The Development of Group Processes during Childhood and Early Adolescence.

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Memorandum

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The theoretical and empirical work herein is independent work. The author has not been awarded a degree by this university or any other university for the work included in this thesis.

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Abstract

Within social psychology, little attention is given to group processes occurring outside of adult populations. The development of these group processes is rarely discussed or otherwise is assumed to be identical to that of the adult processes observed in the literature. Developmental literature in psychology on children's group processes is also sparse and the systematic testing of children's intragroup processes is rare. This thesis aims to address these issues, firstly arguing for the benefit of research that brings together developmental and social literature. A review of intragroup process research with children is given, citing major publications in this area to date, along with important considerations from intergroup, peer relation and identity research. The thesis then moves on to discuss distributive justice and resource allocation in children to introduce the experimental paradigms that will be used. Two studies examine at how intra- and intergroup processes impact on children's decision making on resource allocation, with a third study focussing on intragroup processes in a cumulative estimation paradigm. The second part of the thesis considers productivity in children's groups across two studies using a brainstorming paradigm. Findings from all of these studies have shown a divergence in children's intragroup behaviour from that typically found with adults. The continued research of children's intragroup processes is advocated as a necessary and exciting new direction for both social and developmental literature to take.

Contents

List of Tables

List of Figures

Chapter 1

Introduction

Social psychology is 'an attempt to understand…how thoughts, feeling and behaviour of the individual are influenced by the actual, imagined or implied presence of others' (Allport, 1968, p.3). Research into this area also considers how different groups interact with one another and how belonging to a certain group can affect the individual (Tajfel & Turner, 1979). There is at present, a wealth of such research in social psychology ranging from social identity (Rubin & Hewstone, 1998) to group decision making (Kerr & Tindale, 2004), to collective action (Gamson, 1992), intergroup behaviour (Brewer & Kramer, 1985) and group performance and productivity (Kerr & Tindale, 2004; Lamm & Trommsdorff, 1973). From this research we have gained a detailed account of group behaviour in a variety of contexts and the factors that can affect it however little attention has been given in this domain to the developmental trajectory of behaviours seen in adult populations.

Social developmental psychologists have criticised social psychology research for the apparent assumption that group behaviour starts at University age and for the general ignorance of any developmental considerations as to where the group behaviour they observe may stem from (Durkin, 1995; Bennett & Sani, 2004). To assume that children do not form or work in groups and that this experience would not shape the way they function in groups as an adult seems improbable and at the very least assumptions worth researching further. Current research on social development has focussed mostly on intergroup scenarios, demonstrating that children have quite a complex understanding of their social world (for a full discussion see Chapter 2). However, less is known about children's intragroup behaviour.

Although less obviously applicable, children's intragroup behaviour is important to understand. For example, learning the basics of how children make decisions and how these decisions can be influenced by others can help to explain group ostracism and bullying, raising questions such as: do individual attitudes in a group become polarised, do children side with the majority or can a minority position have influence? The development of intragroup behaviour can also have important theoretical ramifications. Looking at productivity loss in groups, Steiner (1972) argued that process loss, which ultimately causes lower productivity levels, is an inherent part of being in a group. If that is the case, then productivity loss should be seen in children's groups and if it is not, it implies that process loss is something we learn as we get older. If the latter is the case, then further questions need to be answered; at what age does process loss start and are there any developmental variables at that age that can explain where it may come from?

By looking at the development of intragroup processes, we can learn more about group behaviour and some argue that we can never fully understand group psychology without first looking at where this behaviour comes from (Durkin, 1995). Additionally developmental psychologists can use social psychological research to answer questions in their own work such as the social psychological processes that are present in children that help them to understand their social world. Recent research presented both in this thesis and in peer review journals have also demonstrated the applicability and value of using social psychological measures and statistical methodology when working with child populations (Gummerum, Keller, Takezawa, & Mata, 2008; Keller & Canz, 2007).

Despite the potential for new research areas, there remains a gap in the literature in both social and social-developmental literature on intragroup processes in children that needs to be addressed. Since initial work on collaborative learning demonstrated that working with others improved children's cognitive development and reasoning ability, group work has

become a permanent feature of classrooms in the UK. Coupled with the fact that children often play together in groups and join after school clubs, groups and how to behave in a group are salient issues for children of school age. The purpose of this thesis is to address the gap in literature on children's intragroup processes to further our understanding of how children work in a group and how they benefit from group work, when the adult literature suggests that being part of a group impairs performance (Diehl & Stroebe, 1991; Steiner, 1972). In order to do this thoroughly, two things must be defined: what is meant by group and group processes.

Definition of group

Although a seemingly obvious idea, the definition of a group still has no consensus in the social psychology literature. Groups are comprised of a wide variety of people, ranging from fans at a football match, to the social category of women and to more salient groups such as family and profession. To try to encompass all these different types of groups into one overarching definition has proven difficult.

McGrath (1984) felt it better to take the view of 'groupiness' thus creating a dimension along which different people and groups can vary. McGrath believed that groupiness could be considered as the extent to which small numbers of people interact freely and repeatedly with one another on a wide range of tasks and who have a history of interaction and a strong expectation of future interaction (1984). Whilst this serves the purposes of incorporating as many groups into one comparable and superordinate category, in terms of laboratory based testing in social psychology, the groups used would attain low scores for groupiness. Additionally the focus of this thesis is on small group dynamics so the ability to incorporate larger and varying group types is less relevant here although focussing only on small groups is a limitation of the work presented.

As the groups used throughout this thesis are temporary groups, made up of three or more people, arbitrarily formed for the purposes of completing certain tasks, the definition of groups given by Forsyth (1999) will be used. Forsyth defined groups as 'two or more interdependent individuals who influence each other through social interaction' (p.5)

Definition of group processes

Group behaviour can be approached in two distinct ways; behaviour between two different groups (intergroup behaviour) and behaviour occurring within the group (intragroup behaviour). Whilst both are equally important, this thesis will be focussing predominately on intragroup behaviour and in particular on small group dynamics. Small group dynamics research primarily concerns itself with the relationship between group structure and cohesiveness and the overall efficiency/effectiveness of the group (Hogg & Abrams, 1998).

Thesis Overview

In Chapter 2 I will be discussing the current literature available on children's inter and intragroup behaviour with the aim of providing a context for this thesis. I will briefly discuss intergroup behaviour, social competence, peer relations, categorisation ability and social identity literature before moving on to discuss the current literature available on intragroup processes. The chapter highlights the benefits of this research and highlights how this thesis adds to the current literature available on this topic.

In Chapter 3, I discuss the literature on children's decision making on resource allocation and the impact of groups on these decisions. The aim of this chapter is to provide background on the methodology and theories behind the decision tasks used in Studies 1 and 2. The chapter ends with a discussion of group decision making models typically used in social psychology research and argues for the use of these models in developmental psychology.

In Chapter 4, two studies are presented which aim to investigate the intragroup and intergroup influences on children's decision making and any changes in influence occurring with age. In the first study children are asked to make an individual and then group decision on resource allocation amongst three fictional children. Their individual answers are compared to the final group decision to see how the group has influenced individual's initial preferences. The second study asks children to share sweets out between themselves and another pupil in different scenarios. An intergroup context is presented for some children and the target who they are sharing sweets with also changes from another pupil in their own school to an outgroup member. The findings are presented and conclusions drawn using literature presented in Chapter 3.

In Chapter 5, another empirical study on children's group decision making is introduced using a different methodology in an attempt to address some limitations of the previous two studies in Chapter 4. The type of decision children are asked to make is a cumulative estimation judgement rather than a resource allocation task. The children are asked to estimate individually and then in groups, the number of times they hear a certain word when a vignette is read aloud to them. Using decision models typically found in the adult literature, the results are analysed and decision rules children use to make their final group decision are discussed.

In Chapter 6, literature on brainstorming in adult populations is introduced and an argument put forward as to why children in similar groups would behave differently from adult groups. These arguments are based on empirical evidence including topics such as collaborative learning, social comparison and conformity. In Chapter 7, two empirical studies are presented testing the theoretical arguments made in the literature chapter. The first study focuses on individual performance and nominal group performance (the sum of individuals' answers with repeating answers removed). The second study in the chapter looks at the

difference in performance between nominal groups and ‘real groups’ (groups of children who interacted with one another).

Chapter 8 consists of a general discussion on the key findings of the thesis. It reiterates the main aims of the thesis, the implications of the findings for current literature, the strengths and limitations of the thesis and ideas for future research. The aim of this chapter is to provide an overview of the key points made throughout the thesis.

Chapter 2

Children and Groups

Overview

As previously stated in the introduction, research into intragroup processes in children could give researchers insights into social psychological phenomena, as well as an additional understanding of children's social worlds. This chapter will give a brief overview of the literature on children and intergroup processes, social identity and children's understanding of group membership and peer relations. All of these aspects relate to children's understanding and knowledge of groups which will help to inform this thesis in terms of what might be expected when children are placed in intragroup situations. Next the chapter will focus on research that has examined intragroup relations such as conformity, collaborative learning, information sharing and decision making. As yet, there is no theory of children's intragroup processes, but previous research can give insight into the ways children handle different intragroup scenarios. The purpose of this chapter is to highlight theory and research on intergroup behaviour, explain how this may aid our understanding of intragroup behaviour and review all the research currently available on children's intragroup processes as these areas were used as the premise for the research presented in this thesis. .

Children's Understanding of Group Membership and Social Identity

Before discussing the effects of intergroup and intragroup contexts on children, it is important to establish what children understand about what it means to belong to a group. Their understanding about what is involved in group membership and what it means to be a 'good' group member is likely to have an impact on how they behave once in a group. First, it needs to be highlighted that children can categorise themselves and others as belonging to

certain groups at a very young age. Gender and ethnicity groups can be distinguished by both 3-month-olds and 6-month-olds respectively (Katz & Kofkin, 1997; Quinn, Yahr, Kuhn, Slater, & Pascalis, 2002). This ability to categorise gender and ethnicity based group membership at such an early age may not be reflective of children's ability to categorise others in more ambiguous group memberships (nationality for example) but it does suggest that children seem to be prone to organising their social world in this way.

It cannot be assumed that simply because a child can identify and categorise themselves using appropriate gender terms for example, that they fully understand the expectations of attitude and behaviour associated with that group. Kohlberg (1966) found that, when looking at children's gender development, it is not until age 4.5-7-years that children understand gender is biologically based and remains constant over time and context (such as cross dressing). Despite this lack of knowledge about gender, studies have shown that children as young as 3- and 4-years both reinforce gender appropriate behaviour and punish gender inappropriate behaviour (Lamb, Easterbrooks, & Holden, 1980). Children being treated in this way respond accordingly reducing inappropriate behaviour and continuing with appropriate behaviour.

It could be argued that children do seem to have an understanding of what 'should' be done when you belong to a certain group which suggests then that not fully understanding gender and its constancy does not matter. However, others have argued that anyone can respond to positive and negative reinforcement, leading them to change behaviour, without really understanding the reason behind the reinforcement (Martin & Little, 1990). In their study on children's gender understanding and gender typed preference/knowledge, Martin and Little (1990) found that children needed only a basic understanding of the concept of gender before going on to show preferences for and knowledge of sex-typed toys and

clothing. It would seem then that children at an early age do understand the ‘should’ of gender group behaviour without really understanding the concept of gender itself.

Quintana (1998) theorised that children’s understanding of ethnicity occurs in four levels. First, between 3- and 5-years racial differences are viewed mostly as physical (differences in skin colour for example) therefore making racial status changeable (for example if you get a tan you are now Spanish). Between 6- and 10-years racial differences are viewed as differences in culture such as food and language. Between 10- and 14-years children understand racial differences in terms of social class and allocation of resources meaning they are aware of the differences in social standing of different races and stereotypes associated with them. During adolescence, the fourth stage occurs whereby children develop a sense of belonging to their own racial group which results in pride in belonging to said group.

Not everyone agrees with Quintana’s (1998) proposal arguing that children under the age of 10 have an understanding of race that goes beyond simple physical differences. Hirschfeld (1995) found 3-year-old children were able to recognise that race is derived from family background and is fixed at birth and unchangeable. However these findings are not mutually exclusive to Quintana’s proposed stages- children could recognise the biological basis of skin colour and hair type and not understand the cultural and social attributes that come with these differences.

Being able to recognise that you belong to a particular group, especially groups with such obvious and observable differences as gender or ethnicity does not mean you identify that group within your self-concept however. By identifying with the group, you are taking on their norms, attributes and behaviours. Bennett and Sani (2008a) attempted to address this issue by looking at children’s self-stereotyping with five, seven and ten-year-olds. They made

gender salient, and observed that in these situations, children judged themselves as more similar to same-sex classmates and assigned to themselves, more 'sex-appropriate' attributes. This behaviour was observed in all age groups. The fact that children are able to recognise these stereotypes and identify with them, suggests an understanding of group membership and what group members should be like.

Bennett and Sani (2008b) demonstrated similar findings using an additional technique: self-referencing. They gave children a list of words and asked them whether the word described themselves, an in-group (gender, family or age), the semantic connections of the word and whether the word described a 'non-self' category (dogs). The idea behind self-referencing is that children will better remember the list of words when applied to themselves and their in-groups. Children as young as 5-years-old did have a better recall on words when applied to themselves and in-groups, particularly the family, suggesting that the internalisation of the in-group within the self does occur in children as young as 5-years.

Using a third method to demonstrate the internalisation of group membership in the self, Sani and Bennett (2009) used the self-ingroup confusion paradigm with children at ages 5-, 7-, and 10-years. In this paradigm participants are asked to rate the extent to which different traits apply to themselves, an in-group, and an out-group. They were then asked to recall who they rated each trait as belonging to. What the authors found was that children were more likely to confuse words rated for the ingroup with words rated to themselves suggesting again that ingroups are reflected in children as part of the self. Taken together these three papers, each using different methodology, demonstrate that from the age of 5-years, children not only identify with an ingroup but that the ingroup forms a part of their own self-concept.

All of the groups considered in typical identity studies are groups that have obvious physical determinants. Gender, age, ethnicity and family are all groups that are easy to tell apart either by distinct physical characteristics or through familiarity. Not all groups that we belong to have such obvious prerequisites. National identity for example has been shown to follow a different developmental pattern than other group memberships. Barrett, Lyons and del Valle's (2004) research on national identity, something which may be less salient for young children in terms of a lack of strong physical identifiers, has proven to have less of an obvious developmental pattern. This lends support to the idea that some group membership is easier to ascribe and that, although children can recognise themselves as black or as a girl, they are less able to pick up on more subtle group memberships they possess which may be an important factor when trying to assess their group behaviour in a minimal groups paradigm. Anytime a group paradigm is introduced to children, researchers need to ensure that the group membership is obvious for the child in order for the manipulation to work.

