) after the first five items or 18 to 20 (max score = 20) after the first 10 items then a higher age range was selected. Conversely if the participant

achieved scores of 0 to 1 after five items (min score = 0) or 2 or less after 10 items (min score = 0) then a lower age-range was selected. This process was repeated for each sub domain until an appropriate age range was selected.

At the end of the interview participants were thanked for their time and informed that they would be sent an indirect functional assessment summarising the responses made to the *QABF* within the next two weeks. Confirmation of the genetic status of each parent's child if not already provided was sought from Regional Genetics Centres, paediatricians or GPs. Participants from the FXS and SMS groups who were not recruited via NHS Regional Genetics Centres were also asked if they would be willing to consider their child participating in a subsequent study. All data were stored in a secure location and inputted into *SPSS version 15* for later analysis.

Results

Adaptive Behaviour

Groups were compared for levels of adaptive behaviour and independent functioning using the Vineland Screener. Age equivalent scores from the full Vineland manual were derived from the Vineland Screener equated raw scores. Table 4.2 presents descriptive statistics for each group.

The Kolmogorov-Smirnov test of goodness-of-fit was significant at the .05 level for the mixed etiology group on the Daily Living Skills sub-domain, suggesting that the data were not normally distributed. As such a non-parametric Kruskal-Wallis test was used to examine group differences across all sub-domains of the Vineland. To reduce the probability of making a Type I error by multiple comparisons, $\alpha = .05$ was divided by the number of comparisons made, resulting in a significance level of .012. Henceforth where the same process has been used to account for multiple comparisons, this shall be referred to as the Bonferroni adjustment. Mann Whitney tests were used to examine post hoc between-group differences using a significance level of 0.016 (Bonferroni adjustment).

Table 4.2

Vineland. Age Equivalent Scores (in months)

	FXS		SMS		Mixed Etiology	
	(N = 34)		(N= 22)		(N=30)	
	M	SD	M	SD	M	SD
Overall Mean	46.9	21.2	56.0	18.9	42.3	23.6
Communication Skills	50.6	30.7	68.1	27.8	40.4	28.2
Daily Living Skills	42.1	26.2	50.9	19.6	42.77	30.4
Socialization	48.0	17.8	49.2	16.8	43.8	18.7

For overall Vineland mean age equivalent scores, the Kruskal-Wallis chi-square test was not significant at the 0.012 level: $\chi^2(2) = 8.05$; $p = 0.018$. The Kruskal-Wallis chi-square test was also not significant for the Daily Living Skills sub domain: $\chi^2(2) = 5.727$; $p = .057$; and the Socialization sub domain: $\chi^2(2) = 1.205$; $p = .547$.

There were significant between group differences for the Communication sub domain of the Vineland. The Kruskal-Wallis chi-square test was significant at the 0.012 level: $\chi^2(2) = 12.99$; $p = 0.002$. A series of Mann-Whitney tests showed: differences between children with FXS and SMS were significant at the .016 level ($U = 203$; $p = .004$), as were differences between the SMS group and mixed etiology group ($U = 157.5$; $p = .001$). Differences between children with FXS and the mixed etiology group were non-significant at the .016 level ($U = 403$; $p = 0.149$).

Challenging Behaviour. Form

The ABC-C and BPI-SIB subscale were used to assess group differences in the form and severity of challenging behaviour.

Aberrant Behavior Checklist.

Table 4.3 shows descriptive statistics for the between-group comparison for the overall and sub domain scores of the ABC-C.

Neither Levene's test nor the Kolmogorov-Smirnov test were significant at the .05 level for any group or sub-domain, suggesting that the data were normally distributed. As such a series of one-way ANOVAs were used to examine group differences on all sub domains of the ABC-C, using a significance level of 0.008 (Bonferroni adjustment).

Table 4.3

Aberrant Behavior Checklist. Descriptive statistics

ABC-C	FXS (N=35)		SMS (N= 23)		Mixed Etiology (N=30)	
	M	SD	M	SD	M	SD
Overall Score	65.9	35.3	74.1	28.9	77.0	28.9
Irritability	18.6	11.0	25.3	8.9	24.5	8.9
Lethargy	11.5	9.3	9.4	9.6	12.1	9.0
Stereotypical	8.1	5.2	6.8	4.5	8.9	5.8
Hyperactivity	21.2	11.4	27.0	9.6	26.9	13.2
Inappropriate Speech	6.5	3.4	6.0	3.1	4.8	3.9

There were no significant between-group differences on any sub domains of the ABC-C at the .008 level. The one-way ANOVA revealed no significant between-group differences on overall scores: $F(2, 85) = 1.065$; $p = 0.349$; the irritability subscale: $F(2, 85) = 4.344$; $p = .016$; the lethargy subscale: $F(2, 85) = .599$; $p = 0.551$; the stereotypical behaviour subscale: $F(2, 85) = 1.072$; $p = 0.347$; the hyperactivity subscale: $F(2, 85) = 2.564$; $p = 0.083$; or the inappropriate speech subscale: $F(2, 84) = 2.102$; $p = 0.129$.

Behaviour Problems Inventory. SIB subscale.

The BPI was completed for all participants who were reported to display self-injurious behaviour. Some 91.4% of the FXS group were reported to display some form of self-injurious behaviour, 95.8% of the SMS group and 80% of the mixed etiology group. Table 4.4 shows descriptive statistics for the total BPI SIB subscale scores.

Table 4.4

Behavior Problems Inventory. SIB subscale. Descriptive statistics.

BPI	FXS (N=32)		SMS (N=23)		Mixed Etiology (N=24)	
	M	SD	M	SD	M	SD
Total SIB Subscale	11.3	8.7	18.8	9.6	14.3	7.3

Neither Levene's test nor the Kolmogorov-Smirnov test were significant at the .05 level for any group on the BPI, suggesting the data were normally distributed. As such, a one-way ANOVA was used to examine group differences. The one-way ANOVA test revealed significant between group differences on the Total SIB subscale at the .05 level: $F(2, 76) = 5.156; p = 0.008$.

Bonferroni pair-wise comparisons revealed significant differences between the children with FXS and children with SMS ($p < 0.05$). There were neither significant differences between children with FXS and the mixed etiology group nor between the SMS group and mixed etiology group.

Challenging Behaviour- Function

FXS. Within-group analysis.

Table 4.5 and Figures 4.1-4.3 show descriptive statistics depicting the within-syndrome profile of scores on the QABF for children with FXS across self-injurious

behaviour, aggression and destructive behaviours. There appears to be a similar differentiation between the five subscales across all topographies. Children from the FXS group appear to score lower on the attention subscale in comparison to other socially influenced subscales across all topographies. Scores on the demand and tangible subscales appear to be slightly elevated in comparison to all other topographies.

Table 4.5

Within-syndrome descriptive results of the QABF for children with FXS (Total Scores).

QABF Total Scores	Self-Injury (N=30)		Aggression (N=32)		Property Destruction (N= 23)	
	M	SD	M	SD	M	SD
Attention Subscale	3.20	3.77	3.65	3.99	2.78	3.46
Tangible Subscale	8.57	3.73	8.26	4.12	5.87	4.29
Demand Subscale	9.07	3.79	10.45	3.59	6.04	4.48
Physical discomfort Subscale	3.87	5.37	3.32	4.69	1.26	2.85
Automatic Subscale	6.13	4.29	1.23	2.23	5.65	5.31

The Kolmogorov-Smirnov test of goodness-of-fit was significant at the .05 level for at least one subscale across all three behavioural topographies, suggesting that the data were not normally distributed. As such a series of non-parametric Friedman tests were used to examine within group differences in behavioural function for all behavioural topographies, using a significance level of .016 (Bonferroni adjustment).

Figure 4.1. Boxplot for QABF total scores. Self-injurious behaviours

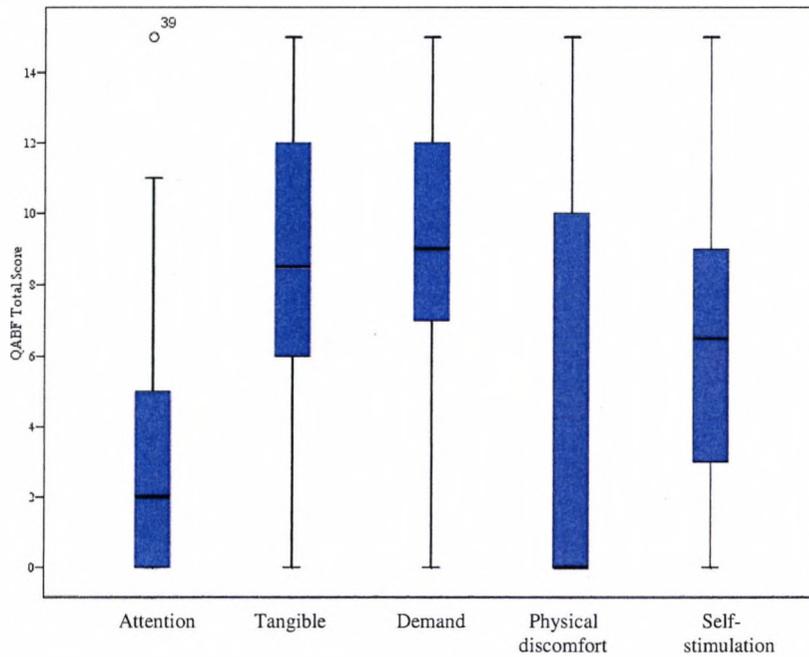


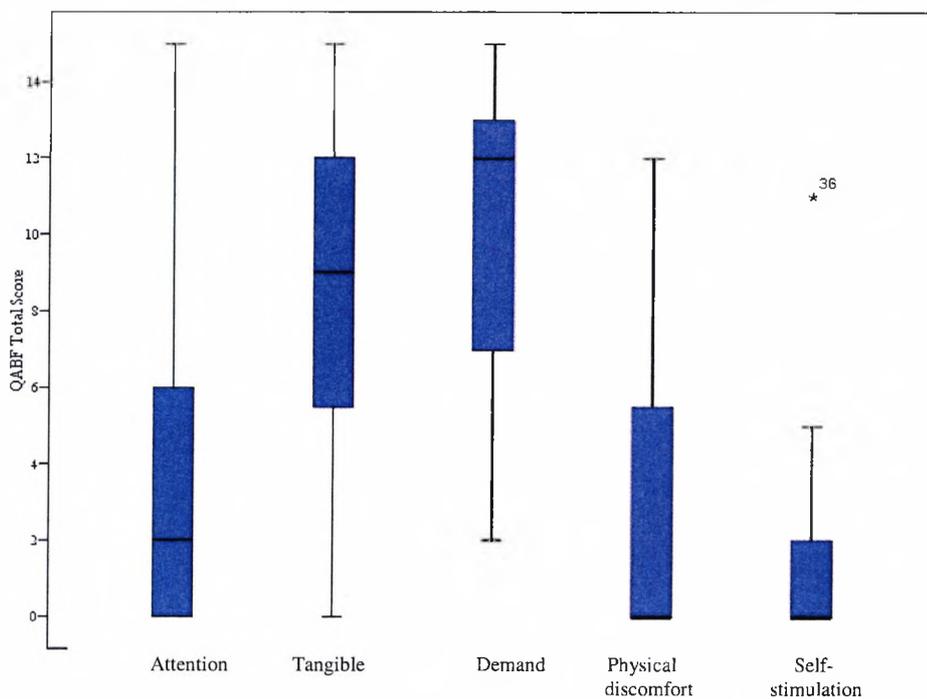
Table 4.6

Results of Pair-wise Comparisons on the QABF for Children with FXS who Display Self-Injurious Behaviour

Pair-wise comparison	Wilcoxon's W	N	p
		(excluding ties)	(*sig at .005 level)
Attention vs. Tangible	27.5	28	.000*
Attention vs. Demand	29.5	29	.000*
Attention vs. Physical discomfort	147	25	.686
Attention vs. Self-stimulation	95	28	.012
Tangible vs. Demand	158.5	27	.471
Tangible vs. Physical discomfort	41.5	27	.000*
Tangible vs. Self-stimulation	90.5	28	.009
Demand vs. Physical discomfort	32	28	.000*
Demand vs. Self-stimulation	54.5	23	.009
Physical discomfort vs. Self-stimulation	115.5	27	.078

For self-injurious behaviour, the Friedman test was significant at the .016 level: $\chi^2(4) = 35.88$; $p = 0.000$. A series of Wilcoxon matched-pairs signed rank tests were conducted to compare pair-wise within group differences. The significance level of .005 (Bonferroni adjustment) was used for all non-parametric pair-wise comparisons. The results of each pair-wise comparisons are presented in Table 4.6 above. For self-injurious behaviours the following pair-wise differences were significant at the .005 level: attention<tangible; attention<demand; tangible>physical discomfort; demand>pain.

Figure 4.2. Boxplot for QABF total scores. Aggressive behaviours



For aggressive behaviours, the Friedman test was significant at the .016 level: $\chi^2(4) = 69.856$; $p = 0.000$.

A series of Wilcoxon matched-pairs signed rank tests were conducted to compare pair-wise within group differences using a significance level of $p = .005$ (Bonferroni adjustment). The results of each pair-wise comparison are presented in Table 4.7 below. For aggressive behaviours the following pair-wise differences were significant at the .005 level: attention<tangible; attention<demand; attention>self-stimulatory; tangible>physical

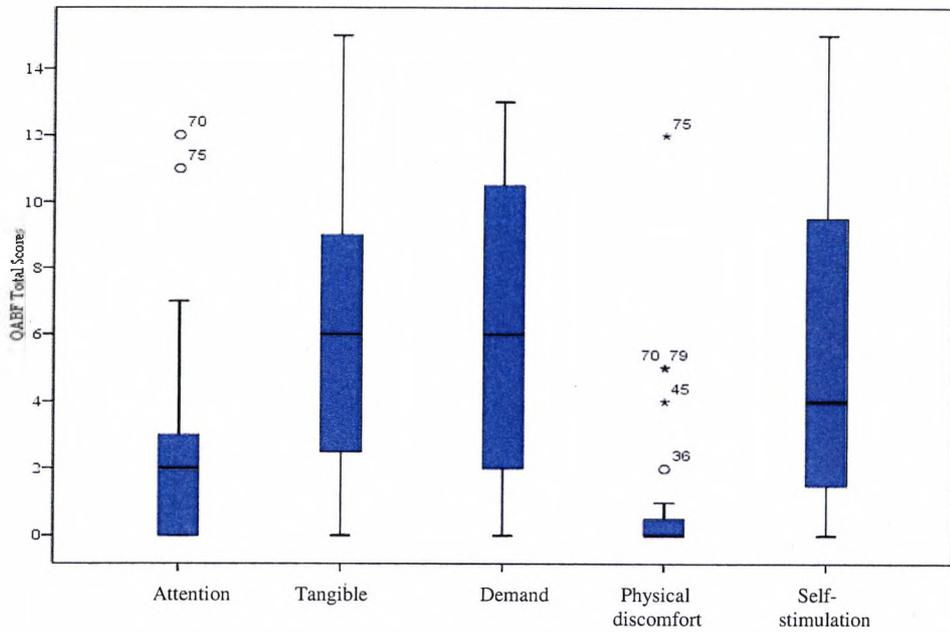
discomfort; tangible>self-stimulatory; demand>physical discomfort; demand>self-stimulatory.

Table 4.7

Results of Pair-wise Comparisons on the QABF for Children with FXS who Display Aggression

Pair-wise comparison	Wilcoxon's W	N	p
		(excluding ties)	(*sig at .005 level)
Attention vs. Tangible	33	31	.000*
Attention vs. Demand	27.5	32	.000*
Attention vs. Physical discomfort	176.5	28	.555
Attention vs. Self-stimulation	60	25	.004*
Tangible vs. Demand	72	26	.007
Tangible vs. Physical discomfort	37.5	30	.000*
Tangible vs. Self-stimulation	13.5	29	.000*
Demand vs. Physical discomfort	.00	29	.000*
Demand vs. Self-stimulation	.00	29	.000*
Physical discomfort vs. Self-stimulation	69	22	.062

Figure 4.3. Boxplot for QABF total scores. Destructive behaviours



For destructive behaviours, the Friedman test was significant at the .016 level: $\chi^2(4) = 28.325$; $p = 0.000$.

A series of Wilcoxon matched-pairs signed rank tests were conducted to compare pair-wise within group differences using a significance level of $p = .005$ (Bonferroni adjustment). The results of each pair-wise comparison are presented in Table 4.8 below. For destructive behaviours the following pair-wise differences were significant at the .005 level: tangible > physical discomfort; demand > physical discomfort; physical discomfort < self-stimulation.

Table 4.8

Results of Pair-wise Comparisons on the QABF for Children with FXS who Display Destructive Behaviour

Pair-wise comparison	Wilcoxon's W	N	p
		(excluding ties)	(*sig at .005 level)
Attention vs. Tangible	26	18	.007
Attention vs. Demand	42	20	.016
Attention vs. Physical discomfort	18.5	14	.029
Attention vs. Self-stimulation	59.5	20	.090
Tangible vs. Demand	37	12	.892
Tangible vs. Physical discomfort	11.5	20	.000*
Tangible vs. Self-stimulation	133.0	23	.444
Demand vs. Physical discomfort	9.5	19	.000*
Demand vs. Self-stimulation	129	23	.794
Physical discomfort vs. Self-stimulation	25.5	19	.003*

SMS. Within-group analysis.

Table 4.9 and Figures 4.4-4.6 depict the within-syndrome profile of scores on the QABF for children with SMS across self-injurious behaviour, aggression and destructive behaviours. There appears to be little differentiation between the five subscales for self-injurious behaviours, and with the exception of the self-stimulation subscale, for aggressive behaviours. It appears that there may be elevated scores for the attention subscale of the QABF for destructive behaviours, in comparison to other subscales.

The Kolmogorov-Smirnov test of goodness-of-fit was not significant for any topography or subscale, suggesting the data were normally distributed. However, Mauchly's test of sphericity was significant for destructive behaviours. As such a series of

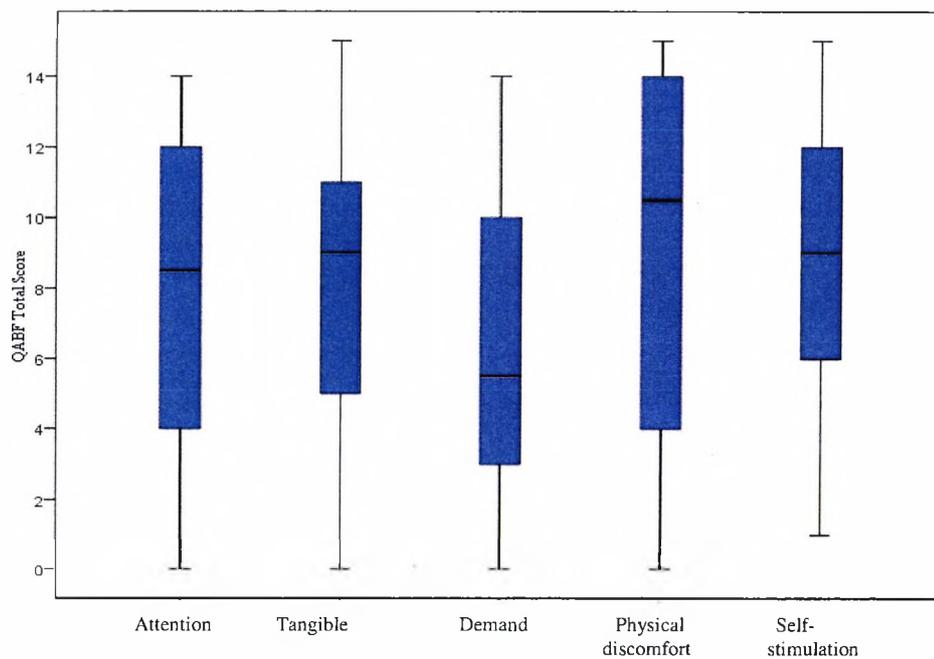
non-parametric Friedman tests were used to examine within group differences in behavioural function for all behavioural topographies, using a significance level of .016 (Bonferroni adjustment).

Table 4.9

Within-Syndrome Results of the QABF for Children with SMS (Total Scores).

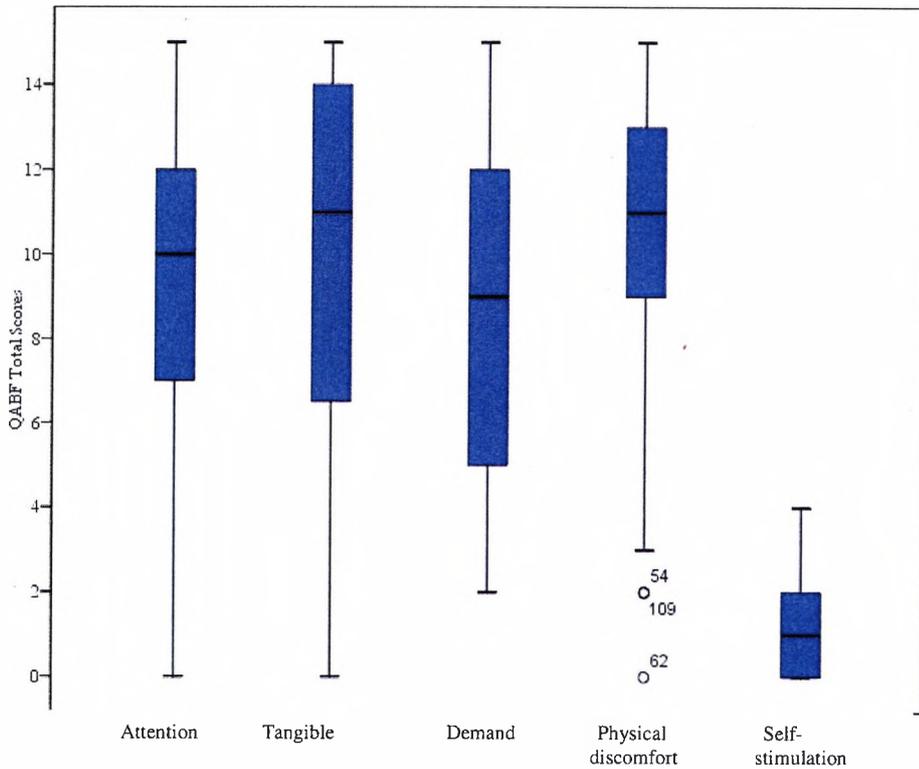
QABF Total Scores	Self-injurious behaviour (N=22)		Aggression (N=23)		Property Destruction (N=19)	
	M	SD	M	SD	M	SD
Attention Subscale	7.91	4.68	8.83	4.35	10.42	3.58
Tangible Subscale	8.23	4.47	9.87	4.77	9.05	4.18
Demand Subscale	6.36	4.19	8.39	4.38	8.26	4.45
Physical discomfort Subscale	9.05	5.33	10.00	4.61	9.26	5.42
Automatic Subscale	8.45	3.93	1.17	1.40	6.89	5.18

Figure 4.4. Boxplot for QABF total scores. Self-injurious behaviours



For self-injurious behaviours, the Friedman test was not significant at the .016 level: $\chi^2(4) = 3.529$; $p = 0.473$. Therefore, the null hypothesis that there were no within-group differences could not be rejected.

Figure 4.5. Boxplot for QABF total scores. Aggression



For aggressive behaviours, the Friedman test was significant at the .016 level: $\chi^2(4) = 40.724$; $p = 0.000$.

A series of Wilcoxon matched-pairs signed rank tests were conducted to compare pair-wise within group differences using a significance level of $p = .005$ (Bonferroni adjustment). The results of each pair-wise comparison are presented in Table 4.10 below. For aggressive behaviours the following pair-wise differences were significant at the .005 level: attention>self-stimulatory; tangible>self-stimulatory; demand>self-stimulatory; physical discomfort>self-stimulatory.

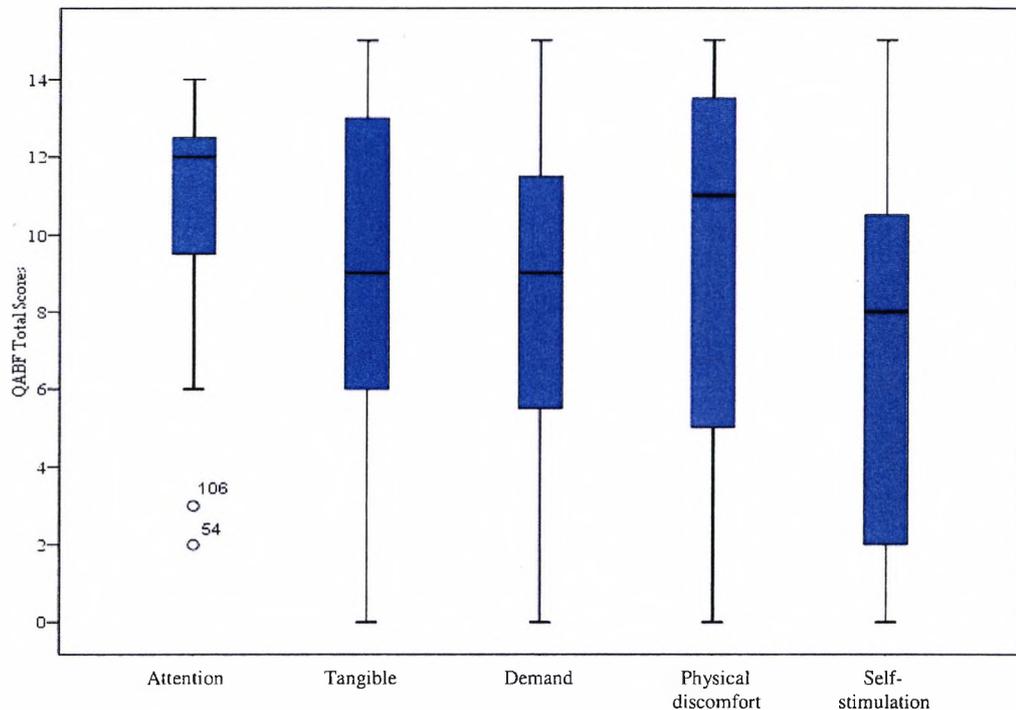
Table 4.10

Results of Pair-wise Comparisons on the QABF for Children with SMS who Display

Aggressive Behaviour

Pair-wise comparison	Wilcoxon's W	N	p
		(excluding ties)	(*sig at .005 level)
Attention vs. Tangible	82.0	20	.389
Attention vs. Demand	98.5	21	.553
Attention vs. Physical discomfort	75.5	20	.269
Attention vs. Self-stimulation	4	22	.000*
Tangible vs. Demand	79.5	21	.207
Tangible vs. Physical discomfort	111	21	.875
Tangible vs. Self-stimulation	0	21	.000*
Demand vs. Physical discomfort	91	22	.248
Demand vs. Self-stimulation	0	23	.000*
Physical discomfort vs. Self-stimulation	5	23	.000*

Figure 4.6. Boxplot for QABF total scores. Destructive behaviours.



For destructive behaviours, the Friedman test was not significant at the .016 level: $\chi^2(4) = 6.689$; $p = 0.153$. Therefore, the null hypothesis that there were no within-group differences could not be rejected.

Questions About Behavioral Function. Between-group analysis

For self-injurious behaviours there were a total of 30 participants with FXS, 22 with SMS and 24 from the mixed etiology group. For aggressive behaviours there were a total of 32 participants from the FXS group, 23 from the SMS group and 28 from the mixed etiology group. Finally for destructive behaviours there were a total of 23 participants from the FXS group, 19 from the SMS group and 15 from the mixed etiology group.

The Kolmogorov-Smirnov test of goodness-of-fit was significant at the .05 level for both FXS and the mixed etiology group across the physical discomfort and self-stimulatory subscales, suggesting that the data were not normally distributed on these subscales. As such a series of non-parametric Kruskal-Wallis tests were used to examine group differences across each subscale, using a significance level of .003 (Bonferroni adjustment).

Attention subscale.

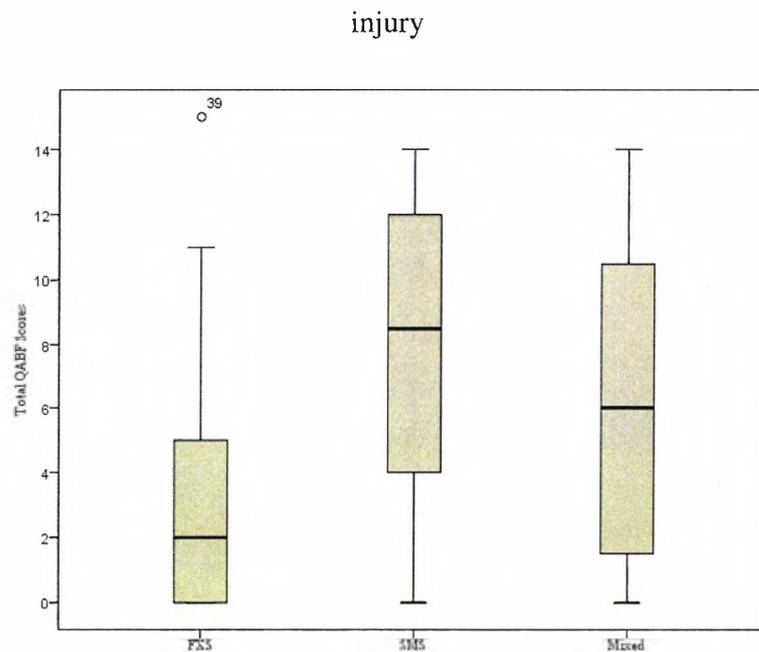
Table 4.11 and Figures 4.7-4.9 depict the between group comparison on the attention subscale of the QABF for self-injurious behaviour, aggression and property destruction. The groups appear to differ in a similar way across all topographies, with children with FXS consistently scoring lower than both comparison groups and children with SMS consistently scoring higher than either comparison group.

Table 4.11

Between-group Comparison of the QABF. Attention Subscale.

Attention subscale	FXS		SMS		Mixed Etiology	
	M	SD	M	SD	M	SD
Self-injurious behaviour	3.20	3.77	7.91	4.68	6.38	4.93
Aggression	3.62	3.93	8.83	4.35	6.61	4.88
Property destruction	2.78	3.46	10.42	3.58	6.33	4.60

Figure 4.7. Boxplot for between-group QABF total scores for the attention subscale. Self-

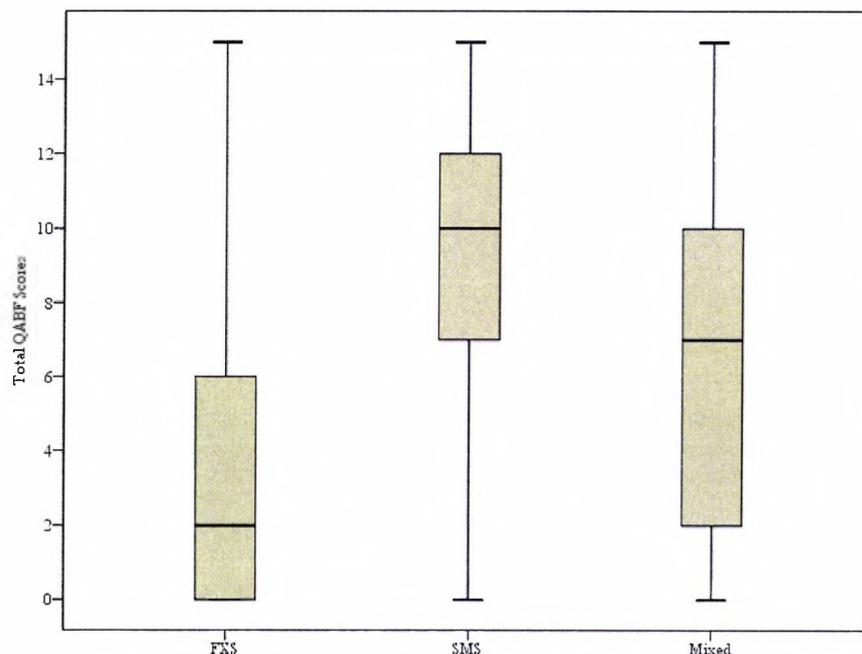


For self-injury, the Kruskal-Wallis revealed significant between group differences on the Attention subscale at the .003 level: $\chi^2(2) = 13.615$; $p = 0.001$. Using a significance level of .016 (Bonferroni adjustment) a series of Mann-Whitney tests showed: differences between children with FXS and SMS were significant ($U = 138.0$; $p = .000$). Differences between children with FXS and the mixed etiology group were significant ($U = 222.5$; $p = 0.015$). Differences between the SMS group and mixed etiology group were not significant ($U = 216.5$; $p = .294$).

In sum, the following differences were significant for self-injury on the attention subscale of the QABF: FXS < SMS; FXS < mixed etiology.

Figure 4.8. Boxplot for between-group QABF total scores for the attention subscale.

Aggressive behaviours.

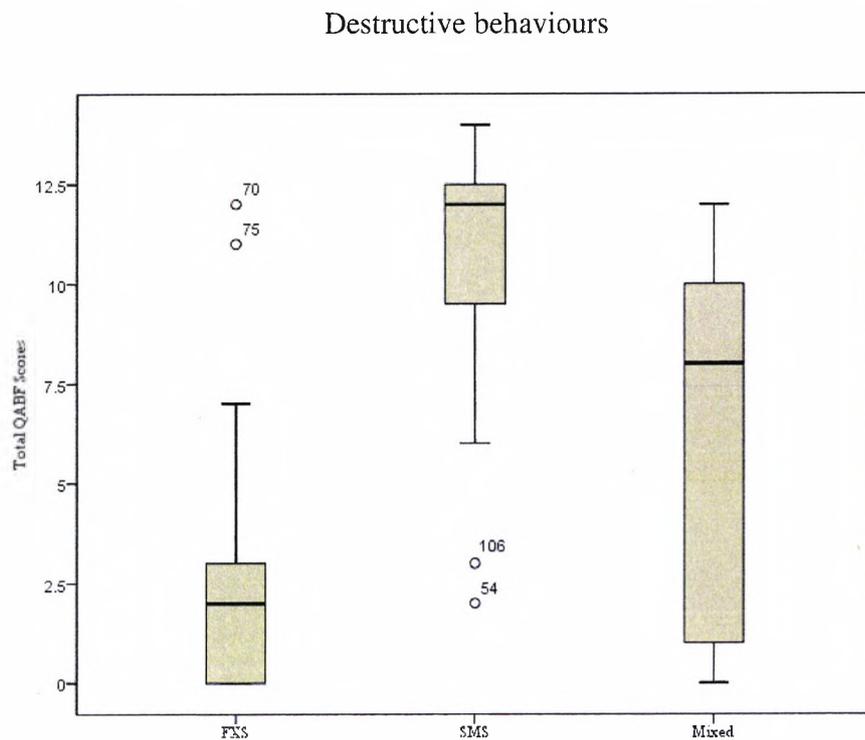


For aggression, the Kruskal-Wallis revealed significant between group differences on the Attention subscale at the .003 level: $\chi^2(2) = 16.434$; $p = 0.000$. Using a significance level of .016 (Bonferroni adjustment) a series of Mann-Whitney tests showed: differences

between children with FXS and SMS were significant ($U = 137.5$; exact $p = .000$), as were differences between children with FXS and the mixed etiology group ($U = 285.0$; $p = 0.015$). Differences between the SMS group and mixed etiology group were not significant ($U = 234.5$; exact $p = .096$).

In sum, the following differences were significant for aggression on the attention subscale of the QABF: FXS<SMS; FXS<mixed etiology.

Figure 4.9. Boxplot for between-group QABF total scores for the attention subscale.



For destructive behaviour, the Kruskal-Wallis revealed significant between group differences on the Attention subscale at the .003 level: $\chi^2(2) = 23.553$; $p = 0.00$. Using a significance level of .016 (Bonferroni adjustment) a series of Mann-Whitney tests showed: differences between children with FXS and SMS were significant ($U = 36.5$; $p = .000$), as were differences between the SMS group and mixed etiology group ($U = 58.5$; $p = .003$). Differences between children with FXS and the mixed etiology group were non-significant ($U = 108.0$; $p = .050$).

In sum, the following differences were significant for destructive behaviours on the attention subscale of the QABF: FXS<SMS; SMS>mixed etiology.

Tangible subscale.

Table 4.12 depicts the between group comparison on the tangible subscale of the QABF for self-injurious behaviour, aggression and property destruction. The groups appear to have a relatively similar profile of scores across topographies.

Table 4.12

Between-group Comparison of the QABF. Tangible Subscale

Tangible subscale	FXS		SMS		Mixed Etiology	
	M	SD	M	SD	M	SD
Self-injurious behaviour	8.57	3.74	8.23	4.47	7.29	4.69
Aggression	8.16	4.09	9.87	4.77	10.25	4.21
Property destruction	5.87	4.29	9.05	4.18	10.00	3.96

For self-injurious behaviour, the Kruskal-Wallis revealed no significant between group differences on the tangible subscale at the .003 level: $\chi^2(2) = 1.031$; $p = .597$.

For aggressive behaviour there were no significant between group differences on the tangible subscale at the .003 level: $\chi^2(2) = 4.587$; $p = .101$.

For destructive behaviour, there were no significant between-group differences on the tangible subscale at the .003 level: $\chi^2(2) = 8.915$; $p = .012$.

Demand.

Table 4.13 depicts the between group comparison on the demand subscale of the QABF for self-injurious behaviour, aggression and property destruction. There appears to be few between-group differences on this subscale.

Table 4.13

Between-group Comparison of the QABF. Demand Subscale

Demand subscale	FXS		SMS		Mixed Etiology	
	M	SD	M	SD	M	SD
Self-injurious behaviour	9.07	3.79	6.36	4.19	7.71	5.50
Aggression	10.12	3.99	8.39	4.38	10.46	4.13
Property destruction	6.04	4.48	8.26	4.45	8.60	4.14

For self-injurious behaviours, the Kruskal-Wallis was not significant at the .003 level: $\chi^2(2) = 4.065$; $p = .131$.

For aggressive behaviours, the Kruskal-Wallis was not significant at the .003 level: $\chi^2(2) = 3.656$; $p = .161$.

For destructive behaviours there were no significant between group differences on the demand subscale at the .003 level: $\chi^2(2) = 3.191$; $p = .203$.

Physical discomfort.

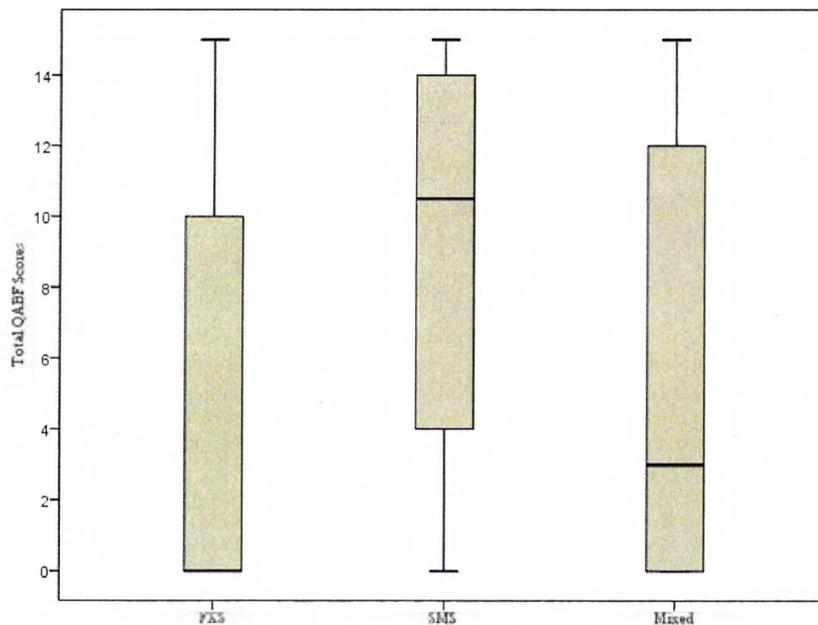
Table 4.14 and Figures 4.10-4.12 depict the between group comparison on the physical discomfort subscale of the QABF across each topography. The groups appear to differ in a similar way across all topographies, with children with FXS consistently scoring lower than both comparison groups and children with SMS consistently scoring higher than either comparison group.

Table 4.14

Between-group Comparison of the QABF. Physical Discomfort Subscale

Physical discomfort subscale	FXS		SMS		Mixed Etiology	
	M	SD	M	SD	M	SD
Self-injurious behaviour	3.87	5.37	9.05	5.33	5.21	5.93
Aggression	3.22	4.65	10.0	4.61	4.75	5.58
Property destruction	1.26	2.85	9.26	5.42	3.73	5.31

Figure 4.10. Boxplot for between-group QABF total scores for the physical discomfort subscale. Self-injurious behaviours

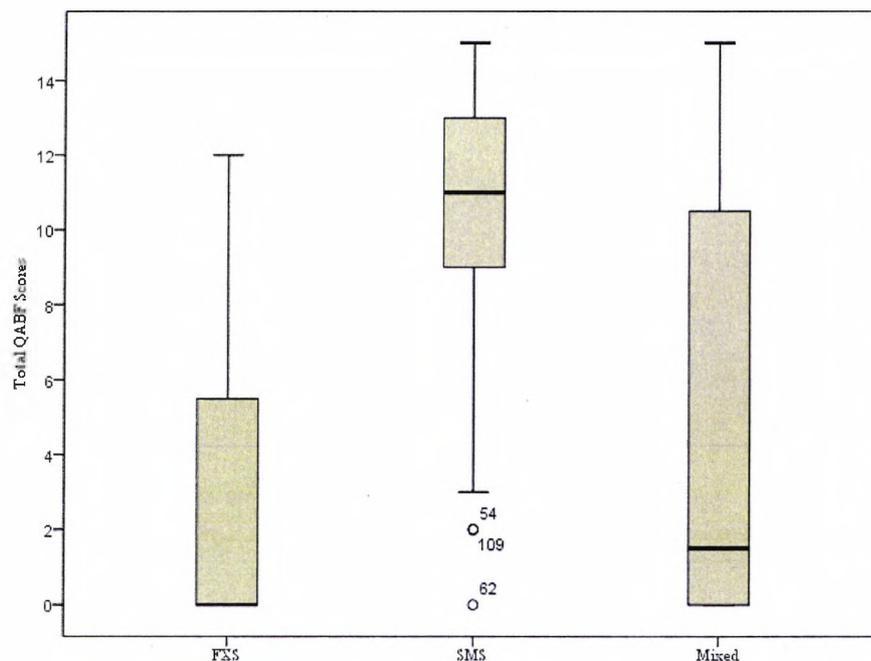


For self-injurious behaviour, the Kruskal-Wallis revealed significant between group differences on the physical discomfort subscale at the .003 level: $\chi^2(2) = 12.482$; $p = 0.002$. Using a significance level of .016 (Bonferroni adjustment) a series of Mann-Whitney tests showed: differences between children with FXS and SMS were significant ($U = 154.0$; $p = .001$). Differences between children with FXS and the mixed etiology group were non-

significant ($U = 275.5$; $p = .120$). Differences between the SMS group and mixed etiology group were not significant ($U = 162.0$; $p = .024$).