Bennett and Sani (2004) discuss a study which investigated children's feelings of responsibility for ingroup member's transgressions. They presented 5-, 7- and 9-year-olds with a scenario where, during a sports visit to another school, either they or unknown children from their school committed a transgression. They were then asked about their response to this situation and it was found that only in the older two groups did children report a desire to apologise for the transgression when it was committed by another child from their school. This shows that a more fully developed social identity may not occur until middle childhood. If young children do not perceive group members actions as reflecting badly on themselves, it suggests that their identification with their ingroups are different from that of older children and adults who do show such behaviour.

Children have been shown to be influenced by the salience of group categories, hold varying group memberships as more important than others and demonstrated awareness of

status differences between groups as well as demonstrating in-group bias (Ruble et al., 2004). Although the complexity of these phenomena may not match that of adults, it is clear that children have a very considered and detailed understanding of their social world. Svirydzenka, Sani and Bennett (2010) found that whilst children and adults did classify social groups in similar ways (task groups, social categories, intimacy groups and loose associations), they differed in terms of the factors they thought determined a group's entitativity ('groupiness'). Children emphasised concrete properties such as the degree of interaction between people and having shared activities where as adults emphasised the degree of similarity and the importance of the group to its members as important.

Group memberships can also help young children to make sense of their social world and predict what others around them will do next (Birnbaum, Deeb, Segall, Ben-Eliyahu, & Diesendruck, 2010). In a series of studies conducted by Rhodes and Gelman (2008), when asked to predict individual consistency in behaviour, young children (4- to 5- years of age) relied on category based information (in this case gender membership) to help them predict a target's future preferences. Children were presented with a pair of targets that were either the same gender or different gender. Each individual within the pair was presented as having different initial preferences for made up games. When the pair belonged to the same gender group, young children were unable to predict based on previous preference information, what the targets preference would be later on. When the targets belonged to different gender groups however, young children predicted that the target would remain consistent in their initial preference. When more benign groups were used (the colour of shirt targets are wearing), children were unable to predict what a targets future preference might be. This demonstrates how children can use other people's group membership to help them predict and plan that person's future behaviour and opinions. This effect of gender on predicting individual consistency diminished for older children (10 years) as these children were able to

use the information about previous preferences to predict future preferences without the aid of a group context.

Rhodes (2012) also published an additional series of studies that looked at the naïve theories of social groups in children aged between 3- and 10-years. Children were introduced to novel groups and asked to make predictions about their behaviour. 3- to 5-year-olds predicted that group members would harm others belonging to a different group (rather than people in their own group) but expected group members to help people belonging to both groups equally regardless of group membership. Older children expected group members to harm members of another group and to only help members of their own. Again, these findings demonstrate children's proclivity to use group membership to guide predictions about behaviour.

A further demonstration of more complex understandings of what is expected in group behaviour comes from the theory of Developmental Subjective Group Dynamics (Abrams & Rutland, 2008). The theory argues that children from an early age are able to distinguish between intergroup members but that it is not until later that children differentiate between intragroup members. At this point, children understand that deviance by an ingroup member constitutes a departure from group norms that other group members may wish to protect. This then leads them to be able to make different judgements on whether to include ingroup and outgroup members based on their adherence to group norms. The theory postulates that older children would rate normative ingroup members and deviant outgroup members more highly than deviant ingroup members and normative outgroup members. This is because a deviant outgroup member lends more support to the ingroup relative to a deviant ingroup member.

Research evidence supporting this theory demonstrates that it is not until middle childhood (10-11-years) that children develop this ability to differentiate between their own ingroup members although the exact age has been debated (Abrams, Rutland, & Cameron, 2003; Abrams, Rutland, Cameron, & Marques, 2003). If the content and understanding of our social identity and group membership can change that must impact on intragroup processes and behaviour demonstrated in children. Understanding what it means to be a part of a group and the expectations attached to that group member in terms of behaviour and attitude, are going to impact on the behaviour researchers observe when asking children to complete intragroup tasks. Questions such as 'is it okay for me to disagree with the group's decision?' or 'do I do more work and embarrass the other members of my group, or cap my performance?' are factors that affect adult group behaviour and are bound to change in children as their understanding of group membership changes.

Children's intergroup behaviour

Understanding aspects of children's intergroup behaviour is important when considering their intragroup behaviour because motivations such as wanting their ingroup to remain distinct and wanting their ingroup to be superior to others, could affect their intragroup behaviour. According to Social Identity Theory (Tajfel & Turner, 1979), people are motivated to belong to groups that are superior to others as this enhances their self-esteem. This can lead to individuals believing themselves to be similar to other members of their group and having more favourable opinions, attitudes and behaviours toward members of their own group. Out-groups on the other hand are viewed as different from members of the in-group and 'less good' and it is through these mechanisms that prejudice and discrimination can occur (Tajfel & Turner, 1979). The theory itself however, did not concern the development of such in-group biases and how they may affect children and their behaviour.

Despite the lack of application of this theory directly to children, several studies have demonstrated both ingroup bias and prejudice in this population. Gender, ethnicity, race and even accents have been shown to influence children's opinions and decisions about others. Augoustinos and Rosewarne (2001) found children aged 5 years showed ethnic bias when associating positive and negative adjectives to others of different races; positive traits were more likely to be supported when applied to white stimuli and negative traits were more likely to be supported when applied to black stimuli. Prejudice has also been found in children in relation to gender comparisons, with both male and female children selecting their own sex for positive attributes and both male and female children giving the more negative attributions to boys (Zalk & Katz, 1978). Kinzler, Shutts, DeJesus and Spelke (2009) found prejudice in relation to accents finding that children prefer others who have similar accents to them, choosing those with similar accents as friends regardless of their race.

Prejudice is reported to decrease with age with research showing a peak in prejudice at around 7-years and a decline thereafter, which is a trend predicted by social cognitive researchers (Aboud, 1988). Despite this apparent decline, prejudice has such adverse effects on those being stigmatized (Neisser, 1986) that a lot of focus in the intergroup literature has been given to interventions attempting to reduce such behaviour. There are many forms of intervention studies that can be found in the literature based on theories such as empathy (Nesdale, Griffith, Durkin, & Maass, 2005), socialisation (Graves, 1999) and cognitive development (Bigler & Liben, 1992). One theory that has garnered particular attention comes from Allport's (1954) inter-group contact theory which purports that contact with an outgroup can reduce prejudice provided certain conditions are met. These conditions include equal status between groups, shared goals, intergroup cooperation and support of an authority figure or establishment (Pettigrew, 1998).

There has been an argument in the literature of late as to whether studies demonstrating prejudice are actually measuring positive ingroup bias rather than outgroup derogation. Nesdale (2004) developed the Social Identity Development Theory (SIDT) which argues children who eventually express prejudice toward the outgroup go through four distinct stages. At phase one children are undifferentiated paying little attention to things such as racial cues and as they get older they enter phase two where children are able to recognise and distinguish different racial groups and label themselves accurately as belonging to a certain group. During phase three children focus their attention on their ingroup; their perceived similarity, superiority and preference for their ingroup over others. At this point Nesdale argues, any display of differential treatment between groups is simply a reflection of ingroup focus. Only those children who reach phase four and shift their focus to equally attend to both the in- and outgroup begin to display prejudice.

Ingroup bias has been shown to occur in children, even in the context of minimal group paradigms. Bigler, Jones and Lobliner (1997) found that children as young as 6-years-old demonstrated a preference for their ingroup despite it being a temporary group (lasting only four weeks) and Dunham, Baron and Carey (2011) found similar findings when randomly assigning children to a colour group. Vaughan, Tajfel and Williams (1981) also found ingroup bias in children's resource allocations finding high levels of ingroup bias from the age of 7- to 11-years. Such preferences for the ingroup mirror that of adult populations and lend support to the Nesdale's idea that children display ingroup preference rather than outgroup derogation.

Children and Peer Relations

Throughout childhood and adolescence the amount of time spent interacting with peers increases with age (Rubin, Bukowski, & Parker, 1998). Given this increasing time,

understanding how children work together with their peers is important if we are to understand the social world they live in. Particularly during middle childhood concerns about peer acceptance increase sharply (Kuttler, Parker, & La Greca, 2002). The nature of children's friendship concepts also change with age with younger children focussing on concrete benefits such as sharing toys and enjoying the same activities (Bigelow, 1977). When children reach 10 to 11-years they begin to focus on shared values and the importance of sticking up for each other. This then develops at 11 to 13-years into the idea that friends share the same interests and that it is important to understand each other and share personal information (Bigelow, 1977). It is during middle childhood that cliques begin to appear which are friendship based groups and by the age of 11-years children report that most of their social interaction occurs within the context of their clique (Rubin et al., 1998).

A lot of research into peer relations has focussed on researching those children who get rejected by their peers and those who are considered popular. Given the serious impact exclusion can have on children it is easy to understand why this has been a focus. Exclusion can lead to a variety of problems for the target of the exclusion including withdrawal, low self-esteem, poor academic performance, impaired cognition and depression (Williams, Forgas, & von Hippel, 2005). Children who struggle to make friends are reported as more likely to be at risk of victimisation by bullies (Boulton, Trueman, Chau, Whitehand, & Amatya, 1999).

Research has looked at what traits popular children have and what traits those who are likely to be rejected have in an attempt to distinguish reasons for the difference between the two groups. Popular children are seen to be cooperative and friendly, helpful to others, skilled at maintaining positive relationships with others, good at communication and are more likely to show leadership than children who are not rated as popular (Black & Hazan, 1990; Rubin et al., 1998). Some groups of rejected children on the other hand tend to be more aggressive

than their peers (Newcomb, Bukowski, & Pattee, 1993) and others who are rejected are more timid and withdrawn (Parkhurst & Asher, 1992).

Research into intergroup contexts as mentioned previously (see intergroup subheading) has shown that children will often exclude others based on differing group membership (Bigler, Jones, & Lobliner, 1997). With the introduction of Developmental Subjective Group Dynamics this focus on exclusion has also been investigated *within* the group. Abrams, Rutland, Pelletier and Ferrell (2009) posited the idea that older children are able to distinguish between ingroup members based on their adherence to ingroup norms. Those ingroup members for example, who were shown to be deviant, are rated as less liked by children than outgroup members who are also shown to be deviant (Abrams et al., 2009). It is argued that this is because deviant ingroup members are seen as a threat to the stability and superiority of the ingroup whereas a deviant outgroup member lends support to the ingroup (Abrams & Rutland, 2008).

It seems exclusion and rejection in children can be based on individual competence and characteristics as well as group membership and adherence to group norms. As human beings are motivated to avoid exclusion and rejection by others, understanding the factors involved that can lead to this rejection are important considerations when thinking about children's intragroup processes. It follows that concerns about rejection by important peer groups may affect the behaviour demonstrated by children when working within a group.

Children's Intragroup Behaviour

The following sections focus on research that has already begun in the area of children's intragroup processes. There is not yet any theoretical framework for this area and the research remains sparse and therefore disjointed. The intragroup literature presented below has been organised into the following main categories: collaborative learning, social

loafing, decision making (including the risky shift paradigm), conformity and information sharing. Several of these papers will be discussed elsewhere in the thesis so this chapter will focus solely on their findings and implications. Chapters where these papers are discussed more fully will be highlighted to the reader throughout. Those studies which will remain unique to this chapter are explained more fully.

Collaborative Learning: Piaget (1932) and Vygotsky (1978) were some of the first researchers to stress the importance of social interactions for children's cognitive growth. Research following the socio-constructivist approach (based on Piaget) demonstrated several situations in which children working together demonstrated a higher level of reasoning than children who worked alone (Doise & Mugny, 1984; Glachan & Light, 1981). The reason for this according to the approach is that conflict in points-of-view or solutions lead children to be exposed to other ways of thinking. This exposure allows children to incorporate new knowledge and opinions with their own, leading to the mastering of new skills and ways of thinking (Doise, 1990).

Vygotsky's (1982) approach to collaborative learning is referred to as the socio-cultural approach, as it emphasises the role of interaction with others and the internalisation of that interaction by the individual (Dillenbourg, Baker, Blaye, & O'Malley, 1996). Rumelhart and Norman (1978) suggested that through verbalising ideas and introducing them to the social plane, children receive feedback from peers that can highlight various problems in the child's original solution. The highlighting of these shortcomings can lead to the child refining their knowledge of the problem and correcting themselves.

Whilst most research into collaborative learning produced positive results, there were negative results which, when found, were often attributed to methodological error (Dillenbourg et al., 1996). Empirical studies using dyads tended to find results that suggested

collaborative learning was more effective than those studies using larger groups, however changes to methodology have been shown to remove the difference between groups of differing size (Colbourn & Light, 1987). Another factor to consider when looking at the benefits of collaboration between children is the child's age when interacting. To be able to understand and take on another peer's ideas requires some level of Theory of Mind which typically begins to develop at around 4-years of age (Tomasello, Kruger, & Ratner, 1993). This would mean that collaborative learning would only be effective in children of school age who would be able to use this skill effectively.

Although no consensus has been reached in this literature regarding how collaboration aids children, it is important to consider, as it is some of the first literature considering the impact of others on children. The nature of the tasks used in the experimental paradigms means that intragroup processes would have been at work so the theoretical arguments and ideas made in this literature, although now dated, should be considered when investigating future intragroup behaviour (for further application of collaborative learning see Chapter 6).

Social Loafing: Social loafing is the tendency for individuals to input less effort when working in a group than when working alone (Karau & Williams, 1993). Karau and Williams (1993) conducted a meta-analysis of 78 studies all of which reported social loafing in adult and child samples. Of the 78 studies, only 17 used children and adolescents as participants. They found that several variables moderated levels of social loafing across studies including the potential for participants' performances to be evaluated, participants' expectations of co-workers performance, how important or meaningful the task was and the cultural background of the participants.

Gabrenya, Latane and Wangs' (1983) study with children from Taiwan found social loafing occurred across all ages (7-years to 14-years) on clapping and shouting tasks.

Children were asked to shout and clap individually and then in 'pairs' (this was a deception by the experimenter). The level of noise they produced individually and in pseudo-pairs was compared and social loafing was found across all age groups. When clapping in pseudo-pairs performances for clapping were reduced to 92% of their individual level and shouting reduced to 82%. Although less social loafing occurred in 8- and 9-year-olds, the study did not find reliable age effects. This demonstrates the propensity for children to socially loaf when asked to perform together on a task.

Social loafing has been demonstrated by research as a group process present in both children and adults although less research has been conducted using child participants. The development of social loafing over time remains unclear (Gabrenya, Latane, & Wang, 1983) and this may be due to evidence finding that social loafing is less common in highly cohesive groups (Karau & Hart, 1998). As testing with children is often done within schools, the likelihood of children knowing one another is greater than in samples where adult participants are sampled at random. This may mean that the children see themselves as more accountable to the rest of the group and loafing on a particular task may have ramifications for them outside of the experimental paradigm. More research needs to be conducted in this area in an attempt to map the development of social loafing with age controlling for these variables.

Decision making: There has been some recent research on intragroup processes particularly on the topic of decision making. Gummerum and colleagues have conducted studies looking at the impact of the group on decision making in children in dictator and ultimatum games. As these studies will be discussed in more detail in the following chapter (Chapter 4), a summary of the findings will be all that is presented here. Gummerum, Keller, Takezawa and Mata (2008) found that in groups of three children, prosocial majorities were more likely to win in the group when the child with the highest level of moral reasoning was

for the prosocial argument and therefore had a higher level of reasoning than the selfish group member. This interaction between developmental factor and group outcome demonstrates in part the reason that groups of children should be considered distinct from adult groups. Although Social Domain Theory argues that it is simply the focus of reasoning that changes with age (Smetana, 2006) by the time we reach adulthood (considered here to be University age given the proclivity to use undergraduates as adult participants in social psychology research), we will have reached a plateau of similar reasoning level. This means that factors such as higher levels of reasoning would no longer influence the outcome of the group decision as theoretically all group members should be at a similar level.

Keller and Canz (2007) observed arguments made during group discussions about resource allocation by children. Young children (3rd grade) used basic principles such as fairness and selfishness for their reasoning and children in 6th grade referred to the needs of the self and others when discussing equal allocation (whether they argue for or against the allocation). Children in 8th grade used fairness and reciprocity norms or excuses to justify their choices and the eldest age group (11th grade) used more sophisticated arguments including the use of negative stereotypes about the other group they would have to share resources with. The changes with age in reasoning demonstrate again how developmental factors influence group outcomes in children. The stages children go through and their relative success using the strategies observed at different stages could reasonably be considered to shape the way they argue in groups as an adult. These intragroup processes described here also reflect the changes in understanding of children's social world with the eldest age group being able to negatively stereotype groups in order for their own ingroup to benefit.

The ways in which groups interact have also been shown to affect the levels of moral reasoning in children. Killen and Damon (1982) found that after group discussions, moral

reasoning improved with higher levels of reasoning being used after the group discussion had taken place and those children who did improve were found to be more collaborative with one another and built upon each other's ideas within the group discussion. Children who were rejecting of others' ideas and had conflict in their discussions did not show any advance in their moral reasoning after group discussion.

This study demonstrates the impact intragroup processes can have on development; in particular that certain intragroup processes work better than others at producing beneficial outcomes for children. Why is it that some children working together end up in conflict while others do not and what does that mean about the ways in which they develop and progress in their intragroup behaviour? It would seem logical that past intragroup experiences could shape future behaviour and expectations when working in groups and being able to map intragroup development could help in creating a fuller picture of adult group processes.

Other studies looking at decision making in children have focussed on conformity in groups. Some of the first researchers looking at conformity in children were Hoving, Hamm and Galvin (1969) who tested children in grades 2, 5 and 8, and (controlling for task ambiguity) asked them which of two slides had the greater amount of dots. The children were taken out in groups of three but kept in separate booths and shown each other's answers through a series of lights controlled by the experimenter who changed them to give the impression of an erroneous majority. Ambiguity in the task was manipulated and the authors found that conformity decreased with age on non-ambiguous tasks and increased with age on ambiguous tasks. It has been argued that these findings reflect two needs present in children: the need to be correct (informational influence) and the need for peer approval (normative influence).

These ideas reflect findings in the literature with adult population where these two types of conformity have also been found (Deutsch & Gerard, 1955). Findings in more modern research also support these conformity types. Corriveau, Fusaro and Harris (2009) looked at conformity among preschool children and found that children in the study continually sided with a majority group member and distrusted answers given by a dissenter (someone who disagreed with the majority). The most recent studies into conformity have used adaptations of the Asch paradigm, using differing sizes of picture rather than lines. Haun and Tomasello (2011) found that children (4- to 5-year-olds) generally performed the task well and conformity only occurred when the child was asked to publicly share their response by saying it aloud.

In a second study, the researchers confirmed that in conflict with a majority, minority children performed significantly better when giving private over public answers. Children tended to conform more in public than in private overall and adapted their level of conformity to match the level of privacy from trial to trial. This suggests that children conform mainly for social reasons but more research needs to be conducted to understand fully under what circumstances need for peer approval overrides the need to be correct.

The findings in these studies again reflect the same phenomena found in adults (Cialdini & Goldstein, 2004). Sharing answers publicly increases levels of conformity in adults and when allowed to keep their answers private, adults prefer to give the correct answer rather than conform. The similarity in findings suggests that some aspects of group experience are the same for both children and adults and that conforming with the majority is inherent in our behaviour. More work needs to be done in order for the literature on children and conformity to be as extensive as the literature is with adults. Whilst the outcome may look the same, the processes behind conformity or when it happens could be quite different.

The Risky Shift Phenomenon. Another phenomenon recorded in the decision making literature with adults is that of the risky shift. Most research into the Risky Shift (the idea that people are more likely to make riskier decisions in groups than alone; Stoner, 1961), has typically focussed on participants aged between 14- and 60-years-old. It has been found that adolescents tend to make riskier decisions than adults but that all ages tend to make riskier decisions in groups than alone (Lejuez, Aklin, Zvolensky, & Pedulla, 2003). Josic (2011) looked at the impact of groups on risky decision making in 10-year-olds to see if children demonstrated the same pattern as adolescents and adults. In the paper Josic cited previous work where she found that 10-year-olds made less risky decisions when placed in a group (Josic, Budevac, Baucal, 2012). In the current paper the purpose was to determine why children did not make more risky decisions by looking at the conversational content in the group discussion phase.

Children were presented with a scenario called ‘Petar’s dilemma’ and were asked what they would do in his situation (they had a list of 6 options to choose from). After their individual choice, they were then put into same-sex groups of three and asked to come to a group decision on the dilemma. Josic found that in groups where a safer decision was made, a group member(s) involved an authority figure to help win their argument, the children favouring more risky choices were passive (did not speak as much, choosing to observe rather than participate) or the children favouring risky choices were in the minority. In the few groups where the riskier decision was made by the group, the individual who supported the risky decision was loud, persistently interrupted other group members and dominated the group. The findings demonstrate the divergence of group decision making literature in adults and children (children not making riskier decisions) as well as explanations as to how or why this might occur.

Information Sharing: Gummerum, Leman and Hollins (2014) looked into how children share information in groups. Using similar methodology to that used in adult 'hidden profile' studies (Kerr & Tindale, 2004) they gave groups of 7- and 9-year-old children shared or unshared information about two potential candidates for the lead in the school musical. In the shared condition, all group members received full information on both candidates (one candidate was obviously better than the other having seven positive traits over the other candidates four) and in the unshared condition, all group members received one piece of shared information and each member received two pieces of unique information only known by them. They measured how often unshared information was discussed in groups compared to shared information and the how likely it was across the two conditions (and ages) that the best candidate was selected.

They found that in the shared condition 74% of 7-year-olds and 86% 9-year-olds chose the best candidate and that in the unshared condition these numbers fell to 37% and 11% respectively. Both ages groups were significantly more likely to choose the best candidate in the shared rather than the unshared condition. The proportion of shared and unshared information mentioned in the group discussion was only marginally significant for 7-year-olds (9-year-olds discussing significantly more shared information than unshared). 7-year-olds were more likely than 9-year-olds to detect the hidden profile and pick the better candidate due to this smaller ratio of shared to unshared information being discussed. The researchers also investigated the impact of intersubjectivity by measuring joint focus; group members look at each other with affective state, engage with same object or follow gestural points, meta-communication- communication that initiated, maintained or terminated collaborative discussion and communication- utterances that repeat or complement another group members previous utterance. They found groups who detected the hidden profile had significantly less intersubjectivity than those groups who did not discover the hidden profile.

Gummerum et al.'s (2014) study demonstrates support for the collective information sampling model (Stasser & Titus, 1985) which argues that shared information is more likely to be discussed as it only needs to be mentioned by one group member to bring it to the group's attention. As all group members could bring up a piece of shared information but only one member can bring up a piece of unshared information, the probability of shared information being discussed is higher. The authors also interpret their findings alongside the collaborative inhibition theory (Basden, Basden, Bryner, & Thomas, 1997) which states that a group recalling or producing ideas will generate fewer answers than nominal groups due to retrieval strategy disruption. This occurs when a group disrupts individuals' recall strategies; the theory assumes each group member encodes and retrieves information differently. By listening to other members who may use recency retrieval for example, would disrupt a member who uses primacy retrieval. This study demonstrates the importance of developmental findings on social psychology literature as Gummerum et al. findings supported theories developed initially with adults.

Concluding points

The research included in this chapter has demonstrated that although children and adults are similar in some ways, in the way they perceive and are affected by groups, there are clear and distinct differences which could affect the way children work within a group. The research presented here provides support for the notion that group behaviour does not simply start when we reach University (Durkin, 1995) but that our adult group behaviour reflects the outcome of a complex developmental process. Understanding this process and mapping the changes throughout childhood will lead to a better understanding of the phenomena presented in adult literature. Two areas of social psychology are examined within this thesis to investigate intragroup processes further: decision making and production loss. The next chapter of the thesis looks in detail at a particular decision paradigm, resource

allocation, the theories used to explain children's distribution decisions, how this changes developmentally and what contextual factors can influence it. The aim is to gain a better understanding of the processes behind this particular form of decision making as it will be used in Chapter 4 as part of the experimental design.

Chapter 3

Sharing and Social Motives in Childhood

Overview

The aim of this chapter is to review literature available on decision making in children with particular emphasis on distributive decision making (the sharing of resources) as this literature was used to develop the methodology for studies 1 and 2 in the thesis. The role of groups on children's decision making will also be outlined as the focus of the thesis is how groups may impact and change children's initial decisions. Potential methods for studying such decision making, taken from Social Psychological literature, including the Social Decision Scheme (SDS) and Social Judgement Scheme (SJS) models will be outlined along with studies that have used these methods with children. The chapter argues that research on children's group decision making could be benefitted by using techniques such as the SDS and SJS as they provide a unique way of assessing how groups come to their final decision from an initial set of preferences and that previous research with children has failed to use these models in this way.

Moral reasoning

Moral reasoning is a broad concept which deals with issues such as fairness, justice, equal opportunities and others welfare (Killen, 2007). In relation to the development of moral reasoning, it was initially thought to be a stage process (Kohlberg, 1971; Piaget, 1932). More recent empirical research however, has found that children as young as preschool age can use what would be considered higher level moral reasoning in complex exclusion situations (Theimer, Killen, & Stangor, 2001). To explain this discrepancy and others like it, a newer theory of moral reasoning was developed: Social Domain Theory (Smetana, 2006).

Social Cognitive Domain Theory

Social-Cognitive Domain Theory argues that social knowledge is broken up into three distinct categories, the first of which is the moral domain (Smetana, 2006). The moral domain deals with the same issues relating to moral reasoning as mentioned above; fairness, justice, equal opportunities and other's welfare. The second domain is the socio-conventional domain which involves social norms and the rules and conventions involved in social interactions (Horn, 2003). The last domain considered by the model is the psychological domain which is principally concerned with judgement and common sense issues such as harm to the self, personal health and preferences with regard to friends and privacy (Smetana, 2006).

Whilst the model argues that reasoning in these domains develops independently of one another, age trends have still been found with regard to the emphasis of one type of reasoning over others (Killen, 2007). In very simplistic scenarios such as whether it is right or wrong to exclude someone from a group based on their gender, no age related patterns in types of reasoning are found (Killen & Stangor, 2001). All children use moral reasoning to explain why such exclusion is wrong. Age related patterns do emerge however, in more

complex scenarios where the children are asked to pick one of two children to join their group, and the children's qualifications are manipulated (one child being more qualified to join the group than the other). In these situations, there is an increase in the amount of socio-conventional reasoning used as children get older (Killen & Stangor, 2001). Older children focus on the individual merits of the child and the functioning of the group if the child were to join (for example 'the group won't work well if you pick the child that isn't good at the task'). Children's views on whether effort or ability counts for more, have been shown to impact on whether they view the sharing of resources as fair or not (Killen, 2007).

These age trends suggest that there is some developmental difference occurring as children age in what types of reasoning they use. What is causing this change however is less clear from these studies. The focus of the current research is on sharing and distributive justice, one specific aspect of moral reasoning. Literature on the developmental trends of potentially related factors, are going to be looked at further.

Sharing Behaviours

Egalitarian sharing is something that is considered a human only trait (Warneken, Lohse, Melis, & Tomasello, 2011). The difference between humans and other animals is that we cooperate and share resources across many situations with genetic strangers (Fehr, Bernhard, & Rockenbach, 2008). This 'other-regarding' behaviour is important as it seems to be the driving force for the sharing behaviour humans exhibit (why else would someone share out valued resources unless they cared for the other person?). However, research suggests we are not born with this ability and that we develop it over time.

Fehr, Bernhard and Rockenbach (2008) looked at the development of one such 'other-regarding' preference, inequality aversion (behaviour that reduces inequalities regardless of whether inequality is advantageous to them or not). Across three different 'games' where

children could choose various sweet allocations between themselves and an anonymous partner, the experimenters found that children aged 3- to 4-years behaved selfishly with only 8.7% choosing the option to share when the game allowed it. This selfishness decreased with age until, at 7-8-years, other- regarding egalitarian preferences were found across all games in the experiment. Additionally, they discovered that the number of siblings children have and their birth order affected their sharing behaviour, with only-children sharing more than children with siblings and youngest children sharing the least.