In sum, the following differences were significant for self-injury on the physical discomfort subscale of the QABF: SMS>FXS.

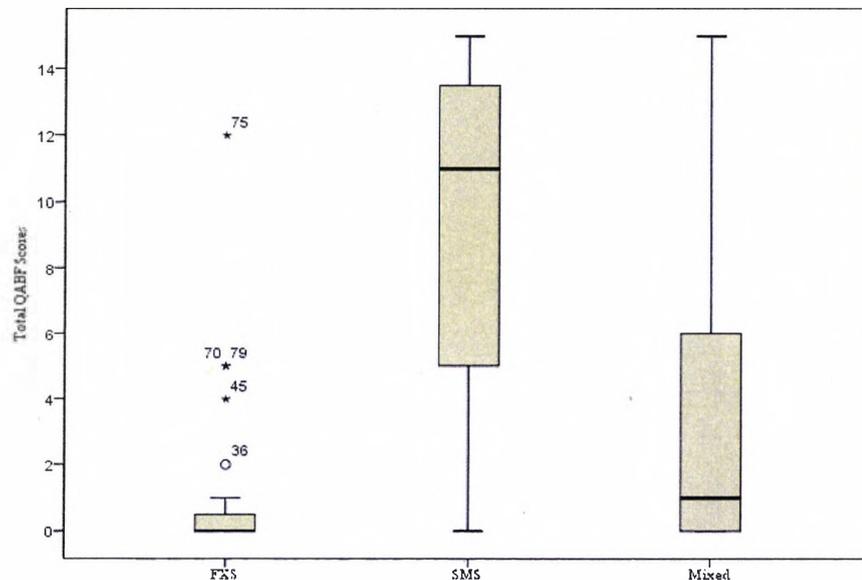
Figure 4.11. Boxplot for between-group QABF total scores for the physical discomfort subscale. Aggressive behaviours.



For aggressive behaviour, the Kruskal-Wallis revealed significant between group differences on the physical discomfort subscale at the .003 level: $\chi^2(2) = 21.93$; $p = 0.000$. Using a significance level of .016 (Bonferroni adjustment) a series of Mann-Whitney tests showed differences between children with FXS and SMS were significant ($U = 114.5$; $p = .000$), as were differences between the SMS group and mixed etiology group ($U = 152.5$; $p = .001$). Differences between children with FXS and the mixed etiology group were non-significant ($U = 354.5$; exact $p = .143$).

In sum, the following differences were significant for aggression on the physical discomfort subscale of the QABF: SMS>FXS; SMS>mixed etiology.

Figure 4.12. Boxplot for between-group QABF total scores for the physical discomfort subscale. Destructive behaviours.



For destructive behaviours, the Kruskal-Wallis revealed significant between group differences on the physical discomfort subscale at the .003 level: $\chi^2(2) = 21.598$; $p = 0.000$. Using a significance level of .016 (Bonferroni adjustment) a series of Mann-Whitney tests showed: differences between children with FXS and SMS were significant ($U = 48.5$; $p = .000$), as were differences between the SMS group and mixed etiology group ($U = 66.5$; $p = .008$). Differences between children with FXS and the mixed etiology group were non-significant ($U = 120.0$; $p = .070$).

In sum, the following differences were significant for destructive behaviours on the physical discomfort subscale of the QABF: SMS>FXS; SMS>mixed etiology.

Automatic.

Table 4.15 depicts the between group comparison on the automatic subscale of the QABF for self-injurious behaviour, aggression and property destruction. The groups appear to have a relatively similar profile of scores across topographies.

Table 4.15.

Between-group Comparison of the QABF. Automatic Subscale

Automatic subscale	FXS		SMS		Mixed Etiology	
	M	SD	M	SD	M	SD
Self-injurious behaviour	6.13	4.29	8.45	4.35	4.96	4.81
Aggression	1.23	2.23	1.17	1.40	1.64	2.66
Property destruction	5.65	5.31	6.89	5.18	2.93	3.35

For self-injurious behaviour, the Kruskal-Wallis was not significant at the .003 level: $\chi^2(2) = 6.653$; $p = .036$.

For aggressive behaviours, the Kruskal-Wallis was not significant at the .003 level: $\chi^2(2) = .314$; $p = .855$.

For destructive behaviours, the Kruskal-Wallis was not significant at the .003 level: $\chi^2(2) = 4.832$; $p = .089$.

Categorical Analysis of Between-group Differences in Behavioural Function.

An additional analysis was also conducted to examine whether the same differences on the QABF were also present when the data were analysed categorically. A function was deemed to be present only if the score on a subscale was 10 or more (requiring that a minimum of 4/5 of items on the QABF were endorsed for a specific subscale).

Between-group differences were examined for each of the five subscales across each topography. Using a significance level of 0.003 (Bonferroni adjustment) a series of chi square analyses were conducted. For self-injurious behaviours, there were no significant between-group differences on either scale, there was however a non-significant trend for the attention subscale ($p = .010$). For both aggression and property destruction

significant differences were found on the attention and physical discomfort subscales of the QABF.

Table 4.16 and Table 4.17 show contingency tables for the attention and physical discomfort subscales of the QABF showing nominal data for the three groups across each topography. All percentages refer to differences within each diagnostic group.

Although there were some discrepancies between the two analyses, specifically on the findings for the self-injurious behaviour subscale, these categorical findings are broadly consistent with those reported in the previous section. A lower proportion of children with FXS were reported to display attention-maintained challenging behaviours. A higher proportion of children with SMS were reported to display challenging behaviours related to physical discomfort. This provides further evidence to suggest that the three groups differed solely on scores on the attention and physical discomfort subscales of the QABF.

Table 4.16.

Categorical Data for Attention Subscale of the QABF by Topography

Topography	FXS	SMS	Mixed Etiology
Attention subscale	N (%)	N (%)	N (%)
<i>Self-injury</i>			
Yes	2 (6.7%)	9 (40.9%)	8 (33.3%)
No	28 (93.3%)	13 (59.1%)	16 (66.7%)
<i>Aggression</i>			
Yes	2 (6.2%)	14 (60.9%)	9 (32.1%)
No	30 (93.8%)	9 (39.1%)	19 (67.9%)
<i>Destructive</i>			
Yes	2 (8.7%)	14 (73.7%)	6 (40%)
No	21 (91.3%)	5 (26.3%)	9 (60%)

Table 4.17

Categorical Data for the Physical Discomfort Subscale of the QABF by Topography

Topography/Subscale	FXS	SMS	Mixed Etiology	
Physical Discomfort subscale		N (%)	N (%)	N (%)
<i>Self-injury</i>				
Yes	9 (30%)	12 (54.5%)	7 (29.2%)	
No	21 (70%)	10 (45.5%)	17 (70.8%)	
<i>Aggression</i>				
Yes	7 (21.9%)	17 (73.9%)	8 (28.6%)	
No	25 (78.1%)	6 (26.1%)	20 (71.4%)	
<i>Destructive</i>				
Yes	1 (4.3%)	12 (63.2%)	3 (20%)	
No	22 (95.7%)	7 (36.8%)	12 (80%)	

Summary of Results

Behavioural Form

- The SMS group had significantly higher scores on the Communication sub-domain of the Vineland Screener than either comparison group.
- There were no other between group differences on Vineland Screener scores.
- There were no significant differences between the groups on any subscale of the ABC-C. There was a non-significant trend on the Irritability subscale, with children with FXS appearing to have lower scores than the SMS group.
- The SMS group showed significantly higher scores on the BPI SIB subscale than did the FXS group.

Behavioural Function

Within group.

- The FXS group showed significantly lower scores on the attention subscale than tangible or demand for both self-injurious behaviour and aggressive behaviours, there was a non-significant trend in the same direction for destructive behaviours.
- The FXS group showed significantly lower scores on the physical discomfort subscale than tangible or demand for self-injurious behaviour, aggression and destructive behaviours.
- Both the FXS and SMS groups showed significantly lower scores on the automatic subscale for aggressive behaviours than all other social subscales.
- There were no other within-group differences for the SMS group.

Between group.

- The FXS group had significantly lower scores on the attention-subscale than the SMS group for all three topographies.
- The FXS group had significantly lower scores on the attention-subscale than the mixed etiology group for self-injurious and aggressive behaviours. There was a non-significant trend in the same direction for destructive behaviours.
- The SMS group had significantly higher scores than the mixed etiology group on the attention subscale for destructive behaviour.
- The SMS group had significantly higher scores on the physical discomfort subscale of the QABF than the FXS group or mixed etiology group for aggressive and destructive behaviours, and only the FXS group for self-injurious behaviour.
- There were no between group differences for the tangible, demand or automatic subscales across any topographies.

- Categorical analyses were broadly supportive of these findings. Significant differences were found between the groups only on the attention and physical discomfort subscales of the QABF for aggression and property destruction.

Discussion

The current study found within- and between-group differences in both the form and function of adaptive and challenging behaviours in children with FXS and SMS. Using the QABF as a measure of behavioural function the results of both the within- and between-group comparison suggested that children with FXS were less likely to display attention-maintained challenging behaviours across all topographies. The results of the between-group comparison showed that children with SMS were more likely to display challenging behaviours related to physical discomfort across all topographies than were other groups. To the author's knowledge these are the first reported between-syndrome differences in the function served by challenging behaviour.

The results of the current study suggested that the groups were relatively well matched for CA and, with the communication sub-domain of the Vineland Screener apart, adaptive behaviour. Prior studies have suggested that children with SMS tend to score lower on the Daily Living Skills sub domain than would typically be expected given levels of functioning in other areas (Greenberg et al., 1996; Madduri et al., 2006; Udwin, Webber, & Horn, 2001); although some studies have failed to replicate this finding (Dykens, Finucane, & Gayley, 1997). Daily living skills have also been reported to be a relative area of strength for people with FXS in comparison to communication and social skills (Dykens et al., 1989; Dykens, Ort et al., 1996; Hatton et al., 2003); although again some studies have failed to find such differences (Baumgardner, Reiss, Freund, & Abrams, 1995). The current study showed that children with SMS were reported to have a higher level of communication skills than either control group. There were no significant differences for

either children with SMS or children with FXS on scores for any other sub-domain of the Vineland Screener. This is the first study to compare adaptive behaviour in FXS and SMS against one another and against a mixed etiology control.

There were no significant differences between the groups in carer reports of the severity of challenging behaviour. There was a non-significant trend however for the Irritability subscale of the ABC-C, with children with SMS appearing to score higher than the FXS group. Relatively high scores on the Irritability subscale of the ABC in comparison to other groups have been reported in prior research involving people with SMS (Clarke & Boer, 1998). Other studies of challenging behaviour in SMS suggest relatively high levels of similar problems. For example Dykens et al (1997) reported high scores on the Aggressive Behaviour domain of the Reiss Screen in their sample of people with SMS. Previous studies to have used the ABC with males with FXS have reported significantly higher scores on the Hyperactivity, Inappropriate Speech and Stereotypical Behaviour subdomains in comparison to mixed etiology controls (Baumgardner et al., 1995). No such differences were found for the FXS group in the current study, however.

Using the BPI- SIB subscale, children with SMS were reported to display more frequent self-injurious behaviour than children with FXS. Although comparisons with the results of other prevalence studies have suggested higher levels of self-injury in people with SMS than would be typically expected (Sloneem, 2005), to the author's knowledge there have been no other direct between group comparisons of self-injurious behaviour involving children with SMS.

Both within- and between-syndrome differences were found in the function served by challenging behaviour. These are of particular interest as the current study is the first to have included a between groups comparison of behavioural function in either of these syndrome groups. The only subscales on which significant between-group differences were found were the attention and physical discomfort subscales of the QABF.

Children with FXS appeared to be less likely to display challenging behaviours that were reported to be maintained by social attention than children with SMS or the mixed etiology group. This conclusion was supported by the within-syndrome profile of scores for the QABF across each topography. There was also some indication in the within-group analysis that children with FXS were more likely to display aggressive behaviours that were maintained by escape than any other function. In short, children with FXS appeared to be less likely to display attention maintained challenging behaviour, than other functions (particularly escape-maintained). This profile reflects existing findings that have been reported in the literature. Using a measure derived from the Functional Assessment Interview (O'Neil, Horner, Albin, Storey, & Sprague, 1990), Symons (2003), reported that only 3% of boys with FXS who displayed self-injurious behaviour were reported to do so in order to access attention, in comparison to 87% of participants who did so in response to routine changes, and 65% in response to task demands. Other studies have demonstrated that children with FXS may be particularly likely to engage in challenging behaviours in situations that are characterised by high social or performance related demands (Hall et al., 2006; Hessler, Glaser, Dyer-Friedman, & Reiss, 2006; Lesniak-Karpiak, Mazzocco, & Ross, 2003; Woodcock et al., 2009).

It is unclear as to why children with FXS may be less likely to display attention-maintained challenging behaviours. One mechanism that has been postulated is that FXS is associated with the abnormal functioning of the limbic-hypothalamic-pituitary-adrenal (LHPA) axis, which plays an important role in the human stress response (Hessler et al., 2002). Further work is needed to examine the influence of such physiological variables on the function of challenging behaviour.

There was evidence to suggest that children with SMS were more likely to display attention-maintained challenging behaviours than children with FXS and attention-maintained destructive behaviours than mixed-etiology controls.

Previous studies have highlighted an apparent heightened 'need' for adult attention in individuals with SMS (Dykens et al., 1997; Smith et al., 1998). A within-syndrome study using the QABF reported that individuals with SMS were particularly likely to display attention-maintained physical and verbal aggression (Sloneem, 2005). Likewise, in a recent study Taylor and Oliver (2008) reported that the challenging behaviour of four of five children with SMS was more likely to occur following periods of low adult attention or following reduced levels of demands. Challenging behaviour was, for these individuals, likely to lead to an increase in attention or demands. Taylor and Oliver suggest that children with SMS may have a "predisposition to experience social or other stimuli... as significantly rewarding" (p. 839). The current study, although hampered by low N, provides some preliminary evidence to support this assertion. The within-group analysis for children with SMS did not however, show any clear differentiation between the different subscales suggesting that children with SMS may be likely to display challenging behaviour that is multiply controlled.

The current study found that in comparison to other groups, children with SMS were more likely to display challenging behaviour related to physical discomfort. Prior studies have suggested a possible relationship between health factors in SMS, such as chronic sleep deprivation, and challenging behaviour (De Leersnyder et al., 2001). However the current study is the first to identify between group differences in such relations using a measure of behavioural function. Given the high occurrence of sleep disturbance and peripheral neuropathy in SMS (Finucane et al., 2001; Greenberg et al., 1996), then high levels of challenging behaviour related to physical discomfort should perhaps be expected in this group. Whilst further experimental work is required to delineate the nature of such interactions, treatment of such conditions would also represent an obvious first step for clinicians working with individuals with SMS.

There are a number of limitations with the current study which may hamper the strength of conclusions which can be drawn from the findings presented above.

The measure of behavioural function was indirect and it may be that the responses of parents/caregivers do not correspond to the actual contingencies that influence the behaviour of their child. Further research is required which adopts experimental functional analysis methods in order to provide a more rigorous examination of behavioural function than was possible in the current study.

It is unclear whether social attention functioned as a less effective type of reinforcement for children with FXS (i.e., its value as a type of reinforcement is enduringly abolished), or whether it functioned as an aversive stimulus (i.e., its value as a type of punishment is enduringly established). The use of an alternative measure of behavioural function which includes a social-escape subscale may have helped tease such information out. This hypothesis could be explored using experimental analogues. For example, high levels of challenging behaviour in a condition characterised by high levels of attention, with escape provided contingent on challenging behaviour, would indicate that social attention functioned as an aversive stimulus. In contrast, low levels of challenging behaviour in this same condition and in the standard attention condition, would indicate that rather than functioning as an aversive stimulus, attention was simply an ineffective source of reinforcement.

There were a number of problems with participant recruitment which may have limited the power of the statistical analysis involving the SMS group. In addition, the reliance on convenience sampling (primarily via parental support groups) may have impinged on the external validity of these findings. For example, it is possible that parents of a child who displayed more severe challenging behaviour were more likely to volunteer to participate in the study. Whilst potentially limiting the generalisability of the current findings, there is no data of which the author is aware to suggest that topographical

severity is related to behavioural function, suggesting that this may have limited implications for the interpretation of findings relating to the QABF.

Previous research suggests that females with FXS may be less affected than males and differ in terms of the severity of challenging behaviour (Hessl et al., 2002). Other studies of challenging behaviour in this syndrome have tended to treat males and females separately for this reason. However, due to the emphasis of the current study on behavioural function and in order to facilitate comparisons with the SMS group, females with FXS were included in the current study. Only three females with FXS took part in the current study, precluding the use of inferential statistics to examine any potential gender differences in behavioural function. However, inspection of descriptive statistics did not suggest any notable gender differences in scores on the QABF subscales for children with FXS.

The inclusion of several different topographies within each general category of behaviour, may have led to behaviours that formed separate response classes being treated together. It is recommended that the QABF be completed for each separate topography of challenging behaviour in order to prevent such problems (Matson & Vollmer, 1995). Whilst this would have allowed for a more sensitive analysis, the differential pattern of results across each behavioural function suggests that the methods adopted in the current study were still sufficient to determine general differences in the probability of certain functions being endorsed.

These weaknesses aside, the findings of the current study are promising and should stimulate further research on the influence of genetic events on behavioural function. Experimental analogue methods would appear to be a logical next step in order to overcome some of the limitations identified in the current study. Future research is also required that examines the influence of third variables (or the 'endophenotype') on behaviour-environment relations. For example, it would be of interest to examine the

extent to which variations in the functioning L-HPA axis underpin the behaviour-environment relations identified above for children with FXS. Further study of the association between health-related factors associated with SMS and challenging behaviour would also seem to be required. Experimental analogue methods may also help in this regard and have been demonstrated to be especially effective at identifying the influence of factors such as sleep deprivation (cf., Kennedy & Meyer, 1996; O'Reilly, 1995).

The current study has provided some preliminary evidence of the role of GxE in challenging behaviour displayed by children with FXS and SMS. Evidence was provided to suggest that developmental changes associated with certain genetic syndromes may alter the reinforcing value of certain environmental consequences. Specifically, children with FXS were less likely to display attention-maintained challenging behaviour and children with SMS were more likely to display physical discomfort-related and possibly attention-maintained behaviour than would be typically expected. Such relations are likely to be particularly important to the development of challenging behaviour in children with certain genetic syndromes (Langthorne & McGill, 2008).

Chapter V.

Gene-Environment Interactions. An Experimental Analysis.

“The genesis of many events that function as positive or negative reinforcers has a phylogenetic basis and is expressed as behavioral phenotypes with unique topographies of behavior-environment patterns.”(Kennedy, Caruso, & Thompson, 2001, p. 544)

Chapter Overview

It has been suggested that genetic events may influence the function served by challenging behaviour. The study reported in the previous chapter adopted indirect questionnaire methods to examine this question in children with FXS and SMS; reporting both within- and between-group differences in the function served by challenging behaviour. The study reported in the current chapter adopted experimental single-case design methodology to examine this same question. These methods were used to overcome some of the weaknesses associated with the use of indirect methods of functional assessment.

A subset of children from the FXS and SMS groups were included in the current study. Variations in the occurrence of challenging behaviour across different environmental conditions were examined for each child. This allowed for a comparison of the function served by challenging behaviour both within- and between- each group. Of the eight children with FXS; four were shown to display at least one response class of challenging behaviour that was tangible-maintained, five displayed at least one response class that appeared to be negatively-reinforced by the removal of demands or social attention, none displayed challenging behaviours that were found to be positively reinforced by the provision of social attention. Of the six children with SMS, four were found to display multiply controlled challenging behaviour which was, at least in part, attention-maintained. The implications of these findings for future research, as well as for the assessment and treatment of challenging behaviour are discussed.

Introduction

It has been suggested that, for some individuals, genetic events may enduringly alter the reinforcing value of the consequences that maintain challenging behaviour (Kennedy et al., 2001; Langthorne & McGill, 2008; Oliver, 1993). Evidence from a number of recent studies suggests that the challenging behaviour of individuals with FXS may be less likely to be maintained by social attention and more likely to be maintained by the removal of aversive stimuli, and/or the provision of tangibles (Hall, DeBernadis, & Reiss, 2006; Symons, Clark, Hatton, Skinner, & Bailey, 2003; Woodcock, Oliver, & Humphreys, 2009). In contrast, the challenging behaviour of children with SMS may be more likely to be attention-maintained (Dykens & Smith, 1998; Sloneem, 2005; A. Smith, Dykens, & Greenberg, 1998; Taylor & Oliver, 2008).

The study reported in the previous chapter reported between-syndrome differences in behavioural function between children with FXS and SMS. Specifically, the study showed that children with FXS were less likely to display attention-maintained challenging behaviour than children with SMS or controls. In addition, children with SMS were more likely to display pain-related behaviours than children with FXS or mixed etiology controls. The study also reported within-syndrome differences. Children with FXS were less likely to display attention-maintained challenging behaviours than escape- or tangible-maintained challenging behaviours. Interestingly, and contrary to findings reported in prior research (e.g., Taylor & Oliver, 2008), children with SMS were no more likely to display attention-maintained behaviours than either escape- or tangible-maintained behaviour.

There were a number of weaknesses associated with the above study. The study adopted an indirect measure of behavioural function. Whilst this enabled a comparison involving relatively large numbers of participants, care-giver perceptions of the determinants of challenging behaviour may not necessarily correspond to the actual contingencies responsible for the evocation and maintenance of challenging behaviour. As

such, a comparison based on direct observation and experimental manipulation may provide a more rigorous examination of the research question. Secondly, it was unclear from the previous study as to whether attention functioned as an aversive stimulus for children with FXS (i.e., the value of attention is enduringly established as a type of punishment) or whether attention simply does not function as a particularly effective reinforcer for this group of children (i.e., the value of attention as a type of reinforcement is enduringly abolished). Analogue methods may allow further exploration of this by examining the occurrence of challenging behaviour in children with FXS when in situations characterised by high levels of social contact.

The methods used in study two differ markedly from those in study one and are rooted in a very different underlying epistemology²³. Some time will therefore be spent describing the underpinnings of experimental single-case design and contrasting this against the group-comparison approach used in the study reported in the previous chapter. The use of experimental functional analysis methodology shall then be justified.

Experimental Single Case Design

Morgan and Morgan (2001) present a number of characteristics of single-case design which are used to structure the following discussion.

Repeated measurement of behaviour over time.

Single-case design, with few exceptions, relies upon the direct observation of changes in behaviour rather than indirect measures such as those used in study one. Measurement is 'direct' when the behaviour being measured is exactly the same as that which is of interest. This correspondence between the phenomena of interest and what is being measured is one of the main advantages of the methods used in the current study.

²³ Such differences have: "to do with what counts as the subject matter of psychology, with what questions we should ask about this subject matter, with how we should go about finding answers to these questions, with the status of existing psychological knowledge, and with whether psychology can be a science." (Lee, 1992).

Rather than being a static entity, behaviour is continuous and changes over time. Group design methods such as those used in study one typically rely on single measures of dependent variables in relative temporal isolation and thereby fail to account for the complexity of their subject matter. In contrast single-case design requires the experimenter to remain in close contact with the ongoing process of behaviour²⁴.

The strength of the assertions that can be made about the effects of an independent variable on a dependent variable is directly related to the number of data points for which behaviour is observed. This contrasts markedly with the approach common in group designs of taking a small number of data points for a large number of participants and using a group 'average' to summarise group performance.

Participants serving as their own controls.

Of interest to the behavioural scientist are the effects of a particular experimental manipulation on the behaviour of a single participant. In this sense single case research is characterised by participants serving as their own controls. In contrast, control in study one was achieved by comparing the performance of an experimental and a control group. However as Johnston and Pennypacker (1993) note:

There is no such phenomenon as "group behaviour" because there is no such organism as the "group" or "average subject." If an effect appears in group but not in the individual records then, it should not be considered solely a result of experimental variables (p.304).

This emphasis on a 'thorough analysis' of the behaviour of the individual represents the hallmark of single-case design. A stable pattern of behaviour prior to any experimental manipulation is termed a *steady state* and it is this that provides the baseline

²⁴ As Sidman (1960) states: "Behavioural processes occur in time and must be measured over time. To identify the precise boundaries of a process frequent measurements are necessary." (p. 288).

of control against which subsequent predictions and verifications can be made²⁵. The baseline or control condition allows predictions to be made about the effect of an independent variable and this prediction can then be verified by an actual change in performance that occurs when the independent variable is introduced.

Emphasis on experimental replication.

Prediction and verification are necessary but not sufficient conditions for the demonstration of a functional relationship. Rather the replication of such effects both within and between individuals is a fundamental requirement of single-case design. Intra and inter-participant replication contributes to both the internal and external validity of single-case design. There are a host of potential threats to the internal validity of any pre-post test experiment; and it is through the process of systematic replication that a functional relationship can be demonstrated between an experimental manipulation and behavioural change. Group design methods, such as those used in study one rarely adopt experimental replication as a means of ensuring internal validity.

The external validity of group design research is typically judged on the representativeness of the sample and the extent to which it reflects the underlying population. This contrasts markedly to the demonstration of external validity in single-case design, in which the aim is to verify initial findings in 'ever widening set of conditions' (Sidman, 1960) by systematically replicating any effects across individuals, settings and behaviours.

²⁵ As Sidman (1960) states: "*The descriptive investigation of steady-state behavior must precede any manipulative study. Manipulation of new variables will often produce behavioural changes, but in order to describe the changes we must be able to specify the baseline from which they occurred; otherwise we face insoluble problems of control, measurement and generality.*" (p. 238).

Graphic presentation and visual analysis of data.

Group-design research typically involves using inferential statistics to determine whether observed between- or within-group differences are of a sufficient magnitude to reject the null hypothesis that no difference exists between the underlying population parameters. Johnston and Pennypacker (1993) suggest that the use of inferential statistics is ill-suited to the study of behavioural change. Whilst inferential statistics may be useful in supporting an analysis of behavioural processes they should not be used as the primary means of data analysis in single case design. Instead the existence of a functional relationship is best determined by visual inspection. Such an approach allows the experimenter to remain in close contact with the behaviour of his subject, and prevents potentially interesting data being lost within a myriad of statistical procedures.

Unique treatment of variability.

Radical behaviourism assumes human behaviour is lawful. As such rather than treating variability as 'experimental noise' to be silenced through the use of statistical procedures, it is assumed that variability simply reflects functional relationships that are yet to be uncovered (Sidman, 1960).

Unexplained sources of variability function as a barrier to establishing generality, and radical behaviourism therefore accepts the individuality of the organism rather than suppressing it in favour of the average (Chiesa, 1992). The aim of an experimental analysis is therefore to explain the sources of such variability and thereby transform such 'confounds' into independent variables in their own right.

In sum, the characteristics of experimental single-case design and the logic which underpins it stand in stark contrast to the group-comparison methods adopted in study one. Group comparison and statistical analysis may be of use as a supplemental aid to studying behavioural processes. However of primary importance is the demonstration of functional

relationships at the level of the individual arrived at through an inductive process of prediction, verification and replication. Such experimental tactics are utilised in study two in the form of experimental analogue functional analyses.

Justification of Experimental Functional Analysis

Functional assessment methods aim to identify the variables that serve to evoke and maintain challenging behaviour. These methods may be informant-based, descriptive or experimental (analogue). In study one, indirect informant-based methods were adopted to examine the function of challenging behaviour associated with FXS and SMS. In the study reported in the current chapter experimental ABC experimental functional analysis methods were used to examine this same question. There are a number of advantages as well as disadvantages to experimental functional analysis and the following section aims to justify the use of these methods over and above alternative options.

Indirect functional assessment.

Indirect functional assessment methods involve interviewing significant others about the factors they believe to be related to the occurrence of challenging behaviour. Indirect measures do not involve the direct observation of challenging behaviour but instead measure the factors that informants report as being related to challenging behaviour.

A number of methods exist for conducting an indirect functional assessment. One means of conducting indirect assessments is to use semi-structured interviews, such as the *Functional Assessment Interview* (O'Neil, Horner, Albin, Storey, & Sprague, 1990). Other forms of indirect functional assessment, such as the *Motivation Assessment Scale* (MAS; Durand & Crimmins, 1988) or the *Questions About Behavioral Function scale* (QABF; Matson & Vollmer, 1995), involve the use of more structured interviews or checklists.

The advantage of indirect assessments lie in their ease of use and the low demands they place on the resources of the researcher or clinician. However, this is counterbalanced by genuine concerns surrounding the validity and reliability of such methods. Such

measures provide an indirect measure of behaviour and measure only those variables that informants report as being responsible for its maintenance. Such reports are not necessarily valid or accurate, as demonstrated in a recent study (Hall, 2005). The threats to the internal validity of such instruments perhaps accounts for the poor psychometric data for measures such as the MAS (e.g., Sigafos, Kerr, & Roberts, 1994). Even if respondents provide an accurate reflection of what they have observed the sample of observations on which their judgments are based may not be representative of the conditions that truly evoke and maintain the behaviour. In addition there are likely to be important inter-rater differences that influence the outcome of such measures (Sturmey, 1995; Vollmer & Smith, 1996). For this reason it has been recommended that instruments, such as the QABF, be used jointly with other methods and to help inform and develop hypotheses which can be tested using alternative functional assessment methods (Hanley, Iwata, & McCord, 2003).

Descriptive functional assessment methods.

Descriptive assessments involve the identification of antecedent and consequent variables that are temporally related to the target behaviour and typically involve the direct observation of behavior in its natural settings. The conditional probability of certain events preceding or following the target behaviour can be calculated from such information using methods such as lag sequential analysis (Yoder, Short-Meyerson, & Tapp, 2004).

Descriptive methods have been used to assess the function of a wide range of behavioural topographies such as aggression, bizarre speech, self-injurious behaviour, stereotypy and disruption (Lerman & Iwata, 1993).

As descriptive assessments include variables that are present in the natural setting in which the behaviour takes place, descriptive methods have been cited as being more ecologically valid than experimental methods (Hall, 2005). Such methods may be of particular use in identifying the influence of relatively idiosyncratic variables (Mace & Lalli, 1991). However this is not necessarily always the case and the presence of an

observer alone has the potential to reduce the external validity of observations by virtue of reactivity effects. In addition adaptations can be made to increase the ecological validity of experimental methods so as to negate this apparent advantage.

There are a number of problems associated with descriptive methods. The demonstration of temporal associations between behaviour and environmental events is purely correlational and therefore falls short of the standards required to demonstrate a functional relationship. Without experimental manipulation or replication definitive conclusions regarding functional relationships are not possible (Bijou, Peterson, & Ault, 1968).

Due to the reliance on such correlations descriptive functional assessment methods may be especially vulnerable to both Type I and Type II errors. A particular concern is that irrelevant variables may mask functional relations due to their relative frequencies; that is there may be both a false positive and a false negative result (Iwata, Vollmer, & Zarcone, 1990; Oliver, 1991). For example, a behaviour maintained on an intermittent schedule of negative reinforcement may also be consistently correlated with social reprimands and disapproval. Even though such reprimands may exert no functional control over the behaviour, a descriptive assessment would falsely suggest that the behaviour is positively reinforced. Secondly, the variables that evoke and maintain challenging behaviour may be relatively idiosyncratic and be of such a nature as to escape the attention of the observer (Oliver, 1991). Finally, antecedents known by caregivers to evoke challenging behaviour may be deliberately avoided thereby precluding their assessment. Given the risk of making such Type I and Type II errors the use of descriptive assessments as the sole basis for treatment recommendations may in some circumstances be contraindicated (Lerman & Iwata, 1993).

Studies that have assessed the validity of descriptive assessments have typically used experimental analysis as the yardstick against which their validity can be compared.

Lerman and Iwata (1993) found direct naturalistic observations were unable to yield consistent ascriptions of function for five of the six subjects, suggesting that the validity of descriptive assessments may be limited. Likewise, Mace and Lalli (1991) reported that the descriptive assessment of bizarre speech suggested alternative functions than did experimental analogue methods. Other researchers have found agreement between analogue and descriptive assessments to be good when comparison is restricted to topographies for which both methods are able to ascribe function (Emerson, Thompson, Reeves, Henderson, & Robertson, 1995).

Recent developments have advanced descriptive methods and have in part addressed some of the disadvantages discussed above. One strategy to improve the utility of descriptive methods is to programme the occurrence of certain antecedent events that are known to be likely to evoke challenging behaviours. This method, known as a *structured descriptive assessment* (SDA), involves manipulating specific antecedent events, in a manner similar to those used in analogue settings, whilst observing naturally occurring consequences. SDAs have been shown to represent an improvement over standard descriptive assessment methods (Anderson & Long, 2002; Freeman, Anderson, & Scotti, 2000).

Anderson and Long (2002) describe several advantages to the SDA over alternative functional assessment methodologies: 1) unlike analogue assessments it is not necessary to remove individuals from their natural environment or disrupt their natural routine; 2) because these assessments occur in the natural environment they may be more ecologically valid than analogue methods; 3) unlike standard descriptive methods SDAs ensure that relevant antecedent events are delivered at a rate similar to those found in analogue conditions, reducing the likelihood of a missed detection. However, many of the weaknesses associated with descriptive assessments remain intact with SDAs. For example,

behaviours that are maintained on a thin schedule of reinforcement may be relatively difficult to identify.

Experimental methods.

Experimental analogue methods involve the contrived manipulation of environmental variables to establish relations between the experimental manipulation and behaviour. As environmental events are experimentally controlled such methods provide a more convincing demonstration of the determinants of challenging behaviour.

Analogue methods are an umbrella term, covering two different models of functional analysis. The first model was initially described in a seminal paper by Iwata et al (1982/1994) and has been termed the ABC model of functional analysis (Hanley et al., 2003). Typically this method involves the repeated presentation of several experimental conditions, in which putative antecedents (i.e., discriminative stimuli and motivating operations) and consequences (i.e., reinforcers) are systematically manipulated using a multi-element design. The experimental conditions originally reported by Iwata et al included a *social disapproval* condition, a *social demand* condition, an *alone* condition, and a control *play* condition (see chapter one for a detailed description of these conditions).

Several modifications of this design have been used over the past twenty five years. For example, *tangible* (Day, Horner, & O'Neill, 1994) or *social avoidance* (Hagopian, Wilson, & Wilder, 2001) conditions have been added to test additional hypotheses about the function of challenging behaviours. The procedure and experimental design have been adapted in a number of ways to accommodate time restraints and other practicalities (Iwata & Dozier, 2008; Northup et al., 1991). Other researchers have simply shortened the duration of sessions from 15-min to either 10-min or 5-min conditions (Hanley et al., 2003).

An alternative 'analogue' model was reported by Carr and Durand (1985). This model, termed the AB model, involves manipulating the amount of antecedent attention (i.e., between either 100% of intervals or 33% of intervals) and the difficulty of tasks (i.e.,

between either easy or difficult). This results in three experimental conditions (i.e., easy 100, easy 33, and difficult 100), in which the easy 100 condition is designed to act as a control against which any changes in behaviour in the other conditions can be compared. Challenging behaviours are typically ignored, unless the child has eloped, whereby the experimenter leads the child back to their seat, or the behaviour poses a physical risk, whereby the child is briefly restrained.

General critique of analogue methodology.

There are a number of critiques that have been made about the use of analogue methodology in general. Such critiques typically focus on the ethical concerns associated with such work and the issue of external validity.

One of the most significant ethical criticisms directed at analogue methods has been that such methods are explicitly designed to evoke challenging behaviour (Hastings & Noone, 2005). When dealing with behaviours, such as self-injury, that have the potential to incur injury to the individual this is a clear ethical concern. This concern appears to have been one of the greatest barriers to the use of analogue methods.

The risk of injury can to some extent be attenuated by making practical adjustments to analogue sessions. For example, Iwata et al (1982/1994) describe clear criteria for session termination based on the frequency, intensity or duration of self-injury, and the use of medical staff to help in the event of injury. In addition protective equipment can also be incorporated into analogue assessments (O'Reilly, Murray, Lancioni, Sigafoos, & Lacey, 2003).

There also exists an ethical case for the use of analogue methods over their descriptive or indirect counterparts. For example, individuals have a right to the most effective treatment procedures available (Van Houten et al., 1988). If, as has been argued, analogue methods may be more able to deal with the threats to internal validity posed by Type I or II errors, treatments based on the results of a functional analysis are more likely

to be effective than alternative methods. Likewise given that treatments based on an understanding of the function of challenging behaviour are likely to be less restrictive (Pelios, Morren, Tesch, & Axelrod, 1999) there may be a case for the use of analogue methods to ensure that the individual receives the least restrictive treatment option available.

There are legitimate concerns surrounding the resource intensive nature of functional analysis methods. For example it has been estimated that the abbreviated Northrup et al. procedure consist of 54-68 'in session' minutes; whilst the extended Iwata et al. procedure consists of 270-340 'in session' minutes and may take 1-2 weeks to complete (Matson & Minshawi, 2007). This has been used as a justification for seeking alternative, less time-consuming means of assessing challenging behaviour. However, as Vollmer and Smith (1996) note, time constraints alone are not defensible objections to the use of functional analysis.

It has been suggested that analogue methods may not be appropriate for certain topographies of behaviour, particularly for low-rate, high-intensity behaviours, such as some forms of aggression, fire setting, and inappropriate sexual behaviour (e.g., Whitaker, 1993). For example, some behaviours may occur for durations longer than the 10-15 minutes involved in functional analysis sessions or may occur only at very low rates (i.e., only once a week). In some cases the severity of behaviour may preclude any extended period in which the person is able to freely engage in the behaviour. Whilst careful consideration is required one particular benefit of analogue methodology is its flexibility and with appropriate modifications such topographies of behaviour have been included in analogue functional analyses (e.g., O'Reilly et al., 2003). In addition, the functional analysis of pre-cursor behaviours has been shown to be an effective means of identifying the function of high-intensity challenging behaviours that are part of the same response class (R. G. Smith & Churchill, 2002).

Given that analogue conditions aim to provide an approximation of the variables that maintain behaviour in naturalistic settings the issue of external validity is of some importance. Some have questioned the validity of experimental analysis methods. Indeed, as Mace states, “*experimental analyses...may not generalise outside the analog conditions*” (Mace, 1994). The use of indirect and descriptive assessment methods can help in the identification of relatively idiosyncratic antecedent and consequent manipulations to incorporate into an analogue analysis (Mace, Lalli, Lalli, & Shea, 1993), increasing both the external and internal validity of analogue methods. Therefore, it is not necessarily the case that analogue methods have lower external validity than alternative modes of functional assessment. Indeed, Iwata and Dozier (2008) suggest that the results of numerous treatment studies suggest that the contingencies provided in a functional analysis are ‘close enough’ to those found in the natural environment to form the basis of effective treatments (p. 4).

Serial dependency between sessions poses a potential problem for any design that involves the repeated measurement of behaviour over time (Sturmeiy, 1995). This is particularly true for analogue methods, which involve rapid alterations between different experimental conditions. In the current context, for example, an attention condition preceded by a no interaction condition may result in a very different pattern of responding than an attention condition that is preceded by a demand condition. Whilst a potential confound such factors are not beyond experimental control. In addition to randomising the order in which conditions are implemented, within-session analyses can be conducted to monitor potential order effects. The flexibility of analogue methodology facilitates the control of such confounds once detected. Iwata et al (1994) recommend implementing functional analysis conditions in a ‘semi-random’ manner in order to reduce the extent that preceding conditions function as MOs for those that follow. Such a semi-random schedule

would, for example, involve a no interaction condition never following an attention condition to reduce the likelihood of an extinction burst for attention maintained behaviour.

Benefits and costs of the ABC model of functional analysis.

The AB model of functional analysis provides a less rigorous demonstration of the function served by challenging behaviour, as potential sources of reinforcement are not manipulated in such analyses (Hanley, Iwata & McCord, 2003). Such methods may lead to erroneous conclusions about the function served by certain behaviours due to this reduction in experimental control. This contrasts against the ABC model of functional analysis whereby experimental control is demonstrated over the behaviour-consequence contingency. Some recent evidence exists to suggest that Type II errors may be more likely to occur when using AB assessments in comparison to their ABC counterparts (Potoczak, Carr, & Michael, 2007; Worsdell, Iwata, Conners, Kahng, & Thompson, 2000). There may also be some specific ethical concerns regarding the use of AB assessments. The 'consequence' in such assessments is to simply ignore challenging behaviour, for behaviours maintained by attention or escape this is akin to placing the response on extinction whilst the EO for the maintaining variable remains in effect. Recent evidence has shown that such manipulations are likely to evoke high levels of challenging behaviour (O'Reilly et al., 2006) and one would expect there to be an increase in the intensity of such behaviours as a result of an extinction burst (Vollmer et al., 1998). Further research is needed in this area but AB assessments may be associated with more costs from an ethical perspective, than is commonly acknowledged.