The results support another study by Fehr, Rutzler and Sutter (2013) who investigated the development of altruism, spite, egalitarianism and parochialism and revealed that spite decreased with age (between 8- to 17-years) and egalitarianism peaked at the age of 8-years. After this age however, egalitarianism declined and altruism appeared to take over as the predominant other-regarding preference. This again demonstrates the development of other-regarding behaviours with age. Fehr, Rutzler and Sutter (2013) argue that this focus on altruism in adolescence is vital for smooth and positive interactions with others especially in the workplace. Another finding from the paper is sex-differences with males being more altruistic and females remaining predominantly egalitarian (Fehr, Rutzler& Sutter, 2013). This is not a consistent finding as other studies have shown that girls are more altruistic than boys (Benenson, Pascoe, & Radmore, 2007) but it demonstrates the importance of considering gender as a potential moderator in this area.

Even when children are given the opportunity to monopolise rewards, they have been found to share equally. In a study by Warneken, Lohse, Melis and Tomasello (2011), 3 year old children were asked to work collaboratively on a task with a partner. The task varied in such a way that on some trials it was easy for one child to monopolise the rewards received for completing the task. They found that, even when rewards could be monopolised, the majority of children shared out the reward equally. This demonstrates the human specific

nature of egalitarianism and sharing, as similar studies in chimpanzee populations have found that despite collaboration, chimpanzees monopolise as many rewards as they can (Melis, Hare & Tomasello, 2006).

Factors affecting other-regarding behaviour

Another factor that seems to affect the development of other-regarding behaviour is socio-economic status (SES). Benenson, Pascoe and Radmore (2007) studied children's altruistic behaviour using the dictator game; a paradigm where the participant (the dictator) chooses how to hand out resources between themselves and another anonymous individual. The offer cannot be rejected and it is played only once so that there cannot be any repercussions for their behaviour. Therefore, any offer of resources to the anonymous individual can be seen as a prosocial act by the dictator (Camerer, 2003). They found that children with higher SES demonstrated more altruism than children with lower SES and that age differences in altruism could only be found in children with high SES. This finding seems to suggest that the development of altruism is not universal and does depend on cultural and situational factors. It also supports Fehr, Rutzler and Sutter's (2013) argument that altruism is beneficial for the workplace, as those with lower SES would be in lower level jobs. This could be because of their lower levels of altruism, meaning that they are less suited to working environments than those with higher SES and therefore more altruism.

Another argument being developed in the literature is the role that Theory of Mind (ToM) might play in fairness preferences. ToM refers to our ability to understand another person's actions in relation to their emotions, beliefs and desires (Cutting & Dunn, 1999). An overall preference for fairness increases with age between 7 and 18 years (Harbaugh et al., 2003). Takagishi, Kameshima, Schug, Koizumi and Yamagishi (2010) argue that Theory of Mind is key to these fairness behaviours as an understanding of others' reactions to unfair

behaviour encourages the child to be fair. Using an ultimatum game in a face-to-face setting, children had to decide how to hand out resources but their partner could reject the offer made. They found that preschoolers who had developed a ToM gave fairer offers than those children who had not yet acquired ToM. These children could understand and predict that another person given an unfair allocation of resources would be angry, which would lead them to potentially reject the offer made. The methodology used in the study however, could be argued to create a pressure to act fairly. Having the other child present in the room and knowing them would facilitate fairer behaviour especially given that the partner had the ability to reject the offers made. It may have therefore inflated levels of fairness in their sample.

Alongside this development of fairness preferences, children also become more accepting of inequalities relating to differences in individuals' achievements. Almas, Cappelen, Sorensen and Tungodden (2010) gave children 3 dictator games requiring them to focus on either individual achievement or efficiency considerations. They found that with age, individual achievement became increasingly important in their fairness considerations and that older children were more likely to differentiate based on these achievements. Levels of self interest appeared to remain stable over this period of development (5^{th} to 13^{th} grade) but a shift from egalitarian to more meritocratic fairness preferences occurred.

These studies show that with age, children's focus on different aspects of sharing seem to shift and include considerations of the self, altruism, egalitarianism, equity and meritocracy. These factors must at some point come together to aid children in their reasoning of how to share and there seems to be a definite developmental trend. Damon (1977) was one of the first authors to attempt theorise how this development occurs.

Distributive Justice

Damon (1977) defined positive justice (also called distributive justice) as "the aspect of justice that is concerned with who in society should get what proportion of the available resources, praise and other rewards" (p.73). Distributive justice looks at how people choose to allocate resources amongst themselves and others and how they reason about these distributions (Gummerum, Hanoch, & Keller, 2008). Damon initially categorised the stages that children go through developmentally to achieve a greater level of distributive justice. The first stage of Damon's (1977) theory, stage 0-A, is when the child believes that the person who wants something the most should get it. This then develops into stage 0-B where the child bases their decisions on people's (often irrelevant) characteristics such as the tallest or eldest should get the most. At stage 1-A the child becomes focussed on equality believing that everyone should get an equal amount regardless of their input. In the next stage, the child bases decisions on behavioural reciprocity (1-B) meaning that those who work harder or do the best/most should get more resources. The next stage (2-A) concerns psychological reciprocity, where those who need the most should get the most for example the poorest person, should get the most money. In the final stage (2-B) children attempt to compromise between behavioural and psychological reciprocity when making their distributive decisions (Damon, 1977).

Damon (1980) conducted several studies to test his theory of distributive justice. Distributive justice studies involve children allocating rewards amongst hypothetical people who have usually worked together on a task, are described in basic detail and differ from one another on certain characteristics (for example effort and age). Damon (1977) conducted a one year longitudinal study in order to assess the universality and invariance of sequence of his distributive justice theory. Using children ranging from 4 to 9 years of age, Damon gave them a 'positive justice' interview with the second stage of testing (a year later) including both the original interview and a newly developed one to prevent test-retest bias. 35% of the

children remained at the same reasoning level in both parts of the study whilst the others showed a clear developmental pattern in line with Damon's theory. The sample size was small however (5 or 6 children in each age category) making the findings hard to generalise.

To address this issue, and that children did not change their reasoning in the time period, Damon conducted a second two year longitudinal study (Damon, 1980). Damon measured 4 and 9 year olds' levels of positive justice 3 times over the course of the study at yearly intervals. Despite the regression of some children to earlier levels of reasoning, overall the vast majority improved along the sequence predicted by Damon's theory.

Enright, Manheim and Franklin (1980) developed a standardised scale to measure distributive justice based on Damon's (1977) theory. Across three studies, they validated the measure adding weight to Damon's theory. They found the relevant age trends predicted by the distributive justice theory and validated them by replicating them in a second study. Of more importance however, was the replication of results in a cross-cultural study completed in Africa. Cross-cultural studies have also been conducted in Sweden and the USA with results supporting Damon's levels of distributive reasoning (Enright et al., 1984). Given that Damon (1977) claims his theory is universal, cross-cultural studies are vital in supporting his argument.

A problem however with Enright, Manheim and Franklin's (1980) first two studies is that the children were recruited from the same school for both studies. This means confounding factors such as social class and other environmental factors, may explain the replication of results. As already mentioned, levels of altruism differ in children with different social economic statuses (Benenson, Pascoe & Radmore, 2007) and there may be other factors not yet discovered that may be confounded which taking samples from different places could factor out.

Contextual factors affecting distributive justice

Enright, Enright and Lapsley (1981) found social class differences in distributive justice reasoning in their study of distributive development. Children in lower classes were consistently lower in distributive justice reasoning than their middle-class peers and this difference continued to at least 3rd grade. These findings replicate those of Enright, Enright, Manheim and Harris (1980) who also found these differences between classes despite there being no difference in verbal ability between them.

There have also been cross-cultural studies that have demonstrated differences in reasoning. In a study by Mann, Radford and Kanagawa (1985) children from Japan and Australia were asked to share out rewards amongst a majority and a minority group. Japanese children adopted an 'equal say' policy whereby majority and minority groups would get an equal chance to obtain rewards (despite their obvious size difference) whereas Australian children went for a more proportional distribution. Although the scenario is not quite the same as the ones used in the studies above, it demonstrates a clear cultural impact on how children reason on the distribution of resources.

The development of distributive justice reasoning has also been shown to be different in other cultures. Sin and Singh (2005) found that Chinese children were more likely to match their distributive justice decisions to Asian values of maintaining group harmony; younger children using equity based reasoning and older children more equality based reasoning. In Western cultures, the pattern of distributive development is the complete opposite; younger children basing their decisions on equality and older children on equity. The study demonstrates the pervasiveness of culture in distributive reasoning and again demonstrates that lack of universality in Damon's distributive justice theory.

Distributive justice development has also been found to be contextually dependent. Enright et al., (1984) found that, despite an overall increase in distributive justice reasoning with age, when the characters involved in scenarios were family members, levels of distributive justice were higher than when people in scenarios were peers. McGillicuddy-De Lisi, Watkins and Vinchur (1994) also found differences in children's responses when characters in a scenario were either strangers or friends. As children got older, they were more likely to take this relationship between characters into account and change their reasoning accordingly. Benton (1971) also found sex differences with regard to these contextual effects. This fits in with Deutsch's (1975) argument that distributive justice principles change depending on the aims of the decision maker. For example, if people want to achieve economic productivity they would use an equity principle but if people want to encourage positive social relationships then equality would be a more suitable principle.

In Benton's study, pairs of children completed a task (one was the better performer than the other) and asked to decide how to share out toys between them. Male dyads maintained an equity principle between each other regardless of their relationship (friend vs non-friend) whereas females only used equity reasoning in non-friend pairs. The nature of the relationship made little difference to boys overall but girls were seen to discuss their preferences more when with friends and displayed more emotional behaviours with friend pairs than non-friend pairs.

Equity Theory of Distributive Justice

Adams' (1963) equity theory of distributive justice suggests that people regard distributions of resources as fair when their inputs are proportionally related to the outcome (rewards). People do not like violations on this principle, whether it is they who receive too much for their efforts or too little (Montada, 2003). Studies testing this theory have found that

only adults and adolescents follow a strict equity rule whereas younger children are more concerned with self-interest (Hook & Cook, 1979). As children get older (junior school into adolescence) the equity principle is used but not as precisely; the person who contributes more gets more but the proportions of reward are not calculated (Hook & Cook, 1979).

Hook and Cook (1979) argued that cognitive and mathematical ability was likely to be the cause of this developmental trend and found that Piaget's (1969) stages of cognitive development corresponded with the patterns seen in equity theory. Preoperational children distribute rewards according to self-interest, concrete operational children according to basic equity principles and Formal operational children use proportional equity. These findings are also supported by Damon (1975) who found similar links with distributive justice reasoning and cognitive ability specifically related to Piaget's stages.

Contextual factors in distributive justice

It is not only relationships between characters that can influence distributive reasoning but also situational factors. Distributive justice studies tend to focus on situations around a reward-for-work setting but in other settings, different strategies of reasoning may be more appropriate. In voting for example, one cannot say that one person deserves more votes than another because they worked more throughout the year. Distributive justice reasoning based on equity in this situation would be both inappropriate and wrong. In the same scenario an equality based preference would be most appropriate but it is often described as being at a lower level of distributive reasoning. Sigelman and Waitzman (1991) found that changing the situational context of the task changed children's distributive justice level. Whilst the youngest children (5 years) always chose to distribute resources equally regardless of the situation, 9 and 13 year olds chose the equity rule in performance related

situations, an equality rule in voting situations and an equality rule in charity situations although they paid special attention to needy children.

The ability to change reasoning strategies based on situational information should demonstrate a more advanced stage of distributive reasoning given the greater understanding and flexibility required, yet previous studies have not always considered this when testing across multiple scenarios. Damon's longitudinal work (1977, 1980) used a variety of scenarios to assess children's levels of distributive justice reasoning (classmates dividing profits from a paint sale, siblings splitting newspaper round money and picking classmates to win free ice cream). This raises questions about the validity of his findings, as he may have been measuring contextual effects on children's reasoning leading him to underestimate or overestimate children's actual reasoning level. Additionally, this much flexibility back and forth through the stages of distributive justice reasoning would suggest its stage-like structure is not accurate either. A norm of reasoning must therefore be found for each contextual scenario before a child's actual level can be ascertained.

Another contextual issue is that of task complexity. Tompkins and Olejnik (1978) found that the number of rewards children had available to them influenced the way in which they shared the rewards out. A 'good' performer was always given more rewards than the 'poor' performer but this pattern was less pronounced in situations where there were too many or too few sweets to give each performer one sweet for each unit of work. This pattern may be because the task and maths involved were too complex for the age of children they worked with. Children in the study who scored high in a proportions test were more likely to give more sweets to the 'good' performer demonstrating that lack of ability may be a confound in research in this area.

Messick (1993) further highlights this problem in his work in that, when presented with an ambiguous or novel situation, people were shown to choose to share equally as it is less cognitively demanding. Given the young ages of participants in these studies, it may be problematic to assume that their answers reflect their level of distributive reasoning rather than their ability at mathematics or other such skills. Additionally, Debusschere and van Avermaet (1984) demonstrated that adolescents (some of the older participants used in these studies) will fall back on equality as a means of solving a complex and difficult task.

Despite these concerns, there also exists research demonstrating that children as young as 4 years can divide resources equitably when they are explicitly instructed to do so (Nelson & Dweck, 1977). Nelson and Dweck (1977) also asked children to rate how fair their decisions on sweet distribution were and those children who did not follow an equity rule admitted to not being fair in their sweet allocation. McGillicuddy-De Lisi, Watkins and Vinchur (1994) found a similar pattern of results in their study on distributive reasoning too, finding that 3rd grade children did not take into account the relationships of the characters involved in the distributive justice scenario when asked how to share out rewards, but did recognise the importance of the relationship when asked to rate the fairness of sweet distributions already done for them. These studies demonstrate the problems in relying on children's behaviour to infer their level of distributive reasoning as they may have a greater understanding then their behaviour would suggest.

Despite these findings, Leventhal, Popp and Sawyer (1973) found that preschool children could distribute resources equitably but that the larger the difference between the good and bad performers, the more equitable the children were. This again highlights the importance of complexity in the tasks set as simpler tasks may produce more instances of extreme egalitarianism (for overly complex tasks) or extreme equity for simpler tasks.

A general problem with Damon's theory is that he only explains the development of distributive justice up to the age of 10 years. He admits that the reasoning achieved in his final stage, 2-B, is still very basic and that the development of justice reasoning continues throughout adolescence (Damon, 1977). This cannot be considered, then as a full explanation of the development of distributive justice as it does not explain the latter stages or defines what completely developed distributive reasoning would be.

Economic Game Theory

More recent studies on children's sharing have focused on a different methodology stemming from economic game theories. Many economic games are based on distribution of resources between people. The ultimatum game and dictator game have been specifically developed to measure fairness preferences (Gummerum, Hanoch & Keller, 2008). Although they do not refer to 'distributive justice', they are relevant to the topic as they are a different way to measure how children share out resources but in an alternative context. In a dictator game (as mentioned previously), children are given a certain amount of resources (these can be anything including sweets, money or stickers) and told that they can share them with an anonymous partner. The partner cannot reject the offer made and no repercussions can arise from the decision the child makes. Due to its simplicity and nature, it is considered a reliable way of measuring children's sharing behaviour, especially altruism (Gummerum, Hanoch, Keller, Parsons, & Hummel, 2010). In university student populations, the typical amount of resources offered by participants to their partners in dictator games is between 20-30% (Benenson, Pascoe, & Radmore, 2007). Studies with children have found this number to be lower however, with Harbaugh and Krause (2000) finding that younger children (2^{nd} grade) offered less than 10% to their partners whereas older children offered between 10-20%.

Gummerum, Hanoch, Keller, Parsons and Hummel's (2010) study also supports the idea that children give more as they get older. They looked at how moral emotions affect 3-5 year-olds distribution of resources in the dictator game. They found that younger children preferred a more self-serving distribution of resources but that this decreased with age. Older children opted for more egalitarian choices (supported by Fehr, Bernhard, & Rockenbach, 2008) and those who understood the emotional consequences of violating moral norms (guilt) were more likely to allocate more resources than those who didn't. Girls gave more resources to their anonymous partner than boys did and children who understood the emotional consequences of immoral behaviour (guilt, shame) gave more generously in the dictator game than those who did not.

Role of Groups in Distributive Justice Development

What is of current interest is the role that groups can play in the development of distributive justice reasoning. Piaget and Vygotsky both argued that children's development, cognitive and otherwise, occurs during interactions with peers. Piaget (1926) believed development occurred when a child learns to take another's perspective (intersubjectivity) whereas Vygotsky (1962) argued the transmission of knowledge from an advanced peer to a less advanced peer would aid development. Children working together in pairs on problem solving tasks have achieved higher post-test scores than other children who only received individual training on the tasks (Doise & Mugny, 1984) and children working together have also been shown to come to the correct solution when they both initially had the wrong answer (Glachan & Light, 1981).

Not only do peers seem to enhance each other's development, they are also very influential in other ways. Harris (1995) argued that parents have no long lasting effects on

children's behaviour (aside from their genetics) and that peer groups were more influential in the development of children's personalities and in relaying environmental and cultural norms.

Although this view is contentious, supporting evidence for this idea comes from Lamb, Easterbrooks and Holden (1980) who found that children as young as 3 and 4 years reinforced one another's gender appropriate behaviour and punished gender inappropriate behaviour. The children whose behaviour was punished by their peers terminated their behaviour significantly sooner than those who were reinforced by their peers. Older children were more likely to give and receive intentional punishment; actions or words that were specifically designed to stop the behaviour rather than general criticism. Lamb et al. also found that positive reinforcement in younger children took the form of joining play, imitating and coveting the target child's toy. Older children were significantly more likely to comply and observe behaviour.

This study demonstrates children's roles as socialising agents, correcting each other for inappropriate behaviour that does not comply with societal norms of gender roles. The correction here teaches children what behaviour is acceptable in society and demonstrates the role of peers in effectively transmitting environmental and cultural norms. This behaviour has been demonstrated in other studies (Fagot, 1977; Lamb & Roopnarine, 1979) and supports Harris' notion of the importance of peers for guidance in these matters. The finding in this study is a demonstration of conformity which refers to the changing of attitudes, verbalised statements or behaviours by individuals so that they adhere more closely to a social norm and it can be seen as a type of social influence (Baron & Kerr, 2003).

Conformity in children

Studies attempting to map conformity developmentally have been somewhat divided as to when conformity is at its highest and lowest (Constanzo & Shaw, 1966; Iscoe, Willams,

& Harvey, 1964). In an attempt to explain these disparities in findings Hoving, Hamm and Galvin (1969) argued that across the studies, the levels of ambiguity in tasks were not kept consistent. They argued that ambiguity may act as a confound in the relationship between age and conformity. They tested children in grades 2, 5 and 8, asking them which of two slides had the greater amount of dots. They were taken out in groups of three but kept in separate booths and shown each other's answers through a series of lights controlled by the experimenter who changed the lights to give the impression of an erroneous majority. The task was changed so that effects of ambiguity could be tested and they found that conformity decreased with age on non-ambiguous tasks and increases with age on ambiguous tasks.

The findings were argued to demonstrate a conflict of two needs: the need to be correct and the need for peer approval (Hoving, Hamm & Galvin, 1969). Older children seem to have a greater need to be correct and so, in the simpler tasks, do not conform to an incorrect majority. On harder tasks where their own answers may not be accurate, they are more likely to conform. These findings and interpretations fit with literature on the adult population by Deutsch and Gerard (1955). They argued that there are two types of influence: normative and informational social influence. Normative social influence is the influence on a person to conform to the expectations of a group such as liking a certain pop band or wearing certain clothes. Informational social influence is the influence on a person by information from group members about reality such as confirming a rumour or seeking help with homework.

Findings in more modern research seem to confirm this idea. Corriveau, Fusaro and Harris (2009) looked at conformity among preschool children. The children were shown a video in which a group of 4 people were asked to name unknown objects. Three of the people gave the same answer and the fourth gave a different one. In later clips, only the dissenter (the fourth person) and one of the people in the majority position of the group were left and

continued to give names of unfamiliar objects. Children in the study continually sided with the majority group member and distrusted answers given by the dissenter. This finding demonstrates that even young children are able to both recognise and trust group consensus, especially in ambiguous situations where they are asked to give a correct answer. Their need to be right, therefore, encourages them to conform.

Other research has also demonstrated that children are very careful of who they select to give them information suggesting that informational social influence is of high importance. Children as young as 4 years of age have demonstrated monitoring the accuracy of potential 'informants' across tasks in order to make judgments on whom to trust later, with effects being seen up to one week after the initial exposure to accuracy information (Pasquini, Corriveau, Koenig, & Harris, 2007; Corriveau & Harris, 2009). With these effects found in such an early age group, it is questionable then as to whether it is only children who are older that are concerned with being correct and what it is that influences any child with such a strong bias to submit an answer known to be wrong.

If children in conformity studies were known to one another then their ability to monitor the accuracy of their classmates may be a potential confound in all conformity studies. If for example, a child is put into a group with two other children known to be of a lower ability than them (therefore being more likely to be viewed as inaccurate informants), they may be less likely to conform when put into a group with similar or higher ability children. The random sampling of children may have helped this problem to a degree; however studies cannot escape the problem that children will often have a very intimate knowledge of one another, their intellectual abilities and their social standing within the class. All of these things could affect the amount of conformity a child displays.

The most recent studies into conformity have used adaptations of the Asch paradigm. Haun and Tomasello (2011) looked at preschool children's conformity using different sized pictures of animals and asked children to judge their relative size. They found that children generally performed the task well and a drop in performance (suggesting conformity to an incorrect majority) only occurred when the child had to publicly share their response by speaking it aloud. In a second study, the researchers confirmed that in conflict with a majority, minority children performed significantly better when giving private over public answers. Children tended to conform more in public than in private overall and adapted their level of conformity to match the level of privacy from trial to trial. This suggests that children conform mainly for social reasons but little is known under what circumstances children's preferences for being correct get overridden by their need for peer approval. Haun and Tomasello (2011) explained their findings as children conforming in order to avoid any conflict resulting in their going against the majority. They may have learned from previous experience that the best way to avoid such conflict is to simply go along with what everyone else is saying.

The pattern of very young children conforming for social reasons reinforces Piaget's (1969) idea that peer conformity would decrease from middle childhood through adolescence due to a change in a solitary respect for rules encouraging such conformity, to a mutual respect for peers allowing for the tolerance of non-conforming behaviour. Therefore, at a young age, children are still bound to conform by their developmental stage. Regardless of the developmental pattern, it is clear that children do conform, which means they are influenced by the presence of others. How then, especially given children's more limited verbal skills, do they go about influencing each other?

Children's social influence

Research has attempted to answer this question by looking at children's conversations. In adult literature, it has been found that those with logical well structured arguments are more likely to persuade others, whereas those with weaker arguments are more influential when reasoning is not considered (Petty & Cacioppo, 1986). Moscovici and Personnaz (1980) demonstrated that minority influence can lead to conversion, a cognitive change in one's opinion, by the presentational style used; that of being consistent but not dogmatic (Leman, 2002). Both reasoning and style, then can be important in persuading someone that one's own view point is correct. Children's style and reasoning have both been researched.

Leaper (1991) developed a coding scheme for the interactions of children in conversation. He created four broad categories that conversational phrases could be coded into: controlling, collaborative, withdrawing and obliging. Controlling phrases involve direct influence and can include phrases that are rejecting, commanding, countering and resisting such as 'Don't do that', 'That's not right'. Collaborative phrases also use direct influence but are more affiliative including mutual affirmation ('I like playing with you'), constructive elaboration of problems and initiating joint action with another child. Withdrawing phrases involve non-direct influence and include non-participation (silences), reluctant submission ('I don't care') and delaying their participation for example saying 'umm' before answering the question. The last category, obliging, applies indirect influence and is also affiliative. It includes things like going along with the other person, being willingly submissive and seeking help from the other person.

Leaper (1991) also pointed out the importance in the sequence of these types of exchanges. For example, if an obliging act was noted in response to a controlling act it would suggest a dominant-submissive relationship or possibly conformity. If however, the obliging

act followed on from a collaborative act, it suggests mutual agreement. Therefore measures of exchanges should also be taken and coded for, when dealing with conversational data.

Leman, Ahmed and Ozarow (2005) used Leaper's (1991) coding scheme in their work with children and problem solving tasks whereby dyads had to come to an agreement on the correct solution. Leman et al., found that with boy-boy pairings, more controlling speech was used, moreover in mixed-sex pairs, boys dominated girls using more controlling communications and girls more obliging speech than in other pairings. Female dyads used more affiliative speech than their male counterparts but were less likely to engage in faciliative overlaps (interruptions that aided the conversation, such as words of agreement). In relation to who 'won' the argument (whose answer the pair gave), those children who 'won' used more assertive (collaborative but not controlling) and less affiliative speech acts. The losers in the pair were unassertive and more obliging. In those pairs where a compromise was made, collaborative speech was more frequent but contained fewer controlling speech acts than displayed in children who 'won'. They concluded that girls tend to use more coaxing strategies when attempting to influence a partner whereas boys were more direct in their influence attempts.

These findings of gender differences are not new as Serbin, Sprafkin, Elman and Doyle (1982) found that boys were more direct and girls more indirect in their influencing techniques and that each sex tried to influence their own sex more than children from the opposite sex. Boys seem to become less influenced with age, owing to a greater resistance of indirect, more polite forms of influence (typically used by girls). Jacklin and Maccoby (1978) noted that even in children as young as 33 months, the sex of the influencer and influencee were important. Girls were more likely to be passive and ignored when paired with a boy than in any other gender pairing however, given the year the study was conducted, these findings may be less applicable now as gender inequality is less prevalent.

Leman's (2002) paper on moral reasoning demonstrated the different influencing strategies used by children with differing levels of reasoning. Using an adapted version of Piaget's moral reasoning scenarios, children were put into pairs depending on their moral reasoning levels. They were then presented with a scenario, asked for their initial preferences and then told to discuss the issue and come to an agreement. Leman found that out of those children who 'won' (the final decision of the dyad being the same as their initial preference) the word 'and' was used more often than those who did not win. Less advanced peers who were successful in winning despite their lower level of reasoning used 'but' more and had more justifications in support of their argument than those who lost. This demonstrates that those who have more developed arguments can influence another child by signalling support for their position (using the word 'and') where as those with lesser arguments use conversational style to continually bring conversation back to their view point (using 'but') and eventually win over their partner.

Dyads may not be like groups and the studies mentioned so far have only included dyads in their methodology which doesn't explain what happens in group discussion or how content can influence decisions. Gummerum, Keller, Takezawa and Mata (2008) looked at the dictator game scenario with children both individually and in groups of three. The children recorded their preferences on how to share money privately and then discussed the situation as a group and were told to come to a group decision. They found that all groups referred to simple allocation principles of fairness when justifying equality arguments and egoistic principles when trying to defend selfish behaviour. Older children used more developed and complex justifications to explain their preferences but still based in the same basic principles. Prosocial majorities were more likely to win in the group when the child with the highest level of moral reasoning was for the prosocial argument and therefore had a higher level of reasoning than the selfish group member.

This finding seems logical when considering the asymmetry of the argument between prosocial/altruistic motives and egotistical/selfish motives. Egotistical reasoning is more logical and beneficial to the group with immediate gratification (having more resources) whereas altruistic motives leave the group with less. Therefore, the altruistic person needs to have a higher level of reasoning in order to effectively persuade others to give up more resources. Haidt (2001) claimed, somewhat controversially, that moral reasoning is not the cause of individuals' moral judgments. He also believed that moral reasoning is only of importance in social situations. It is in the social sphere that one's level of moral reasoning may be used as a means of influencing others to agree; this is not a new concept in literature, with peer interaction always being seen as a key factor in stimulating cognitive and moral development (Walker, Hennig, & Krettenauer, 2000). However it does highlight that the social context of a group may alter how children make decisions and judgements.

Takezawa, Gummerum and Keller (2006) attempted to test Haidt's claim looking at children aged 11- and 13-years in groups completing a dictator and ultimatum game. They found that individual offers were not related to moral reasoning, supporting Haidt's theory. Levels of moral reasoning were higher in the older age group and there was a significant difference in group decisions with age. Younger children were more egoistic with their offers in the dictator game whereas older children followed a majority rule pattern. As egoism reduced with age, prosocial reasoning became more influential. This suggests that a higher level of reasoning is needed to influence others to behave in a prosocial way and confirms the importance of reasoning in social settings.

Keller and Canz (2007) also looked at arguments children made in the group discussion phase of the dictator game. They found that the youngest children (3^{rd} grade) used basic distribution principles such as fairness and selfishness for their reasoning where as 6^{th} graders referred to the concrete needs of the self and others to argue on equal allocation

(either for or against). Children in 8th grade used fairness and reciprocity norms to justify their choices, and in unequal distributions used simple excuses. The eldest age group (11th grade) used the most sophisticated arguments including using negative stereotypes of the other group. The complexity of the argument also followed a developmental pattern (as one would expect) with young children often offering no explanation at all for their decisions, young adolescents using psychological and social circumstances present in the situation and the oldest adolescents referring to normative behaviours and considerations.