There are some ethical and practical concerns specifically associated with the ABC model which require some consideration.

A common criticism to have been directed at ABC analogue methods is that exposure to ABC contingencies within a functional analysis may over time lead to the acquisition of a new behavioural function (Mace, Lalli, & Lalli, 1991); that is either a

previously uncommitted behaviour may acquire operant status, or the function of an existing operant may change as a direct result of the assessment procedure. Iwata, Vollmer and Zarcone (1990) acknowledge that the ABC model may establish new relations that have the potential to generalise to the natural environment. They recommend curtailing analogue assessments to the shortest time required in order to demonstrate functional control as a means of minimizing such potential effects. Despite such concerns it has been suggested that the probability of this occurring in experimental conditions is no more than and may be less than in naturalistic conditions (Iwata et al., 1982/1994).

During an analogue session several non-target behaviours may occur and experimenter responses to such behaviours may function as a potential threat to internal validity (Sturmeay, 1995). Iwata et al recommend that non-target behaviours be ignored. However, if non-target behaviours form part of the same response class as the target behaviour, then their extinction may lead to increases in the target behaviour (Sprague & Horner, 1992). Alterations in the pattern of responding for the target behaviour would in such circumstances be an artefact of the effects of extinction on other members of the response class. To overcome such problems non-target behaviours need to be monitored to determine whether they do indeed form part of the same response class as target behaviours, when they do all members of that response class should be included in the assessment (Sturmeay, 1995). Hanley, Iwata and McCord (2003) suggest that best practice would be to minimise the number of different topographies of challenging behaviour included in a single functional analysis and if multiple topographies are to be included that each topographical class should either be subjected to extinction or separate topographies should be graphically analysed before being aggregated into a single data path.

There is considerable latitude in the design and implementation of analogue conditions, and as such there may be an erroneous ascription of function to certain target behaviours. For example, there appears to be several aspects of task demands that evoke

challenging behaviour (R. G. Smith, Iwata, Goh, & Shore, 1995) and for some individuals the high level of social interaction in the play condition may act as an aversive stimulus (Hagopian et al., 2001). High rates of challenging behaviour in this condition may lead to the false inference that the behaviour is automatically reinforced; when in fact the behaviour is negatively reinforced (by the removal of attention due to the DRO component embedded within the analogue condition). Similarly the alone condition may not be truly implementable (i.e., in cases in which there is no one-way screen) and stimuli that are discriminative for attention may remain in place in the modified no interaction condition (Hanley, Iwata & McCord, 2003). The social contact provided in the social disapproval condition may in some circumstances serve to punish and not reinforce attention-maintained behaviour (Fisher et al., 1994). Such concerns are not beyond experimental control and it appears that a particular strength of analogue methodology is in its ability to demonstrate functional relationships between relatively idiosyncratic events and operant behaviour.

Given that ABC analogues are the benchmark against which other methods are compared the issue of reliability is of some importance. Findings in this regard have been somewhat equivocal. Martin, Gaffan and Williams (1999) reported a high percentage of undifferentiated patterns of responding and weak to poor test-retest reliability using experimental analogue methods. However, the use of brief assessment conditions that were 5-min length, and the absence of any contingencies, apart from in the attention condition, may have hindered discrimination between conditions for participants in the study. Toogood and Timlin (1996) report that experimental methods failed to ascribe function in 50% of cases compared with 11-15% for clinical interview and MAS (Durand & Crimmins, 1988) and 18% for descriptive analysis. This contrasts markedly with the 95% success rate reported in an epidemiological study by Iwata et al (1994) although different decision-making criteria were used in each study in order to ascribe function. There does appear to

be some relationship between the length of assessments and the likelihood of ascribing function. For example, Derby et al (1992) report that brief functional analyses involving some 79 people were only successful in recording the function of behaviour in 50% of cases. Hanley, Iwata and McCord (2003) recommend that researchers and clinicians should continue to work to identify the sources of variability that give rise to 'noisy' functional analysis results.

In sum, the strength of ABC analogue assessments lies in the level of experimental control that such methods provide. Such methods utilise the advantages of experimental single-case design to identify the variables of which behaviour is a function. Whilst concerns exist about the appropriateness of using such methods it does seem that their advantages outweigh the disadvantages when judged against indirect, descriptive and AB analogue alternatives. In addition, it is far from clear that one method of analogue assessment holds any advantage over the other in terms of their ethical implications.

The study reported in the current chapter adopted ABC functional analysis methods in order to examine within- and between-group differences in behavioural function between a small number of children with FXS and SMS. Individual variations in challenging behaviour were examined across several different environmental conditions. To the author's knowledge this is the first study to conduct such a between-group comparison using experimental analogue methods. To address some of the ethical concerns that exist regarding the acceptability of analogue methods (Hastings & Noone, 2005), data were collected on the social acceptability of the assessment (Wolf, 1978).

Method

Participants and Ethical Considerations

All participants had a confirmed diagnosis of either FXS or SMS and were selected primarily according to their geographical proximity to Canterbury. The majority of

participants were located within a 150 mile drive of the study base. Participants from other geographical areas were then recruited. No family who had been contacted via NHS Regional Genetics Centres in the study reported in the previous chapter (henceforth referred to study one) were approached about the current study (henceforth referred to as study two). Otherwise the inclusion and exclusion criteria remained the same as in study one. There were a total of 8 children in the FXS group and 6 in the SMS group who took part in the current study.

The study received ethical approval from the Tizard Centre Ethics Committee. As participants were expected to display challenging behaviour during the course of study two it was important that a rigorous criterion (expressed in terms of either degree of injury or level of responding or both) was established for the termination of experimental sessions. This criterion was set following consultation with the child's parents, and carers. If a participant's target behaviour met criterion then the session was to be halted and a decision made as to whether the session should be either postponed or resumed. In no cases did any participant's behaviour reach the criteria for session termination. Inclusion in the study was under continual review and regular discussions were held between the author, parents and other relevant individuals as to the individual's continued participation in the study. In addition regular discussions regarding each participant were held in supervision sessions. It was felt that the risks to which participants were exposed were no greater (and in some cases considerably less) than those found in the natural environment.

Response Measurement and Reliability

Target behaviours included *stereotypical behaviour*, *self-injurious behaviour*, *destructive behaviours*, *non-compliance* and *aggressive behaviours*. Response definitions were developed on an individual basis and were based on responses made in study one, as well as informal observations and further discussion with parents and carers. In some cases, either unexpected behaviours occurred during the functional analysis or there were no

occurrences of expected target behaviours. In cases where behaviours occurred that were not initially reported by parents/caregivers then where possible these were included for analysis. In cases where target behaviours did not occur during the functional analysis this is noted in the discussion of the specific individual's results below. All non-target behaviours were ignored, unless the child attempted to leave the assessment area, in which case the child was redirected to the area using minimal amounts of interaction.

All sessions were videotaped to facilitate data collection and reliability checks. A 10-s partial-interval method was used to code the data for all participants. All responses were scored using pen and paper. Data were then inputted into *Excel*TM using a desktop computer.

A second observer recorded participant behaviour for at least 29% of functional analysis conditions for each participant. All target behaviours were collapsed and coded according to their response class (see individual participant descriptions). The percentage of inter observer agreement was calculated using the exact agreement method. Agreement was defined as both observers agreeing on the occurrence and/or non-occurrence of the target behaviour(s) in any given interval. Disagreement was scored as any discrepancy between the observers in any given interval. The number of agreements was divided by the number of agreements plus disagreements, and the resulting value was multiplied by 100%. Overall inter-rater reliability for all intervals (R-tot), as well as the reliability for only the occurrence (R-occ) and the non-occurrence (R-non occ) was calculated for each response class. In each case the most stringent measure is presented for each participant in the text below. In addition the Kappa statistic was calculated for each response class. Appendix 5 shows all IOA data for all participants and response classes. For individuals where the IOA was unacceptably low (less than 50%) the second observer was given additional training and asked to recode those topographies for which there was a problem. The dissertation supervisor reviewed all cases where additional training was required.

Experimental Design

Experimental conditions were implemented using a multi-element design. Participants were exposed to up to six different experimental conditions, which were implemented in a randomised fashion.

General Procedure

A subset of families who had taken part in study one and indicated a willingness to take part in study two were sent an information sheet and consent form about taking part in study two. One child who took part in study two (Shelley) was recruited via other means. Families were asked to return a completed consent form if they were interested in taking part in the second study. Families were then contacted to establish a convenient time and date for the researcher to visit.

Before beginning the study there was an initial visit in which key stakeholders (families and/or teachers) were talked through the procedure involved in conducting functional analysis. A DVD depicting the assessment methods to be used was also shown on request. At this initial meeting response definitions were drafted for each child and preferred tangibles were identified for use in the *Tangible* condition. Other factors that may have influenced the results of analogue assessments were also identified (i.e., type of attention provided, presence of any health conditions). In some cases this led to changes in the design of the specific analogue conditions described below. Some time was also spent interacting with each child on this initial visit.

There was a maximum of four subsequent visits to either the child's home or school in order to run the functional analysis and each visit lasted up to a maximum of 90 minutes. Functional analyses are often conducted in specially designed rooms, equipped with one-way mirrors, to minimise the influence of extraneous variables and to facilitate the running of certain conditions (Iwata et al., 1982/1994). As the analyses were conducted some way from the study base (Canterbury, UK), this was not possible in the current study, and

assessments were conducted in a room in the participant's home or school. In some cases, due to the structure of the room in which the analyses were conducted, it was not possible to run particular conditions without the child eloping from the room and/or interacting with caregivers. In such cases this specific condition was removed from the analysis. Where this occurred this is noted in the discussion of individual results.

Each participant was exposed to a maximum of six different experimental conditions. Each session lasted 5-min.

A brief description of each condition is provided below. In cases where modifications were required to specific conditions these are highlighted in the discussion of individual participants (Sean, John, Patrick and Matt) in the results section below. Modifications were only made to conditions if the results of the QABF suggested that the individual displayed challenging behaviour that served a certain function. For example, the attention condition was only modified if the results of the QABF suggested that the individual displayed attention-maintained behaviour (indicated by a score of 10 or more across one or more topographies).

- 1) *Attention*. The participant was asked to play with some toys. The experimenter then pretended to read a book and stated that he was going to do some work. Attention was given for 10s contingent on each occurrence of challenging behaviour and took the form of statements of concern and mild disapproval paired with non-punitive physical contact, whilst the child was redirected to his toys. All other responses were ignored. This condition aimed to test whether attention served to maintain each child's challenging behaviour.
- 2) *Academic demand*. Educational activities were selected following discussion with informants and direct observation. Completion of tasks was judged to have a low probability of occurrence and never occurred spontaneously. Learning trials were presented to the participant using a three-prompt procedure (verbal request, modelling,

and physical guidance). If the child did not respond to the demand after 5 seconds the experimenter gave a gestural or model prompt indicating the correct response. If the participant still did not respond a physical prompt was used. Social praise was given contingent on the successful completion of the learning trial, except on those occasions in which physical guidance was required for task completion. Academic demands were removed for 10-s contingent on target behaviours. This condition aimed to test whether each child's challenging behaviour was negatively reinforced by the removal of academic demands.

- 3) *No interaction*. The experimenter turned his back to the child and provided no interaction contingent on any behaviour. The child had no access to toys. This condition aimed to test whether target behaviours were maintained by their non-social consequences.
- 4) *Unstructured play*. The child had access to preferred toys, whilst the experimenter delivered social praise at least every 15-s following the first 5-s period in which challenging behaviours had not occurred. All target behaviours were ignored and the experimenter provided no demands on the child. This condition aimed to provide a control condition and provide an analogue of the 'enriched environment'.
- 5) *Social avoidance*. The child was provided with preferred toys and asked to play with them. The experimenter provided continuous attention by talking with the child and commentating on their play. If challenging behaviours occurred then attention was removed for approximately 10-s (c.f., Hagopian et al., 2001). This aimed to determine whether the child's challenging behaviour was maintained by the removal of social attention.
- 6) *Tangible*. In the tangible condition, toys or food items, identified as highly preferred, were placed in sight but out of reach of the child. The experimenter delivered the

tangible for approximately 10s contingent on the occurrence of target behaviours or the child was given access to food on a FR-1 schedule.

At the end of the assessment families were sent a copy of an assessment based on the results of the analogue assessment together with some basic recommendations. Key stakeholders (parents and teachers/therapists) were asked to return an anonymised questionnaire in which the acceptability of the assessment was rated. The questionnaire was an amended version of the shortened Treatment Acceptability Rating Form-Revised (Reimers, Wacker, Cooper, & DeRaad, 1992) and included 9 items each of which was rated using a 5 pt rating scale (1 = strongly disagree – 5 = strongly agree).

Data Analysis

In order to overcome some of the problems of relying solely upon visual analysis a structured method was used to ascribe behavioural function. A number of different methods have been proposed to formalise this process (Hagopian et al., 1997; Martin et al., 1999; Toogood & Timlin, 1996).

In the current study, a modified version (see Martin et al., 1999) of the Hagopian et al criterion for differentiation was used. One of the relative advantages of the Hagopian et al method is the ability to deal with relatively complex patterns of data (Hanley et al., 2003). Other methods, such as the probability based Criterion Z approach proposed by Martin et al (1999) or that proposed by Toogood and Timlin (1996) have no clear criteria as to how to interpret such data. In addition, due to the relatively low number of replications of each experimental condition the probability-based approach proposed by Martin et al was not deemed appropriate for the current study.

Using the modified Hagopian et al method a condition is considered differentiated when at least 50% of the data points for one condition falls 1 standard deviation (SD) above the mean of the play condition. A criterion line (CL) is drawn at this mark on the

graph of the functional analysis²⁶. In situations where levels of responding in the play condition are near zero the criterion is set at a minimum of .5 responses per minute (in the current study this would mean a CL being set at a minimum of 8.33% of intervals). The CL is marked on all functional analysis graphs presented in the individual results section below, apart from for one participant (Katie) where the response occurred at an especially low rate. Hagopian et al also propose criteria for the interpretation of unusual data paths. In cases where these additional criteria were used this is noted in the results section below and the criteria used are presented as a footnote.

In order to ensure that the method of interpretation was consistently applied all judgments were made initially by the first author and checked for consistency by the first author's dissertation supervisor. Any disagreements were re-analysed and re-checked for consistency.

Results

Analyses and resulting conclusions are presented for each individual who took part in the current study²⁷. Summary data for each syndrome group are also presented. The primary role of the latter was to examine the hypothesis that there were within- and between-group differences in socially-mediated functions of challenging behaviour. As such, response classes that served a sole automatic function were excluded from the summary data for each syndrome group.

Participants with FXS. Individual Functional Analyses

A total of eight individuals with a diagnosis of FXS took part in study two. All participants were male and their parents had taken part in study one. Table 5.1 provides some basic demographic information for each participant.

²⁶ A condition is considered differentiated when 50% or more of data points fall at or above the CL.

²⁷ A table depicting the correspondence between each individual's results for indirect and analogue assessment methodologies is presented in Appendix 6.

Given the small numbers involved in the current study it is possible that any within- or between-group differences in behavioural function could be due to sampling bias. Categorical data from the QABF for the 8 children with FXS were compared against the remainder of the FXS group from study one. A function was deemed to be present if the individual scored 10 or more for a given subscale. Using a significance level of $p = .05$, a series of chi-square analyses revealed no significant differences between the two sub groups for any scale across any topography. This suggests that the participants with FXS were representative of those who took part in study one in terms of the potential function served by challenging behaviours.

Table 5.1

Characteristics of Participants with FXS.

Participant	Age*	Total ABC	Age equivalent (Vineland Sub-domains)		
			Communication	Daily Living	Socialization
Abe	9yrs 8mths	108	1yr 9mths	1yrs	2yrs
Greg	9yrs 8mths	112	3yrs 1mth	2yrs	2yr 1mth
Jacob	8yrs	51	4yrs 1mth	4yrs2mths	5yrs 5mths
Luke	15yrs 10mths	59	1yr 3mths	1yr 1mth	0yrs 6mths
Theo	10yrs 4mths	39	3yrs 1mth	2yrs 8mths	6yrs 9mths
John	13yrs	128	2yrs 2mths	2yrs 3mths	3yrs 1mth
Calum	15yrs 1mth	80	5yrs 3mths	8yrs 4mths	5yrs 7mths
Richard	11yrs 7mths	47	5yrs 5mths	3yrs 1mth	4yrs 10mths

*Age at the beginning of study two

Abe.

Abe was nine years old and had a diagnosis of FXS and autism; he attended a school for children with severe learning disabilities and lived in the family home. Abe would communicate using one or two word utterances or by signing. The QABF was completed as part of study one by Abe's mum, which indicated that challenging behaviours

appeared to serve multiple functions, with notably high scores on the tangible and demand subscales. The total subscale scores for Abe are presented in Table 5.2.

Target behaviours included self-injurious behaviour (finger-biting with accompanying low guttural vocalisation, and hand-biting), aggression (kicking, pulled punch, slapping, and pinching), and property destruction (throwing toys). Target behaviours were collapsed into either finger-biting or other challenging behaviours. Interrater reliability was calculated for 41.6% of experimental sessions. Using the more stringent measure of reliability (R-Occ) the reliability for finger-biting was 92.1% and for other challenging behaviours was 87.5%.

Table 5.2

Abe. Total subscale scores from QABF subscales

	Self-injurious behaviour	Aggression	Property Destruction
<i>Abe.</i>			
Attention	7	7	N/A
Tangible	15	15	N/A
Demand	12	15	N/A
Physical discomfort		10	10
N/A			
Automatic	12	2	N/A

All experimental sessions were conducted in Abe's bedroom. Academic tasks used in the demand condition were part of Abe's current educational goals (matching to sample, counting) and were tasks which he had not yet achieved mastery of. The tangible condition involved withholding access to a preferred toy, which was identified via parental report. Due to practical difficulties associated with conducting the analysis in Abe's bedroom, (he

would close the door, thereby making direct observation impossible) a no interaction condition could not be included. All other experimental conditions were run in accordance with the protocol for the study.

Results of the functional analysis suggested that challenging behaviour displayed by Abe formed two separate response classes. Results of the functional analysis for each response class are therefore presented separately.

Figure 5.1. Abe. Percentage of intervals with finger biting during functional analysis.

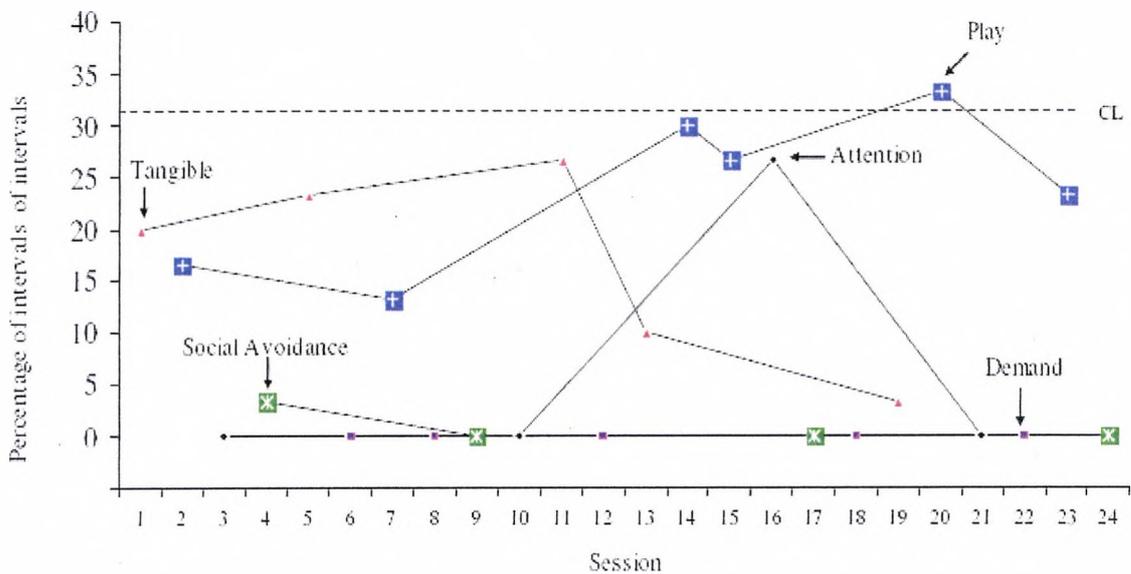


Figure 5.1 shows session by session data for the occurrence of finger-biting. There were elevated rates of finger-biting in the play condition ($M = 23.9$; range = 13.3 – 33.3) and to a lesser extent the tangible condition ($M = 16.6$; range = 3.3 – 26.6). There were also high rates of finger-biting in a single session of the attention condition ($M = 6.7$; range = 0 – 26.6). There was a single occurrence of finger biting in the social avoidance condition ($M = .83$; range 0 - 3.3) and zero occurrences of finger-biting in the demand condition of the functional analysis.

Due to the high level of challenging behaviour occurring in the play condition no condition met the criteria for differentiation between experimental conditions (Hagopian et al., 1997). This suggested that further analysis was merited to explore a potential automatically reinforced function.

Due to the unclear pattern of responding for finger-biting an exploratory analysis of the data was conducted to test the hypothesis that finger-biting was occasioned by the presence of specific stimuli. It appeared that Abe displayed finger-biting more frequently in sessions in which he interacted with certain preferred toys that shared similar characteristics (i.e., produced movement and sound), such as a toy train, balloons and a penguin toy. The percentage of intervals in which Abe interacted with these stimuli is shown in Figure 5.2, along with the percentage of intervals in which finger-biting occurred. Finger-biting appears to have been more likely to occur in sessions in which Abe had access and interacted with these toys than in sessions in which there was no toy interaction²⁸. Indeed, apart from in session 4, there were no occurrences of finger-biting in the absence of interaction with these stimuli.

Figure 5.2. Abe. Percentage of intervals with toy interaction and finger biting across all conditions

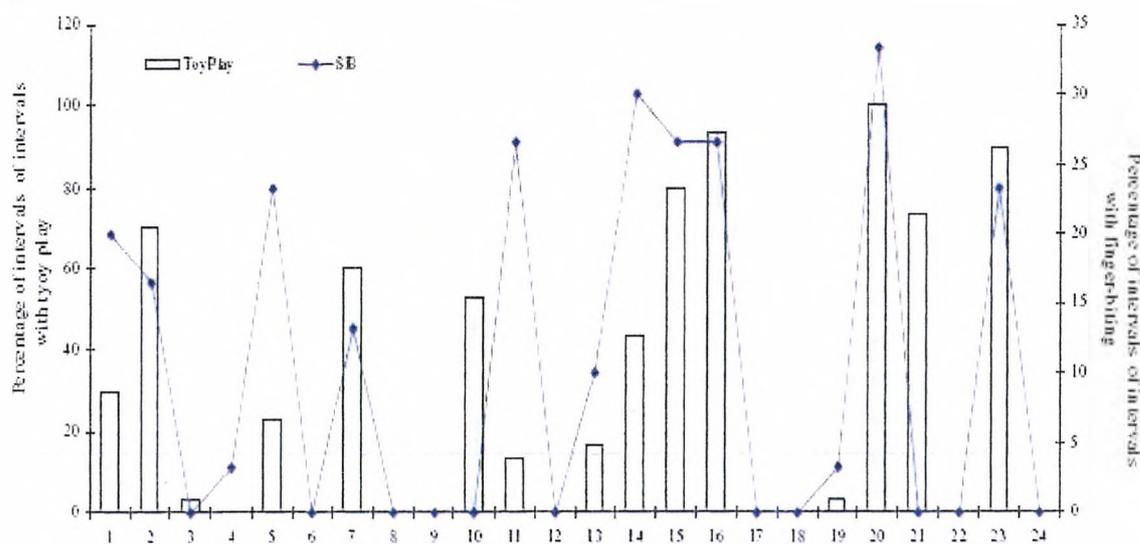
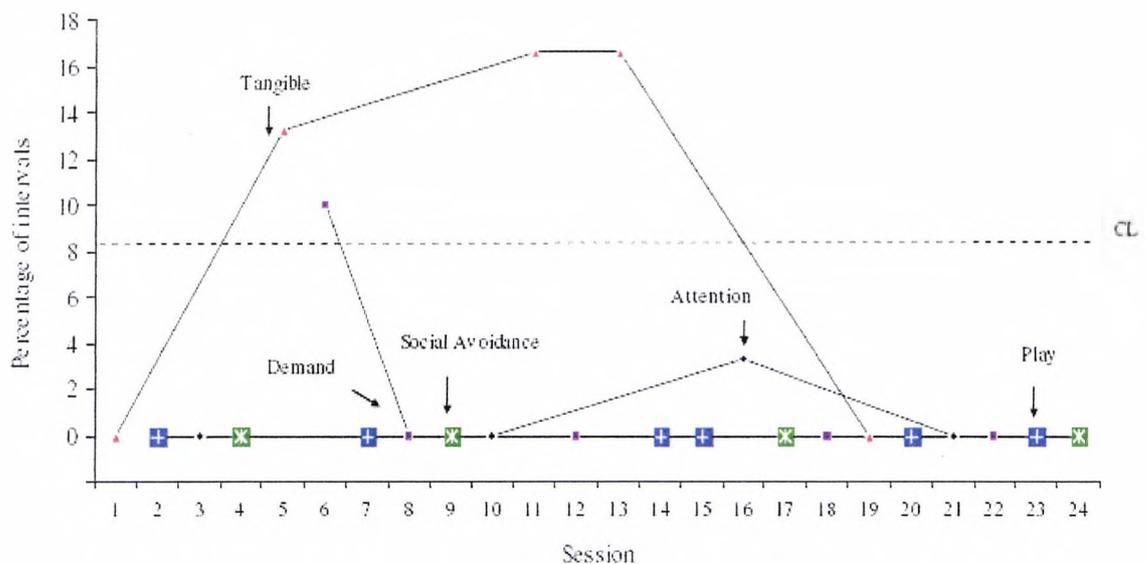


Figure 5.3 shows session by session data for the occurrence of all other topographies of challenging behaviour, excluding finger-biting. There were heightened

²⁸ The low levels of finger-biting occurring in session 21 may have been due to the fact that Abe had a pacifier in his mouth throughout the session. As such the target behaviour could not occur. Anecdotally, Abe brought his finger to his mouth throughout the session without it making contact with his teeth.

rates of challenging behaviour in the tangible condition of the functional analysis ($M=9.3$; range= 0 - 16.6). There were also heightened levels of challenging behaviours in the initial demand condition of the functional analysis, although this reduced to zero rates in all subsequent demand sessions ($M = 2$; range = 0 - 10) . There were near zero levels of challenging behaviour in all attention ($M= .83$; range = 0 – 3.3), play ($M= 0$; range = 0) and social avoidance ($M= 0$; range = 0) conditions.

Figure 5.3. Abe. Percentage of intervals with other challenging behaviours during functional analysis.



As at least 50% of scores for the tangible condition lay above the CL the data met the criteria for differentiation suggesting the behaviour was tangible-maintained.

In sum, data for Abe suggested that finger-biting was automatically reinforced and some evidence was provided to suggest that it was occasioned by the presence as opposed to absence of particular stimuli, a pattern of responding that corresponds to that reported in other studies (Friman, 2000; Van Camp et al., 2000). Other topographies of challenging behaviour appeared to form an alternative response class and were maintained by access to tangibles. Anecdotally, parents reported that Abe frequently displayed challenging behaviour in the presence of demands. This was directly observed when ABA therapists presented academic demands to Abe. However, when the lead researcher presented the

same demands using the same prompts, apart from in the initial demand condition, Abe displayed no challenging behaviour. It may be that this was due to differences in the discriminative properties associated with each individual or that some aspect of the lead researcher's behaviour attenuated the aversiveness of the demand. Alternatively, challenging behaviour that occurred in the context of demands in the natural setting may have been associated with the deprivation of tangibles and thereby evoked tangible-maintained behaviour (as a result of the behaviour-altering effect of the MO) irrespective of the demand per se.

Greg.

Greg was nine years old and had a diagnosis of FXS. Greg communicated by one or two word utterances; he attended a school for children with severe learning disabilities and lived in the family home. The QABF was completed as part of study one by Greg's mum, which indicated that Greg displayed escape maintained aggressive behaviour and automatically reinforced property destruction. The total subscale scores for Greg are presented in Table 5.3 for each topographical category.

Table 5.3

Greg. Total Subscale Scores from QABF Subscales

	Self-injurious behaviour	Aggression	Property Destruction
<i>Greg.</i>			
Attention	N/A	1	0
Tangible	N/A	5	2
Demand	N/A	14	2
Physical discomfort	N/A	6	0
Automatic	N/A	0	14

Target behaviours for Greg included; aggression (hitting the therapist on the head with an object), spitting, and property destruction (banging objects repeatedly whilst crying). Target behaviours were collapsed into either hitting the therapist on the head or other challenging behaviours. Inter-rater reliability was calculated for 38.1% of experimental sessions. Using the more stringent measure of reliability (R-Occ) the reliability for head hitting was 100% and for other challenging behaviours was 95.4%.

All experimental sessions were conducted in the lounge area of Greg's home. Academic tasks used in the demand condition were selected following initial assessment and involved a matching to sample task. The tangible condition involved withholding access to the television. Only a single no interaction condition was included in the experimental analysis as the layout of the room made it difficult to contain Greg in the designated area and he would frequently leave the assessment area to enter the kitchen and speak with his mother.

Results of the functional analysis suggested that challenging behaviour formed two separate response classes. Results of the functional analysis for each response class are therefore presented separately.

Figure 5.4. Greg. Percentage of intervals with head hitting during functional analysis.

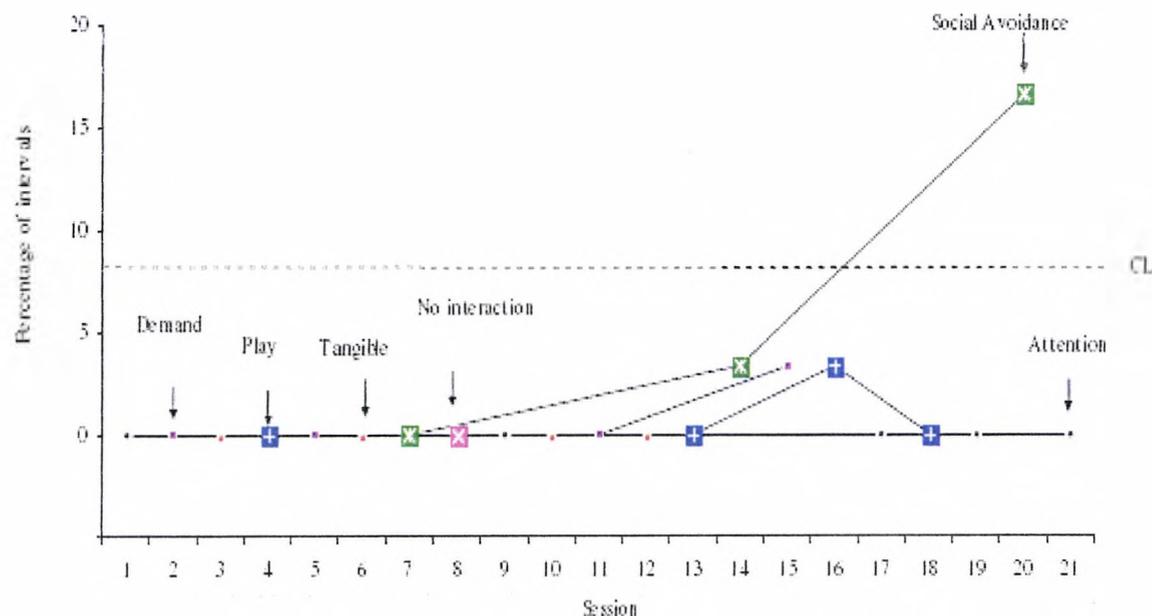
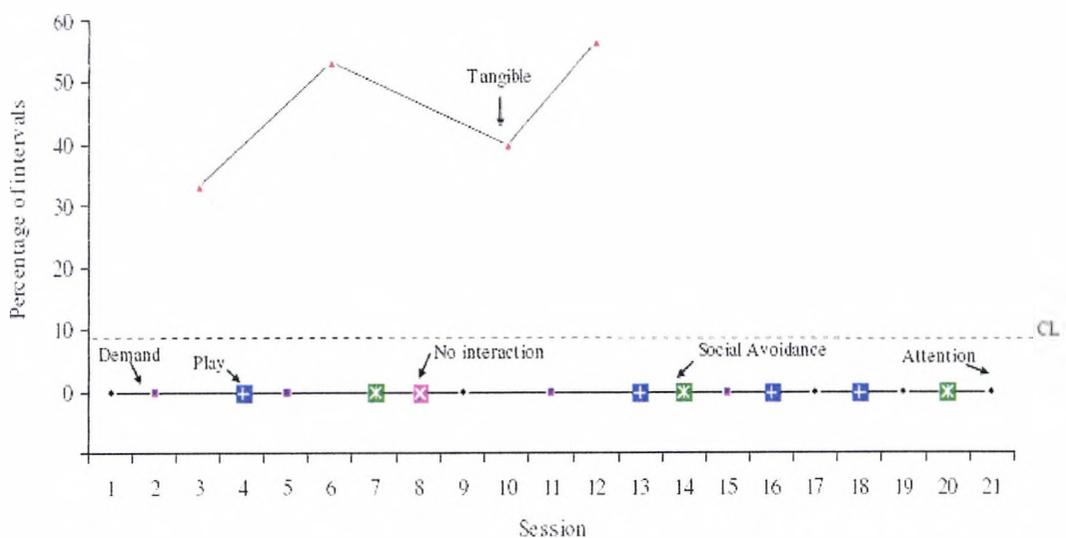


Figure 5.4 shows session by session data for the occurrence of head hitting. There were elevated rates of head hitting in the social avoidance condition ($M = 6.63$; range = 0 - 16.6) and to a lesser extent the play condition ($M = .83$; range = 0 - 3.3) and demand condition ($M = .83$; range = 0 - 3.3) of the functional analysis. There were zero occurrences of head hitting in attention, tangible and no interaction conditions.

As head hitting occurred at a relatively low rate, the criteria suggested by Hagopian et al (1997) for such behavioural patterns was applied to ascribe function²⁹. Using this criterion, there was differentiation in the social avoidance condition of the analysis, suggesting that the behaviour may have been maintained by escape from social attention. Further support for this hypothesis is provided by the fact that the only other conditions in which the response occurred (play and demand) are characterised by relatively high levels of social contact.

Figure 5.5. Greg. Percentage of intervals with challenging behaviour (excluding aggression) during functional analysis.



²⁹ "In cases in which most of the data points are low, the condition in which all or most of the higher rate behavior occurs is considered to be differentiated.... However, one of those high points must occur in the last half of the assessment." (see Hagopian et al., 1997, p. 325).

For Greg, there were a total of 6 intervals in the social avoidance condition in which head hitting occurred, in comparison to 1 interval in the play condition and 1 interval in the demand condition.

Figure 5.5 shows session by session data for the occurrence of other challenging behaviours (property destruction and crying; spitting). There were elevated rates of challenging behaviours solely in the tangible condition ($M = 45.8$; range = 33.3 – 53.3). There were zero occurrences of challenging behaviour in any other condition.

As at least 50% of scores for the tangible condition lay above the CL the data met the criteria for tangible-maintained challenging behaviour.

Data for Greg suggested that head-hitting may have been negatively reinforced by the removal of social attention. Other topographies of challenging behaviour appeared to form an alternative response class and were tangible-maintained. Anecdotally, Greg's parents reported that he was also especially likely to display challenging behaviour when out of the house and asked to do things that were novel (e.g., going somewhere new). An analogue of this situation could not be included in the functional analysis for practical reasons, however.

Jacob.

Jacob was eight years old and had a diagnosis of FXS. Jacob was verbal using simple sentences to communicate; he attended a school for children with moderate learning disabilities and lived in the family home. The QABF was completed as part of study one by Jacob's mum, which indicated that Jacob displayed tangible-maintained challenging behaviour. The total subscale scores for Jacob are presented in Table 5.4.

Target behaviours for Jacob included self-injury (slapping his hand against his head, forcing his forehead against surfaces, arm-biting), aggression (hitting others) and property destruction (banging objects, throwing items, kicking surfaces). There were no occurrences of arm-biting or aggression in the analysis. All target behaviours were collapsed and coded as a single response. Inter-rater reliability was calculated for 29.6% of experimental sessions. Using the more stringent measure of reliability (R-Occ) the reliability for challenging behaviour was 87.5%.

Table 5.4

Jacob. Total Subscale Scores from QABF Subscales.

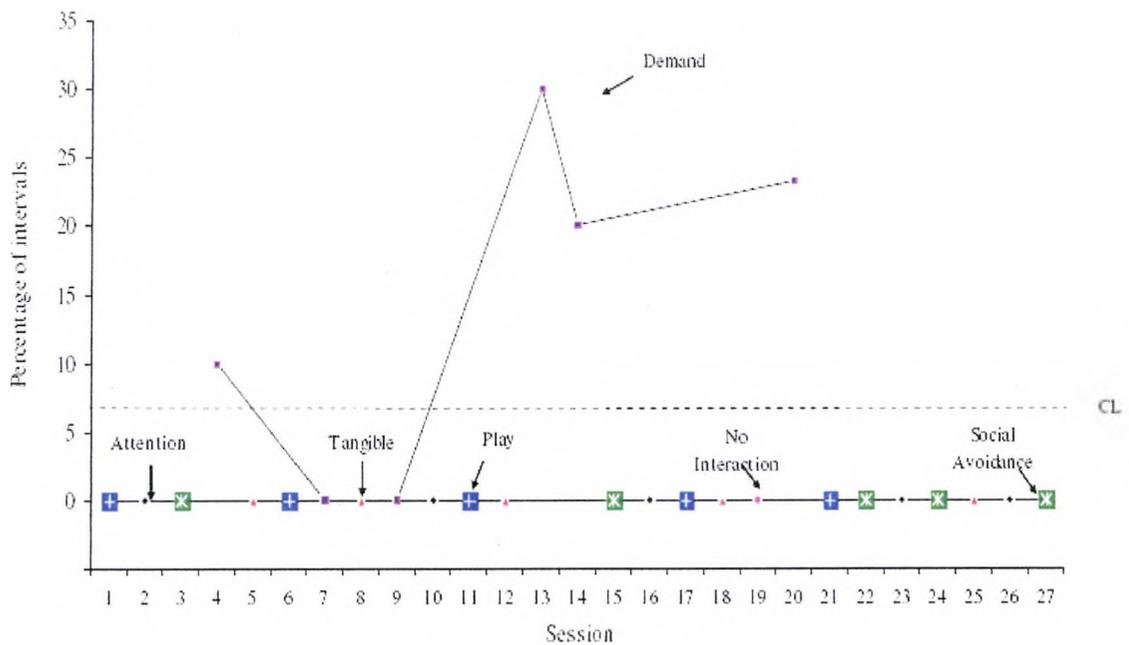
	Self-injurious behaviour	Aggression	Property Destruction
<i>Jacob.</i>			
Attention	3	0	N/A
Tangible	8	7	N/A
Demand	6	6	N/A
Physical discomfort	0	0	N/A
Automatic	4	5	N/A

All experimental sessions were conducted in a room in the family home. Academic tasks used in the demand condition were selected following initial assessment and involved a matching to sample task (e.g., matching coins and numbers). The tangible condition involved withholding access to toys/food items. Only a single no interaction condition was included in the analysis due to practical difficulties (Jacob would interact with family members on the other side of the door).

Figure 5.6 shows session by session data for the occurrence of challenging behaviour during the functional analysis. Challenging behaviours occurred exclusively in the demand condition of the functional analysis ($M = 13.9$; range = 0-30). There were no occurrences of challenging behaviour in any other condition of the functional analysis.

As at least 50% of scores for the demand condition lay above the CL the data met the criteria for escape-maintained challenging behaviour.

Figure 5.6. Jacob. Percentage of intervals with challenging behaviour during functional analysis.



Data for Jacob suggested that challenging behaviour may have been negatively reinforced by the contingent removal of aversive stimuli (e.g., demands). Interestingly there were no occurrences of arm-biting or aggression during any of the functional analysis conditions, despite this being reported by Jacob’s mother as occurring several times a day. During informal observations by the lead researcher it appeared that both responses were occasioned by physical attacks by Jacob’s brother. For ethical reasons this hypothesis could not be experimentally tested during the functional analysis.

Luke.

Luke was fifteen years old and had a diagnosis of FXS. He was non-verbal and primarily communicated by leading people to objects which he wanted. Luke lived in the family home and attended a school for children with severe learning disabilities. The QABF was completed as part of study one by Luke’s mum, which indicated that Luke primarily displayed challenging behaviours maintained by escape and access to tangibles. The total subscale scores for Luke are presented in Table 5.5.

Table 5.5

Luke. Total Subscale Scores from QABF Subscales.

	Self-injurious behaviour	Aggression	Property Destruction
<i>Luke.</i>			
Attention	5	6	5
Tangible	9	13	1
Demand	11	13	3
Physical discomfort	0	0	0
Automatic	2	2	7

Luke's mother requested that the analysis be conducted at school. Target behaviours included self-injurious behaviour (hand-biting with vocalisation) aggression (pulling, hitting, and scratching at therapist), property destruction (throwing and ripping objects) and foot stamping. Target behaviours were collapsed and coded as a single response. Inter-rater reliability was calculated for 34.6% of sessions. Using the more stringent measure of reliability (R-Occ) the reliability for challenging behaviour was 90.9%.