Groups have also been shown to increase overall levels of moral reasoning. Killen and Damon (1982) found that group discussion and argument impacted on children's levels of moral reasoning in distributive justice settings. After peer discussion, moral reasoning improved with higher levels of reasoning being used afterward. Children in this condition outperformed other children who had had similar justice discussions with adults, demonstrating the importance of peers being involved in developing reasoning levels. Children who did improve were found to be more collaborative with one another and developed the ideas of each other in the discussion. Children who were rejecting of others' ideas and had conflict in their discussions did not show any advance in their moral reasoning after group discussion. This study highlights the role groups can play in developing moral reasoning and the importance of the type of interactions taking place within the group discussion.

What remains unknown in the developmental literature on resource allocation but also decision making generally, is how children come to group decisions when individual answers are different from one another. In an attempt to look at the influence of individual preferences on groups decisions in the adult literature, a mathematical model has been developed. Social Decision Scheme Model (SDS, Davis, 1973) uses the principle of aggregation on individual preferences in order to predict the group's decision. The principle applies mathematical

models in order to predict a group outcome based on known facts about individual group members preferences and their interaction (Levine, 1999). It applies various mathematical models (based on a set of predictions made from the outset) to best explain the outcome of the group decision. Such models include the proportionality model, whereby the probability of group choice rests on the proportion of members favouring that choice, and the majority equi-probability otherwise model which assumes the group will choose the decision favoured by the majority of its members (Hinsz, Tindale, & Vollrath, 1997). These models are compared to observed data and the one that best fits is used to explain the process. The method enables researchers to test assumptions about group processes by comparing them to the baselines the models create, without having to directly observe groups (Levine, 1999).

Individual Preference

Social Decision Scheme Models (SDS) is comprised for four components. The first, individual preference, usually refers to the proclivity of an individual to choose a particular option from a set of finite responses (although its meaning can change depending on the context of the task). In order to discuss the mathematical aspects of the theory, Stasser (1999) will be quoted as the explanation given in the paper is the most succinct and clear explanation of SDS available. Applied examples of the mathematics will be given alongside these quotes to demonstrate understanding and also aid the reader in conceptualising these ideas.

'Let *a* denote a finite set of discrete and mutually exclusive response options, $a = \{a1, a2, a3,...,an\}$, where *n* the number of response options. Define two companion vectors. The vector *p* is a distribution of probabilities, $p = \{p1, p2, p3,...,pn\}$, where *pi* is the probability that an individual will prefer response *ai.* The vector *r* contains the distribution of preferences within a group of size *r*, $r = \{r1, r2, r3,...,rn\}$, where *ri* the number of members that prefer *ai.* Note that $r = \sum ri$' (Stasser, 1999, p. 5)

To explain with an example consider a group of three children (r=3) who have to choose whether to eat some sweets now (*a1*) or wait until later (*a2*). The vector *p* represents the probability of randomly selecting a child who favours each response (*before* entering a group discussion). So p= (.7, .3) would represent a population of children who would prefer to eat sweets immediately rather than waiting until later. The vector *r* contains any of the possible patterns of preference within the given group for example r= (2, 1) would indicate a group where 2 members would prefer to eat sweets immediately and 1 member who would prefer to wait until later.

Group Composition

Group composition is the distribution of preferences among group members (which is r). The number of potential distributions will change depending on the group size (r) and the number of possible responses (n). Using mathematics to symbolise this Davis (1973) came up with the following notation $(n+ r\text{-}1)Cr$ where *C* represents the binomial coefficient. A binomial coefficient is the mathematical way to determine how many different ways there are to do something. So *C* will equal the number of preference distributions possible within a particular group. So in the example used above with a three person group and two potential decisions, there are (2 + 3-1) *C*r which equals 4*C*3 = 4 possible distributions in the group. Knowing where a group starts, in terms of the individual's preferences, means it is possible to predict where the group will end up, which is central to the SDS theory. Alternatively, we can map the decision rules groups use to come to a final decision by knowing the initial preference distribution and the group's final answer.

Group influence processing

Once the group composition is known, knowledge about social influence can be applied to attempt to predict the group process. For example, majorities often win in group

settings either due to a normative influence (social pressures to conform) or through informational influence (appearing to have more knowledge than other group members) particularly when no 'correct' answer exists (Laughlin & Ellis, 1986). Additionally, when the majority of a group favours a particular decision, this may trigger notions of fairness in others; in democratic countries in particular, where votes are taken and the majority decision is taken. Those who disagree with the majority may only voice their dissent about views that are particularly important to them given the low likelihood they have to achieve group consensus.

Although this is often the case, studies have also demonstrated that some positions are more easily defended than others. MacCoun and Kerr (1988) found a leniency bias in jury decision making tasks whereby acquitting someone was found to be an easier position to defend than convicting someone of a crime. This is not only found in jury decision making groups, as research has shown in problem solving tasks, groups often side with a single member's answer if they provide the group with a correct answer and are confident in their answer (Hinsz, 1990). Therefore both the group composition and group process must be known/predicted in order for an accurate SDS model to be applied. Collective response

The last component of the SDS is the final group decision. Usually, the group can choose from the same set of options as the individual (answer A, B or C for example) however this similarity is not needed for the SDS to be applied. One area in particular where this is not the case is in jury decision making where the group has a third option of 'hung' which an individual juror cannot choose from.

Development of the Social Judgement Scheme

One of the problems with SDS models is that they are only able to handle discrete decisions and are not applicable to continuous variables. This is because the SDS predicts different compositions of the group and with continuous variables the number of compositions becomes infinite. Due to this shortcoming, a new model was developed which could be applied in this area; the Social Judgement Scheme (SJS).

The SJS is based on the distance among preferences amongst group members, along a response continuum (Kameda, Tindale, & Davis, 2003). For example, using Sherif's (1937) autokinetic study where participants had to guess individually (and then in a group) how much a single white dot moved along a black screen, the SJS would look at the differences between each individuals initial guesses (the distance between their estimates). The model then uses the following equation:

$G = c_1x_1 + c_2x_2 + \ldots + c_rx_r.$

G represents the group decision and r the number of people in the group. X is that group member's preference and C is the weight of that preference. Meaning that c1x1 is group member 1's weight of preference multiplied by their actual preference. As initial preferences can be collected before the group phase of the study, they will not be discussed further however what is left to be explained is the weight of each preference.

Preference Weighting

An individual's preference weight varies depending on how central their position is relative to other group members. The closer the group member's answer is to others, the more weight their answer is given in directing the final group decision. Group members whose initial guesses are far away from the rest of the group's positions are given the least weight.

Decision Models in Developmental Psychology

At present, only a few studies have employed this type of methodology with developmental populations. Takezawa, Gummerum and Keller (2006) used the SJS and averaging models on their data looking at children's individual and group decision making on dictator and ultimatum games (studies mentioned above). In their study, Takezawa, Gummerum and Keller were interested in moral reasoning, particularly egoistic and prosocial arguments put forward by group members in the group discussion phase. As the SJS model

assumes that there is no difference in influence between egoistic and prosocial arguments and the authors expected that fair offers would occupy majority decisions, if their data set violated the SJS prediction, it would suggest a greater influence in egoistic arguments.

They used the SJS to compare the influence of egoistic and prosocial arguments in groups by looking at how much and in what direction groups deviated from the prediction made by the SJS model. What they found was that the influence of prosocial arguments relative to egoistic arguments becomes greater in older children (13 to 14-years) compared to younger children (11-years-old). In a second paper Gummerum, Keller, Takezawa and Mata (2008) used the SJS in the same way as described above, using the model as a baseline to look the influence of different arguments. They found that in groups of older girls (17-years) and young boys (11-years), selfish minorities were more influential than the generous majority.

What these studies demonstrate is the applicability and usefulness of applying decision models to developmental data. This chapter argues that there is a need to apply group decision models to children's resource allocations; other than papers by Gummerum et al., this method has not been applied before and the results garnered could be very valuable. If researchers are able to understand the types of decision rules children use and how these differ between groups making fair or unfair decisions, psychologists can understand more fully why and how groups behave. If we know the decision rules that lead to bad group decisions or behaviours, then interventions can be introduced and our understanding of groups increased.

Chapter 4

Decision making in social contexts: How groups impact resource allocation

Overview

The purpose of the following studies was to investigate how group contexts might influence children's decision making. In order to assess this, a scenario had to be created that children could make a decision about. Resource allocation scenarios were used as there is a wealth of literature in this area with children, meaning that accurate predictions of how children of difference ages might behave individually or interpersonally could be made. Also, any changes in the types of decisions made could be compared to previous literature and a conclusion made as to whether the group scenario changed the way children of a certain age would typically decide about the issue.

The aim of Study 1 was to investigate how children would come to a final group decision when their initial preferences differed. Children's rejection, inclusion and preference decisions were explored as well as which target the decision was applied to. The key finding from this study was that there was no difference in terms of amount of rejection, inclusion or preference decisions between groups and individuals but that the group context did influence who children preferred and included. Being in a group made children significantly more likely to include and prefer the child in the scenario who worked the hardest compared to the child with the best ability, or the child who was ill. Groups were also significantly more likely to reject the child that was ill compared to individuals.

Study 2 focussed on the effects intergroup contexts would have on children's decision making about resource allocation. When reviewing the literature it was noted that only one

study by Vaughan et al. (1981) had considered this issue and this study aimed to improve on the methodology and extend the original findings (for full discussion see introduction to Study 2). Children were asked to share sweets out in intergroup settings (between themselves and a fellow ingroup member, themselves and an outgroup member, an ingroup and outgroup member) or in an interpersonal setting (themselves and another student). The key finding from this study was that children's sharing significantly decreased in conditions where the receiver of the resource was an outgroup member. Together, the studies in this chapter demonstrate that group contexts do change children's decisions.

Introduction

For the purposes of Study 1, the Social Decision Scheme Model will be used (see Chapter 3 for mathematical principles behind it) to help understand what occurs in children's group discussions in terms of what decision rules children use. The group decision making literature has shown that when there is no logically correct answer or when no one can demonstrate the correctness of an opinion, a majority usually dominate (Kameda, Tindale, & Davis, 2003). Given this and the evidence on conformity to majorities presented in the previous chapter, we will be including a majority decision rule as one of the rules to be tested against the data collected.

Based on prior research, Study 1 was developed to look at distributive justice in children and how their individual preferences can shape the final group decision. The aim is to use the SDS to look at the types of decision rules children in groups use and compare this across ages. In order to do so, the scenario presented to children needed to produce variability in their individual preferences in order to be able to test different types of individual preferences within a group and how this affected the group outcome.

Children aged 6-8-years, 9-10-years and 12-14-years were asked to share out seven sweets between the three targets: the smart target, the target who worked hard and the ill target. First, they filled in their preferences individually on a piece of paper which was then taken away by the experimenter. They were given a filler task and then asked to make a group decision on the final distribution of sweets. This was again recorded on paper and removed after the group had agreed to their final decision. A large sample size was needed for the study as when analysing the group level data, each group of three people only counted as one participant meaning a larger sample size was needed in order to have an appropriate amount of power to run the analyses.

Variability

It was decided that three targets would be introduced; one target who was ill, one who was clever (and therefore able) and one who tried their best (thus being a hard worker). Each of these targets corresponds to Weiner's attributional theory of achievement and motivation (Weiner, 1985). Weiner's theory attempted to outline the ways in which people explained the causes of their successes and failures. The attribution of these successes and failures can be attributed to three general causes: first whether the factors of success are within a person (internal) or factors within the environment (external), the second, whether these factors are stable over time or unstable and lastly controllability, whether a person is able to exert control over these factors or not. To give an example, the smart target in the scenario used in this study would be considered as an internal factor, a stable factor over time and uncontrollable (you cannot control whether you are capable at a task or not). On the other hand, the target who tried their best represents an internal factor that is unstable (you do not always put the same amount of effort in to every task) and also controllable- it is up to you how hard you work. Lastly, being ill can be categorised as an external factor, unstable (you are not always ill) and also uncontrollable (you have little control over when you will get better). How their

respective outputs within the group task are perceived by children should vary based on these attributions types.

Additionally, Killen (2007) demonstrated that children's views on whether effort or ability counts for more have been shown to impact on whether they view the sharing of resources as fair or not, using an able and effortful target was thought to produce a variety of results in children's individual responses. The ill target was included to add additional complexity to the scenario and it was thought that moral reasons of fairness may influence the number of sweets given to this target as their illness cannot be helped.

Given the differences of gender in some of the research findings mentioned above, gender will be controlled for by making sure all children are in same-sex groups. Additionally, as research has shown that children are prone to using equality as a means of distribution in complex scenarios, the children were instructed to hand out seven sweets amongst the targets meaning that equality was not possible. This has also been done to ensure variability in individual responses as a favourite target would have to be selected.

For clarity, the hypotheses have been organised by predicted age differences, group and individual differences and SDS model predictions.

Age Differences

It is predicted that the oldest children will prefer the smart target more than the other two age groups as they rely more on social-conventional reasoning when making their decisions (Killen & Stangor, 2001) as demonstrated by giving the target more sweets. It is also predicted that the youngest children will give more sweets to the ill target than the other age groups as they will focus more on equality than equity (Sigelman & Waitzman, 1991) when reasoning as demonstrated by giving the target more sweets. Lastly, it is predicted that

as children get older generally, they will prefer both the 'tried best' target and 'smart' target as demonstrated by giving these targets more sweets.

Group and individual differences

It is predicted that groups will give more sweets to both the effortful target and able target than individuals. Research has shown that being in groups increases levels of distributive justice reasoning (Killen & Damon, 1982) and equity is seen more in older age groups (Hook & Cook, 1979) as is a preference for social-conventional and individual merit based reasoning (Stangor & Killen, 2001).

SDS predictions

It is predicted that group decisions in this study will follow a majority rule pattern with the final group decision reflecting the majority of the initial preferences prior to group discussion. Literature has shown that children are influenced by majorities (Haun & Tomasello, 2011) and that in ambiguous situations where there is no obvious correct answer group decisions also reflect that of the majority (Kameda, Tindale, & Davis, 2003).

Study 1: Intragroup contexts and children's resource allocation

Method

Participants

400 children participated in the study across three age ranges. There were 127 children aged between 6-8-years (67 boys and 60 girls); 123 children aged 9-10-years (69 boys and 54 girls); 150 children aged 12-14-years (51 boys and 99 girls). Participants were recruited from primary and secondary schools in Kent, South-East of England. Schools were approached by letter and then contacted by phone. Informed consent letters were given to all

parents and in schools where Opt-Out was chosen as a method, a Loco Parentis was signed by the Headteacher.

Design

A mixed 3 factor design was used with a 2 (Context: Individual and Group) x 3 (Target: Ill, Smart or Effort) x 3 (Age: Year 2-3, Year 5-6, Year 8-9) design. Context and target were within-subjects factors and age was the between-subjects factor. The dependent variable was operationalised as the number of sweets given to the targets in both the group and individual contexts. Children were informed they could give out the sweets however they wanted until all seven sweets were given out, meaning that the number of sweets each target received was interdependent.

Procedure

Children were taken out of the classroom in same-sex groups of three and given a verbal description of what the study involved. It was explained that both their parents and teachers knew what was involved and had allowed the experimenter to talk to them. Once informed consent was given, their participant codes were created and they were given a sheet with the following scenario: 'Johnny, Andrew and Michael were asked to do a presentation of their work to the class. Johnny was really ill and couldn't do as much work as the other two, Andrew was very smart and did the best work and Michael wasn't as smart as Andrew but he tried really hard to do his best. At the end of the presentation the teacher gave them 7 sweets. How would you share the sweets out? Write the initial of the child you want to have the sweet under each picture' (the names of the children were changed to Natasha, Sarah and Louise for the female groups). The children were told verbally that their answers should remain secret and the experimenter intervened at any signs of copying.

Once this was completed, the sheets were collected by the experimenter and the children were asked to do a brainstorming task together. The task was part of another study but also acted as a filler task and a method to increase group identification under the minimal group paradigm setting. The subject the children were asked to brainstorm on was 'things you need in space'. At this point in the study, the children were informed that they would be voice recorded to ensure that all their ideas were accurately recorded by the experimenter. The voice recorder remained on for the rest of the experiment to enable the experimenter to revisit the children's group discussions and code them at a later date.

Children were presented with the same sweet sharing scenario and instructed that this time they had to make a group decision on how best to share out the sweets. They were encouraged to come to an agreement but told that the experimenter would not help them do this. When they had completed the task, they were instructed to write the answer on the sheet in front of them. The experimenter did not participate in this part of the study and only intervened when time was running short. At this point the children were prompted to make a decision but no more help or advice was given. When the task was finished, the children were verbally debriefed and given a certificate and sticker for their participation. Debrief letters were sent home to their parents with participant codes on them should any wish to withdraw their child from the study.

Results

Constructing decision models

Models were run using ANOVAs; first an overall model on the data file was conducted, followed by more specific models relating to certain types of behaviour such as inclusion, rejection and preference. These behaviours were chosen due to the focus on such behaviours within the peer relation literature (Rubin, Bukowski, & Parker, 1998). Ability

wins and effort wins models were also investigated as two separate models relating specifically to the smart and tried best targets. To help understand the following analysis, age was split into three age ranges. The first age range refers to children aged 6-8-years, the second age range 9-10-years and the third age range 12-14-years.

Overall ANOVA

The following analyses were run using an aggregated data file so that group data was not triplicated. The data was aggregated by using the 'aggregate' function on SPSS, which summated the data file by group number (so that each group appeared only once in the data set). Gender, age, individual distributions of sweets to each target and the group distribution of sweets to each target were all included in the aggregated data set. A repeated measures ANOVA was conducted examining sweet distributions between the targets with target (ill, smart and tried) and context (individual or group) as within-subjects factors and age and gender as between-subjects factors. A main effect of target was found with $F(2, 254)= 55.12$, $p<.001$, partial eta=1.00. The ill target was given significantly fewer sweets than both the smart and tried best target (*MD*=-.756, $p<.001$ and *MD*=-.753, $p<.001$ respectively).

There was a significant target x age-range interaction $F(4, 254)=7.50$, $p<.001$, partial eta= .997. Looking at the simple main effects it was found that across all age groups the ill target was liked the least getting significantly fewer sweets than both the smart and tried best targets. In age range 2, the tried best target was liked significantly more than the smart target *MD*=.357, $p =.01$. In age range 3, the only significant differences found were for the ill target with the other two targets (ill target was liked significantly less than both the smart target *MD*= -1.24, $p<.001$ and tried best target *MD*= -.99, $p <.001$). The ill target was liked significantly more in age range 1 than age range 3 (MD=.486, $p<.001$) and by age range 2 than age range 3 (*MD* =.298, $p<.05$). The smart target was liked significantly more by age

range 3 than the other two age ranges (*MD* =.329, *p*<.005 for age range 1, *MD* =.454, *p*<.001 for age range 2). The tried best target was liked significantly more by age range 2 than age range 1 (*MD* =.314, *p*<.005). No other significant differences were found.

Another interaction effect was found for target and context *F* (2, 254)=9.04, *p*<.001, partial eta=.97. At the individual level, the ill target was liked significantly less than both the smart and tried best target (*MD* =-.676, *p*<.001 and *MD* =-.497, *p*<.001 respectively). The smart target was liked significantly more than the tried best target too, *MD* =.179, *p*<.05. In groups the same pattern occurs for the ill target with them being liked the least. There was no significant differences between the tried best target and smart target however, suggesting that the strong preference for the smart target at the individual level was somehow negated by groups. The ill target was significantly more liked by individuals than groups *MD* =.179, *p*<.05. The tried best target was significantly more liked by groups than individuals *MD* =.255, *p*<.001. There were no significant differences found between contexts for the smart target.

Rejection Model

For each target a rejection model was created by coding, as 1, participants' answers at both individual and group level for each target if children gave the target one sweet or less and 0 if they gave the target more than one sweet. This was done because it is thought that by giving a target only one sweet compared to other targets, it demonstrates a rejection of that particular target as that target could have received two sweets and still be the least favoured. These new variables were then entered into a repeated measures ANOVA with context (individual rejection scores for each target and group rejection scores for each target) being a within-subjects factor and age range and gender a between-subjects factor. A significant main effect of target was found *F*(2, 254)= 60.58, *p*<.001. The ill target was significantly more

likely to be rejected than the smart and tried best targets (*MD*=.27, *p*<.001 and *MD*=.28, *p*<.001)

An interaction effect of gender and target was found *F* (2, 254)= 3.50, *p*<.05. Looking at the simple main effects, boys were more likely to reject the ill target than girls, *MD* =.13, *p*<.05. Girls were significantly more likely to reject the ill target than the smart and tried best targets however (*MD* =.30, *p*<.001, *MD*=.34, *p*<.001 respectively). The same pattern was found in boys who were also more likely to reject the ill target over the other two (smart target *MD*=.21, *p*<.005, tried best target *MD*=.20, *p*<.001), which overall suggests that the patterns in gender for rejection are the same but more pronounced for boys.

An interaction effect was also found with target and age range *F*(4, 254)=5.56, *p*<.001. Simple main effects showed that across all age ranges, the ill target was significantly more likely to be rejected than the smart and tried best targets. The oldest children (age range 3) were more likely to reject the ill target than both children from age ranges 1 and 2 (*MD*=.17, *p*<.05, *MD* =.20, *p*<.01). For the smart target, the youngest children were significantly more likely to reject them than the children at age ranges 2 and 3 (*MD* =.08, *p*<.01, *MD*=.10, *p*<.001). No significant differences were found between age ranges 2 and 3. The same pattern for the tried best target was found with the youngest children being more likely to reject the tried best target than children at age ranges 2 and 3 (*MD*=.07, *p*<.01, *MD*=.06, *p*<.01).

There was a third interaction effect for target and context *F* (2, 254)= 6.49, *p*<.005 (this effect can be seen in Figure 4.1). The pairwise comparisons showed that individuals were significantly more likely to reject the ill target than the smart or tried best targets (*MD*=.22, *p*<.001, *MD* =.20, *p*<.001). In groups the same pattern is found (ill-smart *MD*=.29, *p*<.001, ill-tried *MD*=.33, *p*<.001). However, children in groups were also significantly more

likely to reject the smart target than the tried best target *MD*=.04, *p*<.05. The ill target was significantly more likely to be rejected by groups than individuals (*MD*=.85, *p*<.05) and interestingly the tried best target was significantly more likely to be rejected by individuals than groups (*MD*=.04, *p*<.05). No differences were found for the smart target and rejection by individuals and groups. The findings suggest that the differences here occur because groups favour the tried best target more rather than favouring the smart target less.

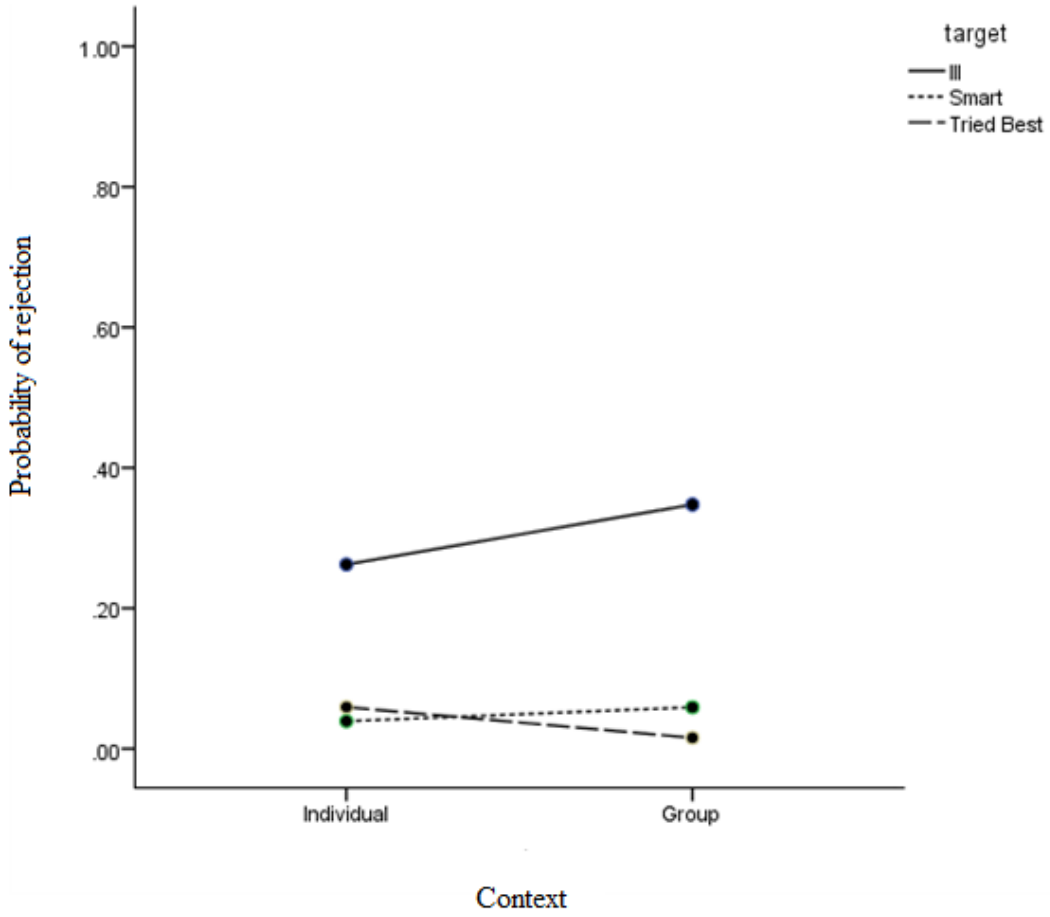


Figure 4.1: The interaction effect between context and target in terms of which target the participants rejected when sharing sweets

Inclusion Model

The inclusion model again looked at all three targets and coded participants answers at both individual and group level as 1 if the target was given at least two sweets and 0 if they were given less than two sweets (therefore rejected). This is a different decision from rejection because participants do have the option of only giving the target one sweet. By giving them an additional sweet, it suggests a different decision other than rejection, an attempt to include the target more. Another repeated measures ANOVA was run with context (individual inclusion scores for each target and group inclusion scores for each target) as a between subjects factor and gender and age range as a between-subjects factor. A main effect of target was found $F(2, 254)=14.06$, $p<.001$. The ill target was significantly less likely to be included than both smart and tried best targets ($MD=-.27$, $p<.001$ and $MD=-.28$, $p<.001$ respectively).

An interaction effect was found for context and target $F(2, 254)=5.11$, $p<.01$ (as demonstrated in Figure 4.2). At the individual level, the ill target was significantly less likely to get included than the tried best target ($MD=-.07$, $p<.05$). At the group level, the ill target was significantly less likely to be included than both the tried best target and smart target ($MD=-.21$, $p<.001$, $MD=-.15$, $p<.005$ respectively). A significant simple main effect was also found between the smart target and tried best target at the group level with the smart target being less likely to be included than the tried best target, $MD=-.07$, $p=.005$.