It was reported that Luke was much more likely to display challenging behaviour in the classroom than when he was in other parts of the school (e.g., therapy room). A limited number of studies have previously noted differences in the function of challenging behaviour across different settings (e.g., Harding, Wacker, Berg, Barretto, & Ringdahl, 2005; Lang et al., 2008). As such the current experimental analysis aimed to determine a) the function served by challenging behaviour, b) any changes in the occurrence and function of challenging behaviour across settings (e.g., classroom and therapy room). An

ABAB reversal with an embedded multi-element design was used in order to examine each of these two questions.

The functional analysis was conducted over four visits. In visit one and three the functional analysis was conducted in the classroom, in visits two and four the functional analysis was conducted in the therapy room. The classroom had at least five other students in at any time and two teaching assistants as well as the teacher. In order to minimise disruption to other students the functional analysis was conducted in a partitioned part of the classroom. The therapy room was a relatively large room, furnished with large cushions. The lead researcher and research assistant were the only other people in the therapy room.

All experimental sessions were conducted in either the classroom or the therapy room. Academic tasks used in the demand condition reflected those typically used at school and involved asking Luke to point at pictures of classmates. The tangible condition involved withholding access to preferred crisps. All other experimental conditions were run in accordance with the protocol for the study and each lasted for five minutes. There were a minimum of three replications of each experimental condition across settings.

Figure 5.7. Luke. Mean percentage of intervals with challenging behaviour across settings

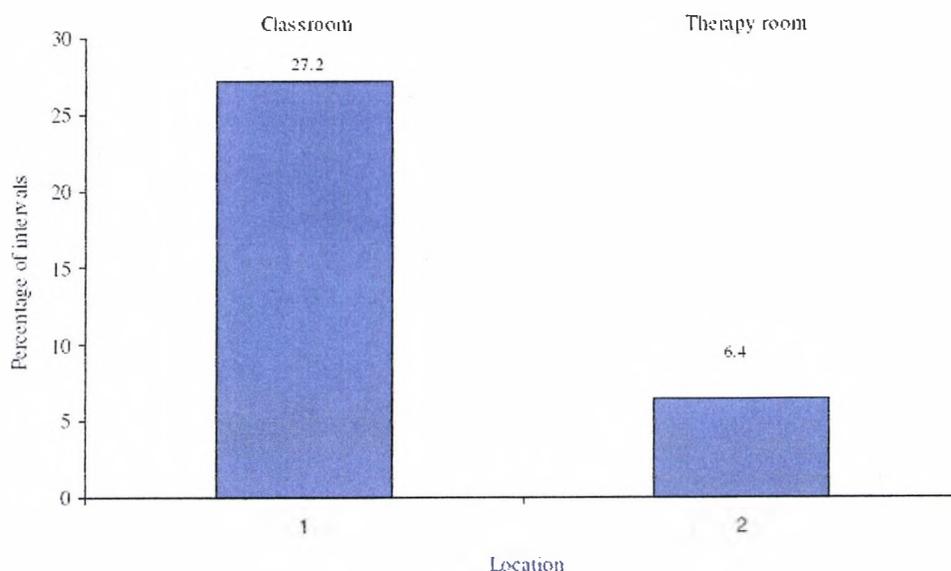


Figure 5.7 shows the overall occurrence of challenging behaviour in the classroom and therapy room. The overall mean percentage of intervals with challenging behaviour in the classroom ($M = 27.2$) was notably higher than when in the therapy room ($M = 6.4$).

Figure 5.8 shows session by session data for the occurrence of challenging behaviour during the functional analysis in both the classroom and therapy room.

Figure 5.8. Luke. Percentage of intervals with challenging behaviour during functional analysis in the classroom and therapy room.

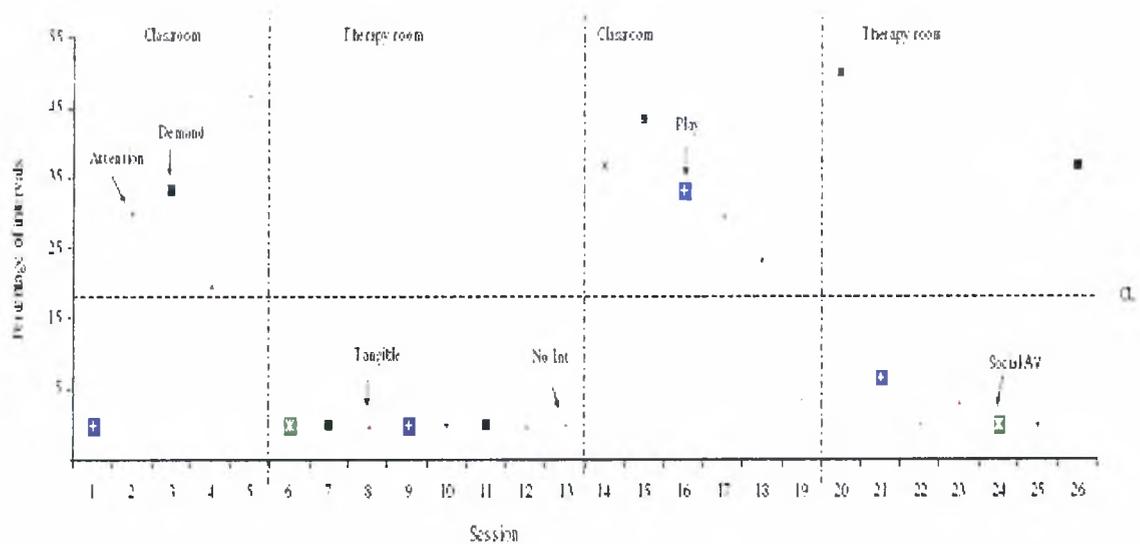
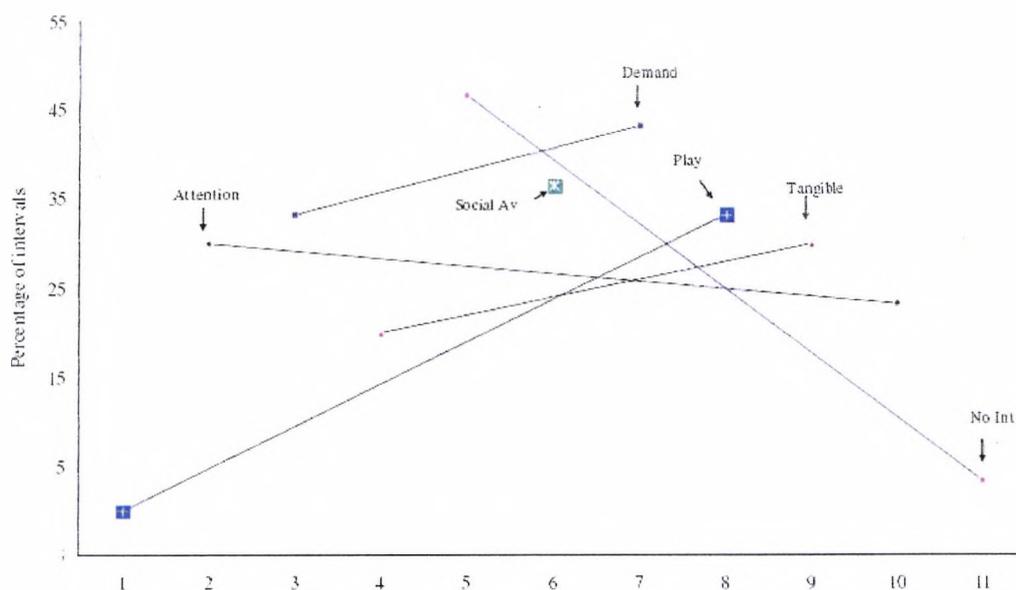


Figure 5.8 shows that with the exception of the demand condition, challenging behaviours were much less likely to occur in the therapy room than classroom. The functional analysis itself was generally characterised by high levels of variability, which were only in part attributable to the setting in which the analysis was conducted. There were high rates of challenging behaviour in all but two of the demand conditions ($M = 27.2$; range = 0 - 50), there were also relatively high levels of challenging behaviour in two of the five tangible conditions ($M = 11.98$; range = 0 - 30) and attention conditions ($M = 13.3$; range = 0 - 30). Challenging behaviour occurred in two of the four no interaction ($M = 9.97$; range = 0 - 36.6) and play ($M = 10$; range = 0 - 33.3) conditions and one of the three social avoidance conditions ($M = 12.2$; range = 0 - 36.6).

As at least 50% of scores for the demand condition lay above the CL, the data met the criterion for escape-maintained challenging behaviour. Despite the observed variability no other condition met this criterion.

Figure 5.9 shows the results of those functional analysis conditions that were solely conducted in the classroom.

Figure 5.9. Luke. Percentage of intervals with challenging behaviour during classroom functional analysis.

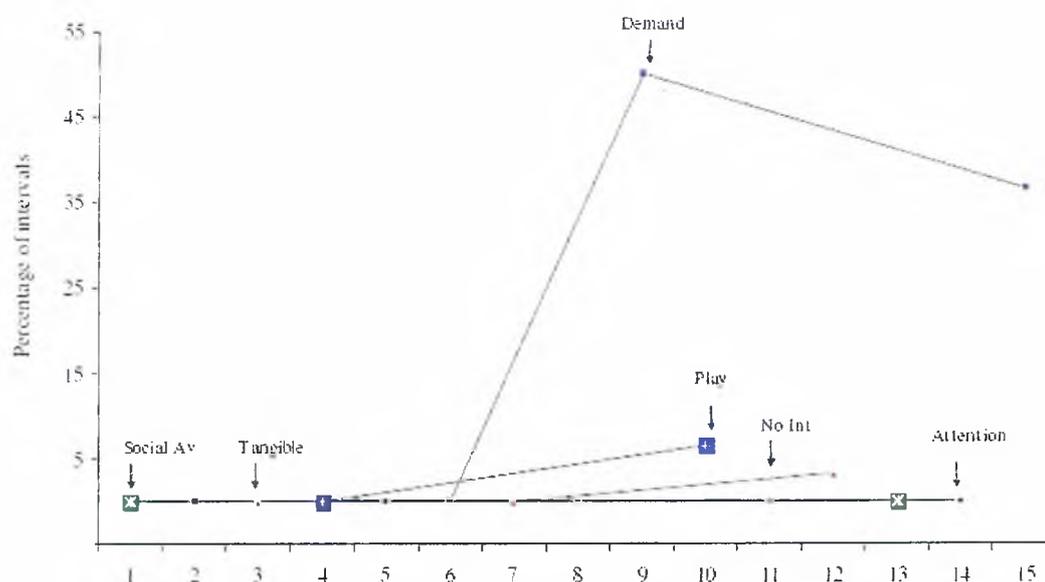


There were heightened levels of challenging behaviour occurring in at least one of each experimental condition occurring in the classroom (*Demand*, $M = 38.3$; range = 33.3 – 43.3; *Social Avoidance*, $M = 36.6$; *Tangible*, $M = 25.0$; range = 20 - 30; *Play*, $M = 16.7$; range = 0 – 33.3; *No Interaction*, $M = 25$; range = 3.3 – 46.6; *Attention*, $M = 26.7$; range = 23.3 - 30). The absence of a clear ‘control’ condition in this setting makes a judgment about the function served by challenging behaviour difficult.

Figure 5.10 shows the results of those functional analysis conditions that were solely conducted in the therapy room. There were elevated levels of challenging behaviour in the demand condition ($M = 21.7$; range 0 - 50) in comparison to other experimental

conditions (*Social Avoidance*, $M = 0$: *Tangible*, $M = 1.1$; range = 0 - 3.3: *Play*, $M = 3.3$; range = 0 - 6.6: *No Interaction*, $M = 0$: *Attention*, $M = 0$) in this particular setting.

Figure 5.10. Luke. Percentage of intervals with challenging behaviour during therapy room functional analysis.



In sum, whilst it appeared that Luke primarily displayed escape-maintained challenging behaviour, it was not possible to rule out alternative accounts of potential maintaining variables when in the classroom. In classroom settings there were high levels of variability across all experimental conditions. One explanation for this could be that challenging behaviour occurring in the classroom was automatically reinforced and not sensitive to environmental contingencies. Whilst certainly possible, it is unclear why challenging behaviours would cease to be automatically reinforcing when Luke was out of the classroom. This points to the influence of potential extraneous variables that may have influenced the occurrence of challenging behaviour in each setting. For example, when Luke was working in the partitioned ‘functional analysis’ area of the classroom he was prevented from accessing other parts of the classroom and thus potential reinforcers, such as food, classmates, teachers, books. Thus, it is possible that the restriction of movement

and reinforcement functioned as an establishing operation for challenging behaviour (e.g., Fritz, DeLeon, & Lazarchick, 2004) and led to high levels of challenging behaviour occurring across all conditions of the functional analysis in these settings. When in the therapy room there were no partitions and thus with the removal of this particular EO, Luke's behaviour may have become sensitive to the more immediate contingencies of the functional analysis.

Theo.

Theo was ten years old and had a diagnosis of FXS. Theo was verbal and tended to communicate using single repetitive words. Theo attended a school for children with moderate learning disabilities and lived in the family home. The QABF was completed as part of study one by Theo's mum and indicated that Theo primarily displayed escape-maintained challenging behaviours. The total subscale scores for Theo are presented in Table 5.6.

Table 5.6

Theo. Total Subscale Scores from QABF Subscales.

	Self-injurious behaviour	Aggression	Property Destruction
<i>Theo.</i>			
Attention	2	2	N/A
Tangible	0	0	N/A
Demand	9	9	N/A
Physical discomfort	0	0	N/A
Automatic	3	3	N/A

Target behaviours included destructive behaviours (ripping up paper), self-injury (finger-biting) and aggression (hitting others). There were no occurrences of finger-biting

in the analysis. Target behaviours were collapsed and coded as a single response. Inter-rater reliability was calculated for 36% of experimental sessions. Using the more stringent measure of reliability (R-Occ) the reliability was 89.5%.

The functional analysis was conducted in a room in the family home. Following discussion with Theo's parents a matching-to-sample task involving numbers was selected for the demand condition of the functional analysis, and the tangible condition involved withholding access to preferred 'Pringles' crisps. As one of the target behaviours included ripping paper, a piece of paper was made available in each session for all conditions.

Figure 5.11. Theo. Percentage of intervals with challenging behaviour during functional analysis.

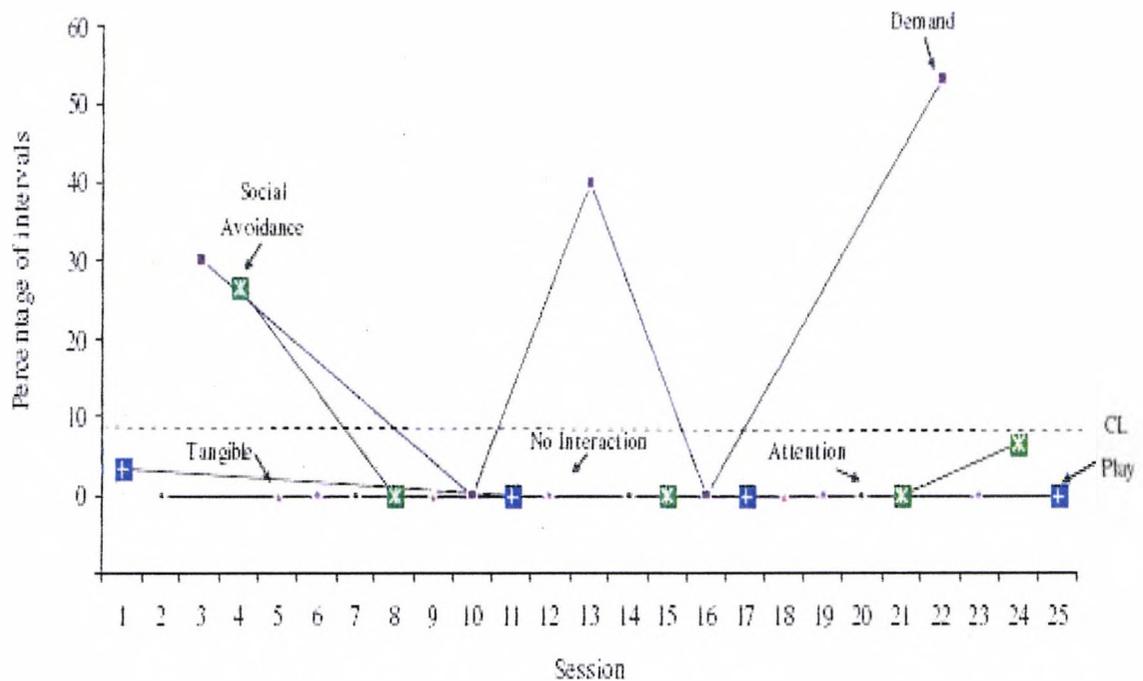


Figure 5.11 shows the results of the functional analysis for Theo. There were high rates of challenging behaviour in three of the five demand conditions ($M = 24.7$; range = 0 – 53.3). There were also elevated levels of challenging behaviour in two of the five social avoidance conditions ($M = 6$; range = 0 - 26.6). There were zero to low rates of

challenging behaviour in all other conditions (*Play*, $M = .83$; range = 0 - 3.3; *Attention*, $M = 0$; *Tangible*, $M = 0$; *No Interaction*, $M = 0$).

As at least 50% of scores for the demand condition lay above the CL, the data met the criterion for escape-maintained challenging behaviour.

It appears that Theo displayed challenging behaviour that was negatively reinforced by the removal of aversive stimuli, such as academic demands. Interestingly, during the functional analysis there were minimal occurrences of aggression and no occurrences of finger-biting. Theo's parents reported that he was especially likely to display such behaviours when asked to do something novel and when in situations that he found particularly 'stressful'. Anecdotally he was observed to repeatedly punch his father in the face when asked to work alone with the research team on the first visit to the family home. Unfortunately it was not possible to find a way to incorporate an analogue of this situation into the functional analysis itself.

John.

John was twelve years old and had a diagnosis of FXS. John was verbal and primarily communicated using repetitive sentences and one word utterances. He attended a school for children with moderate learning disabilities and lived in the family home. The QABF was completed as part of study one by John's mum and indicated that self-injury and aggressive behaviours were maintained by escape from demands and access to tangibles, whereas property destruction was automatically reinforced. The total subscale scores for John are presented in Table 5.7.

The target behaviours included for analysis were self-injurious behaviour (finger-biting), destructive behaviours (throwing objects, foot stamping) and aggression (hitting out at others). There were no occurrences of object throwing, foot-stamping or aggression in the analysis. Inter-rater reliability was calculated for finger-biting in 36.4% of

experimental sessions. Using the more stringent measure of reliability (R-Occ) the reliability was 87.5%.

Table 5.7

John. Total Subscale Scores from QABF Subscales.

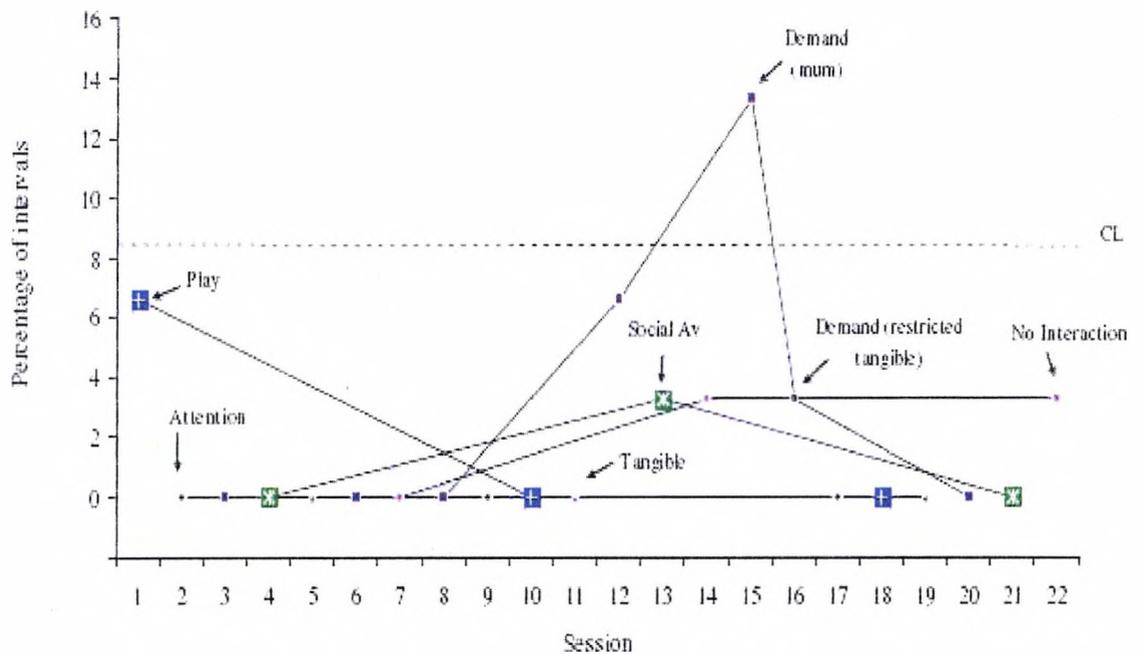
	Self-injurious behaviour	Aggression	Property Destruction
<i>John.</i>			
Attention	2	6	0
Tangible	12	10	2
Demand	12	13	2
Physical discomfort	0	0	0
Automatic	10	0	14

The functional analysis was conducted in a room in the family home. The tangible condition of the functional analysis involved withholding access to preferred items (television control, toy cars, crisps). A number of variants of the demand condition were included in the functional analysis in an attempt to provide a more externally valid analogue of those situations that evoked challenging behaviour in John's natural environment. One session involved John's mother presenting academic demands (without any explicit consequences programmed for any behaviour), another involved combining a standard demand condition with restricted access to the television and providing a break with access to the television contingent on challenging behaviour (cf., Call, Wacker, Ringdahl, & Boelter, 2005).

The results of the functional analysis, shown in Figure 5.12, suggest that finger-biting was primarily negatively reinforced and was occasioned by the onset of aversive stimuli (e.g., demands). There were elevated levels of challenging behaviour in three of

the seven demand conditions ($M = 3.31$; range = 0 – 13.3) of the functional analysis. Finger biting only occurred in one play condition ($M = 2.2$; range = 0 - 6.6) and one social avoidance condition ($M = 1.1$; range = 0 – 3.3). Finger biting occurred in two no interaction conditions ($M = 2.2$; range = 0 – 3.3) of the functional analysis. There were zero rates of challenging behaviour in the tangible and attention conditions of the functional analysis.

Figure 5.12. John. Percentage of intervals with challenging behaviour during functional analysis.



As finger-biting occurred at a low-rate, the criteria suggested by Hagopian et al (1997) for low-rate behaviours was applied to ascribe function³⁰. Using these criteria, there was differentiation in the demand condition of the analysis.

³⁰ "In cases in which most of the data points are low, the condition in which all or most of the higher rate behavior occurs is considered to be differentiated.... However, one of those high points must occur in the last half of the assessment." (see Hagopian et al., 1997, p. 325). Footnote continues overleaf.

It appears that John displayed finger-biting that was primarily negatively reinforced by the removal of aversive stimuli, such as academic demands. Finger-biting occurred at relatively low rates, however, and there were no occurrences of aggression or destructive behaviours. Indeed there were several demand conditions in which John displayed no challenging behaviour. This contrasted markedly with reports from John's mother and school teacher. Indeed, John was anecdotally observed by the lead researcher to engage in high rates of challenging behaviour (including throwing objects, and foot stamping) in natural settings at home both when asked to do something but also when unable to access preferred foods or activities, such as watching the television. However, there were no occurrences of challenging behaviour during any of the tangible conditions, despite restricting access to the same stimuli, and there were only low rates of finger-biting in demand conditions. It is unclear as to why this was the case. One possible account could be that discriminative stimuli that were present in the natural environment were not in situ during the functional analysis and as such John failed to contact the available contingencies. Another interpretation could be that some aspect of the functional analysis served to abolish the reinforcing value of some of the consequences that may have maintained challenging behaviour or alternatively may have established some of the other consequences of challenging behaviour as aversive.

Calum.

Calum was a fourteen year old boy with a diagnosis of FXS, who attended a school for children with moderate learning disabilities and lived in the family home. Calum was verbal and could communicate using relatively complex sentences. The QABF was completed as part of study one by Calum's mum and suggested that Calum's challenging

For John, there were a total of 7 intervals in the demand condition in which finger biting occurred, in comparison to 2 intervals in both the play and no interaction conditions and 1 interval in the social avoidance condition.

behaviours were primarily escape-maintained. The total subscale scores for Calum are presented in Table 5.8.

Table 5.8

Calum. Total Subscale Scores from QABF Subscales.

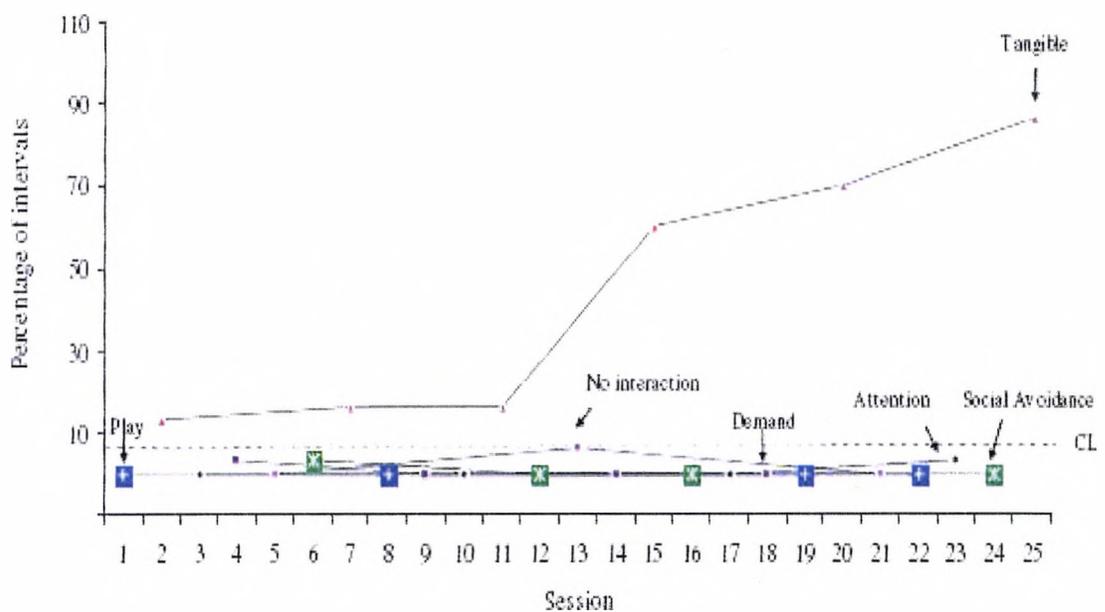
	Self-injurious behaviour	Aggression	Property Destruction
<i>Calum.</i>			
Attention	N/A	7	2
Tangible	N/A	6	6
Demand	N/A	11	11
Physical discomfort	N/A	2	2
Automatic	N/A	11	0

Target behaviours included self-injurious behaviours (banging head against furnishings), aggression (grabbing the lead researcher by the arm) and property destruction (throwing items, banging on surfaces with closed fist). There were no occurrences of self-injurious behaviours in the functional analysis. Target behaviours were collapsed and coded as a single response. Inter-rater reliability was calculated for 34.5% of experimental sessions. Using the more stringent measure of reliability (R-Occ) the reliability was 97.9%.

The functional analysis was conducted in a room in the family home. Following discussion with Calum's mother a matching-to-sample task was used in the demand condition and the tangible condition involved withholding access to preferred chocolate chip cookies. Due to the non-occurrence of self-injurious behaviour (which was the initial focus of the assessment) target behaviours were not consistently consequated until the fourth tangible condition.

The results of the functional analysis, shown in Figure 5.13, clearly show that challenging behaviours were positively reinforced by the provision of preferred tangible items. There were elevated rates of challenging behaviours occurring in each tangible condition ($M = 43.85$; range = 13.3 - 86.6). There were relatively low rates of challenging behaviour in the demand ($M = .83$; range = 0 - 3.3), social avoidance ($M = .83$; range = 0 - 3.3) and no interaction ($M = 2.2$; range = 0 - 6.6) conditions of the functional analysis. There were zero rates of challenging behaviour in the play and attention conditions of the functional analysis.

Figure 5.13. Calum. Percentage of intervals with challenging behaviour during functional analysis.



As at least 50% of scores for the tangible condition lay above the CL, the data met the criteria for tangible-maintained challenging behaviour.

It appears that Calum primarily displayed challenging behaviour that was maintained by the provision of tangible items (i.e., chocolate cookies). The results of this analysis are relatively clear; however it is unclear as to why Calum never engaged in any

self-injurious behaviours, which had been reported as frequently occurring in natural settings.

Richard.

Richard was an eleven year old boy with a diagnosis of FXS, who attended a school for children with moderate learning disabilities and lived in the family home. Richard was verbal and would communicate using relatively complex sentences. The QABF was completed as part of study one by Richard's mum and self-injurious behaviours appeared to be multiply controlled. No clear function could be identified for aggressive behaviours using the QABF. The total subscale scores for Richard are presented in Table 5.9.

Table 5.9

Richard. Total Subscale Scores from QABF Subscales.

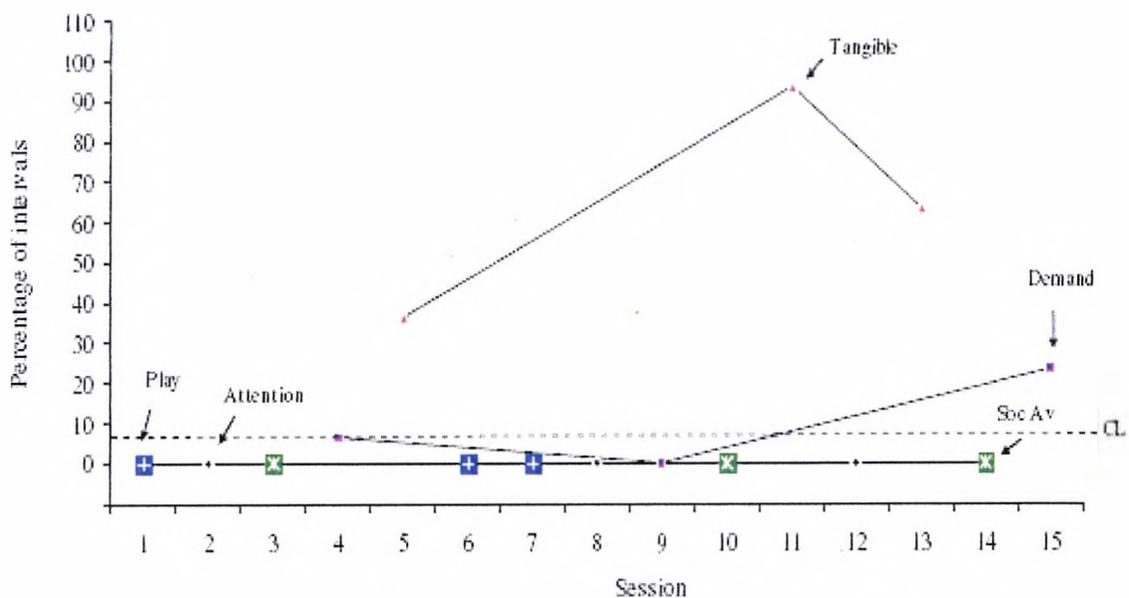
	Self-injurious behaviour	Aggression	Property Destruction
<i>Richard.</i>			
Attention	7	0	N/A
Tangible	8	2	N/A
Demand	9	3	N/A
Physical discomfort	10	1	N/A
Automatic	3	0	N/A

Target behaviours included aggression (kicking, hitting, ear pulling, pushing, spraying water, and throwing items at the therapist), self-injury (biting his little finger whilst sticking the index finger of his other hand up at the therapist), and property destruction (throwing items, ripping materials, spitting water). Target behaviours were collapsed and coded as a single response. Inter-rater reliability was calculated for 46.6% of

experimental sessions. Using the more stringent measure of reliability (R-Occ) the reliability was 96%.

The functional analysis was conducted in the living room of the family home. Following initial assessment a matching-to-sample task was used in the demand condition and the tangible condition involved withholding access to preferred items (such as building blocks and a portable games console). A no interaction condition could not be included as the layout of the room meant that it was difficult to prevent Richard from leaving the assessment area to interact with other members of the family.

Figure 5.14. Richard. Percentage of intervals with challenging behaviour during functional analysis.



The results of the functional analysis, shown in Figure 5.14, clearly show that challenging behaviours were positively reinforced by the provision of preferred tangible items. There were elevated rates of challenging behaviours occurring in each of the three tangible conditions ($M = 64.4$; range = 36.6 - 93.3). There were slightly elevated rates of challenging behaviour in two of the three demand conditions ($M = 9.96$; range = 0 -

23.3)³¹. There were zero occurrences of challenging behaviour in the play, attention, and social avoidance conditions of the functional analysis.

As at least 50% of scores for the tangible condition lay above the CL, the data met the criteria for tangible-maintained challenging behaviour.

It appears that Richard primarily displayed challenging behaviour that was maintained by the provision of tangible items.

Participants with FXS. Within-Group Analysis

A within-group analysis of the pattern of self-injury displayed by each participant is also possible using summary data. Figures 5.15-5.23 provide summary data for each participant in the FXS group. The numerical data in each figure indicates the overall mean percentage of intervals of challenging behaviour and the overall standard deviation. The data for each experimental condition are also presented graphically to present the number of standard deviations each condition mean is from the overall mean (i.e., the Z score for each experimental condition). As such, Figures 5.15-5.23 provide a summary of both the absolute level and relative variability of each participant's challenging behaviour (Iwata et al., 1982/1994).

In what follows, particular emphasis is given to the analysis of those topographies of challenging behaviour that appear to be socially maintained. All topographies that appeared to be automatically reinforced were excluded from the current analysis. A number of apparent patterns in the data are discussed.

Figures 5.15-5.18 present summary data for four participants with FXS, for whom at least one response class of challenging behaviour was positively reinforced by the contingent provision of tangible items. Figures 5.19-5.23 present summary data for five participants

³¹Although unclear in Figure 5.14, the percentage of intervals with challenging behaviour in session 4 (demand condition) is at 6.6% of intervals and falls below the CL of 8.3% of intervals.

who displayed at least one response class of challenging behaviour that appeared to be negatively reinforced by the removal of either social attention or academic demands.

Figure 5.15. Abe. No. of standard deviations each condition mean was from the overall mean for other challenging behaviours.

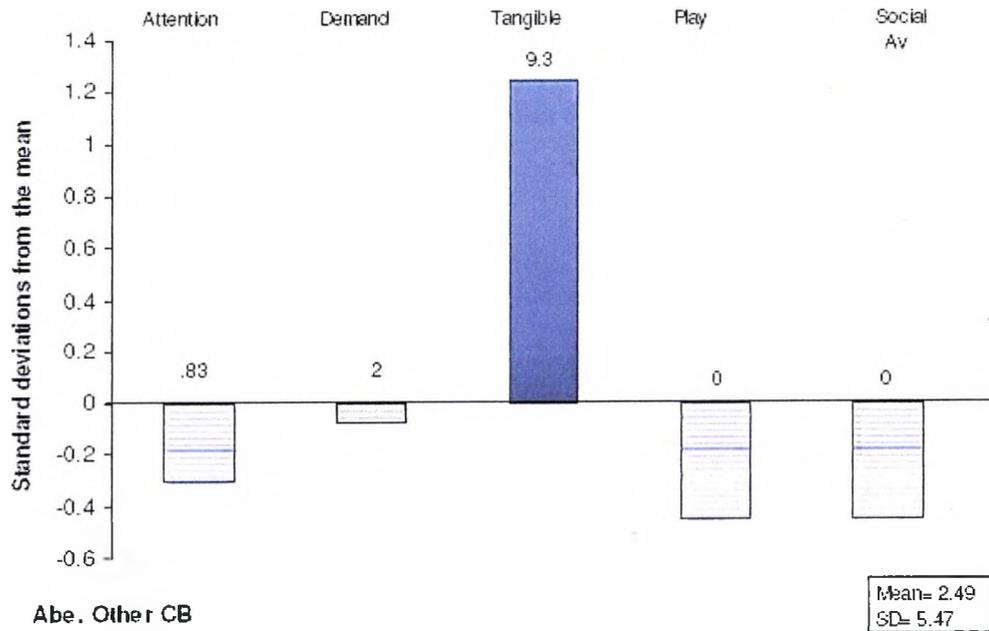


Figure 5.16. Calum. No. of standard deviations each condition mean was from the overall mean for challenging behaviour.

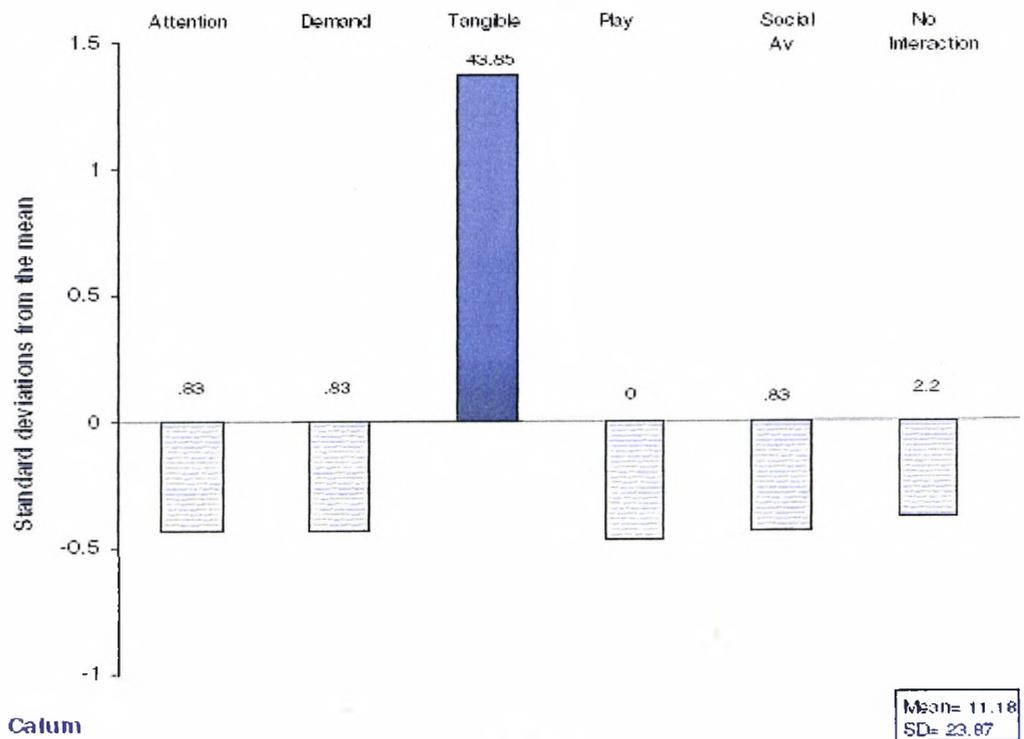


Figure 5.17. Greg. No. of standard deviations each condition mean was from the overall mean for other challenging behaviours.

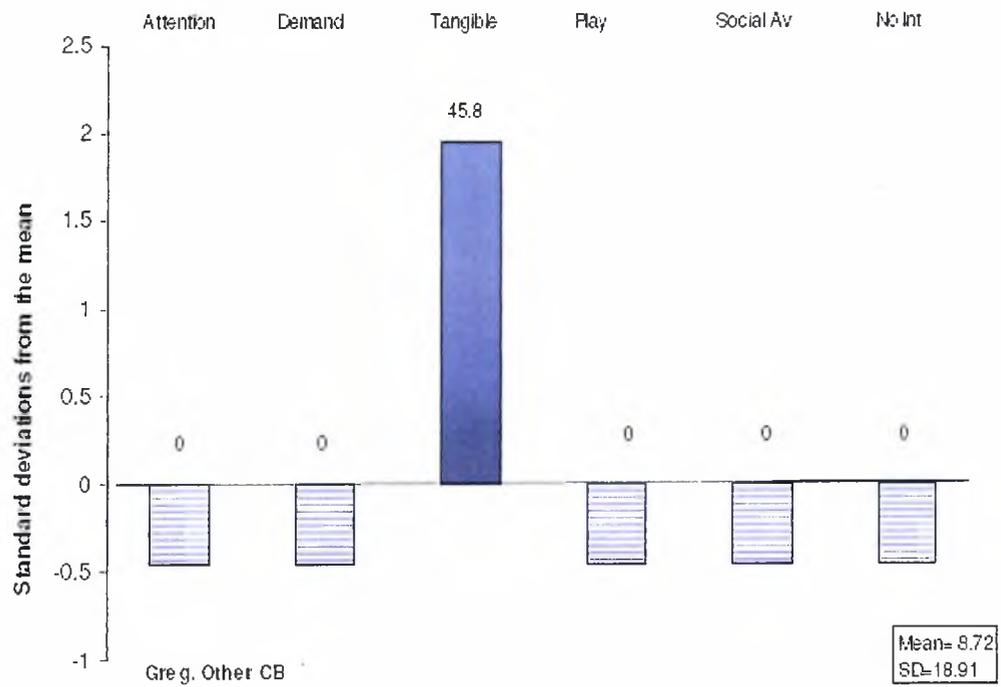
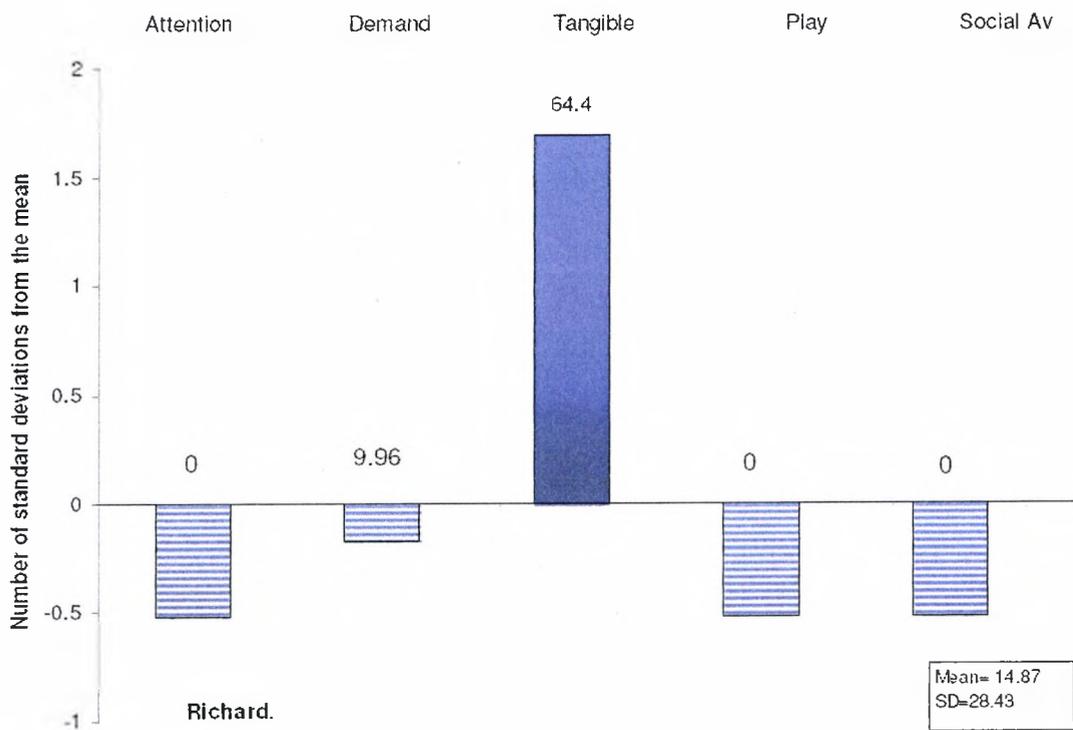


Figure 5.18. Richard. No. of standard deviations each condition mean was from the overall mean for challenging behaviour.



Figures 5.15-5.18 shows the number of standard deviations each condition mean was from the overall mean for Abe, Calum, Greg and Richard's challenging behaviour. It appears that each of these participants displayed at least one topography of challenging behaviour that was positively reinforced by the provision of tangible items.

For Abe, as shown in Figure 5.15, the mean occurrence of challenging behaviours (excluding finger-biting) in the tangible condition was 9.3 which was 1.24 standard deviations above the overall mean of 2.49. For Calum, as shown in Figure 5.16, the mean occurrence of challenging behaviours in the tangible condition was 43.85 which was 1.37 standard deviations above the overall mean of 11.18. For Greg, the mean occurrence of other challenging behaviours in the tangible condition was 45.8, which was 1.96 standard deviations above the overall mean of 8.72, as shown in Figure 5.17. For Richard, as shown in Figure 5.18 the mean occurrence of challenging behaviour in the tangible condition was 64.4 which was 1.7 standard deviations above the overall mean of 14.87. These data support the interpretation that at least one response class for each of these four participants was maintained by access to tangible items.

Figure 5.19. Jacob. No. of standard deviations each condition mean was from the overall mean for challenging behaviour.

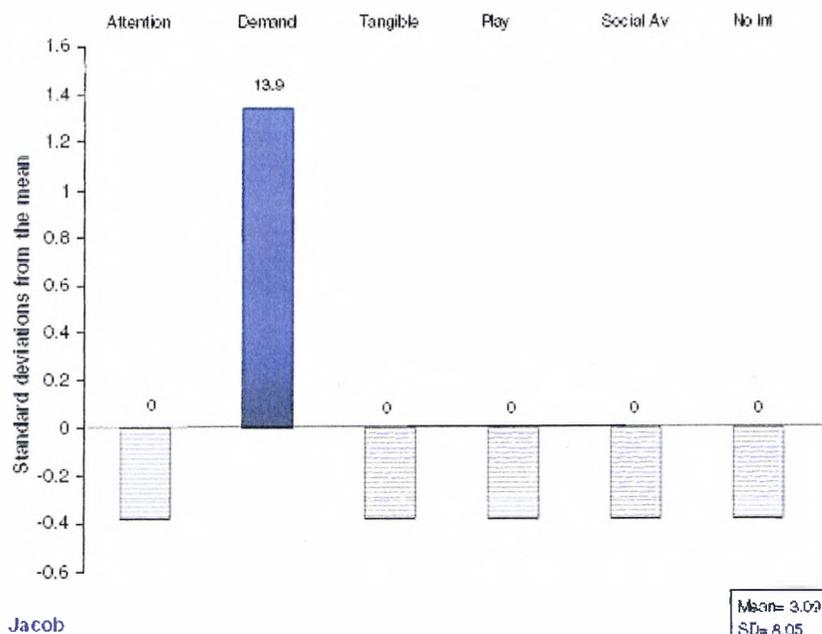


Figure 5.20. Luke. No. of standard deviations each condition mean was from the overall mean for challenging behaviour.

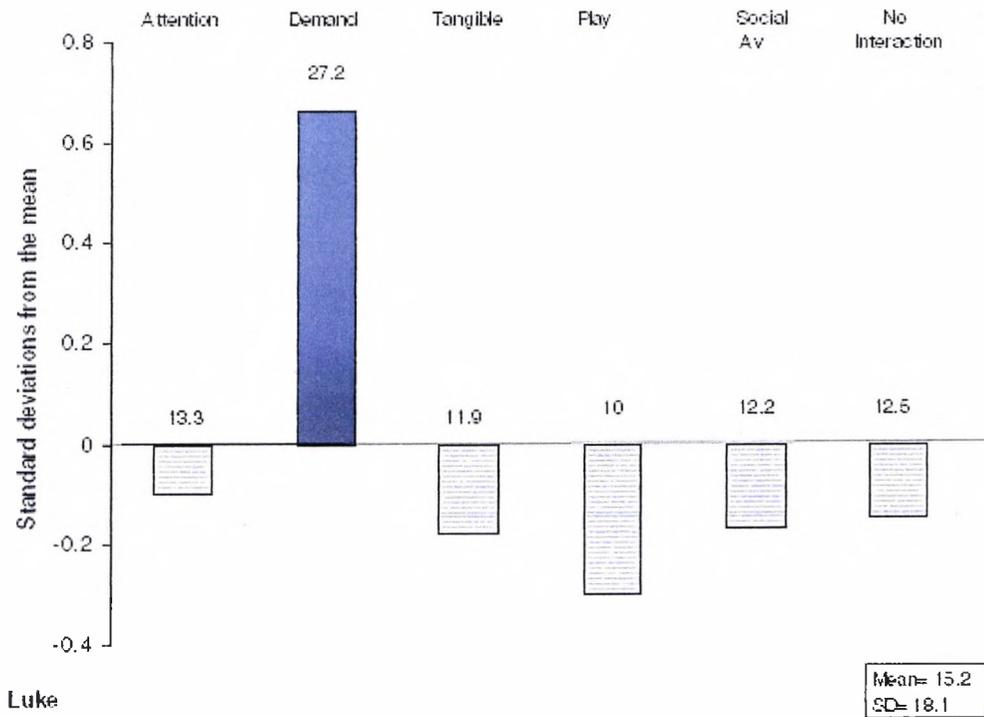


Figure 5.21. Theo. No. of standard deviations each condition mean was from the overall mean for challenging behaviour.

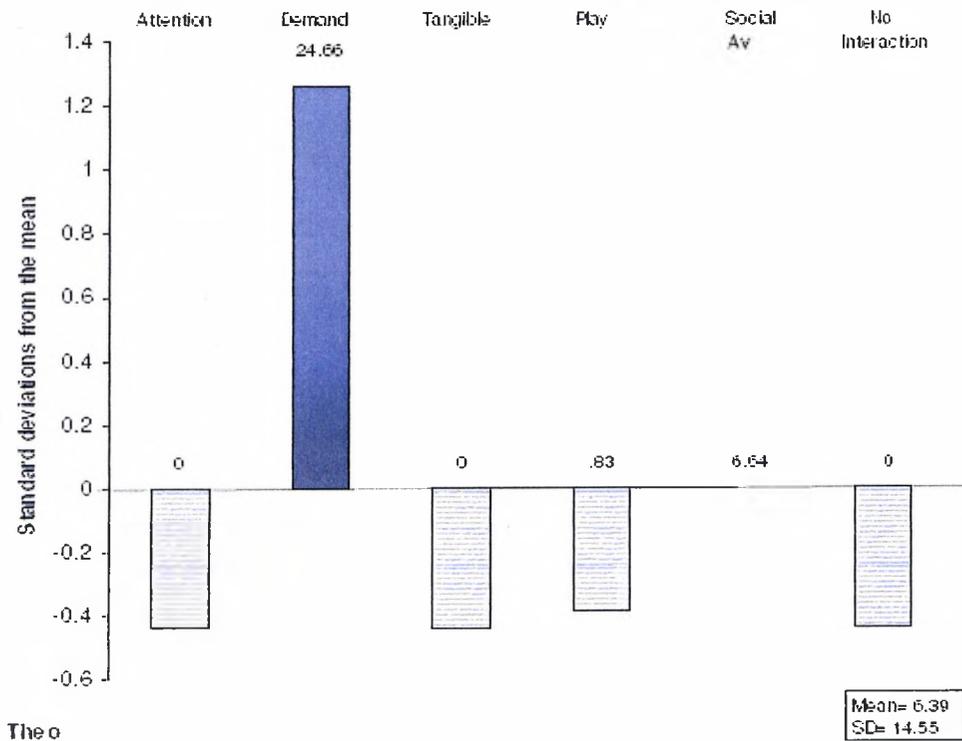


Figure 5.22. John. No. of standard deviations each condition mean was from the overall mean.

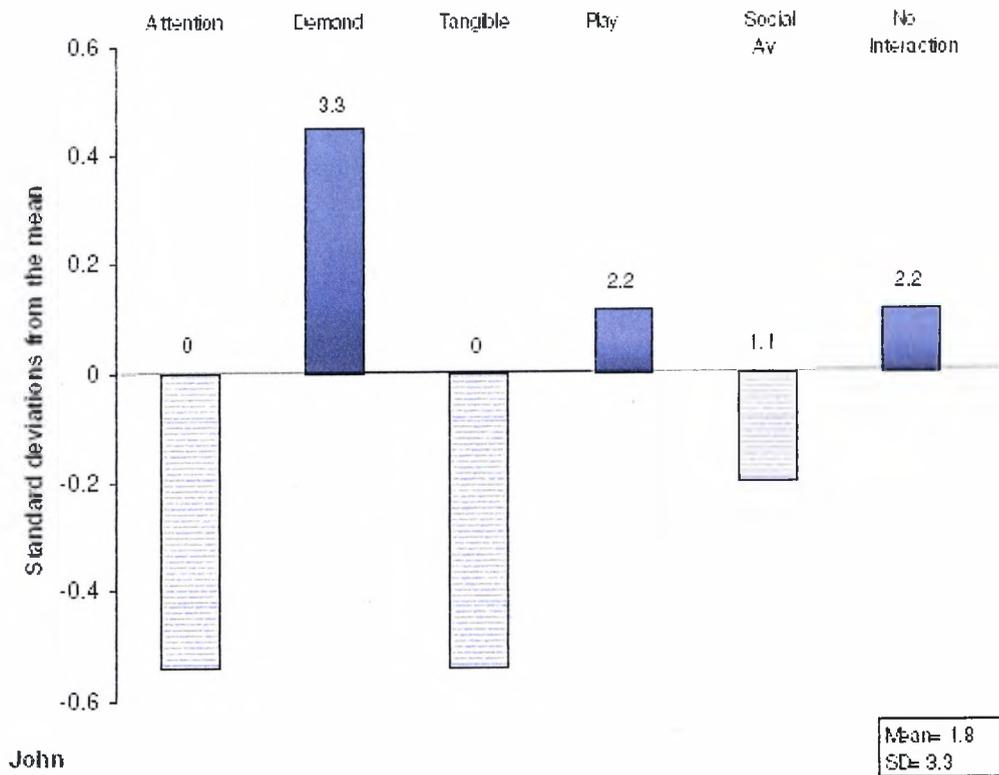
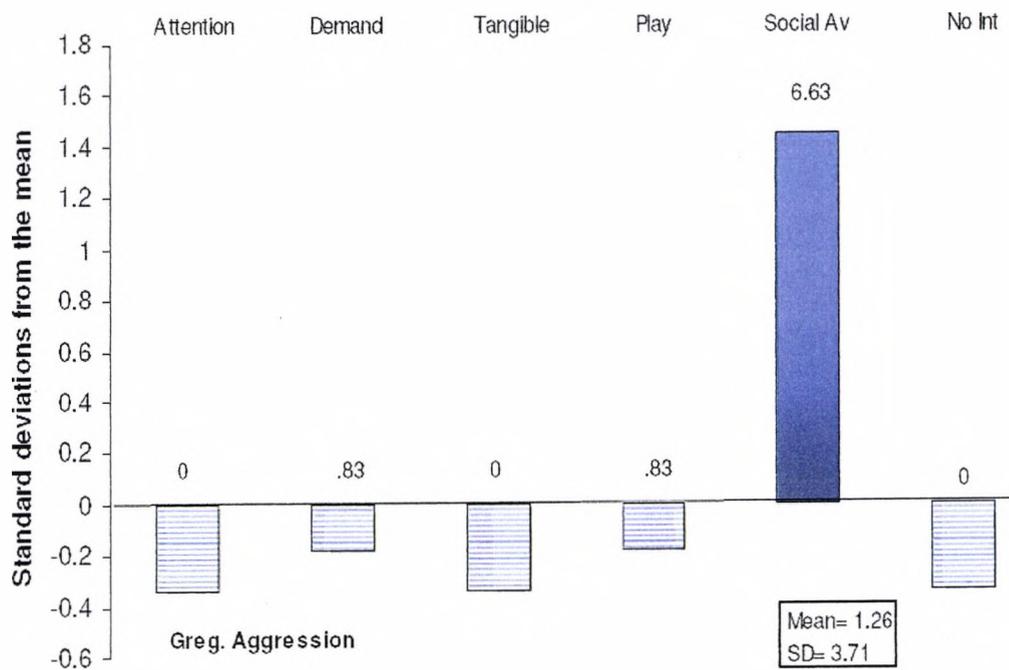


Figure 5.23. Greg. No. of standard deviations each condition mean was from the overall mean for aggression.



Figures 5.19-5.23 present summary data for those participants (Jacob, Luke, Theo, John, and Greg) who displayed at least one topography of challenging behaviour that appeared to be negatively reinforced by the removal of aversive stimuli, such as attention or demands.

For Jacob, as shown in Figure 5.19, the mean occurrence of challenging behaviour in the demand condition was 13.9, which was 1.34 standard deviations above the overall mean of 3.09. For Luke, as shown in Figure 5.20, the mean occurrence of challenging behaviour in the demand condition was 27.2, which was .7 standard deviations above the overall mean of 15.2. Figure 5.21 shows that the mean occurrence of challenging behaviour in the demand condition for Theo was 24.66, which was 1.26 standard deviations above the overall mean of 6.39. Figure 5.22 shows that the mean occurrence of challenging behaviour in the demand condition for John was 3.3, which was .45 standard deviations above the overall mean of 1.8. Finally for Greg, as shown in Figure 5.23, the mean occurrence of aggression in the social avoidance condition was 6.63, which was 1.45 standard deviations above the overall mean of 1.26. Overall this supports the interpretation that challenging behaviour displayed by Jacob, Luke, Theo, John and Greg were at least in part negatively reinforced by the removal of either attention or demands.

No participant with fragile X syndrome displayed any challenging behaviours that were maintained by social attention. Figures 5.18-5.23 show that for all those participants with a socially-influenced response class of challenging behaviour, the mean occurrence of challenging behaviours in the attention condition fell beneath the overall mean occurrence of challenging behaviour across conditions.

In sum, analysis of within-group variation for participants with FXS suggested three patterns of results. First a relatively high proportion of participants (4/8) displayed at least one response class of challenging behaviour that appeared to be tangible-maintained. Second, a relatively high proportion of participants (5/8) displayed at least one response

class of challenging behaviour that appeared to be negatively-reinforced by the removal of demands or social attention. Finally no participants with FXS displayed challenging behaviours that were found to be positively reinforced by the provision of social attention. Indeed for all participants the mean attention condition scores for all socially influenced response classes of challenging behaviour fell below the overall mean.

Participants with SMS. Individual Functional Analyses

A total of six individuals with a diagnosis of SMS took part in study two. All participants' parents had taken part in study one, aside from Shelley who happened to attend the same school as another participant in the study. Table 5.10 provides some basic demographic information for each participant.

Table 5.10

Characteristics of Participants with SMS.

Participant	Age*	Total ABC	Age equivalent (Vineland Sub-domains)		
			Communication	Daily Living	Socialization
Sean	7yrs 9mths	68	1yr 11mths	3yrs 3mths	4yrs 8mths
Matt	9yrs 11mths	60	6yrs 8mths	3yrs 3mths	5yrs 5mths
Angus	11yrs 9mths	48	5yrs 1mth	4yrs 9mths	5yrs 5mths
Patrick	11 yrs 6mths	68	7yrs 8mths	4 yrs 2mths	4yrs 10mths
Shelley**	9yrs				
Katie***	11 yrs 7mths		6yrs 0mths	4yrs 6mths	5yrs 5mths

*Age at beginning of study two

**Due to time constraints Shelley's mother opted not to take part in study one.

***Data missing for Total ABC

Categorical data for five of the six children with SMS (excluding Shelley) were compared against the remainder of the SMS group from study one across all QABF

subscales for each behavioural topography to ensure that the sub-group were representative of other participants with SMS included in the previous study. Using a significance level of $p = .05$, a series of chi-square analyses revealed no significant differences between the participants for any scale except the automatic subscale for self-injurious behaviour (with the subset of children taking part in study two being more likely to display automatically reinforced behaviour). Given that the primary emphasis of study two was on socially-mediated forms of reinforcement the participants with SMS taking part in study two were deemed to be sufficiently representative of the underlying group.

Sean.

Sean was a young boy aged seven years old with a diagnosis of SMS. Sean was non-verbal but was able to communicate using makaton signing. Sean attended a school for children with moderate learning disabilities and lived in the family home. The QABF was completed as part of study one by Sean's mum, and this indicated that self injurious behaviours appeared to be maintained by access to tangible-items and attention, aggressive behaviours appeared to be multiply socially controlled (tangible-, attention-, and escape-maintained). The total subscale scores for Sean are presented in Table 5.11.

Target behaviours included self-injury (finger and hand biting, head banging and head hitting), aggression (hitting and pushing), property destruction (kicking and hitting objects with an open palm, ripping, pulling at furnishings and throwing objects), non-compliance (dropping to the floor or turning away from researcher whilst refusing to go to work area) and crying (vocalisation with hands covering eyes). Target behaviours were collapsed into self-biting and other challenging behaviours. Inter-rater reliability was calculated for 44.4% of experimental sessions. Using the more stringent measure of reliability (R-Occ) the reliability for self-biting was 83.3% and for other challenging behaviours was 85.1%.

Table 5.11

Sean. Total Subscale Scores from QABF Subscales.

	Self-injurious behaviour	Aggression	Property Destruction
<i>Sean.</i>			
Attention	9	10	N/A
Tangible	10	14	N/A
Demand	4	15	N/A
Physical discomfort	2	11	N/A
Automatic	1	4	N/A

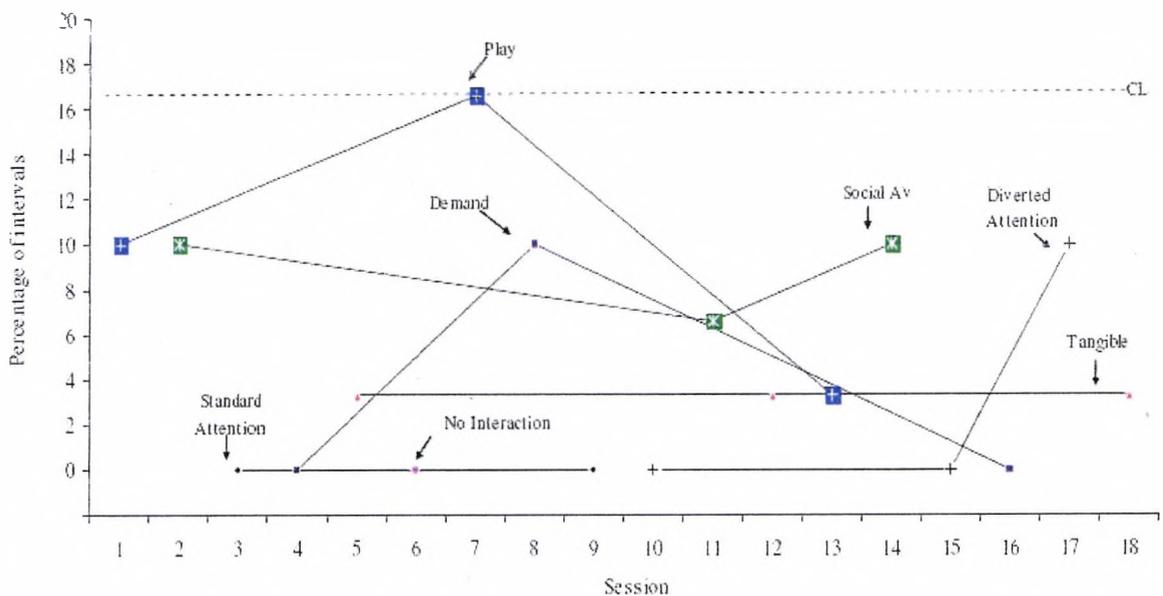
The functional analysis was conducted in a separate part of the family home that had been specifically designed for Sean. Following discussion with Sean's mother the standard attention condition was replaced with a diverted attention condition in which the lead researcher spoke continuously with the research assistant and provided attention to Sean contingent on challenging behaviour (cf., O'Reilly, Lancioni, King, Lally, & Dhomhnaill, 2000). Following initial observations by the research team the demand condition involved a matching-to-sample task that involved matching numbers and a spinning top toy was withheld in the tangible condition of the functional analysis. Due to practical difficulties (Sean would lock himself in the bathroom, where he could not be observed) only a single session of the no interaction condition was run.

Over the course of the functional analysis the severity of Sean's challenging behaviour increased notably and it became extremely difficult to keep Sean in the room for a whole session of the functional analysis (only two sessions could be completed in the final visit). Due to the practical difficulties this posed it was decided that the functional analysis should be terminated earlier than would otherwise have been the case.

Results of the functional analysis suggested that challenging behaviour formed two separate response classes. Results of the functional analysis for each response class are therefore presented separately.

Figure 5.24 shows session by session data for the occurrence of finger-biting. There were high levels of self-biting in the play (M = 10; range = 3.3 – 16.6) and social avoidance (M = 8.9; range = 6.6 - 10) conditions of the functional analysis. There were also slightly elevated rates of this response in the tangible (M = 3.3; range = 3.3) condition and in a single demand (M = 3.3; range = 0 - 10) and single diverted attention condition (M = 3.3; range = 0 – 10) condition. There were no occurrences of self-biting in the no interaction condition or standard attention condition.

Figure 5.24. Sean. Percentage of intervals with self biting during functional analysis.



Due to the high level of challenging behaviour occurring in the play condition there was no differentiation between experimental conditions (Hagopian et al., 1997). This suggested that further analysis was merited in order to explore a potential automatically reinforced function.

Due to the unclear pattern of responding for self-biting an analysis of within-session data was conducted to test the hypothesis that self-biting was occasioned by the presence of specific stimuli. It appeared that Sean displayed self-biting more frequently in sessions in which he interacted with certain preferred toys that shared similar characteristics (i.e., produced movement and sound), such as a spinning toy, balloons and a Mr Face™ toy. The percentage of 10s intervals in which Sean interacted with these stimuli is shown in Figure 5.25, along with the percentage of intervals in which self-biting occurred. Self-biting appears to have been more likely to occur in sessions in which Sean had access and interacted with these toys than in sessions in which there was no toy interaction.

Figure 5.25. Sean. Percentage of intervals with toy interaction and finger biting across all conditions.

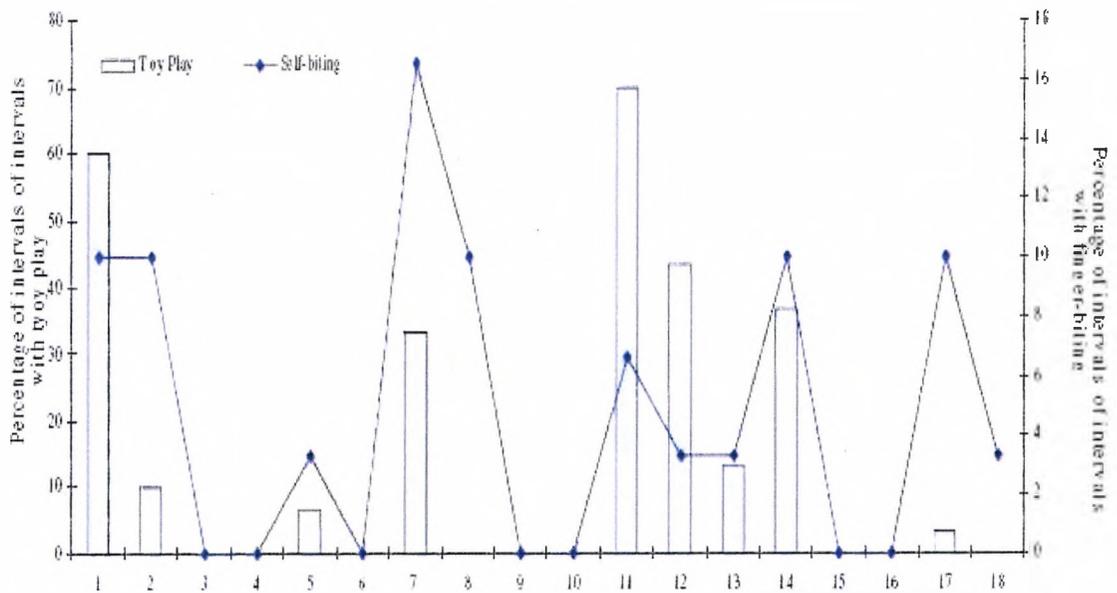


Figure 5.26. Sean. Percentage of intervals with other challenging behaviours during functional analysis.

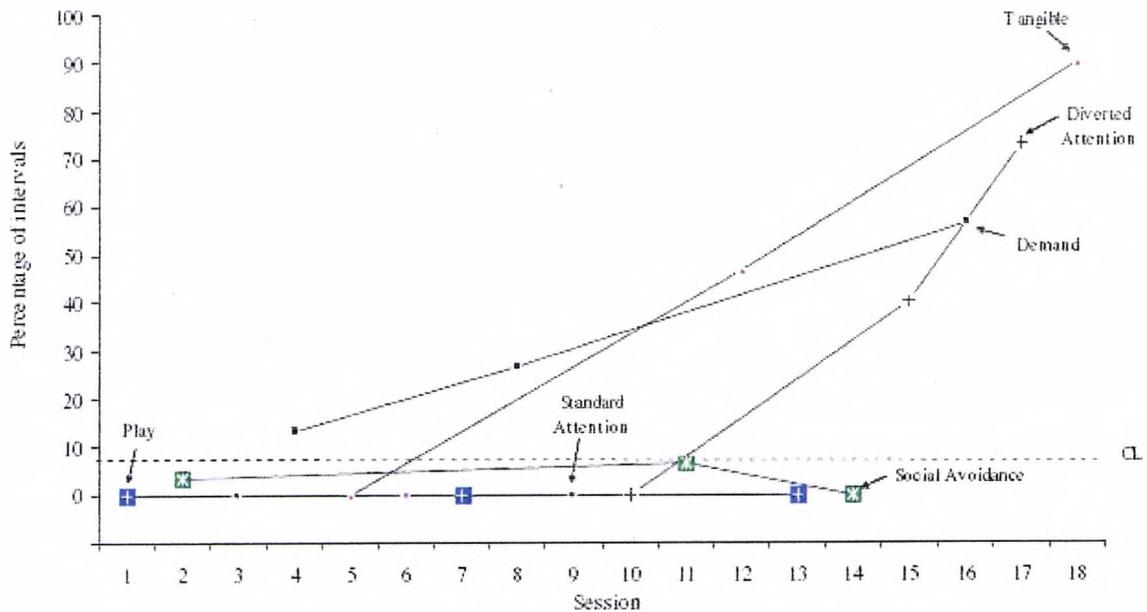


Figure 5.26 shows session by session data for the occurrence of all other topographies of challenging behaviour, excluding self-biting, displayed by Sean. There were heightened levels of challenging behaviour in the tangible ($M = 45.5$; range = 0 - 90), demand ($M = 32.2$; range = 0 - 56.6) and diverted attention ($M = 37.6$; range = 0 - 73.3) conditions of the functional analysis. There were low levels of challenging behaviour in the social avoidance ($M = 3.3$; range = 0 - 6.6) condition and zero rates in the play, no interaction and standard attention conditions of the functional analysis.

As at least 50% of scores for the each of the diverted attention, tangible and demand condition lay above the CL the data met the criteria for multiply-socially controlled challenging behaviour³².

In sum, data for Sean suggested that self-biting was automatically reinforced and appeared to be especially likely to be occasioned by the presence as opposed to absence of particular stimuli, a pattern of responding that corresponds to that reported in other studies

³² "In cases in which more than one condition meets criteria for differentiation, score the analysis as multiply maintained." See Hagopian et al (1997, p. 325).

(Friman, 2000; Van Camp et al., 2000). Other topographies of challenging behaviour appeared to form an alternative response class and were multiply socially controlled, occurring at differentially high levels in demand, attention and tangible conditions of the functional analysis. It is interesting to note that there were notable increases in the frequency, episodic severity (cf., LaVigna & Willis, 2005) and number of topographies of Sean's challenging behaviour as the functional analysis progressed. In addition, Sean would display challenging behaviours when these same conditions were being prepared but before the programmed antecedents were delivered. For example, when academic materials were pulled out of a bag, or certain toys were cleared away. It may have been that the preparation for certain conditions functioned as a reflexive CEO (or warning stimulus) whose onset established its own offset as an effective type of reinforcement (see Carr, Newsom, & Binkoff, 1980) and thereby evoked challenging behaviour.

Matt.

Matt was a boy aged nine years old with a diagnosis of SMS. Matt had good receptive and expressive communication skills, and was generally able to make his needs known. Matt attended a school for children with moderate learning disabilities and lived in the family home. The QABF was completed as part of study one by Matt's mum, and this indicated that challenging behaviours appeared to be multiply socially controlled (attention-, tangible-, and escape-maintained). Matt's challenging behaviours were also reported to be influenced by his sleep cycle and he scored highly on the physical discomfort related-subscale of the QABF. The total subscale scores for Matt are presented in Table 5.12.

Target behaviours included self-injury (banging body against objects), aggression (biting, hitting, spitting, kicking, scratching, pinching, head butting, pushing), property destruction (hitting objects with open palm, throwing large objects, ripping work materials, jumping), and non-compliance (crawling underneath table). Target behaviours were

collapsed into object banging and other challenging behaviours. Inter-rater reliability was calculated for 48% of experimental sessions. Using the more stringent measure of reliability (R-Occ) the reliability for object banging was 75.9% and for other challenging behaviours was 87.5%.

Table 5.12

Matt. Total Subscale Scores from QABF Subscales.

	Self-injurious behaviour	Aggression	Property Destruction
Matt			
Attention	12	12	12
Tangible	9	9	9
Demand	10	10	10
Physical discomfort	15	15	15
Automatic	6	0	2

The functional analysis was conducted at school in a small room, which was used as Matt's classroom. The room was attached to a padded time-out room which remained locked throughout the majority of experimental sessions.

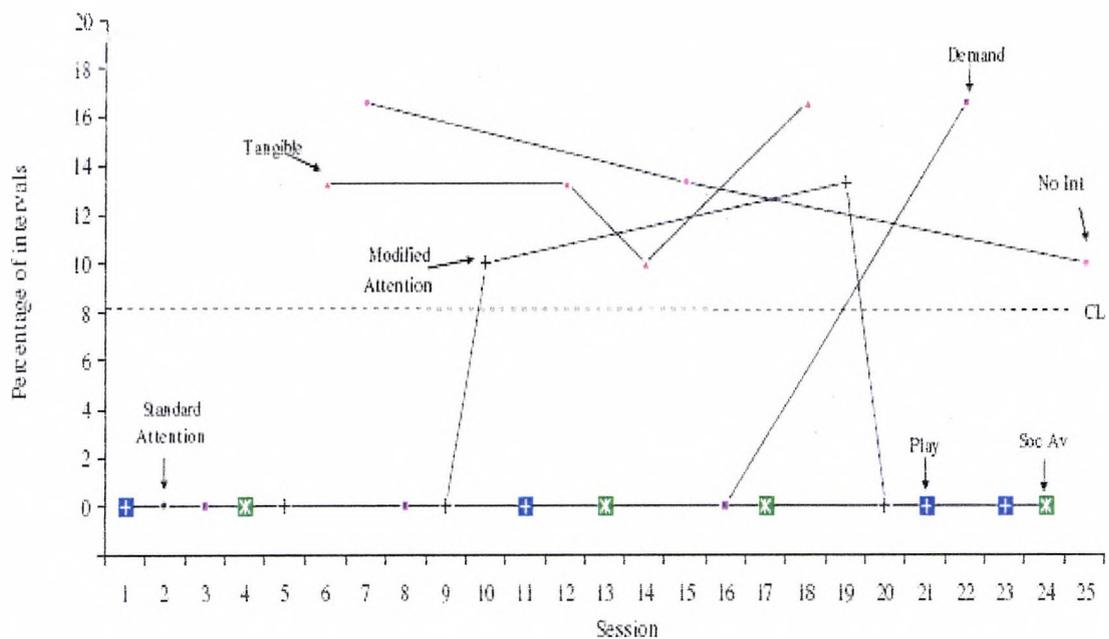
Following discussion with Matt's teaching assistant the standard attention condition was replaced with a modified attention condition in which the lead researcher asked Matt to do 'some work', whilst taking on the appearance of reading a paper. Matt was free to leave the work station at any point and no additional demands were given during the session. Attention was provided contingent on challenging behaviour whilst all other behaviours were ignored. Similar modified attention conditions have been used in other functional analysis studies (cf., Call et al., 2005) and it was felt that this arrangement better reflected the contingencies that governed Matt's behaviour in the natural environment. The

demand condition used a series of arithmetic worksheets prepared by Matt's teacher. The tangible condition involved withholding access to balloons or a spinning top toy. All other conditions were run in accordance with the study protocol.

Results of the functional analysis suggested that challenging behaviour formed two separate response classes. Results of the functional analysis for each response class are therefore presented separately.

Figure 5.27 shows session by session data for the occurrence of object banging. There were high levels of object banging in all tangible (M = 13.3; range = 10 – 16.6) and no interaction (M = 13.3; range = 10 - 16.6) conditions of the functional analysis. There were also slightly elevated rates of this response in two of the modified attention conditions (M = 4.7; range = 0 - 13.3) and in a single demand condition (M = 4.2; range = 0 – 16.6). There were no occurrences of object-banging in the play, social avoidance condition or standard attention condition.

Figure 5.27. Matt. Percentage of intervals with object banging behaviours during functional analysis.



The Hagopian et al (1997) criteria for the analysis of multiply-controlled challenging behaviour was used to analyse the data³³. As at least 50% of scores for the tangible and no interaction conditions lay above the CL, the data met the criteria for multiply controlled challenging behaviour (tangible- and automatically reinforced).

Figure 5.28. Matt. Percentage of intervals with other challenging behaviours during functional analysis

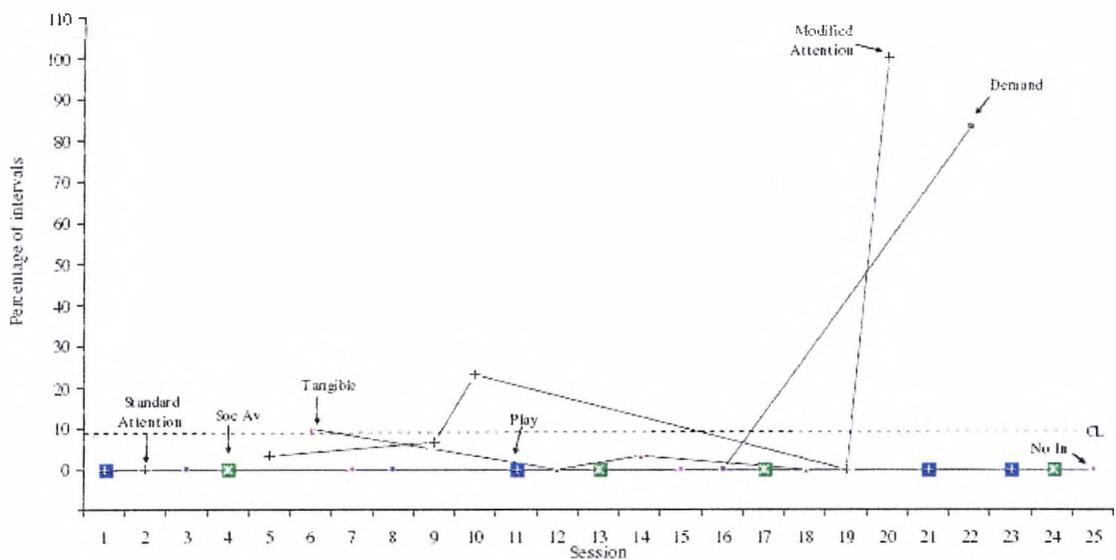


Figure 5.28 shows session by session data for the occurrence of all other challenging behaviours displayed by Matt. There were consistently elevated levels of challenging behaviour in all but one modified attention conditions ($M = 33.3$; range = 0 - 100). There were also slightly elevated rates of challenging behaviour occurring in two of the four tangible conditions ($M = 3.3$; range = 0 - 10) and a single demand condition ($M = 20.8$; range = 0 - 83.3). There were no occurrences of other challenging behaviours in the play, no interaction, social avoidance, or standard attention condition of the functional analysis. As with Sean, there were notable increases in the frequency, episodic severity and

³³ "In cases in which more than one condition meets criteria for differentiation, score the analysis as multiply maintained... If there are two differentiated conditions and the alone is the lower of the two, score it as both automatic and the other condition." (see Hagopian et al., 1997, p. 325).

number of topographies of Matt's challenging behaviour as the functional analysis progressed. As most of the data points were low with a small number of high data points the rules for low rate behaviours were followed³⁴. As most of the high data points occurred in the modified attention condition, this was considered to be differentiated.

In sum, data for Matt suggested that object banging may have been multiply controlled by both its automatic consequences and social influences (i.e., access to tangibles). Other challenging behaviours displayed by Matt were primarily maintained by access to social contact and were specifically evoked at times in which he was asked to independently complete academic work. It may be that the presence of the demand established the reinforcing value of attention by functioning as a transitive conditioned establishing operation (CEO-T). As a parallel to the slotted screw example provided by Michael (1982), one could envisage that the onset of a demand that Matt couldn't independently complete (= the sight of the slotted screw), established social contact (= the screwdriver) as an effective type of reinforcement and evoked challenging behaviour that has led to attention in the past (= manding for the screwdriver). Indeed McGill (1999, p. 402) suggested that if demands were to function as a CEO-T for attention-maintained challenging behaviour then one would expect higher levels of such behaviour in the presence of demands than in the standard attention condition, a pattern of responding which corresponds to that reported above.

³⁴"In cases in which most of the data points are low, the condition in which all or most of the higher rate behavior occurs is considered to be differentiated.... However, one of those high points must occur in the last half of the assessment." (see Hagopian et al., 1997, p. 325).

For Matt, there were a total of 40 intervals in the modified attention condition in which challenging behaviour occurred, in comparison to 25 intervals in the demand condition and 4 intervals in the tangible condition.

Angus.

Angus was a boy aged ten years old with a diagnosis of SMS. Angus had good receptive and expressive communication skills. Angus attended a school for children with severe learning disabilities and lived in the family home. The QABF was completed as part of study one by Angus' mum and this indicated that challenging behaviours appeared to be multiply controlled. Angus' challenging behaviours were also reported to be influenced by his sleep cycle and he scored highly on the physical discomfort related-subscale of the QABF. The total subscale scores for Angus are presented in Table 5.13.

Table 5.13

Angus. Total Subscale Scores from QABF Subscales.

	Self-injurious behaviour	Aggression	Property Destruction
<i>Angus.</i>			
Attention	6	14	14
Tangible	9	14	10
Demand	3	14	15
Physical discomfort	15	15	15
Automatic	7	0	0

Target behaviours included aggression, property destruction, self-injury (banging head with his hand, chin-banging, teeth-banging, faux self-injury, finger-biting and object mouthing) and ear covering. There were no occurrences of property destruction or aggressive behaviours in the functional analysis. Target behaviours were collapsed into finger biting/object mouthing and other challenging behaviours. Inter-rater reliability was calculated for 32% of experimental sessions. Using the more stringent measure of

reliability (R-Occ) the reliability for finger biting/object mouthing was 88.9% and for other challenging behaviours was 81.8%.

The functional analysis was conducted in a large room at school. The demand condition involved the use of a series of arithmetic worksheets. The tangible condition involved withholding access to preferred comics. Following discussion with Angus' mother a single diverted attention condition was used in the initial visit, however due to the non-occurrence of challenging behaviour this was not used again. All conditions were run in accordance with the study protocol.

Results of the functional analysis suggested that challenging behaviour formed two separate response classes. Results of the functional analysis for each response class are therefore presented separately.

Figure 5.29. Angus. Percentage of intervals with finger biting and object mouthing during functional analysis.

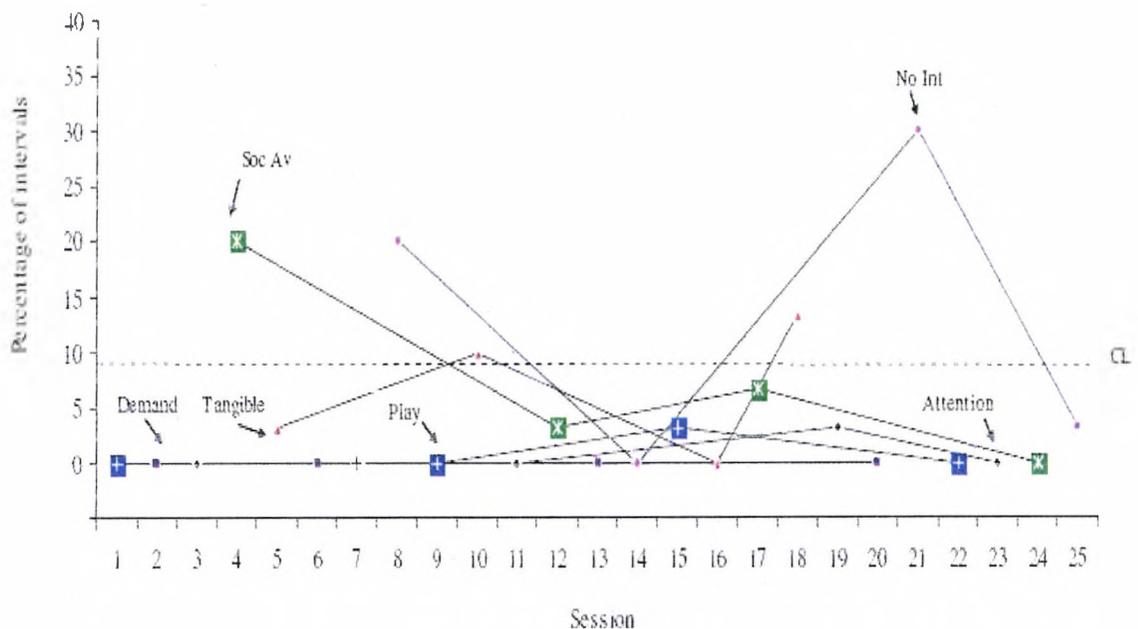


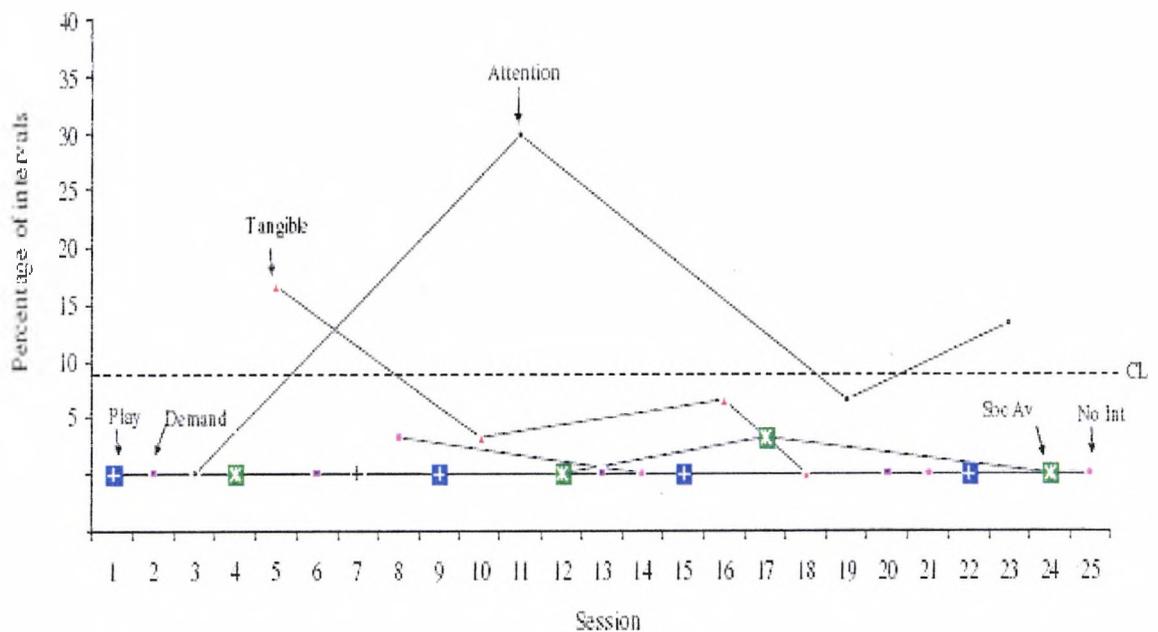
Figure 5.29 shows session by session data for the occurrence of finger biting and object mouthing. There were elevated levels of these behaviours in tangible ($M = 6.7$; range = 0 - 13.3), social avoidance ($M = 7.5$; range = 0 - 20) and no interaction conditions

($M = 13.3$; range = 0 - 30). There were low rates of these behaviours in the attention and play conditions ($M = .83$; range = 0 - 3.3) and no occurrences in the demand condition.

As 50% of scores for the no interaction condition lay above the CL the behaviour met the criteria for automatically reinforced behaviour. No other condition met these criteria.

Figure 5.30 shows session by session data for the occurrence of all other challenging behaviours displayed by Angus. There were consistently elevated levels of challenging behaviour in all but one attention conditions ($M = 12.5$; range = 0 - 30). There were also elevated rates of challenging behaviour occurring in three of the four tangible conditions ($M = 6.5$; range = 0 - 16.6). There was a single occurrence of challenging behaviour in both the no interaction and social avoidance condition ($M = .83$; range = 0 - 3.3). There were no occurrences of other challenging behaviours in the play or demand conditions.

Figure 5.30. Angus. Percentage of intervals with other challenging behaviours during functional analysis.



As 50% of scores for the attention condition lay above the CL the behaviour met the criteria for attention-maintained behaviour. No other condition met these criteria.

In sum, data for Angus suggested that finger biting and object mouthing may have been primarily automatically reinforced. Other topographies of challenging behaviour appeared to form an alternative response class and were primarily attention-maintained.

Patrick.

Patrick was a boy aged eleven years old with a diagnosis of SMS. Patrick had good receptive and expressive communication skills and could clearly make his needs known. Patrick attended an independent school for children with disabilities and lived in the family home. The QABF was completed as part of study one by Patrick's father and this indicated that both aggression and property destruction appeared to be at least in part attention-maintained. No clear function was identified for self-injurious behaviours using the QABF. The total subscale scores for Patrick are presented in Table 5.14.

Table 5.14

Patrick. Total subscale scores from QABF subscales.

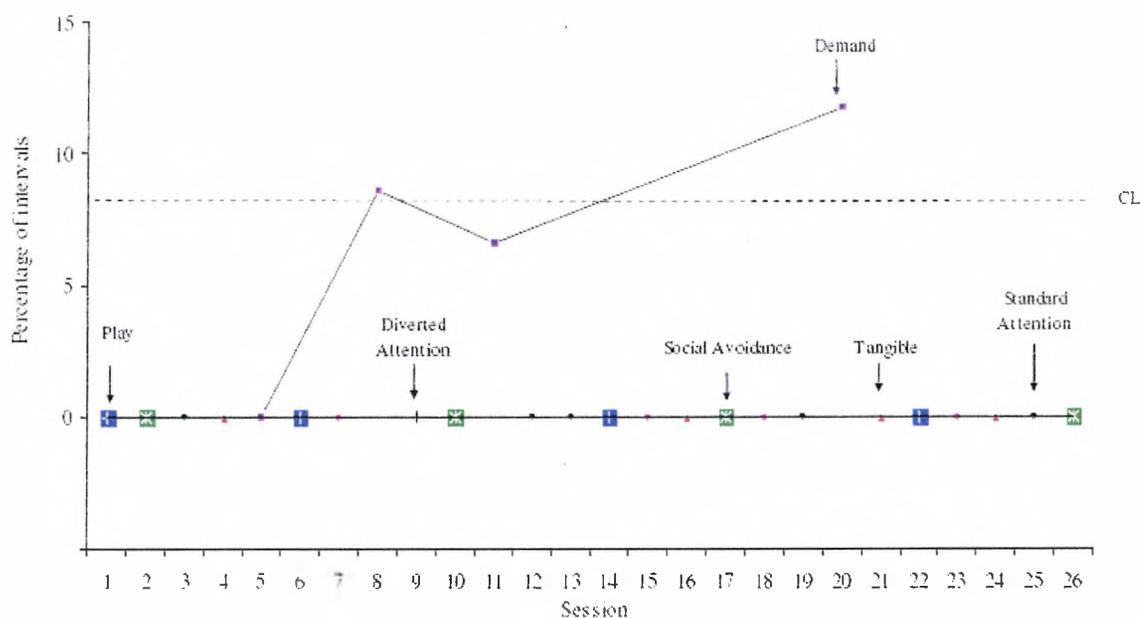
	Self-injurious behaviour	Aggression	Property Destruction
<i>Patrick.</i>			
Attention	6	12	12
Tangible	5	6	4
Demand	7	8	6
Physical discomfort	1	3	0
Automatic	8	2	10

Target behaviours included aggression (head butting, biting, pinching, scratching), self-injury (banging head on surfaces, tapping head with fingers or objects), property destruction (dismantling objects). The only behaviours to occur during the analysis were tapping of the head with fingers or objects (such as the nib of a pen); this often resulted in a red mark on the area where Patrick had been tapping. Target behaviours were collapsed and coded as a single response. Inter-rater reliability was calculated for 34.6% of experimental sessions. Using the more stringent measure of reliability (R-Occ) the reliability was 85.7%.

The functional analysis was conducted in a relatively large room at school. The demand condition involved the use of a series of arithmetic worksheets selected by Patrick's teacher. To better reflect academic tasks in Patrick's natural classroom context, session lengths varied in the demand condition, lasting anywhere between 5-10mins, and continued until the worksheet was finished. The tangible condition involved withholding access to preferred balloons. Following discussion with Patrick's father a single diverted attention condition was used in the initial visit, however due to the non-occurrence of challenging behaviour this was not used again. All other conditions were run in accordance with the study protocol.

Figure 5.31 shows the results of the functional analysis for Patrick. There were elevated rates of challenging behaviour solely in the demand condition of the functional analysis ($M = 6.7$; range = 0 - 11.7). There were zero occurrences of challenging behaviour in any other condition of the functional analysis.

Figure 5.31. Patrick. Percentage of intervals with challenging behaviours during functional analysis.



As 50% of scores for the demand condition lay above the CL the behaviour met the criteria for escape-maintained behaviour. No other condition met the criteria for differentiation.

In sum, head tapping appeared to be primarily escape-maintained. It is unclear as to why other target behaviours, such as aggression, were not observed during the functional analysis. These occurred at relatively high levels outside of the confines of the experimental analysis. It is possible that the behaviour was in part governed by verbal rules making Patrick insensitive to the contingencies of the functional analysis. Patrick would, for example, frequently tact that he was being a 'good boy' throughout the session.

Shelley.

Shelley was a nine year old girl with a diagnosis of Smith-Magenis syndrome. Shelley had a hearing impairment and though non-verbal was fluent in British Sign Language (BSL). Shelley attended an independent school for children with disabilities and

lived in the family home. No QABF data was available for Shelley as her mother opted not to take part in study one.

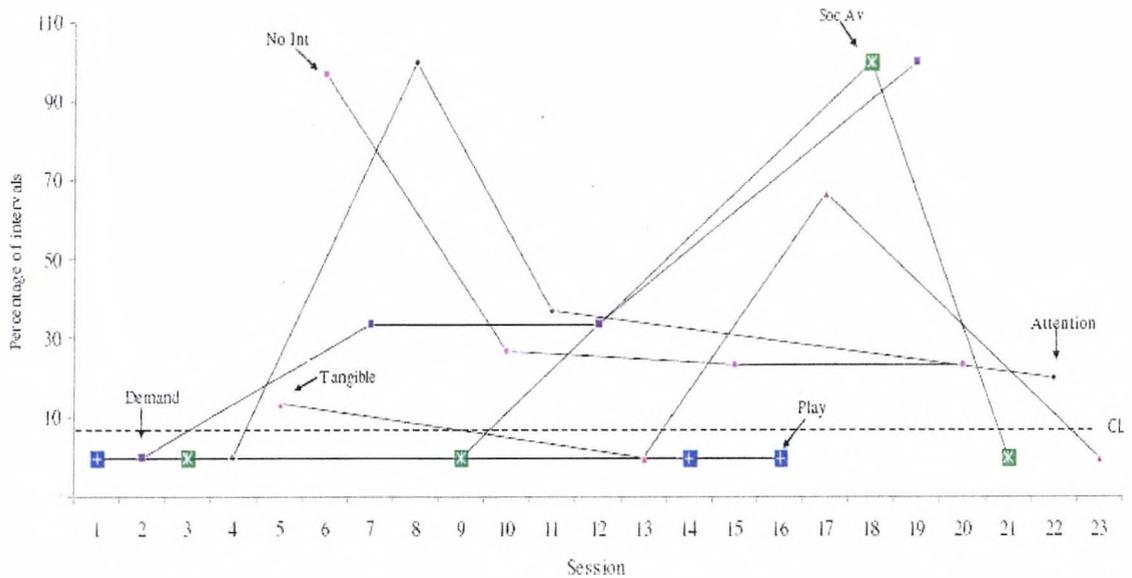
Target behaviours included aggression (lashing out with arm or elbow in proximity of the therapist), self-injury (banging head on surfaces, banging fists/legs against surfaces), property destruction (dismantling hearing aid) and non-compliance (lying on floor, sitting on arms). Shelley also inserted objects into bodily orifices; however, due to concerns regarding the potential risks of including this behaviour in the functional analysis, all such behaviours were ignored or if necessary blocked during the functional analysis. Target behaviours were collapsed and coded as either lying on the floor or other challenging behaviours. Inter-rater reliability was calculated for 34.7% of experimental sessions. Using the more stringent measure of reliability (R-Occ) the reliability for lying on the floor was 95.5% and for other challenging behaviours was 80.9%.

The functional analysis was conducted in a large room at school. The demand condition involved the use of a series of worksheets prepared by Shelley's teacher. The tangible condition involved withholding access to a spinning top toy. All conditions were run in accordance with the study protocol.

Results of the functional analysis suggested that challenging behaviour formed two separate response classes. Results of the functional analysis for each response class are therefore presented separately.

Figure 5.32 shows session by session data for the occurrence of lying on the floor. There were elevated levels of these behaviours in the no interaction condition ($M = 42.5$; range = 23.3 – 96.7), demand condition ($M = 41.7$; range = 0 - 100), attention condition ($M = 39.2$; range = 0 - 100) and two sessions of the tangible condition ($M = 20$, range = 0 - 66.7). There were zero rates of dropping in all but one social avoidance condition ($M = 25$, range = 0 - 100) and in all play conditions.

Figure 5.32. Shelley. Percentage of intervals with lying on floor during functional analysis.

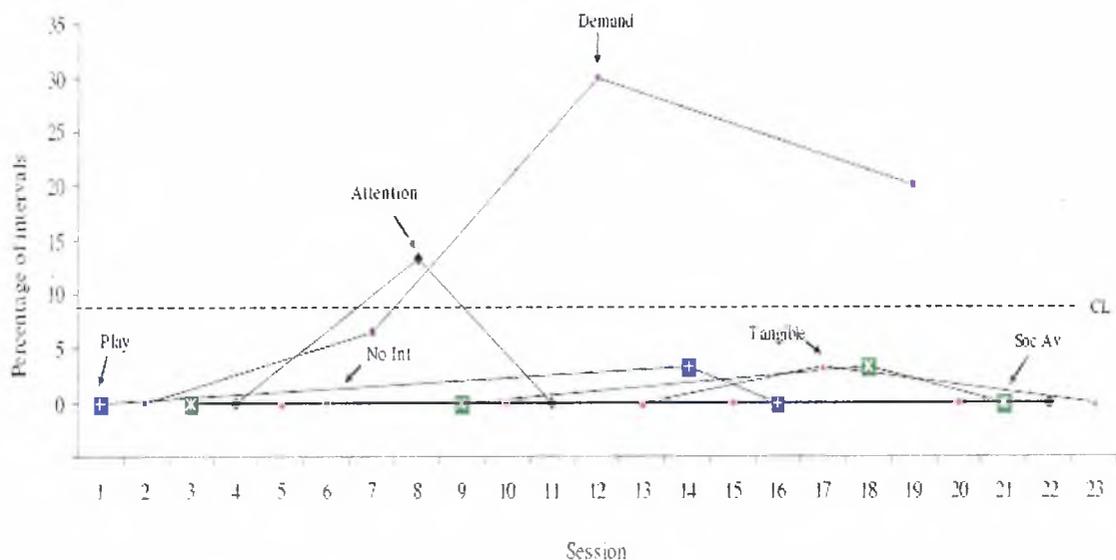


As multiple conditions met criteria for differentiation the Hagopian et al rules for multiple maintaining variables were adopted³⁵. As the highest rate of responding occurred in the no interaction condition lying on the floor met the criteria for automatically reinforced behaviour. It should be noted, however, that the no interaction condition shares the same antecedents as the attention condition and that high levels of lying on the floor may have been an artefact of this experimental arrangement. As such, whilst lying on the floor met criteria for automatically reinforced behaviour it is difficult to completely rule out a multiply socially controlled hypothesis.

Figure 5.33 shows session by session data for the occurrence of other challenging behaviours. There were consistently elevated levels of these behaviours in the demand condition (M = 14.2; range = 0 – 30). There were elevated levels of other challenging behaviours in a single attention condition (M = 3.3; range = 0 - 13.3). There were zero levels of challenging behaviour in all other experimental conditions.

³⁵ “In cases in which more than one condition meets criteria for differentiation, score the analysis as multiply maintained (unless the highest is alone; then score it *only* as automatic).” Hagopian et al (1997, p. 325).

Figure 5.33. Shelley. Percentage of intervals with other challenging behaviours during functional analysis



As 50% of data points in the demand condition fell above the CL this condition met the criteria for escape-maintained behaviour.

In sum, data for Shelley suggested that challenging behaviours formed two separate response classes. Lying on the floor met the criteria for automatically reinforced behaviour (although a multiply socially controlled account could not be completely ruled out). Other challenging behaviours appeared to be escape-maintained. As with both Matt and Sean there was a notable increase in the episodic severity of challenging behaviours as the functional analysis progressed.

Katie.

Katie was an eleven year old girl with a diagnosis of Smith-Magenis syndrome. Katie had good expressive and receptive communication skills and could clearly make her needs known verbally. Katie attended an independent school for children with disabilities and lived in the family home. The QABF was conducted with Katie’s classroom teacher as part of study one. The results of the QABF suggested that both aggression and property

destruction were primarily escape maintained. The total subscale scores for Katie are presented in Table 5.15.

Table 5.15

Katie. Total Subscale Scores from QABF Subscales.

	Self-injurious behaviour	Aggression	Property Destruction
<i>Katie.</i>			
Attention	N/A	7	9
Tangible	N/A	4	4
Demand	N/A	9	11
Physical discomfort	N/A	2	2
Automatic	N/A	7	8

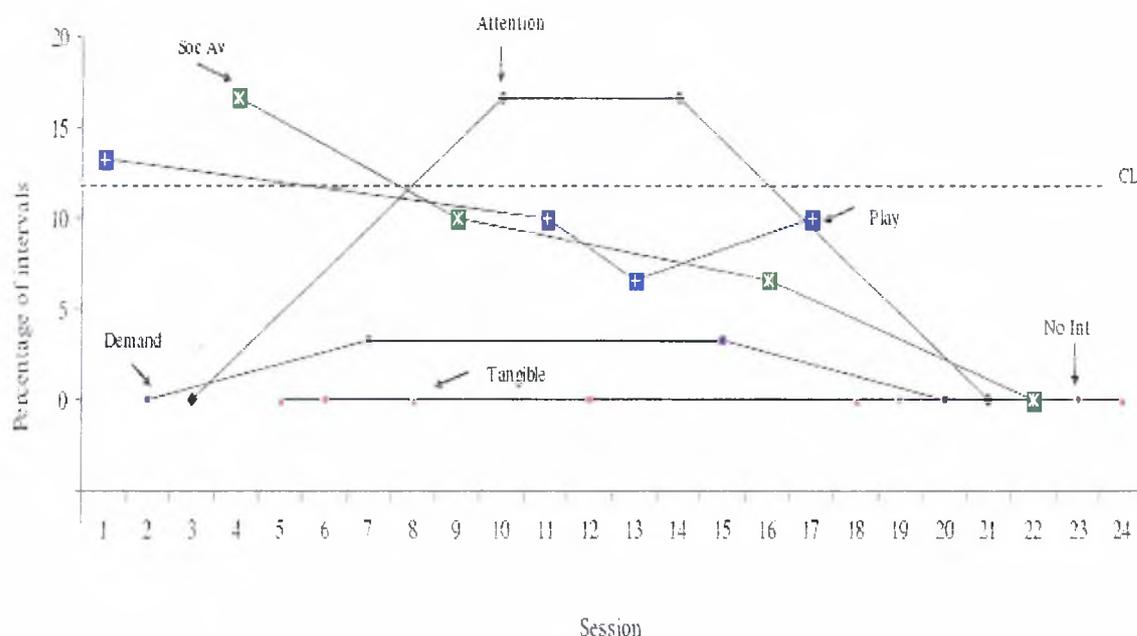
Target behaviours included self-injury (self-slapping, repetitive banging of face with objects), property destruction (breaking pens), aggression (nipping, kicking, hair pulling). Katie also displayed a number of stereotypical behaviours, such as the spasmodic upper body squeeze reported as being characteristic of Smith-Magenis syndrome (Finucane, Konar, Haasgivler, Kurtz, & Scott, 1994). As such stereotypical behaviours (spasmodic upper body squeeze, lifting both hands to the side of face and extending fingers) were also included as target behaviours in the functional analysis. There were no occurrences of aggressive behaviours or property destruction in the functional analysis and it was reported by Katie's teacher that these behaviours were typically only directed at other children. Target behaviours were collapsed and coded as either stereotypical behaviour or self-injurious behaviours. Inter-rater reliability was calculated for 33.3% of experimental sessions. Using the more stringent measure of reliability (R-Occ) the reliability for stereotypical behaviours was 95% and for self-injurious behaviours was 100%.

The functional analysis was conducted in a large room at school. The demand condition involved the use of a series of worksheets prepared by Katie's teacher. The tangible condition involved withholding access to preferred comics. All conditions were run in accordance with the study protocol.

Results of the functional analysis suggested that challenging behaviour formed two separate response classes. Results of the functional analysis for each response class are therefore presented separately.

Figure 5.34 shows the results of the functional analysis for stereotypical behaviours. There were notably elevated levels of stereotypical behaviour occurring in the play (M= 9.9; range = 6.6 - 13.3), social avoidance (M = 8.3; range = 0 - 16.6) and attention (M = 8.3; range = 0 - 16.6) conditions of the functional analysis. There were low levels of stereotypical behaviour in two sessions of the demand condition (M = 1.7; range = 0 - 3.3) and zero rates of the behaviour in tangible and no interaction conditions of the functional analysis.

Figure 5.34. Katie. Percentage of intervals with stereotypical behaviours during functional analysis.



The behaviour met criteria for attention-maintained behaviour with 50% of data points in the attention condition falling above the CL. Some caution needs to be taken with this interpretation, however. The high levels of stereotypical behaviour occurring in the play condition led to the CL being set unusually high. Anecdotally the response appeared to occur during conversation and at times when the therapist commented on Katie's play. The response occurred at higher levels in the social avoidance, play and attention conditions, which all involved some commentary on Katie's play. The behaviour occurred at near zero levels in those conditions in which this source of stimulation was absent. Other studies have shown that the onset of social interaction in the play condition can evoke stereotypical behaviours by acting as an EO for automatically reinforced behaviours (Van Camp et al., 2000). The clear downward trend in the social avoidance condition would suggest that the response did not occur to escape from social attention lending support to this hypothesis.

Figure 5.35. Katie. Percentage of intervals with self-injurious behaviours during functional analysis.

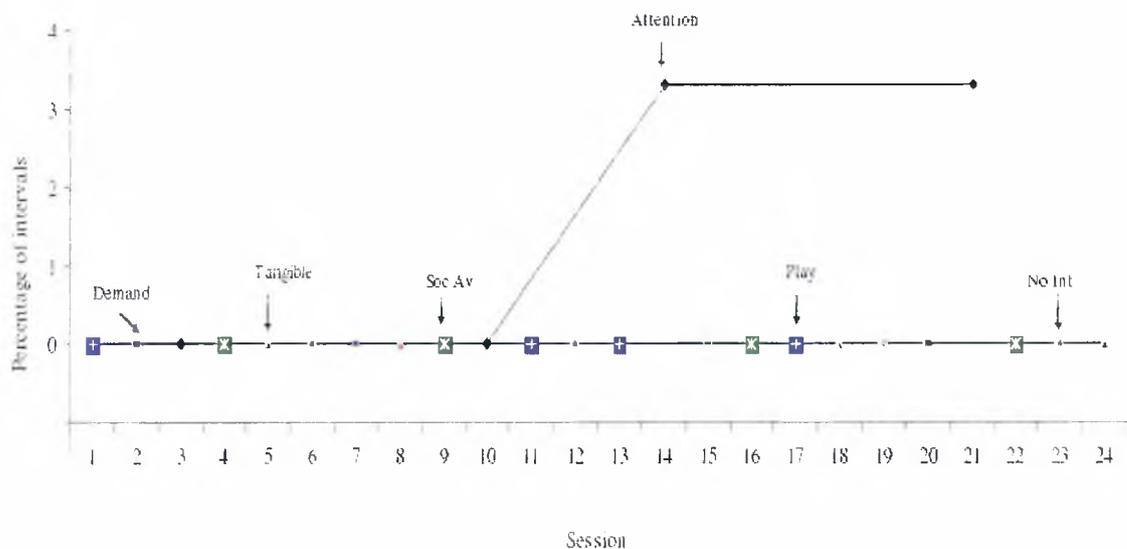


Figure 5.35 shows the results of the functional analysis for self-injurious behaviours. Self-injurious behaviours occurred in two of the four attention conditions ($M = 1.65$; range = 0 - 3.3). There were zero rates of the behaviour in all other conditions.

Due to the low rate of self-injurious behaviours, a CL could not be established and the Hagopian et al rules for the analysis of low-rate behaviours were utilised³⁶.

Accordingly self-injurious behaviour met the criteria for attention-maintained behaviour.

In sum, Katie was found to display attention-maintained self-injurious behaviour. Findings for stereotypical behaviours were relatively unclear. Whilst stereotypical behaviours met the criteria for attention-maintained behaviour, this may have been an artefact of relying on the Hagopian et al criteria for differentiation (which assumes the play condition acts as a control). There were consistently high levels of the same behaviours occurring in the play condition and social avoidance condition and further analysis is required to test the hypothesis that social interaction may have acted as an EO for the automatic consequences that may maintain this response.

Participants with SMS. Within-Group Analysis

Figures 5.36-5.42 provide summary data for each participant in the SMS group. The numerical data in each figure indicates the overall mean percentage of intervals of challenging behaviour and the overall standard deviation. The data for each experimental condition is also presented graphically to present the number of standard deviations each condition mean is from the overall mean (i.e., the Z score for each experimental condition).

In what follows, particular emphasis is given to the analysis of those topographies of challenging behaviour that appear to be socially maintained. All topographies that

³⁶ "In cases in which most of the data points are low, the condition in which all or most of the higher rate behavior occurs is considered to be differentiated.... However, one of those high points must occur in the last half of the assessment." (see Hagopian et al., 1997, p. 325).

For Katie, there were a total of 2 intervals in the attention condition in which self-injurious behaviours occurred. No challenging behaviours occurred in any other condition.

appeared to be automatically reinforced were excluded from the current analysis. Stereotypical behaviours displayed by Katie, which met criteria for attention-maintained behaviour, were also excluded from this analysis due to the failure to rule out the competing hypothesis that the behaviours were automatically reinforced. A number of apparent patterns in the data are discussed.

Figures 5.36-5.39 present summary data for four participants with SMS for whom one response class of challenging behaviour was, at least in part, positively reinforced by the contingent provision of social attention. Figures 5.40-5.42 present summary data for the three participants with SMS who displayed at least one response class of challenging behaviour that appeared to be either negatively reinforced by the removal of academic demands or positively reinforced by access to tangibles.

Figure 5.36. Sean. No. of standard deviations each condition mean was from the overall mean for other challenging behaviours.

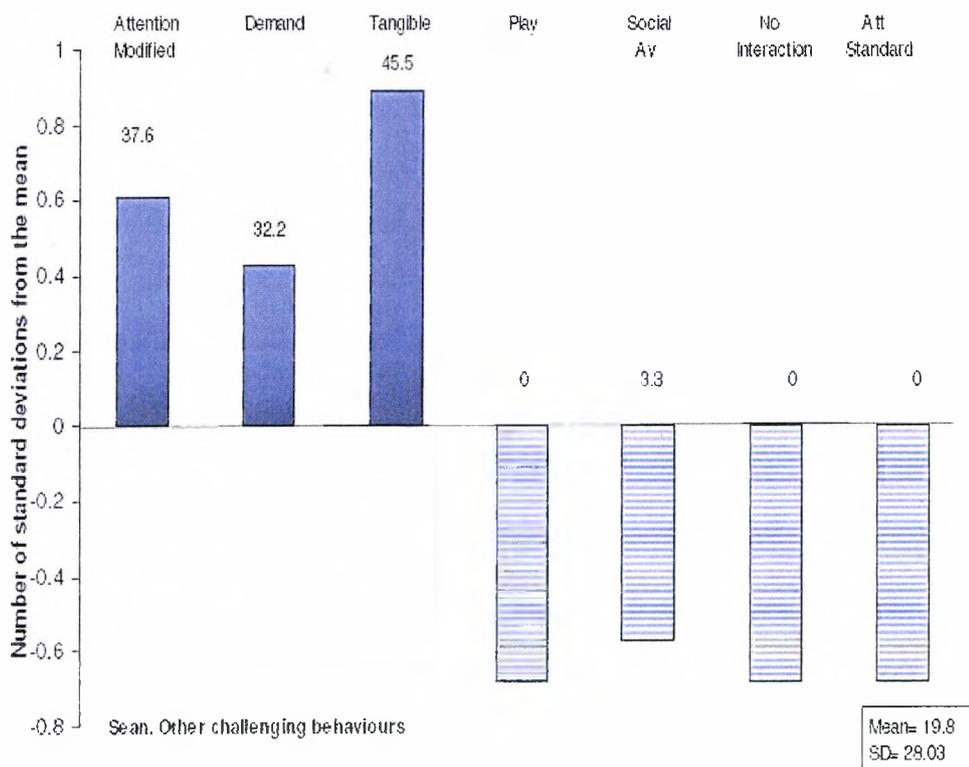


Figure 5.37. Matt. No. of standard deviations each condition mean was from the overall mean for other challenging behaviours.

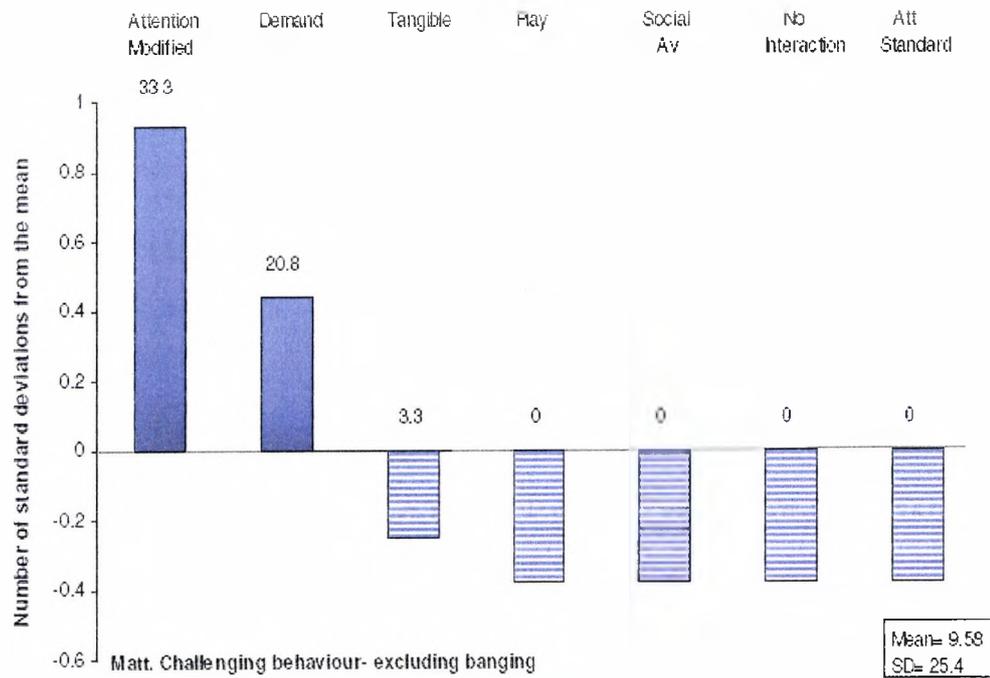


Figure 5.38. Angus. No. of standard deviations each condition mean was from the overall mean for other challenging behaviours.

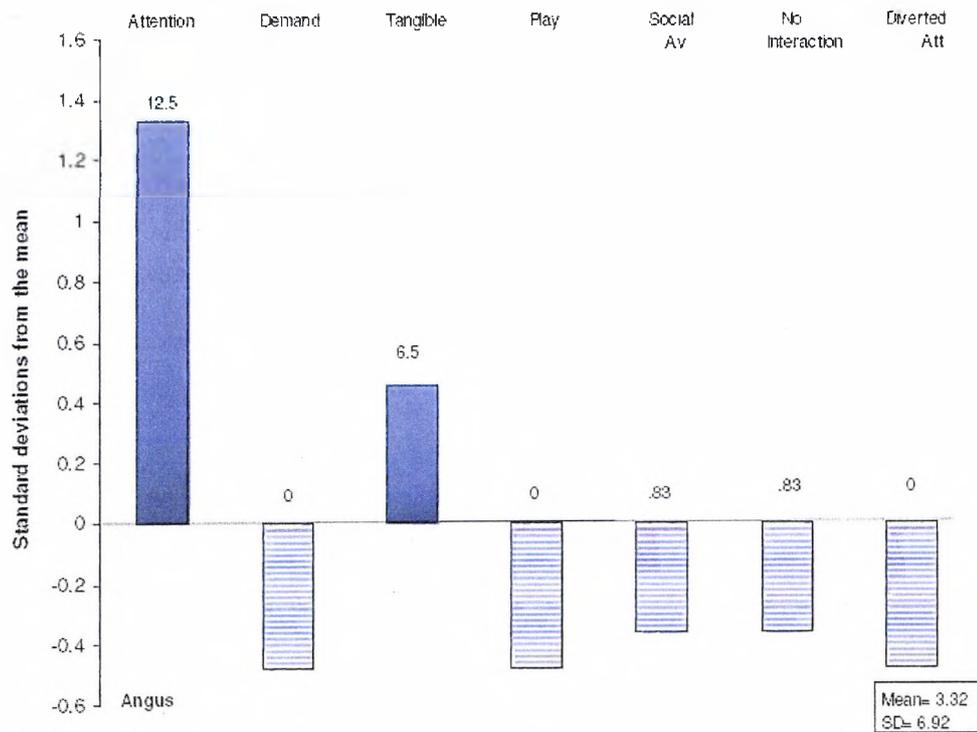
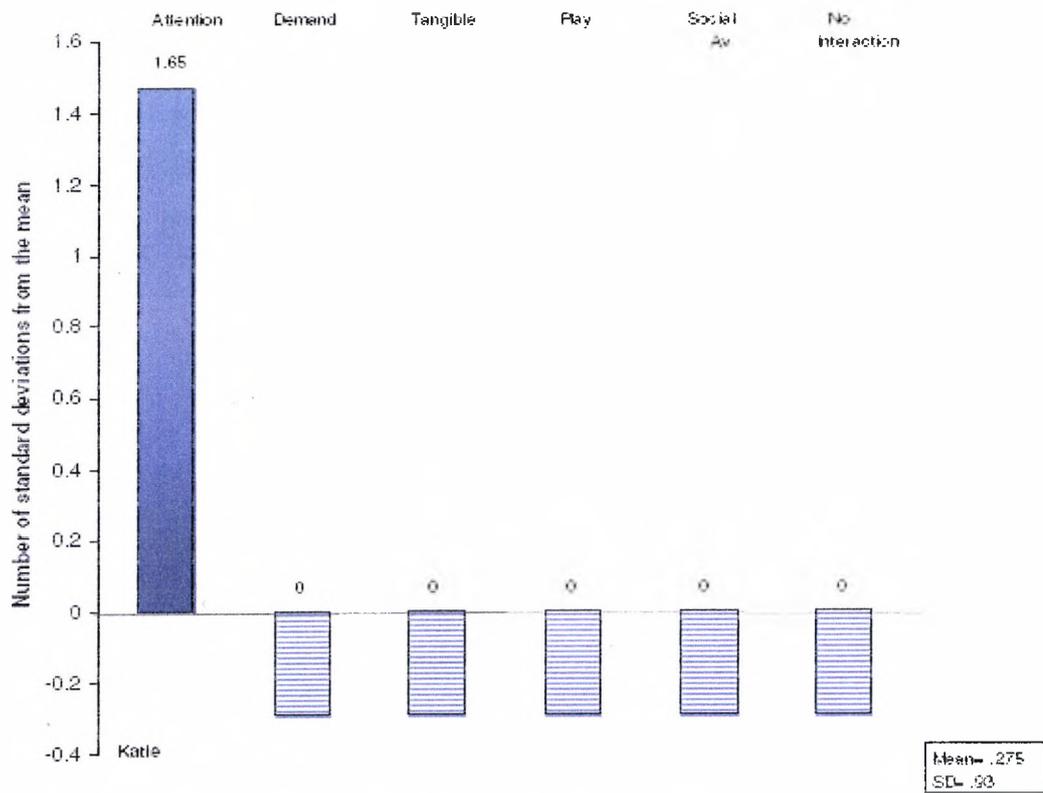


Figure 5.39. Katie. No. of standard deviations each condition mean was from the overall mean for self-injurious behaviours.



For Sean, as shown in Figure 5.36, the mean occurrence of challenging behaviour in the Tangible condition was 45.5, which was .89 standard deviations above the overall mean of 19.8. The mean occurrence of challenging behaviour in the Modified Attention condition was 37.6, which was .61 standard deviations above the overall mean. The mean occurrence of challenging behaviour in the Demand condition was 32.2, which was .43 standard deviations above the overall mean. This supports the interpretation that Sean displayed challenging behaviour that served multiple functions, one of which was attention-maintained.

For Matt, as shown in Figure 5.37, the mean occurrence of other challenging behaviours in the Modified Attention condition was 33.3, which was .93 standard deviations above the overall mean of 9.58. The mean occurrence of other challenging behaviours in the Demand condition was 20.8, which was .44 standard deviations above the overall mean. It should be remembered however that there was only a single Demand

condition in which any challenging behaviours occurred. Overall this supports the interpretation that other challenging behaviours displayed by Matt were primarily attention-maintained.

For Angus, as shown in Figure 5.38, the mean occurrence of challenging behaviour in the Attention condition was 12.5, which was 1.33 standard deviations above the overall mean of 3.32. The mean occurrence of challenging behaviour in the tangible condition was 6.5, which was .46 standard deviations above the overall mean. This supports the interpretation that Angus displayed challenging behaviour that primarily served an attention function.

For Katie, as shown in Figure 5.39, the mean occurrence of challenging behaviour in the Attention condition was 1.65, which was 1.47 standard deviations above the overall mean of .275, suggesting that self-injurious behaviours were attention maintained.

Figure 5.40. Matt. No. of standard deviations each condition mean was from the overall mean for object banging.

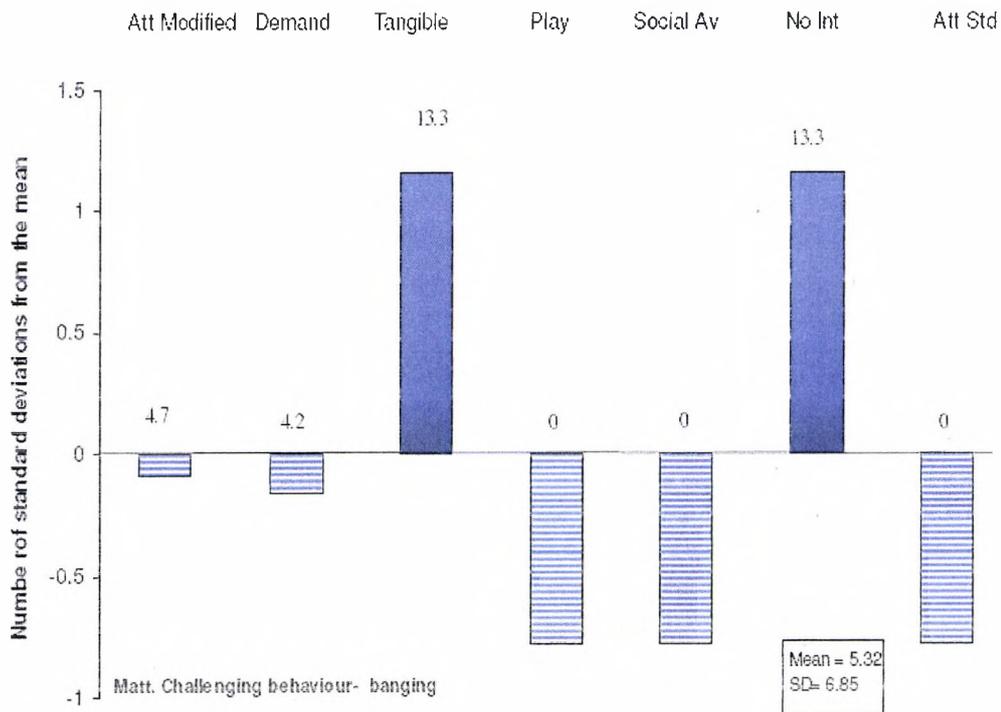


Figure 5.41. Patrick. No. of standard deviations each condition mean was from the overall mean for head-tapping.

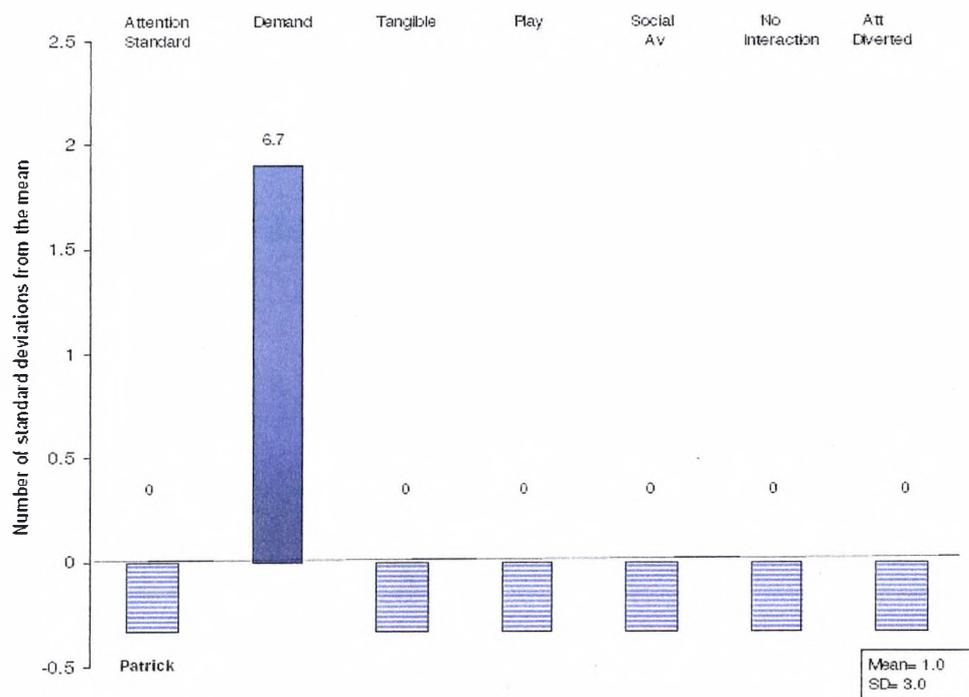
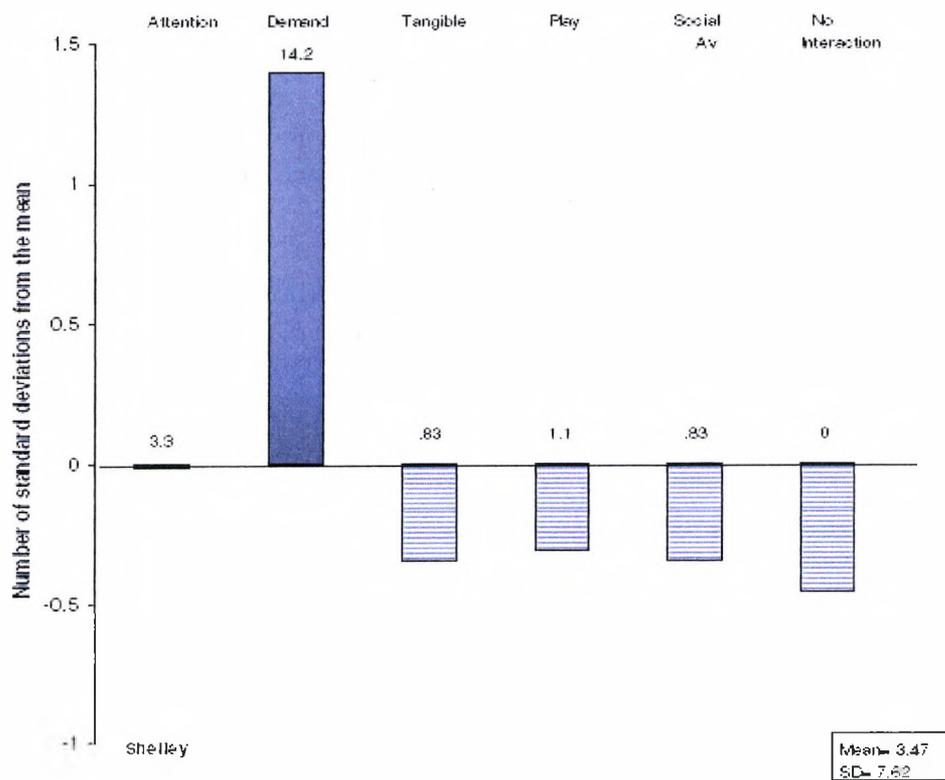


Figure 5.42. Shelley. No. of standard deviations each condition mean was from the overall mean for other challenging behaviours.



For Matt, as shown in Figure 5.40, the mean occurrence of object banging in the Tangible and the No Interaction conditions was 13.3, which was 1.16 standard deviations above the overall mean of 5.32. This supports the interpretation that object banging served multiple functions (both tangible- and automatically-maintained). For Patrick, as shown in Figure 5.41, the mean occurrence of challenging behaviour in the demand condition was 6.7, which was 1.90 standard deviations above the overall mean of 1.0. This supports the interpretation that Patrick displayed challenging behaviour that was maintained by escape from demands. For Shelley, as shown in Figure 5.42, the mean occurrence of challenging behaviour in the demand condition was 14.2, which was 1.4 standard deviations above the overall mean of 3.47. This supports the interpretation that Shelley displayed challenging behaviour that was maintained by escape from demands.

In sum, analysis of within-group variation for participants with SMS suggested two patterns of results. First a relatively high proportion of participants (4/6) displayed one response class of challenging behaviour that appeared to be, at least in part, attention-maintained. Second, 3/6 of participants with SMS displayed at least one response class of challenging behaviour that was not influenced by social attention and was maintained by either escape- or access to tangibles.

Correspondence Between Indirect and Experimental Functional Assessment Methods.

Table 5.16 shows the correspondence between the results of indirect and experimental functional assessment methods for each participant who took part in study 2 (with the exception of Shelley for whom no indirect data were collected). The correspondence between the different methodologies was relatively limited. There was no agreement between indirect and experimental methods for 3 participants (Calum, Patrick and Katie). There was partial agreement for 7 participants (Abe, Greg, Luke, John, Sean, Matt and Angus). Experimental analyses were successful in identifying a behavioural function for 3 participants in which the QABF had been unable to ascribe a function.

Table 5.16. *Correspondence Between Results of Indirect Functional Assessment and Experimental Functional Analysis Methodologies.*

Participant	QABF*	Experimental functional analysis**
<i>FXS</i>		
<i>Abe</i>	Tangible, Escape, Automatic	Tangible, Automatic
<i>Greg</i>	Escape, Automatic	Escape (social avoidance), Tangible
<i>Jacob</i>	Function not identified	Escape (demand)
<i>Luke</i>	Escape, Tangible	Escape (demand)
<i>Theo</i>	Function not identified	Escape (demand)
<i>John</i>	Escape, Tangible, Automatic	Escape (demand)
<i>Calum</i>	Escape, Automatic	Tangible
<i>Richard</i>	Function not identified	Tangible
<i>SMS</i>		
<i>Sean</i>	Attention, Tangible, Escape	Attention, Tangible, Escape (demand), Automatic
<i>Matt</i>	Attention, Escape	Attention, Tangible, Automatic
<i>Angus</i>	Attention, Tangible, Escape	Attention, Automatic
<i>Patrick</i>	Attention, Automatic	Escape (demand)
<i>Katie</i>	Escape	Attention

* For a function to be ascribed using the QABF there had to be a score of 10 or more on the relevant subscale (necessitating that 4 of the 5 items for the subscale were endorsed). Data from the Physical discomfort related subscale were excluded as this function was not assessed in the experimental functional analyses.

**As there is no specific social avoidance subscale on the QABF, social avoidance and demand functions identified via experimental functional analyses were collapsed into the category 'Escape'.

Social Acceptability.

A total of ten stakeholders returned completed assessment of social acceptability forms. Table 5.17 shows summary statistics for each item of the assessment.

Table 5.17

Social Acceptability of Analogue Assessments. Results of Acceptability Questionnaire.

Item:	Paraphrased Question	Mean	Range
<i>All items scored 1 (strongly disagree) – 5 (strongly agree)</i>			
1.	I find this assessment acceptable.	3.8	(2-5)
2.	I would use this assessment again	4.3	(4-5)
3.	It would be acceptable to use this assessment without a child's consent	3.6	(2-5)
4.	I like the procedures used in the assessment	4.1	(3-5)
5.	The assessment is likely to be effective in identifying the function of the child's behaviour	3.9	(3-5)
6.	I believe the child experienced discomfort during the assessment	2.5	(1-4)
7.	I believe the assessment will result in permanent improvement in the child's behaviour	2.9	(2-4)
8.	I believe it is acceptable to use this assessment with people who lack capacity to consent	3.6	(2-4)
9.	Overall I had a positive reaction to this assessment.	4.3	(3-5)

The key items from the perspective of the current study were items 1, 6 and 9. In response to item 1, stakeholders generally found the assessment acceptable ($M = 3.8$; range = 2-5). In response to item 6, the majority of stakeholders did not believe the child had experienced discomfort as a result of the assessment ($M = 2.5$; range = 1-4). Finally, in response to item 9, overall stakeholders reported having a positive reaction to the assessment procedures adopted in the current study ($M = 4.3$; range = 3-5).

Summary of Results

Individual variation

- There was considerable individual variation in the occurrence of challenging behaviours for each participant across each analogue condition.
- All participants displayed at least one response class of challenging behaviour that was socially-influenced.
- In some cases the standard analogue protocol (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982) required individualisation to capture relevant antecedent and consequence relations.

Within group

FXS

- No child with FXS displayed any response class of challenging behaviour that appeared to be attention-maintained.
- Four children with FXS displayed one response class of challenging behaviour that appeared to be tangible-maintained.
- Five children with FXS displayed one response-class of challenging behaviour that appeared to be negatively reinforced by either the removal of demands or social attention.

SMS

- Four of the six SMS participants displayed one response class of challenging behaviour that was, at least in part, attention-maintained.
- Three of the six children with SMS displayed one response class of challenging behaviour that was not influenced by social attention and was maintained by either access to tangibles or escape from demands.

Between group

- The groups appeared to differ only in relation to the likelihood of displaying attention-maintained challenging behaviour.
- Children in both groups were shown to display escape- and tangible-maintained challenging behaviours.

Social acceptability

- The assessment methods were rated as acceptable by key stakeholders.

Discussion

All children who took part in the current study were found to display challenging behaviour that served social and non-social functions. These findings suggest that challenging behaviours in FXS and SMS rather than being genetically determined, are influenced by the same behaviour-environment relations that are known to influence challenging behaviour in people with intellectual and developmental disability generally.

The current study also revealed both within- and between-group differences in the function served by challenging behaviour in FXS and SMS. No child with FXS was found to display attention-maintained challenging behaviour; four children with FXS were found to display tangible-maintained challenging behaviour and five were found to display negatively reinforced challenging behaviour. In contrast, four of the six children with SMS were found to display challenging behaviours that were, at least in part, attention-maintained challenging behaviour and three children displayed response classes of

challenging behaviour that were not influenced by social attention. When considered in the light of the findings of the study presented in the previous chapter and the existing literature, these results appear to provide further evidence for a potential gene-environment interaction (GxE) in challenging behaviour in FXS and SMS.

In the previous chapter, children with FXS were reported by parents and caregivers to be significantly less likely to display attention-maintained challenging behaviours than tangible- or escape-maintained challenging behaviours; and were reported to be significantly less likely to display attention-maintained challenging behaviours in comparison to other groups. A number of other empirical studies have examined behavioural function in FXS. These studies have suggested a relatively high proportion of challenging behaviour in FXS may be escape-maintained (e.g., Hall et al., 2006; Symons et al., 2003; Woodcock et al., 2009). The results of the Symons et al study also suggested elevated levels of tangible-maintained challenging behaviour and unusually low levels of attention-maintained challenging behaviour.

The results of the current study are consistent with these findings. The current study has extended this line of work by using analogue functional analysis methods, providing a 'believable demonstration' of the relations described above rather than relying on indirect or uncontrolled methods of functional assessment. In addition, the studies cited above have not allowed for a clear examination of the role played by social attention in challenging behaviour in FXS. In their study, for example, Hall et al were unable to determine whether problem behaviours in children with FXS occurred to escape from demands or social attention. Thus, it remains relatively unclear whether social attention acts as an aversive stimulus for children with FXS, or whether it simply does not function as an effective type of reinforcement. In the current study, only one child displayed differentially high levels of challenging behaviour in the social avoidance condition of the functional analysis. This suggests that generally speaking social contact did not function as an aversive stimulus for

the other children in the FXS group. The low levels of challenging behaviour in the attention condition of the functional analysis for all children with FXS would seem to support the hypothesis that the value of attention as a type of reinforcement may be abolished in this particular group.

In the previous chapter, children with SMS were reported by parents and care-givers to score relatively highly across all subscales of the QABF. In comparison to other groups, children with SMS were found to be more likely to display attention-maintained and pain-related challenging behaviours. Clinical descriptions of people with SMS have repeatedly reported the apparent high 'need' such children have for adult attention (e.g., A. Smith et al., 1998). A handful of studies have examined behavioural function in SMS (Bass & Speak, 2005; Sloneem, 2005; Taylor & Oliver, 2008). These studies have suggested that challenging behaviour in SMS may be especially likely to be attention-maintained. For example, Taylor and Oliver (2008), using descriptive lag sequential analysis methods, reported that the pattern of challenging behaviour observed in four out of the five individuals with SMS in their sample was consistent with an attention-maintained hypothesis.

The findings of the current study, to some extent, appear to reflect those described above for children with SMS. For example, four children with SMS were found to display challenging behaviour that was, at least in part, maintained by social attention. This was in marked contrast to the findings for the FXS group and may provide some support for the assertion that children with SMS may be more likely to display attention-maintained challenging behaviours (Taylor & Oliver, 2008). In the current study, children with SMS were also found to display challenging behaviours that served other social and non-social functions. Whilst this is something that was also reported in the indirect findings presented in the previous chapter; other empirical work, such as that by Taylor & Oliver (2008) have not reported such relations. Judging from the present findings at least, children with SMS

may be more likely to display challenging behaviour that serves multiple functions, one of which may be attention-maintained. However, it remains unclear as to whether children with SMS are more likely to display attention-maintained behaviour than any other behavioural function.

The current findings therefore seem to suggest that GxE may hold some implications for the understanding of the development and maintenance of challenging behaviour. One suggested means by which genetic events influence behaviour is by enduringly establishing (or abolishing) the reinforcing (or punishing) value of certain behavioural consequences (Kennedy et al., 2001). In this sense, it may be that certain genetic events operate as a type of motivating operation. The within- and between-group differences in behavioural function reported above for children with FXS and SMS appear to have provided some support for this hypothesis using experimental analogue methods.

It is worth reflecting on the use of analogue methods adopted in the current study as within a UK context such methods are rarely used either clinically or in research. One possible reason for the low uptake of analogue methodology in the UK may be due to ethical concerns some hold regarding the use of such methods (Hastings & Noone, 2005). The social acceptability of such assessment methods may therefore be a possible concern for clinicians and researchers alike. Key stakeholders in the current study all reported having a positive reaction to the use of analogue assessment methods and on the whole regarded them as a socially acceptable form of assessment. Only three stakeholders indicated that they felt their child experienced any discomfort as a result of the assessment. These data suggest that analogue methods may be more socially acceptable than is often assumed. To the author's knowledge these are the first data to be reported on the social acceptability of analogue methods of functional analysis modes of assessment.

There are a number of limitations to the current study that merit some consideration. There were a number of threats to the internal validity of each analogue assessment. In

some cases, these could be controlled and incorporated into the assessment. For example, variations were made to the way in which demands were presented, the location in which the assessment was conducted, and the specific antecedents used in the attention condition. These manipulations all appeared to influence the occurrence of challenging behaviour for these individuals. For some individuals, however, there appeared to be uncontrolled sources of variability that may have influenced the occurrence of challenging behaviour. Three children with SMS (Sean, Matt and Shelley) showed a notable increase in the frequency and severity of challenging behaviour on particular days. Care-givers anecdotally attributed this to sleep disruption; however, a controlled analysis of such factors was beyond the scope of the current study. In addition, the no interaction condition may not have provided the most optimal of tests for automatically reinforced challenging behaviour. In this condition, the EO for attention (deprivation of attention) is present, as are salient discriminative stimuli for attention (i.e., the presence of the 'therapist'), recent work on the evocative effect of the EO (e.g., O'Reilly, Sigafoos et al., 2006) suggests that high levels of challenging behaviour occurring in this condition could potentially be indicative of an attention rather than an automatic function. That said, this interpretation could equally apply to the standard alone condition of a functional analysis (which also contains the EO for attention).

A number of individuals did not display the same topographies of challenging behaviour within the assessment that they were reported to in natural settings. A number of studies have noted differences in the results of analogue assessments depending on who is running the condition (Ringdahl & Sellers, 2000). Perhaps this underpinned the poor correspondence between the results of indirect and experimental functional assessment methodologies in the current study³⁷. The internal and external validity of the assessments

³⁷ Although this may also have been a result of the difficulty associated with asking caregivers to correctly describe functional relations that underpin challenging behaviour. For example, parents may describe that their child's challenging behaviour occurs in the context of demands, however it can be very difficult to determine whether this occurs to escape from the demand or because other things (such as attention or access

may therefore have been improved by training parents/care-givers to run the assessment conditions and/or by using more naturalistic functional assessment methods, such as SDAs. However, there were time and resource constraints which precluded the use of the former and concerns over internal validity which precluded the use of the latter.

An analogue functional analysis should continue until there is a clear differentiation between experimental conditions (Hanley et al., 2003). However, in order to manage the practical demands of the current study, a limit of up to four visits was imposed in which to conduct the assessment. In some cases therefore, the assessment was terminated earlier than would otherwise have been the case. This either resulted in a relatively small number of replications for certain conditions or the termination of the analysis when there was still considerable variability in the data. That said, a decision was able to be reached regarding the function served by challenging behaviour for each individual.

For a number of participants, it proved to be very difficult to run the no interaction condition with any procedural integrity. For example, for some children it was difficult to contain them within a room or to prevent interaction with other family members. As such not all participants were exposed to sufficient replications of this condition.

The within- and between-group findings reported in the current study are somewhat hampered by the relatively low N and the reliance on convenience sampling. Thus, it is possible that subject variables, other than genetic status, contributed to the within- and between-group differences reported above. For this reason, study one involved a comparison involving a larger N than was possible in the current study, due to the resource intensive nature of analogue work. Future research is warranted therefore that employs larger N than was possible in the current study to examine this same research question using similar analogue methods.

to tangibles) happen to be withheld at the same time as the demand. Functional analysis allows such competing hypotheses to be directly tested.

The methods used to assess social acceptability in the current study fell somewhat short of 'state of the art' (Schwartz and Baer, 1991). For example, the generalisability of the assessment was limited to parents of children with specific syndromes, little is known regarding the views of society at large regarding the acceptability of functional analysis methods. In addition, the accuracy of the social acceptability ratings is relatively unknown. This could have been improved by comparing ratings of the acceptability of indirect functional assessment methods against experimental counterparts and should be addressed in future research.

Despite these limitations, the current study provided some further evidence of between- and within-group differences in the function served by challenging behaviour in children with FXS and SMS. These findings may have a number of implications for future research.

First, it would be of interest to begin to examine the underpinnings of these apparent GxE. The notion of the *endophenotype* may be important in this regard. For example, FXS is associated with changes in the functioning of the L-HPA axis which is thought to mediate the stress response. It would be important for future research to begin to examine the relationship between such factors and the function served by challenging behaviour in this particular syndrome group. Similarly, it was not possible to examine the influence of health related factors on challenging behaviour in the current study, despite study one suggesting that such variables may be especially pertinent for children with SMS. Given the high levels of sleep disruption associated with the syndrome it would be of interest to begin to examine the influence of such variables more comprehensively using analogue methods.

Second, one of the major implications of the current findings lies in relation to current understanding of the development of challenging behaviour and the early intervention and prevention of such behaviours. It would be interesting to examine whether

young children with SMS and FXS show differences in the way in which challenging behaviours develop and to evaluate the effects of secondary prevention efforts targeted at children from such syndrome groups.

Third, the generalizability of the findings from the current study needs to be further established. This could in part be achieved by replicating the current study with a larger N in order to examine such differences statistically. In addition, it needs to be determined whether similar GxE influence challenging behaviour displayed by individuals with other syndromes.

In sum, the findings of the current study suggest that challenging behaviour may be influenced by GxE. Specifically, no child with FXS displayed attention-maintained challenging behaviour. Children with SMS all displayed challenging behaviour that served multiple functions, one of which may have been attention. The use of analogue methods to examine this question extends the existing literature. In short, the current study has provided some experimental evidence to suggest that genetic events may serve to influence the reinforcing value of those consequences that maintain challenging behaviour.

Chapter VI

General Discussion.

“Context imbues behavior with meaning- the meaning of behavior emerges from its context. Behavior is not the mere interplay of materially defined stimuli and responses, but rather is represented by strong reciprocal interactions among stimulus and response functions in context- where those functions emerge from their context and nowhere else.” (E. K. Morris, 1988, p. 309)

Chapter Overview

The findings of the current thesis suggest that there may be between-syndrome differences in the function served by challenging behaviours displayed by children with different genetic syndromes. Children with FXS and SMS differed in the likelihood of displaying attention-maintained and pain-related challenging behaviours. Such evidence supports the hypothesis that genetic events may enduringly alter the reinforcing (or punishing) value of certain behavioural consequences.

The findings are related back to the underlying literature. It is argued that an approach characterised by either genetic or environmental determinism fails to adequately describe the contingencies involved in the evocation and maintenance of challenging behaviours. The findings of the current thesis are discussed in the context of a developmental systems model (Moore, 2001), in which neither the influence of genetic nor environmental contributions can be fully understood without taking account of the other. This expanded model may hold important implications for the understanding of challenging behaviour.

The implications of the findings of the current thesis for the assessment, treatment and prevention of challenging behaviour are discussed. Some of the methodological limitations of the current thesis are noted, before ideas for future research are presented and final conclusions drawn.

The current thesis aimed to provide both a conceptual and empirical examination of the interaction between genetic and environmental factors in the development and maintenance of challenging behaviour displayed by children with intellectual and developmental disabilities. Findings from the previous four chapters are presented below.

Summary of Findings

In chapter two, a systematic literature review was conducted to identify areas in which future research was needed. The review functioned as a scoping exercise and focused on the concept of the motivating operation (MO; Laraway, Snyckerski, Michael, & Poling, 2003; Michael, 1982, 1993) and its application to the functional analysis of challenging behaviour from 1998-2007. A number of areas for future research were identified. Of greatest relevance in the current context was the lack of empirical literature on interactions between basic behaviour-environment relations and genetic events. It has been argued that the MO may provide a useful means of describing such interactions (Kennedy, Caruso, & Thompson, 2001; McGill, 1999), however there has only been minimal empirical examination of this proposal or integration with existing models of the maintenance and development of challenging behaviour. The remainder of the thesis aimed to meet this need.

In chapter three, a model of the early development of self-injurious behaviour was presented. The model expanded existing operant models by incorporating gene-environment interactions (GxE) to account for why individuals with particular syndromes appear to be at a heightened risk of developing particular topographies of challenging behaviour. It was argued that genetic events may alter the development of the individual in a way that alters; i) the initial general movements of the child before they begin to form an operant response, ii) the discrimination of certain stimulus events, iii) the 'motivation' for some of the consequences that maintain challenging behaviour. A number of suggestions for future research that stem from this GxE model were proposed. Of particular relevance

was the suggestion that future research be conducted that examines the potential motivative influence of genes upon behaviour-environment relations through the adoption of group-comparison designs.

To this end, chapter four presented a study in which within- and between-group differences in the function served by challenging behaviours displayed by children with FXS, SMS and a mixed etiology control group were examined using an indirect measure of behavioural function (the *QABF*).

There appeared to be some notable within-group differences for children with FXS. Children with FXS were significantly less likely to display attention-maintained than either escape- or tangible-maintained aggression or self-injurious behaviour, with a non-significant trend in the same direction for destructive behaviours. Children with FXS were also less likely to display pain-related behaviours than escape or tangible-maintained behaviours across all topographies. In contrast, the within-group pattern of results for children with SMS showed minimal differentiation³⁸. Indeed, contrary to what had been predicted, children with SMS were no more likely to display attention-maintained challenging behaviour than any other function.

The between group comparison were generally supportive of these results. Children with FXS appeared to be less likely than either group to display attention-maintained challenging behaviours. Significant differences were found with the SMS group across all three topographies on this subscale and against the mixed etiology group for self-injurious behaviours and aggression. In contrast, children with SMS appeared to be more likely than either comparison group to display pain-related challenging behaviours. Significant differences were found against the FXS group for all three topographies on this subscale and against the mixed etiology group for self-injurious behaviours and aggression. No

³⁸ With the exception of automatically reinforced aggressive behaviours which, as expected, were significantly lower than all other functions for this topography in both the FXS and SMS groups.

between group differences were found for the tangible, automatic or demand subscales of the QABF.

To overcome some of the problems associated with indirect functional assessment methods, in chapter five, the function of challenging behaviours displayed by a group of eight children with FXS and six children with SMS was determined using experimental functional analysis methods. Each group was deemed representative of those who took part in the previous study.

There was notable individual variation in the occurrence of challenging behaviour. The pattern of results was, however, broadly consistent with those reported in the indirect study. Specifically, no child with FXS displayed any response class of challenging behaviour that appeared to be attention-maintained. In contrast, four children with SMS displayed a response class of challenging behaviour that was, at least in part, attention-maintained. Four of the six participants with SMS displayed challenging behaviours that were maintained by escape from demands and/or access to tangibles. This seems to support the findings of the previous study that children with SMS may not necessarily be any more likely to display attention-maintained behaviours than behaviour that serves other functions.

The text below provides a summary of the main findings from the two empirical studies.

1. Within- and between-group comparisons showed that children with FXS were less likely to display attention-maintained challenging behaviour

- *Indirect study.* Children with FXS less likely to display attention-maintained behaviours than tangible- or escape-maintained challenging behaviours.
- *Experimental study.* None of the eight children with FXS were found to display attention-maintained challenging behaviours, four displayed a response class

that was tangible-maintained and five displayed a response class that was escape maintained.

- *Indirect study.* Children with FXS less likely to display attention-maintained challenging behaviours than children with SMS or mixed etiology controls.
- *Experimental study.* In contrast to the FXS group, four of the six children with SMS displayed one response class of challenging behaviour that was at least in part attention-maintained.

2. *Children with SMS were no more likely to display attention-maintained challenging behaviours than challenging behaviours that served different social functions*

- *Indirect study.* There were no within-group differences in the function served by challenging behaviour for children with SMS.
- *Experimental study.* Four of the six children displayed at least one response class that was in part attention-maintained; three displayed at least one response class that was in part escape maintained, and two tangible-maintained.

3. *Children with SMS were more likely to display pain-related behaviours*

- *Indirect study.* Children with SMS were more likely to be reported as displaying physical discomfort-related challenging behaviours than either children with FXS or mixed etiology.

These findings are now related back to the underlying literature and their implications for the understanding, assessment and treatment of challenging behaviour discussed.

Genetic Events as Motivating Operations

The term MO has been typically restricted to the description of variables that exert a momentary *value-* and *behaviour-altering* effect on operant behaviour. For example, sleep deprivation (Kennedy & Meyer, 1996; O'Reilly, 1995) and the absence of social contact (Berg et al., 2000; McComas, Thompson, & Johnson, 2003) have been shown to function as an EO for challenging behaviour displayed by individuals with intellectual and developmental disabilities. It has been suggested that the effect of certain genetic events may function as a type of MO, albeit whose effects are enduring rather than momentary (Kennedy et al., 2001; McGill, 1999; Oliver, 1993). For example, the value of food as a type of reinforcement appears to be enduringly established for individuals with PWS and the syndrome is characterized by hyperphagia. The genetic event that leads to PWS is associated with particular physiological changes that lead to an altered satiety response to food (see Kennedy et al., 2001). There appears to be many benefits to considering the effects of conditions such as PWS as a type of EO. Not only does this provide a conceptually systematic way of considering the behavioural function of such events (Langthorne, McGill, & O'Reilly, 2007; McGill, 1999) but it also has implications for models of the development and maintenance of challenging behaviours in individuals with particular syndromes as well as efforts for intervention and prevention. However, empirical support for this postulation has to date remained limited. The current thesis has provided some preliminary evidence to suggest that there may be both within- and between-group differences in behavioural function in individuals with different genetic syndrome. That is, aspects of certain syndromes may enduringly alter the value of certain events as types of reinforcement or punishment.

Children with FXS

For children with FXS the findings of the current thesis appear to be generally consistent with previous work to have examined behavioural function in this syndrome

group. Two studies utilised indirect methods to examine behavioural function in FXS (Symons, Clark, Hatton, Skinner, & Bailey, 2003; Woodcock, Oliver, & Humphreys, 2009). Using an adapted version of the FAI, Symons et al reported that only 3% of boys with FXS displayed attention-maintained self-injurious behaviours, whereas 87% were reported to display such behaviour in response to changes in routine and 65% in response to task demands. The current study found similarly low levels of attention-maintained challenging behaviours occurring in children with FXS in comparison to escape- and tangible-maintained behaviours. In their study, which relied on a semi-structured interview similar in format to the FAI, Woodcock et al reported that over 75% of children with FXS were reported to display negative emotional behaviours and repetitive questioning following changes to routines or expectations. Boys with FXS were also reported to display significantly more anxiety-related self-injurious and repetitive behaviours following changes than were children with PWS. There is no data on the reliability or validity of the FAI, from which the measure of behavioural function adopted in both of these studies was derived. The use of the QABF in the current thesis to examine these relations therefore extends existing research on challenging behaviour in FXS; it is also unclear in the two cited studies as to whether the antecedent changes in routine relates to negatively reinforced (i.e., to escape from an aversive event) or positively reinforced behaviour (i.e., to access restricted tangibles). The use of the QABF in the current thesis was able to identify the maintaining variables involved in challenging behaviours displayed by children with FXS. In addition the between-group comparisons, which included a mixed etiology control group, served to extend these studies, which primarily involved within-group analysis.

Other studies have examined challenging behaviours in FXS using more direct behavioural measures. Hall, DeBernadis and Reiss (2006), for example, examined the behaviour of some 114 children with FXS across different social situations and found that

challenging behaviours were more likely to occur across conditions in which there were high social or performance demands. Other studies have reported relatively high levels of behavioural problems occurring in similar situations that involve high social or performance demands (Hessl, Glaser, Dyer-Friedman, & Reiss, 2006; Lesniak-Karpiak, Mazzocco, & Ross, 2003). To the author's knowledge, no study to date has explicitly examined behavioural function in this group using experimental functional analysis methods. The findings from the functional analyses conducted in the current thesis appeared to suggest that children FXS were more likely to display challenging behaviours maintained by escape from demands or access to tangibles than behaviours that served other social functions, such as access to social attention. These findings were also consistent with the indirect findings from the study conducted in chapter four of the current thesis and those of other indirect studies (e.g., Symons et al., 2003). It was unclear from the Hall et al study whether challenging behaviours were evoked by the performance or social demands of the situations. The findings for the sample in the current study suggested that challenging behaviours were generally maintained by escape from academic demands rather than escape from attention.

In sum, children with FXS were found to be less likely to display attention-maintained behaviours than escape- or tangible-maintained challenging behaviours. The findings of the current thesis for children with FXS were generally consistent with those of previous studies but have extended the literature by utilizing validated modes of functional assessment (the QABF, experimental functional analysis) and between-group comparisons to address this question.

Children with SMS

The findings for children with SMS were not entirely consistent with the existing literature and as such require some further discussion. It has been suggested that children with SMS may be more likely to display challenging behaviours that are specifically

maintained by social attention. For example, several clinical descriptions of the syndrome have noted the apparent 'insatiable need' for adult attention (Smith, Dykens, & Greenberg, 1998, p. 183). Other behavioural phenotype studies which used the Reiss Screen or the CBCL have found children with SMS tend to score relatively high on items relating to attention-seeking behaviours (Dykens, Finucane, & Gayley, 1997; Dykens & Smith, 1998). A within-group study by Sloneem (2005), which used the QABF as a measure of behavioural function, reported that children with SMS were more likely to display attention-maintained verbal and physical aggression than other functions. No such differences were found for other behavioural topographies. Finally, Taylor and Oliver (2008) conducted a study which involved lag sequential analysis of the challenging behaviour. The study found that the pattern of challenging behaviour observed in four out of the five individuals with SMS in their sample was consistent with an attention-maintained hypothesis³⁹.

To some extent, the findings of the current thesis for children with SMS are consistent with the findings of other studies reported above. In the indirect study, children with SMS were found to be more likely to display attention-maintained self-injury, aggression and destructive behaviour than children with FXS and destructive behaviour than the mixed etiology group. In the experimental analysis study, four of the six children with SMS were found to display attention-maintained challenging behaviour. There were, however, also some notable discrepancies. The within-group analysis from the indirect study showed that children with SMS were no more likely to display attention-maintained behaviours than other social- and non-social functions. Likewise, in the experimental

³⁹ The reliance on descriptive functional assessment methods may have made it particularly difficult to detect the influence of variables that were delivered on a relatively lean schedule of reinforcement, however. It would seem particularly likely that such methods may be biased towards making a false positive result for attention-maintained behaviour. See chapter five for further discussion of the limitations of such methods.

analysis study, three children were shown to display challenging behaviour that was at least in part escape-maintained and two that was at least in part tangible-maintained. As such, it appears that rather than there being a unique association between SMS and attention-maintained behaviour, rather that children with SMS may be likely to display challenging behaviours that serve multiple functions, one of which may be attention.

Children with SMS were also more likely than either comparison group to be reported as displaying physical discomfort-related challenging behaviours. Although relations between health conditions associated with SMS and the occurrence of challenging behaviour have been described elsewhere (e.g., De Leersnyder, de Blois, Vekemans et al., 2001), this is the first study to document between-group differences in pain-related challenging behaviours using a measure of behavioural function. SMS is associated with a particular pattern of sleep disturbance (De Leersnyder, de Blois, Claustrat et al., 2001; De Leersnyder, de Blois, Vekemans et al., 2001) and peripheral neuropathy (Finucane, Dirrigl, & Simon, 2001) which can lead to severe pain. Health-related conditions, such as sleep disturbance or conditions associated with physical pain, have been found to influence challenging behaviour displayed by individuals with intellectual and developmental disabilities generally (see Kennedy & Becker, 2006; Langthorne et al., 2007; Symons, 2002). As such, it appears likely that such relations will also be present in genetic syndromes associated with particular health conditions, such as chronic sleep disturbance.

In sum, children with SMS were found to be likely to display challenging behaviours that served multiple functions, one of which was attention-maintained. The findings of the current thesis for children with SMS were partially consistent with those of previous studies. However, contrary to the suggestions of other studies (see L. Taylor & Oliver, 2008) no evidence of a unique association between SMS and attention-maintained behaviours was found. The use of a between-group comparison and experimental functional analysis methods extends the existing literature. In addition, children with SMS

were found to be more likely than other groups to display pain-related behaviours. This is consistent with the findings of other studies, which were extended through the use of between group comparison and a recognised measure of behavioural function.

The within- and between group differences in behavioural function found in the current thesis provide some preliminary support for the suggestion that aspects of certain genetic conditions, such as FXS and SMS, can exert an enduring motivative influence on operant behaviour. Such GxE have potentially significant implications for theoretical models of challenging behaviour. In what follows, a developmental systems model, that incorporates GxE, and its implications for the study of challenging behaviour is presented.

GxE and a Developmental Systems Model

GxE

The findings of the current thesis suggest that gene-environment interactions (GxE) may hold important implications for the development of challenging behaviour in some individuals with intellectual and developmental disabilities. GxE refer to genotypic differences in susceptibility to an environmental pathogen for a given disorder (Cicchetti, 2007; Moffitt, Caspi, & Rutter, 2005; Rutter, Moffitt, & Caspi, 2006). For example, variations in the monoamine oxidase A (MAOA) gene have been repeatedly shown to moderate the effects of childhood maltreatment as an environmental 'pathogen' for the subsequent development of antisocial behaviour in the general population (Caspi et al., 2002; A. Taylor & Kim-Cohen, 2007). Similar relations may have an important effect on an individual's susceptibility or resilience to environmental causes of challenging behaviours displayed by people with intellectual and developmental disabilities (Hessl et al., 2008; May et al., in press).

It appears that challenging behaviour may be an optimum area for the further study of GxE⁴⁰. However, little is known about the behavioural processes by which GxE influence the development of a particular disorder or psychopathology.

The concept of the *endophenotype* (Gottesman & Gould, 2003) refers to physical features, such as neurobiological changes, that uniquely vary with a given syndrome. The effects of genes on the developmental process involved in the emergence and subsequent maintenance of challenging behaviour must be via neuro-biological pathways (Moffitt et al., 2005). Such changes may represent the endophenotype of certain genetic syndromes (although variables at the cognitive level have also been invoked in this manner, see Woodcock, Oliver, & Humphreys, in press)⁴¹. Due to the level of experimental control that such studies afford, animal models may help in determining the effects of specific genetic events on neurobiological pathways. Such research may help explain why particular genetic syndromes are associated with particular behavioural functions.

Some recent work with animal models provides some illustrative examples of such work. A number of studies have used mouse models of stereotypy to investigate brain-behaviour-environment relations. Mark Lewis and colleagues in a series of studies examined brain-related changes associated with environmental enrichment in deer mice

⁴⁰ As Moffitt, Caspi and Rutter (2005) state: "Wherever there is variation among humans psychological reactions to a major environmental pathogen for mental disorder, GxE must be expected to some degree (p.473).

⁴¹ Woodcock, Oliver and Humphrys (in press) suggest a model to account for the repetitive questioning and temper outbursts associated with PWS that occur in response to changes in routine or expectations. In this model, the genetic event that gives rise to PWS is assumed to lead to changes in brain functioning that result in a cognitive endophenotype, a specific cognitive deficit in task switching. When high demands are placed on this cognitive ability (for example, by transitions or routine changes), it is argued that this elicits an emotional arousal response that is aversive for the individual and leads to temper outbursts or repetitive questioning.

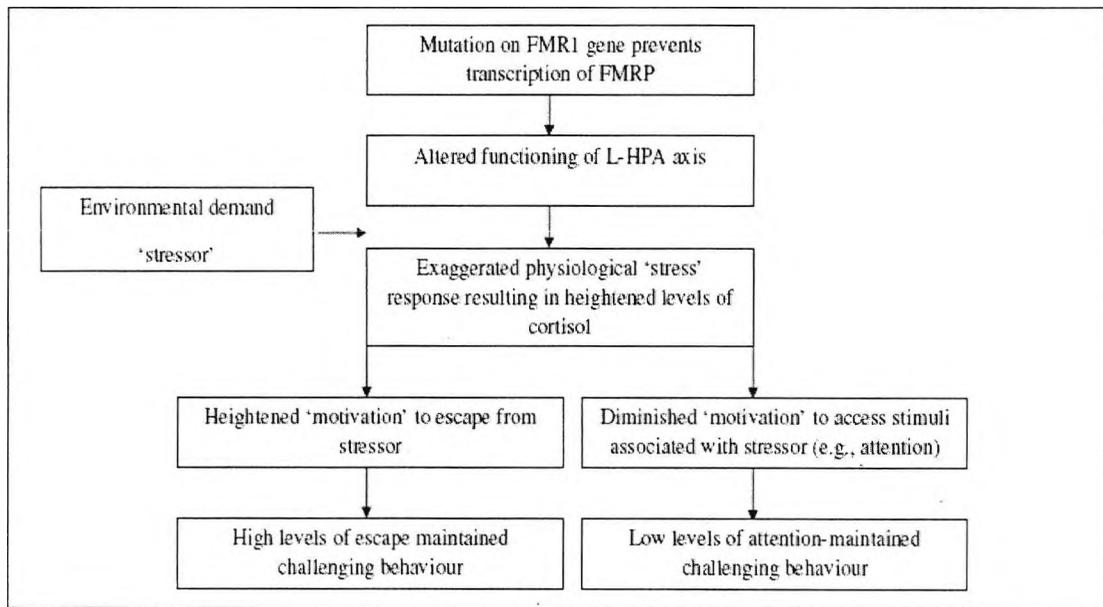
(see Lewis, Tanimura, Lee, & Bodfish, 2007; Turner & Lewis, 2003; Turner, Lewis, & King, 2003). Enrichment-related differences in brain circuitry, specifically in the motor cortex and basal ganglia regions, were found only in those deer mice that 'benefited' (i.e., as defined by the prevention or attenuation of stereotypical behaviours) from environmental enrichment. These enrichment effects were themselves associated with improved performance on learning tasks. Similar findings have been reported using a mouse model of FXS, Restivo et al (2005) found both behavioural and brain changes in FMR1-knockout mice following environmental enrichment. Mouse models have also shed some light on the neurobiological pathways involved in aggression. Couppis and Kennedy (2008) demonstrated that the opportunity to display aggression functioned as a positive reinforcement for a lever-pressing response in mice and that the reinforcing effectiveness of this consequence was itself modulated by alterations in D1 and D2 receptor activation in the nucleus accumbens. In a recent study, Couppis, Kennedy and Stanwood (2008) reported differences in brain circuitry in two mouse strains that differed in aggressive behaviour. Significant differences between aggressive and non-aggressive mice were found in the functioning of the mesocorticolimbic serotonergic and dopaminergic systems. Such studies provide one means by which the neurobiological pathways associated with particular genetic events and their relation to environmental events can be further examined.

It remains to be demonstrated how such factors influence susceptibility to the development of challenging behaviours that serve specific operant functions in individuals with FXS and SMS. However neuro-biological pathways have been implicated in the moderation of operant behaviour displayed by individuals with Prader-Willi syndrome. Holland, Whittington, and Hinton (2003) argue that the genetic abnormality underlying PWS leads to the impaired functioning of the hypothalamic pathways and the absence of metabolic and psychological changes that normally follow food intake. People with Prader-

Willi syndrome have been shown to have an abnormally high blood level of the hormone ghrelin, which may serve to enduringly heighten the reinforcing value of food (Del Parigi et al., 2002).

There may be neurobiological pathways involved in some of the relations described above for people with FXS and SMS. For example, FXS has been associated with the impaired functioning of the limbic-hypothalamic-pituitary-adrenal (L-HPA) axis, which plays an important role in the mediation of the human stress response. It has been suggested that the L-HPA axis may influence the occurrence of challenging behaviour in FXS, indeed positive correlations have been reported between levels of cortisol (an indicator of the functioning of the L-HPA axis) and parental report of behavioural problems (Hessl et al., 2002). Hypothetically, changes in brain circuitry that result from the mutation on the FMR1 gene that causes FXS, may lead to the altered functioning of the L-HPA axis. The onset of an environmental 'stressor', such as a demand, may lead to an exaggerated physiological stress response in children with FXS. This would be expected to enduringly heighten the child's 'motivation' to escape from such aversive stimuli and may explain the relatively high levels of negatively reinforced challenging behaviour observed in this group in the current thesis. One would also expect children with FXS to show a diminished 'motivation' for stimuli correlated with the onset of demands, such as attention, perhaps, accounting for the low levels of attention-maintained challenging behaviour observed for this group in the current thesis. Figure 6.1 provides a depiction of this hypothetical pathway between gene and behavioural function in FXS.

Figure 6.1. A GxE model of challenging behaviour in FXS



Developmental Systems Model

Evidence of the complex interplay between the biology of the individual and their environment suggests that the environmental and genetic determinism that has to date characterised the investigation of challenging behaviour may ultimately hamper the field and our ability to identify the determinants of such behaviour⁴². The findings above suggest that an expanded model is required to account for relations between variables at different levels of analysis, such as genes and environment, on the development of a response such as challenging behaviour.

It has been argued for some time that the nature-nurture debate is 'dead in the water' (S. M. Schneider, 2003). Rather than being caused by genes or environment, development is better understood as being driven by the 'coaction' of elements that form a

⁴² As Schneider (2007, p. 93) notes: "Genetically determined" could be seen as useful shorthand in some cases, such as when a genetic feature...produces given effects across a large range of "normal" environments, just as, vice versa, "environmentally determined" could for an environmental feature that often produces given effects across a large range of "normal" genomes. But these simplifications can become problematic: They get overgeneralized, and the fact that they are simplifications can be forgotten."

single integrated system (Gottlieb, 1997; Moore, 2001; Oyama, Griffiths, & Gray, 2001). Both genes and environment must work together as part of this system to produce any aspect of any living thing (S. M. Schneider, 2007).

According to this developmental systems perspective an organism is comprised of a number of components that exist at several levels of analysis (genes, genes environment, cells environment, organ's environment and the macro environment). The environment in which the organism is embedded is simply viewed as another component of this system. Critically it is argued that each of the components of this system interacts with and affects the other. Thus, not only can variables at the same level of analysis influence the other (i.e., gene-gene relations, see Hessel et al., 2008) but that also variables at different levels of analysis may alter the influence of the other. These relations are completely bidirectional so that variables at a lower level of analysis may influence the effects of those that exist at higher levels and vice versa (i.e., not only can genes influence the effects of environmental variables, but also environment can moderate the influence of genes). Evidence of such bidirectional effects is relatively compelling. For example, Spira et al (2004) have demonstrated that cigarette smoke (an environmental pathogen) can lead to both reversible and irreversible changes in the expression of certain genes in human bronchial airway tissue. As has already been suggested genes may moderate the effects of environmental pathogens (Rutter et al., 2006). For example, the COMT gene has been shown to moderate the effects of heavy adolescent cannabis use as a pathogen for adult psychosis (Caspi et al., 2005).

Historically the application of behaviour analysis has been concerned with addressing only part of this developmental system (i.e., the influence of behaviour-environment relations). However, the radical behavioural philosophy that underpins applied behaviour analysis is consistent with the developmental systems model described above, stressing the importance of interactions between the individual and the context in

which they are embedded (Chiesa, 1992; E. K. Morris, 1988; E. K. Morris & Midgley, 1990; Thompson, 2007). Schneider (2007) notes that behaviour analysis is entirely consistent with the developmental systems model, although its emphasis is on making the role of environmental factors and the behavioural principles therein explicit (p. 101). Within this approach, the question of whether a particular response is genetically or environmentally determined becomes redundant; rather the salient issue becomes what function each variable serves in relation to observable behaviour (Thompson, 2007).

One contribution behaviour analysis can make to the developmental systems model is to explicitly relate the influence of variables at varying levels of analysis (whether that be endogenous or exogenous to the organism) to underlying principles of behaviour. As Thompson (2007) notes, endogenous variables, such as genetic, hormonal and neurochemical influences, can alter the reinforcing value of certain behavioural consequences (see for example; Harvey et al., 2004; Kennedy, 2002a), can function as discriminative stimuli that set the occasion for a given response (e.g., Schuster & Brady, 1971), and can function as a reinforcing consequence for certain responses (e.g., Cataldo & Harris, 1982; Sandman, Spence, & Smith, 1999). Relating genetic or neurobiological variables to operant principles of behaviour will aid the delineation and understanding of the processes involved in GxE. As suggested in chapter three, such an enterprise may hold important implications for our understanding of challenging behaviours, such as self-injury.

In sum, the findings of the current thesis suggest that neither genetic nor environmental determinism provides an adequate model to account for challenging behaviour displayed by individuals with intellectual and developmental disability. GxE may play an important role in the development and subsequent maintenance of such behaviours. The developmental systems model, which is consistent with the tenets of radical behaviourism, provides a means with which both endogenous and exogenous variables can be brought to bear on the functional analysis of challenging behaviour.

Applied Implications

The finding that genetic events may exert a motivative influence on the consequences that maintain challenging behaviour also holds implications for the assessment, treatment and the prevention of challenging behaviours.

Perhaps the most significant applied implications of the current thesis lie in the design of prevention strategies for challenging behaviour in children with intellectual and developmental disabilities.

A number of studies suggest challenging behaviours typically emerge at a relatively young age in children with intellectual and developmental disabilities (e.g., Berkson, Tupa, & Sherman, 2001; Kurtz et al., 2003; Richman & Lindauer, 2005; M. J. Schneider, Bijam-Schulte, Janssen, & Stolk, 1996). Once established and in the absence of effective intervention such behaviours tend to be characterised by their chronicity (Murphy et al., 2005). It is already known that children with particular genetic syndromes, such as FXS or SMS, are at a heightened risk of developing particular forms of challenging behaviour, and as such are appropriate targets for secondary prevention efforts. It can frequently be difficult to identify the function of challenging behaviours in very young children, however (see Kurtz et al., 2003). Knowledge of the probable functions that challenging behaviours are likely to serve in young children with specific genetic conditions will aid efforts at secondary prevention, especially in cases where function is difficult to determine or challenging behaviour has not yet fully developed.

Such a preventative strategy would be based on those maintaining consequences for which 'susceptibility' is thought to exist. The current findings suggest that for children with FXS such early intervention work should be focused on ensuring that the child can *mand* to escape from aversive stimuli and access tangibles and that caregivers are responsive to these forms of communication. Efforts at reducing the aversive nature of demand presentation and on developing the child's ability to tolerate delay until

reinforcement will also be important in this regard. For children with SMS the current findings suggest that the treatment of any health conditions, such as the sleep disturbance characteristic of the syndrome, should be done at as early a stage as is possible. It would seem important that additional secondary prevention efforts are focused on teaching the young child *mands* that serve multiple functions, one of which is to access attention.

The findings of the current thesis also have implications for the assessment and treatment of challenging behaviour in individuals where challenging behaviour is already established in their behavioural repertoire. Although no substitute for conducting a thorough functional assessment, it would be of benefit for clinicians to be aware that certain individuals are especially likely to display challenging behaviours that serve specific functions. For example, it would be useful to be aware that challenging behaviours displayed by an individual with SMS may be influenced by sleep disturbance. This would help prevent otherwise unexplained variability in the individual's challenging behaviour being attributed to unhelpful sources and help to guide intervention (Langthorne et al., 2007).

Limitations and Suggestions for Future Research

The current thesis has provided some preliminary evidence to suggest that there may be differences in the function served by challenging behaviours displayed by children with FXS and SMS. The two empirical studies in the current thesis aimed to complement one another and each was designed to compensate for some of the limitations of the other. Thus the experimental analogue study presented in chapter five was designed to overcome some of the problems associated with the indirect functional assessment methods used in the study presented in chapter four. Likewise, the larger sample size of the indirect study aimed to compensate for the low N necessitated by the use of experimental functional analysis methods. The correspondence between the findings of each study, despite the

different methodologies used, is promising and augments the believability of the overall results.

Despite this there remain a number of limitations with the methods used in the current thesis which merit some consideration. A number of limitations with each empirical study have already been noted in the discussion section of each individual study. The following therefore focuses only on the more significant methodological constraints of each study. For discussion of less significant methodological issues the reader is referred to the relevant section of the discussion of each individual study in chapters four and five.

One of the most significant limitations affecting the indirect assessment study lies in the representativeness of the sample for each group. Convenience sampling was used to recruit participants for each group, with the majority of participants recruited via parental support groups. It may be that these participants were not sufficiently representative of the underlying population for each syndrome group.

An issue affecting both studies is that the author and lead researcher was not blind as to the genetic status of each participant and the aims of the study. Although every attempt was made to mitigate against the effect of this, for example by closely following the study protocol, it is possible that this influenced the responding of participants in both studies.

Chapter two provided a systematic review of the concept of the MO and its application to the functional analysis of challenging behaviour. The review contained reference to a number of potential threats to the internal validity of analogue functional analysis methods. For example, recent research on the behaviour-altering effect of the MO (O'Reilly, Edrisinha, Sigafoos, Lancioni, & Andrews, 2006; O'Reilly et al., 2007; O'Reilly, Sigafoos et al., 2006) suggests that if left uncontrolled MOs, such as the deprivation of attention or tangibles, can evoke challenging behaviour even in conditions where the relevant discriminative stimuli and reinforcing consequences for the behaviour are absent.

Thus, challenging behaviour evoked by the deprivation of tangibles could occur within the demand or attention condition of the functional analysis⁴³. Whilst such confounds are not beyond experimental control, by making pre-session manipulations for example, they do constitute a threat to the internal validity of experimental functional analysis generally. In the current study no efforts were used to control such influences other than those typically used when conducting such analyses (e.g., randomized order of experimental conditions). It is possible therefore that there were uncontrolled confounds that influenced the responding of individual participants. Such threats apply to all experimental functional analyses and with only a few exceptions (see Volkert, Lerman, Call, & Trosclair-Lasserre, 2009) tend not to be explicitly addressed in advance of conducting a functional analysis. Some consensus is required within the field for feasible means of dealing with such potential confounds if the internal validity of analogue assessment methodologies is not to be undermined.

Some concerns remain with the external validity of the experimental functional analysis methods used in the current thesis. For a number of participants in both groups the findings of the experimental analyses did not correspond to the situations reported by caregivers as evoking challenging behaviour. For example, Abe was reported by caregivers to display escape-maintained challenging behaviours in response to academic demands and this was observed firsthand by the author. However, one session aside, this did not occur within the confines of the experimental functional analysis. Although all analyses were conducted in the child's natural settings, it may have been that the use of the author, with whom the child had limited learning history, as the 'therapist' in the functional analysis may have resulted in such discrepancies. Differences in the results of functional

⁴³ Other potential threats include the influence of toy preference and type of attention provided on challenging behaviour in the attention condition, the means of task presentation in the demand condition, the influence of other extraneous variables, such as health factors.

analyses dependent on whom is conducting the assessment have been reported in the literature (e.g., Ringdahl & Sellers, 2000) and it may be that the use of the child's caregivers to run the functional analysis may have provided a more externally valid methodology. Although beyond the scope of the current thesis, due to the additional practical resources required to train caregivers to implement such assessments, future research should consider means of increasing the external validity the experimental functional analysis methods used to assess between-group differences in behavioural function.

The experimental functional analysis study did not have sufficient N to enable meaningful statistical comparison between the groups. Thus it is unclear as to whether the differences observed in the study were similar to what would be expected as a result of normal sampling error. Whilst the results of the indirect study mitigate this concern to some extent; given the status of experimental functional analysis as the 'gold standard' of functional assessment methodologies (Hanley, Iwata, & McCord, 2003) it seems critical that future research be conducted that adopts experimental functional analysis methods and uses sufficient N to facilitate meaningful statistical comparison. Given the resource intensive nature of experimental functional analyses and the low incidence of individuals with genetic syndromes such as SMS, large-scale, collaborative, multi-site studies may be required to meet the practical demands of such work. The use of existing comparative data on the prevalence of different behavioural functions in people with intellectual and developmental disabilities generally (e.g., Derby et al., 1992; Hanley et al., 2003; Iwata et al., 1994) will also provide a meaningful comparison against which experimental groups can be compared. The current thesis suggests that such an endeavor may be worth serious consideration.

As well as replicating the existing studies with larger N, it would be of interest to test the generalizability of these findings with different syndrome groups. The author is

aware of some ongoing research that is examining the function of challenging behaviour in children with Angelman, Cri Du Chat and Cornelia De Lange syndromes (Tunnicliffe et al., 2008), however research is still needed in this area. Such relations, as discussed in previous chapters may be relatively commonplace and it would seem important that both within- and between-syndrome similarities and differences in behavioural function are properly delineated. Such efforts are likely to require collaborative, multi-site efforts.

Future research should elucidate on the proximal effects of genes that may give rise to the differences in behavioural function reported in the current study. The concept of the *endophenotype* (Gottesman & Gould, 2003) has received some recent attention in this regard in relation to challenging behaviour in PWS (see Woodcock et al., 2009, in press). It would be of interest to begin to examine the endophenotype associated with FXS and SMS and specifically to examine how this relates to the differences in behavioural function observed in the current study. This strategy would involve the analysis of variables at a different level of analysis to those examined in the current thesis; however a similar strategy has proved useful in the investigation of the neural underpinnings that underlie the relation between sleep and escape-maintained behaviour (see Harvey et al., 2004). Such studies could potentially increase the options for intervention beyond solely environmental manipulation.

Finally, a proposal made in chapter three and reiterated here is that future research be conducted that examines differences in challenging behaviour as it develops in young children with specific genetic syndromes. Some data does already exist in this regard for children with Lesch-Nyhan syndrome (Hall, Oliver, & Murphy, 2001), however it would be of interest to empirically examine whether the 'motivative' effects of certain genetic events accelerates the mutual reinforcement processes already known to play a causal role in the development of challenging behaviour in children with intellectual and developmental disabilities (Kennedy, 2002b; Oliver, Hall, & Murphy, 2005; Richman,

2008), as suggested in chapter three of the current thesis and by other researchers in the field (e.g., L. Taylor & Oliver, 2008).

Final Conclusions

The current thesis has provided both a conceptual and empirical analysis of GxE as applied to challenging behaviours displayed by children with intellectual and developmental disabilities. It appears that one role of genetic events may be to exert a motivative influence over some of the social and non-social consequences that maintain challenging behaviour. Preliminary evidence of the influence of such relations on challenging behaviour was provided for children with FXS and SMS. Children with FXS were less likely to display attention-maintained challenging behaviours. Children with SMS were found to display challenging behaviours that served multiple functions (one of which may have been attention-maintained) and were more likely than other groups to display pain-related challenging behaviours. The behaviour analytic concept of the MO may help to describe some of the *value-* and *behaviour-altering* effects of such events. Despite some of the limitations of the current thesis, it appears that these findings have considerable implications for the assessment, treatment and prevention of challenging behaviour as well as for models of the initial development and subsequent maintenance of such behaviours.

The probable relevance of such relations has been noted since the early infancy of behaviour analysis. As Sidney W Bijou stated:

Psychological development consists of progressive changes in interactions between the individual, as a total functioning biological system, and the environmental events (Bijou, 1966, p. 2).

Further elucidation of GxE and the role they play in challenging behaviours displayed by people with intellectual and developmental disabilities will help to bring the application of operant science more in line with its theoretical foundations.

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Appendices

Appendix 1

MO Studies for Attention-Maintained Challenging Behaviour

Studies	N	Age	Challenging behaviour (s)	Independent Variable	Design	Findings
Piazza, Hanley et al (1998)	2	4-8	Aggression; disruption; SIB	Effects of break from demands	Multi-element embedded in reversal design (Tom); multi-element (Jerry)	Break from demands evoked attention-maintained problem behaviour
Northup et al (1999)	4	7-8	Inappropriate vocalizations; out of seat; playing with objects; off-task behaviours	Effects of methylphenidate (MPH)	Multielement embedded in super ordinate multielement design	MPH influenced problem behaviour of three participants
O'Reilly (1999)	1	20	Yelling; SIB	Effects of pre session manipulation	Reversal (ABAB)	Pre session deprivation of attention led to higher rates of challenging behaviour
O'Reilly et al (1999)	2	8-31	Aggression; SIB	Effects of pre-session manipulation	Multi-element embedded in reversal design	Pre session exposure to diverted attention condition led to higher rates of challenging behaviour
Roane et al (1999)	5	5-21	Aggression; inappropriate vocalization; SIB; disruptive behaviour	Effects of within-session manipulation	Multielement design	Greater likelihood of problem behaviour when maintaining variable (attention) absent
Berg et al (2000)	3	1-4	SIB; pulling and chewing medical equipment;	Effects of pre session manipulation	Multi-element design	Challenging behaviour influenced by manipulations made to pre-session attention

Fisher et al (2000)	1	17	SIB; aggression; disruption	Effects of tangibles	Multi-element design	Attention-maintained problem behaviour reduced to zero levels in conditions where high preferred tangibles present. Low preferred tangibles had no influence
O'Reilly, Lancioni et al (2000)	2	9-22	Pushing; pinching; SIB; property destruction	Effects of modified attention condition	Multi-element design	Diverted attention condition evoked problem behaviour. Reduced when attention provided non-contingently.
Ringdahl & Sellers (2000)	3	5-13	SIB; aggression	Effects of different individuals	Multi-element embedded in reversal design	Attention-maintained problem behaviour of two individuals only apparent when caregiver ran FA
Worsdell et al (2000)	6	29-52	SIB	Effects of within-session manipulation	Multi-element design	Consistently high rates of challenging behaviour only evoked in EO sessions with reinforcement contingency
LeBlanc et al (2001)	1	11	Aggression	Effects of different individuals	Multi-element embedded in reversal design	Both gender of therapist and type of attention provided influenced challenging behaviour
Ringdahl et al (2002)	2	5-41	Aggression; switch activation	Effects of tangibles	Multi-element embedded in	Availability of toys in attention

					reversal design	condition reduced attention-maintained challenging behaviour
McComas et al (2003)	5	8-12	Throwing materials; hitting; spitting; property destruction; pinching; scratching; kicking	Effects of pre-session manipulation	Multi-element	Pre-session attention influenced attention- but not escape-maintained problem behaviour
English & Anderson (2004)	4	5-16	Aggression; disruption; SIB	Effects of different individuals	Multi-element embedded in reversal design	Presence or absence of caregivers influenced challenging behaviour
Call et al (2005)	2	2-17	Aggression; destruction	Effects of modified attention condition	Multi-element	Higher rates in combined conditions (i.e., demand & diverted attention/cont att)
Dicesare et al (2005)	1	18	Disruption	Effects of MPH	Multi-element embedded in reversal design	Higher rates of attention-maintained behaviour when no MPH; low levels across all conditions when MPH present
Harding et al (2005)	2	1-5	SIB	Effects of location	Multi-element (Phase 1/3); reversal (Phase 2)	Location change allowed identification of social function for previously undifferentiated challenging behaviour
O'Reilly, Edrisinha et al (2006)	1	20	Bizarre speech; elopement	Behaviour-altering effect	Multi-element design	High rates of attention-maintained behaviour following pre-session deprivation in both reinforcement and extinction conditions.

O'Reilly, Sigafos et al	2	14-20	SIB; aggression; elopement hair eating; self-touching	Behaviour-altering effect	Multi-element design	High rates of challenging behaviour (2006) following pre-session deprivation in both reinforcement and extinction conditions.
Roantree & Kennedy (2006)	1	10	Stereotypy	Effects of pre-session manipulation	Multi-element embedded in reversal design	Attention function following pre-session attention and undifferentiated following pre-session alone
O'Reilly, Edrisinha et al (2007)	1	20	Bizarre speech; elopement	Behaviour-altering effect	Multi-element	Higher rates of problem behaviour in both alone and extinction conditions following pre-session deprivation of attention

Appendix 2 *MO Studies for Tangible-Maintained Challenging Behaviour*

Studies	N	Age	Target behaviour (s)	Independent Variable	Design	Findings
Fisher et al (1998)	2	13-14	Aggression; dangerous behaviour; property destruction	Effects of interruption to free operant behaviour	Multi-element design (Phases 3/4; reversal (ABAB) (Phase 5)	Challenging behaviour occasioned by requests that interfered with ongoing activity (e.g., watching game shows and looking out of window)
Adelinis & Hagopian (1999)	1	27	Aggression	Effects of interruption to free operant behaviour	Reversal (ABAB)	High rates of challenging behaviour occasioned by requests that interfered with ongoing activity (e.g., lying of the floor). Not occasioned by symmetrical 'do' requests.
Roane et al (1999)	5	5-21	Aggression; inappropriate vocalization; SIB; disruptive behaviour	Effects of within-session manipulation	Multielement design	More challenging behaviour occurred when tangibles (e.g., toys) absent than when present
Murphy et al (2000)	1	38	Aggression; stereotypical behaviour	Effects of interruption to free operant behaviour	Multi-element design	Challenging behaviour more likely to occur in conditions in which prevented from engaging in free operant response (e.g., flushing objects down toilet).
Worsdell et al (2000)	6	29-52	SIB	Effects of within-session manipulation	Multi-element design	Consistently high rates of

						challenging behaviour when tangibles (e.g., food) absent and reinforcement contingency present
Mueller et al (2001)	1	8	Aggression	Effects of stimulus preference	Multi-element embedded in reversal design (ABCA)	Restricting high preferred items (e.g., books) evoked highest rates of challenging behaviour, restricting less preferred (e.g., stuffed animal) associated with moderate rates of aggression.
Ray & Watson (2001)	3	4-5	Aggression; out-of-seat behaviour	Effects of pre-session influences	Multi-element design	Undifferentiated FA revealed tangible function when examined correlation with prior events
Asmus et al (2003)	1	7	Disruptive behaviour; stereotypical behaviour	Effects of reinforcement for alternative response classes	Multi-element in AB design	Absence of reinforcement for stereotypy increased rate of destructive behaviour maintained by tangibles(toy train)
McLaughlin et al (2003)	1	5	Aggression; tantruming; destruction	Effects of stimulus preference	Reversal design	Challenging behaviour only occurred in conditions that led to active play
Fritz et al (2004)	2	12-19	Aggression; disruption; Dropping	Effects of interruption to free operant behaviour	multiple-baseline; reversal	Termination of preferred activity (e.g., walking) functioned as EO for tangible- maintained problem

						behaviour in the context of demands
McAdam et al (2004)	1	18	Aggression; disruption	Effects of different individuals	ABC design	Tangible (access to leisure items)- and escape-maintained behaviour in conditions run by caregivers none in conditions run by therapist
Harding et al (2005)	2	1-5	SIB	Effects of location	Multi-element (Phase 1/3); reversal (Phase 2)	Location change allowed identification of social function for previously undifferentiated challenging behaviour
O'Reilly, Sigafoos et al (2006)	2	14-20	SIB; aggression; elopement hair eating; self-touching	Behaviour-altering effect	Multi-element design	High rates of challenging behaviour following pre-session deprivation in both reinforcement and extinction conditions for challenging behaviour maintained by edibles
Wilder et al (2006)	2	3	Aggression; tantrums	Effects of interruption to free operant behaviour	Multi-element	Challenging behaviour of one child occurred exclusively when asked to terminate a preferred a activity (e.g., watching a video, playing with toy cars)
Hagopian et al (2007)	3	6-12	SIB ; aggression ; disruption	Effects of interruption to free	Pairwise design (Perry/Kelly);	High rates of challenging

				operant behaviour	reversal design (Maxwell)	behaviour following both 'do' and 'don't' requests (e.g., playing with toys)
O'Reilly, Edrisinha et al (2007b)	1	14	SIB; aggression	Behaviour-altering effect	Multi-element design	High rates of challenging behaviour following pre-session conditions in which no access to edibles

Appendix 3

MO Studies for Negatively Reinforced Challenging Behaviour

Studies	N	Age	Challenging behaviour (s)	Independent Variable	Design	Findings
Asmus et al (1999)	3	3-5	SIB, aggression, destruction disruption	Effects of demand stimulus parameters	Multi-element	For two participants presentation of unfamiliar tasks reduced challenging behaviour.
Garcia & Smith (1999)	2	29-42	SIB	Effects of naltrexone	Multi-element embedded in double blind, placebo controlled reversal design	Escape-maintained head slapping of one participant reduced in naltrexone conditions
Roane et al (1999)	5	5-21	Aggression; inappropriate vocalization; SIB; disruptive behaviour	Effects of within-session manipulations	Multielement design	More challenging behaviour occurred when demand present
McComas et al (2000)	3	8-9	Destructive behaviour	Effects of demand stimulus parameters	Multi-element	Presence of instructional strategy, opportunities for choice-making, and task repetition shown to influence challenging behaviour
O'Reilly et al (2000)	1	5	Aggression, destructive behaviour, pain behaviours	Effects of demand stimulus parameters	Multi-element embedded in reversal design	All background noise conditions evoked pain related behaviours.

						Challenging behaviour only occurred in conditions where both demand and noise were present
O'Reilly & Lancioni (2000)	1	4	SIB; aggression	Effects of sleep deprivation	Reversal design	Correlation between sleep deprivation and escape-maintained SIB but not aggression
Ducharme & Rushford (2001)	1	10	Compliance	Effects of pre-session manipulation	Reversal design	Child compliance increased following pre-session play conditions
Hagopian et al (2001)	1	6	SIB; aggression; disruption; Spitting	Effects of other stimulus events	Multi-element	Challenging behaviour evoked by social attention
McCord, Iwata et al (2001)	7	25-44	SIB; aggression; tantrum; property destruction	Effects of other stimulus events	Multi-element	Challenging behaviour evoked by onset of noise.
McCord, Thompson, et al (2001)	2	27-38	SIB	Effects of other stimulus events	Multi-element	Challenging behaviour of two individuals evoked by onset of transitions that involved change in location. Some demands evoked challenging behaviour independent of location
Moore et al (2001)	4	4-9	Aggression; destructive behaviour; disruptive behaviour;	Effects of other stimulus events	Multi-element embedded in reversal design	Challenging behaviour of two participants evoked by high levels of attention not task

Oliver et al (2001)	1	14	Aggression	Effects of other stimulus events	Alternating treatment	demands. Challenging behaviour occurred in high attention conditions only when therapist in close proximity Extinguished over extended assessment periods.
Carey & Halle (2002)	1	12	SIB	Effects of combined antecedents	Multi-element design	Challenging behaviour occurring in demand contexts reduced when music available
Romaniuk et al (2002)	7	7-10	Aggression; disruptive behaviour	Effects of demand stimulus parameters	Reversal design	Choice making reduced escape-maintained behaviour occurring in demand contexts but no influence on attention-maintained behaviour
Carr, Magito-McLaughlin et al (2003)	8	29-48	SIB; aggression; property destruction	Effects of pre-session influences	Reversal design	Correlation between 'bad mood' rating and occurrence of problem behaviour only in demand contexts
Carr, Smith et al (2003)	4	26-31	SIB; aggression; property Destruction; tantrums	Effects of menses	Reversal design	Higher levels of problem behaviour in demand contexts when menses present
Ebanks & Fisher (2003)	1	9	SIB; aggression; property destruction	Effects of demand stimulus parameters	Reversal design	Providing corrective prompt after task evoked challenging

						behaviour providing pre-task prompt reduced challenging behaviour
Moore & Edwards (2003)	4	7-17	Disruptive behaviour; property destruction	Effects of other stimulus events	Multi-element	Idiosyncratic influences across individuals. Teacher attention functioned as aversive stimuli for two individuals; onset of tasks for remaining participants
Borrero et al (2004)	1	13	Aggression	Effects of demand stimulus parameters	Reversal design	Challenging behaviour in demand contexts occurred more frequently when used abrasive rather than pleasant prompting style
Call et al (2004)	6	4-8	Aggression; destruction; tantrums; off-task behaviour	Effects of combined antecedents	Multi-element	Attention appeared to attenuate aversiveness of demands for three individuals. Altering rate and/or difficulty of demands reduced challenging behaviour for three individuals
McAdam et al (2004)	1	18	Aggression; disruption	Effects of different individuals	ABC design	Tangible- and escape-maintained behaviour in conditions run by caregivers none in conditions run by therapist
Call et al (2005)	2	2-17	Aggression; destruction	Effects of combined antecedents	Multi-element	Higher rates in combined

Long et al (2005)	3	5-19	SIB; aggression; disruption	Effects of demand stimulus parameters	Reversal	antecedent conditions (i.e., demand & restricted tangibles with contingent escape) Providing preferred stimuli reduced challenging behaviour that occurred in the context of hygiene-related demands
Magito-McLaughlin & Carr (2005)	3	28-39	SIB; aggression	Effects of different individuals	Reversal (study 1); multiple-baseline (study 2)	Higher rate of challenging behaviour in demand contexts when presented by poor 'rapport' dyad. Challenging behaviour reduced and task completion improved following 'rapport' intervention
Patel et al (2005)	3	3-4	Food packing; food acceptance; inappropriate behaviour; expulsion; vomiting	Effects of other stimulus events	Reversal design	Higher textured food associated with higher levels of packing and less food intake than lower textured food
Peyton et al (2005)	1	10	Disruptive behaviour	Effects of demand stimulus parameters	Multi-element	Escape-maintained problem behaviour evoked not by task per se but by directive prompts
Buckley & Newchok (2006)	1	7	Ear covering; screaming	Effects of other stimulus events	Multi-element	Source of music shown to be critical variable in evoking challenging behaviour
Crockett & Hagopian (2006)	1	19	SIB; aggression; property	Effects of demand stimulus parameters	Multiple-baseline	Higher rates of problem

			destruction; task completion			behaviour and fewer task completion when used three-step prompting procedure
Kelley et al (2006)	1	11	SIB; aggression; disruption;	Effects of amphetamine	Reversal design	Allocated responses to compliance in drug conditions and to problem behaviour in placebo conditions
Boelter et al (2007)	3	3-6	Aggression; destructive behaviour; non-compliance	Effects of demand stimulus parameters	Multi-element design	Idiosyncratic pattern of results. One-step directives set the occasion for accurate responding and other aspects of the task (e.g., preference, 3-step prompts) evoked challenging behaviour
Potoczak et al (2007)	4	7-17	Destructive behaviour; non-compliance; out-of-seat behaviour	Effects of within-session manipulation	Test-control multi-element	ABC method (EO with reinforcement contingency) resulted in differentiated pattern of responding for all 4 participants. AB method (EO/no reinforcement contingency) more ambiguous

Appendix 4

MO Studies for Automatically Reinforced Challenging Behaviour

Studies	N	Age	Challenging behaviour (s)	Independent Variable	Design	Findings
Fisher et al (1998)	2	7-15	Property destruction; stereotypical behaviour	Effects of matched stimuli V competing stimuli	ABAB (Exp 1/3); multi-element design (Exp 2)	Lower levels of property destruction and stereotypy when given access to matched than unmatched toy.
Piazza et al (1998)	3	4-17	Pica	Effects of matched stimuli V competing stimuli	Multi-element embedded in reversal design (study 3, study 4 Mary only); multi-element (study 4, Brandy)	Lower levels of pica when had access to matched as opposed to unmatched stimuli, subsequent analysis revealed texture was critical variable
Roscoe et al (1998)	3	20-35	SIB	Effects of competing stimuli	Multiple-baseline with embedded multi-element design	Competing stimuli reduced SIB
Thompson et al (1998)	1	7	Chin-grinding; aggression	Effects of matched stimuli	Multi-element design	Matched stimulation <i>with</i> response blocking led to greater reductions in challenging behaviour.

Garcia and Smith (1999)	2	29-42	SIB	Effects of naltrexone	Multi-element embedded in double blind, placebo controlled reversal design	Reductions in automatically reinforced SIB of one participant
Goh et al (1999)	4	40-49	Cigarette pica	Effects of matched stimuli	Multiple-baseline	Providing matched stimuli led to reductions in pica but did not maintain.
Rapp et al (1999)	1	19	Hair pulling; hair manipulation	Effects of matched stimuli	Multi-element design	Lower rates of hair pulling when given non-contingent access to previously pulled out hair
DeLeon et al (2000)	1	11	SIB	Parameters of competing stimuli	Multi-element embedded in a reversal design	Lower levels of SIB when multiple toys available. Within-session analysis revealed that in single-set condition toy play decreased and SIB increased over the course of the session
Friman (2000)	1	3	Thumb sucking	Effects of presence of specific stimuli	Multiple-baseline with reversal design	Thumb sucking only occurred in presence of cloth.
Patel et al (2000)	2	10-30	Head-hitting; rapid tongue movements	Effects of matched stimuli	Multi-element design (Phase 2); Multi-element embedded within a ABAB design (Phase 4)	Providing access to tactile and auditory stimuli reduced problem behaviour

Piazza et al (2000)	3	6-17	Dangerous behaviour; hand- Mouthing; saliva manipulation	Effects of matched stimuli V competing stimuli	Multi-element (Betsy); multi-element embedded in reversal design (Brad/Tyrone)	Challenging behaviour reduced when given access to matched stimuli a but not when given access to unmatched stimuli
Rapp et al (2000)	1	4	Hair manipulation; object manipulation	Effects of matched stimuli	Multi-element design	Low levels of hair-pulling when given access to matched source of stimulation.
Van Camp et al (2000)	2	5-8	Hand-biting; hand flapping; toy play	Effects of presence of specific stimuli	Multi-element design and ABAB reversal	Presence of ball and social interaction occasioned problem behaviour of two individuals
Wilder et al (2000)	1	30	Head rocking	Effects of competing stimuli	Multi-element design; (Phase 2), multi-element embedded in reversal (Phase 3)	Lower levels of head rocking when given massage to shoulders and neck. Providing enriched environment (EE) with vibrating pen reduced head rocking but EE without pen did not
Cuvo et al (2001)	4	44-65	Stereotypical behaviours	Effects of competing stimuli	Multi-element design	Differences in stereotypical behaviour across settings with differing levels of stimulation
Healey et al (2001)	1	21	SIB	Effects of competing stimuli	Multiple-baseline design with embedded reversal	Lower levels of SIB when competing stimuli available
Britton et al (2002)	3	8-28	Stereotypical behaviours	Effects of matched stimuli	Multi-element design; reversal	Stereotypy reduced when had access to matched sources of

Can et al (2002)	1	7	Object mouthing	Effects of matched stimuli V competing stimuli	Reversal with embedded multi-element component	stimulation with prompting Challenging behaviour reduced only when combined NCR with response blocking. No difference between matched and unmatched stimulation
Lindberg et al (2003)	3	30-43	SIB	Parameters of competing stimuli	Reversal design	Brief noncontingent access to single preferred stimuli reduced SIB for all 3 individuals. When extended sessions led to increase in SIB and reduction in object manipulation for 2 participants until varied reinforcers available.
O'Reilly et al (2003)	1	27	Attempts at SIB	Effects of competing stimuli	Multi-element design (Phase 2 and 3); Reversal design (Phase 3)	Attempts at SIB reduced when noncontingent access to vibrating stimuli provided but not when given access to alternative forms of stimulation.
Roane et al (2003)	1	8	Object mouthing	Effects of competing stimuli	Multiple-baseline	Competing stimuli reduced challenging behaviour
Simmons (2003)	1	48	SIB	Effects of matched stimuli	Multiple-schedule design with reversal	Evaluated effects of providing noncontingent access to food on SIB. Measures of SIB post-intervention were lower than pre

Tang et al (2003)	6	4-17	Stereotypical behaviour	Effects of matched stimuli	Multi-element	Lower levels of stereotypy in specific sensory masking conditions for four participants. Providing matched stimulation reduced stereotypy of three participants.
Carter et al (2004)	1	8	screaming; hand-mouthing	Effects of presence of specific stimuli	Multi-element embedded in reversal design	Challenging behaviour occurred only in those conditions in which toys present
Rapp (2004)	1	10	object twirling	Effects of response deprivation/satiation and presence of specific stimuli	Multi-element embedded in reversal design	Stereotypy lower in second session of the day suggesting prior access to reinforcer acted as AO. Higher levels of object twirling when music played
Rapp et al (04)	5	5-14	Stereotypy	Effects of response deprivation/satiation and competing stimuli	ABAB design	For 3 participants, highest level of challenging behaviour occurred after response restriction. Providing stimulation matched to sensory products of behaviour reduced stereotypy of one participant.
Ahearn et al (2005)	2	11-13	Stereotypy	Effects of matched stimuli V competing stimuli and parameters of competing stimuli	Multi-element	Non-matched but highly preferred stimuli led to greater reductions in stereotypy of two participants

Carter (2005)	1	4	SIB	Effect of sinus infection and weighted vest	Multi-element	Higher levels of SIB when sinus infection present than absent. Weighted vest had no influence on SIB.
Higbee et al (2005)	1	12	Stereotypy	Effects of matched stimuli V competing stimuli	Reversal	Stereotypy reduced when given access to matched form of stimulation, no reductions when given access to highly preferred unmatched stimuli
Long et al (2005)	3	5-19	SIB; aggression; disruption	Effects of competing stimuli	Reversal	Providing competing stimuli reduced automatically reinforced challenging behaviour
Rapp (2005)	3	9-11	Stereotypy	Effects of presence of specific stimuli	Multiple probe design (Exp 1; Carl & Ryan; Exp 2/3 Ryan only) design. Reversal (Exp 1; Andy; Exp 2/3 Carl & Andy)	Audio and visual stimulation exerted an influence on various topographies of stereotypy
Sidener et al (2005)	2	6	Stereotypy	Effects of matched stimuli	Multiple baseline design with embedded reversal	Consequence-based intervention had no impact on problem behaviour, but stereotypy reduced following NCR with matched stimuli
Taylor et al (2005)	1	4	Stereotypy	Effects of matched stimuli V competing stimuli	Multi-element design; (Phase 2) concurrent operant choice procedure (Phase 3)	Less vocal stereotypy when given access to auditory toys.

Rapp (2006)	1	9	Stereotypy	Effects of response deprivation/satiation and matched stimuli	Multiple schedules	Higher levels of stereotypy following response restriction; lower levels of stereotypy following access to matched stimuli
Kenzer & Wallace (2007)	1	59	Rumination	Effects of competing stimuli	Reversal design	Food satiation reduced problem behaviour
Rapp (2007)	2	9	Stereotypy	Effects of matched stimuli V competing stimuli	Reversal design; (Exp 1) Multiple-schedule and reversal (Exp 2)	Providing matched stimulation led to greater reductions in stereotypy than unmatched. Stereotypy of both participants remained below pre-intervention levels following the removal of auditory stimulation

Appendix 5. Inter-rater reliability data.

Participant	Response class	Reliability	Reliability	Reliability	Kappa
		Total	Occurrence	Non-occurrence	
<i>Abe</i>	Finger-biting	99%	92.1%	98.9%	.95
	Other CB	99.3%	87.5%	99.3%	.93
<i>Greg</i>	Head-hitting	100%	100%	100%	1.0
	Other CB	99.1%	95.4%	98.9%	.97
<i>Jacob</i>	CB	99.2%	87.5%	99.1%	.93
<i>Luke</i>	CB	97.8%	90.9%	97.1%	.94
<i>Theo</i>	CB	99.3%	89.5%	99.2%	.94
<i>John</i>	Finger-biting	99.6%	87.5%	99.6%	.93
<i>Calum</i>	CB	99.7%	97.9%	99.6%	.99
<i>Richard</i>	CB	99%	96%	99%	.97
<i>Sean</i>	Self-biting	98.8%	83.3%	98.6%	.90
	Other CB	94.1%	85.1%	90.4%	.87
<i>Matt</i>	Object banging	98.1%	75.9%	97.9%	.85
	Other CB	98.3%	87.5%	98.1%	.92
<i>Angus</i>	Finger-biting/object mouthing	99.6%	88.9%	99.6%	.94
	Other CB	98.3%	81.8%	98.1%	.89
	Head tapping	99.4%	85.7%	99.4%	.92
<i>Shelley</i>	Lying on floor	98.3%	95.5%	97.4%	.97
	Other CB	98.3%	80.9%	91.2%	.89
<i>Katie</i>	Stereotypical behaviour	99.6%	95%	99.5%	.97
	Other CB	100%	100%	100%	1.00