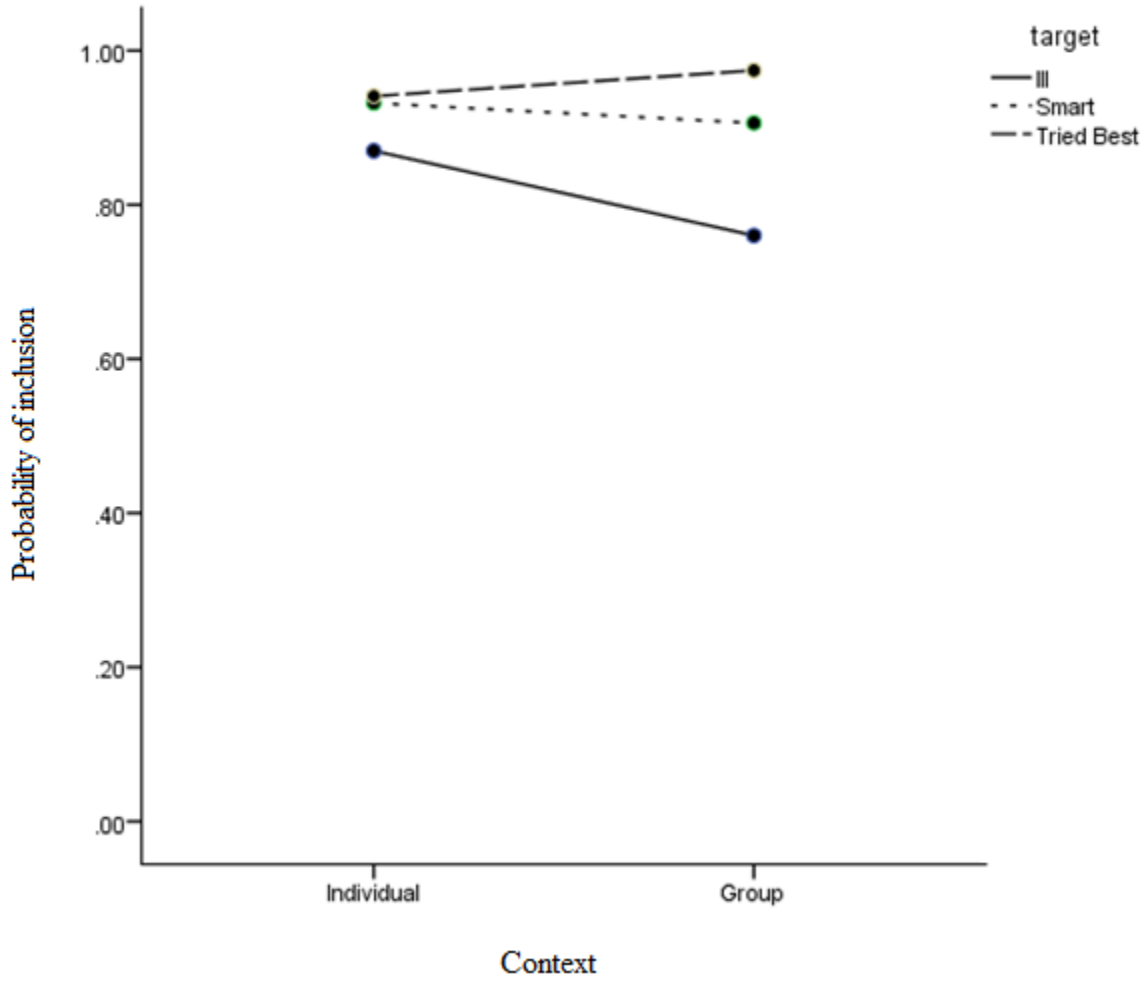


Figure 4.2. The interaction between the context and target in terms of who the participants included when sharing sweets

Preference Model

The preference model was constructed by scoring participants sweet distributions at the individual and group level as 1 if they gave the target three or more sweets or 0 if they gave them less than three sweets. It is argued that by giving a target three sweets or more, they are not just including them but clearly preferring them over at least one other target. A repeated measures ANOVA was run with context (individual preference scores for each target and group preference scores for each target) as a within-subjects factor and gender and

age range as between-subjects factors. Again there was a main effect of target $F(2, 254)=62.29$, $p<.001$, partial eta=1.00. The ill target was significantly less likely to be preferred than both the smart and tried best targets ($MD=-.39$, $p<.001$ and $MD=-.43$, $p<.001$).

Interaction effects were found for target and age range $F(4, 254)= 14.65$, $p<.001$ (see Figure 4.3; for ease of interpretation age range was put on the X-axis), partial eta=1.00. Looking at the pairwise comparisons, it was found that in age range 1, the ill target was significantly less likely than the smart target to be preferred ($MD=-.18$, $p<.01$). At age range 2, there were significant differences between all targets with the ill target being less preferred than the smart and tried best targets ($MD=-.24$, $p<.001$ and $MD=-.59$, $p<.001$). The tried best target was also preferred significantly more than the smart target at this age with $MD=.35$, $p<.001$. In the final age range (3), the ill target was also significantly less preferred than the smart and tried best targets ($MD=-.70$, $p<.001$, $MD=-.55$, $p<.001$) but there were no significant differences between the tried best and smart target at this age.

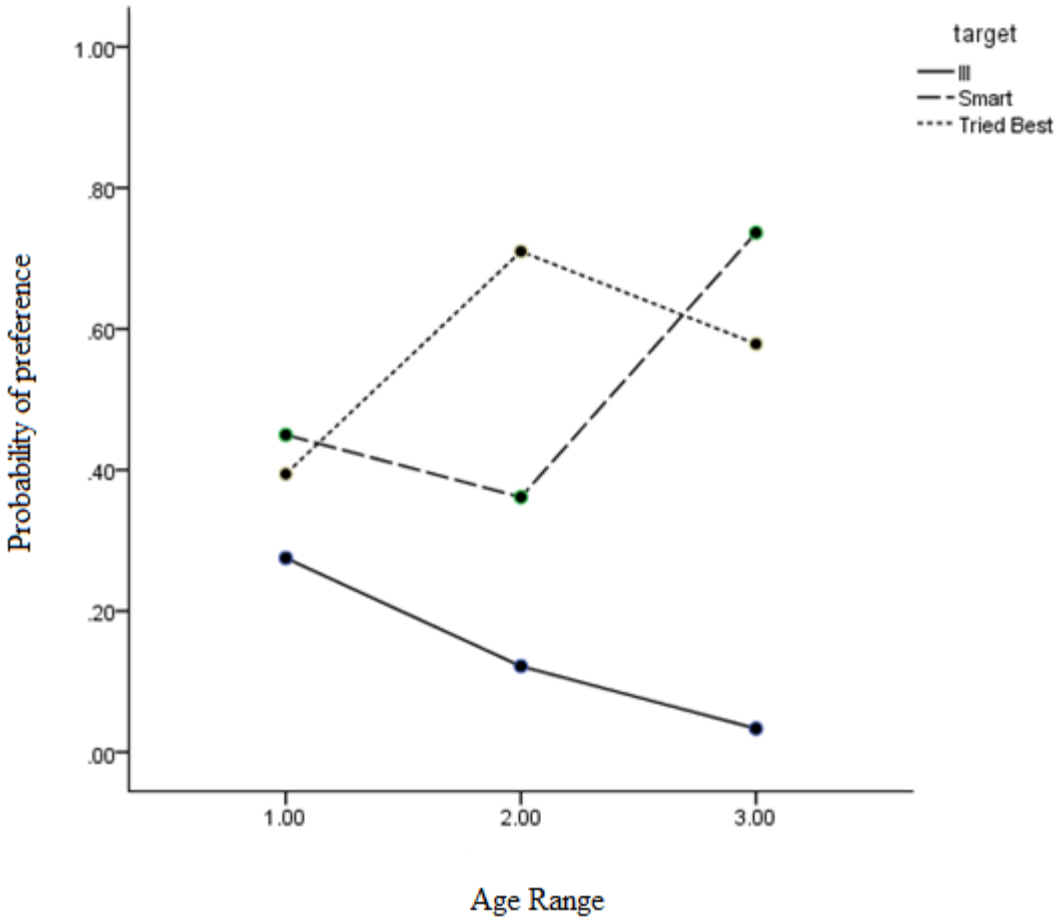


Figure 4.3. The interaction effect between the age of the participant and the target in terms of which target the participants preferred.

For the ill target, there were significant differences between age range 1 and age ranges 2 and 3 with this youngest age range being significantly more likely to prefer the ill target more than the other age groups (with age range 2 *MD*=.15, $p<.001$ and with age range 3 *MD*=.24, $p<.001$). Also, a significant difference between age ranges 2 and 3 were found with age range 2 being significantly more likely to prefer the ill target than the older children (*MD*=.99, $p<.05$).

For the smart target, the eldest children (age range 3) were significantly more likely to prefer the smart target than both age ranges 2 and 1 (*MD*=.38, *p*<.001 and *MD*=.29, *p*<.001). For the tried best target, only age range 1 was significantly different from both age ranges 2 and 3 with this youngest group being less likely to prefer the tried best target than the other two age groups (age range 2 MD=-.32, *p*<.001, age range 3 *MD*=-.18, *p*<.01).

There was also an interaction of target and context *F*(2, 254)=10.06, *p*<.001, partial eta=.99 (see Figure 4.4). Looking at the pairwise comparisons it demonstrated that at both group and individual levels, the ill target was significantly less likely to be preferred than both smart and tried best targets. However the ill target was significantly more likely to be preferred at the individual level than the group level (*MD*=.10, *p*<.001). The context did not have a significant effect on how much the smart target was preferred, but for the tried best target, groups were significantly more likely to prefer them than individuals (*MD*=.16, *p*<.001).

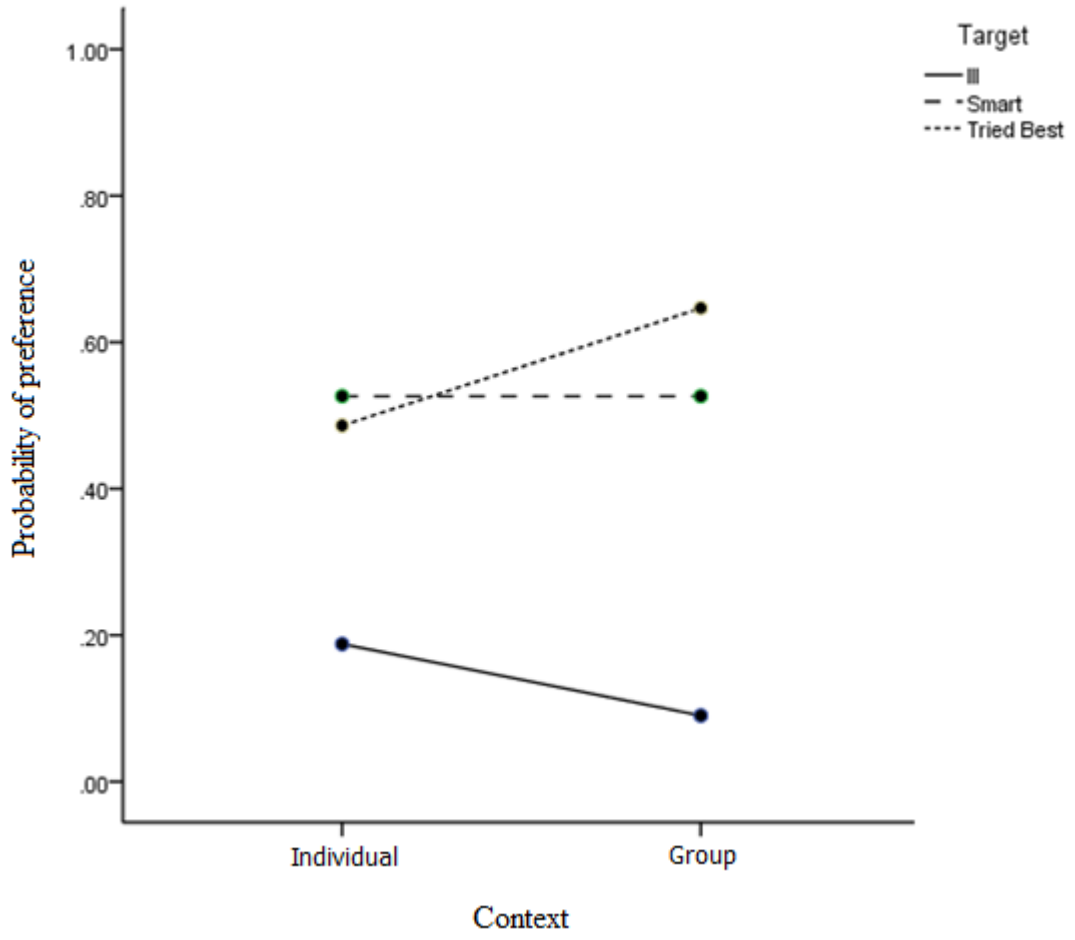


Figure 4.4. Interaction between context and target type in terms of which target was preferred when participants shared out sweets.

Ability Model

As the results demonstrated repeatedly that the ill target was the least preferred out of all the targets, further analyses looked specifically at what happened between the smart and tried best target across age groups and genders. Participants' scores were coded at both individual and group level so that any participant who gave more sweets to the smart target were coded as 1 and those who gave an equal number of or less sweets to the smart target were coded as 0. A repeated measures ANOVA was then run with context (individual scores

for ability and group scores for ability) as a within-subjects factor and age and gender as between-subject factors.

A significant main effect of context was found $F(1, 127)=4.14$, $p<.05$, partial eta=.52. Individuals were significantly more likely to give sweets to the smart target than the tried best target with $MD=.08$, $p<.05$ compared to groups.

Effort Model

An effort model was created using the same method as above with those giving more sweets to the tried best target receiving a score of 1 and those giving the same amount of or more sweets to the smart target being coded as 0. A repeated measures ANOVA was then run with context (individual scores for effort and group scores for effort) as a within-subjects factor and gender and age as a between subjects factor.

A significant main effect of context was found $F(1, 127)=5.09$, $p<.05$, partial eta=.61. Groups were significantly more likely to give more sweets to the tried best target than individuals. There was also an interaction effect of context and age range $F(1, 127)=3.11$, $p<.05$ and partial eta=.59. Simple main effects were run which found that, at the individual level, there were significant differences between children in age range 2 and age ranges 1 and 3 ($MD=.24$, $p<.001$, $MD=.22$, $p<.001$ respectively). Children in age range 2 at the individual level were significantly more likely to give more sweets to the tried best target than the smart target compared to other age groups. At the group level this difference shifts and age range 3 has significantly different results from age ranges 1 and 2 ($MD=-.20$, $p<.05$, $MD=-.35$, $p<.001$). Children in age range 3, when in groups, were significantly less likely to give more sweets to the tried best target than the smart target compared to other age groups.

At the individual levels, the youngest and oldest children were less likely than children in age range 2 to give more sweets to the tried best target. In the group stage, both

ages 1 and 2 were more likely to give more sweets to the tried best target than smart target, whereas children in age range 3 did not show much change across contexts hence the changes in significances. The group process did not seem to impact their decisions.

A 3-way interaction was also found between context, gender and age, $F(2, 127)=3.65$, $p<.05$, partial eta=.66 (see Figures 4.5 and 4.6). The difference is due to a significant difference between boys and girls in age range 2 at the group level; with girls being more likely than boys in groups to give more sweets to the tried best target than smart target (*MD*=.39, $p<.01$). There were also significant differences in girls individual and group decisions in age range 2 with girls being significantly more likely to give more sweets to the tried best target when in groups than when they are alone (*MD*=.259, $p=.01$). For boys, a significant difference occurs at age range 1 where individuals and groups differ with boys being significantly more likely to give more sweets to the tried best target in groups than alone (*MD*=.28, $p<.01$).

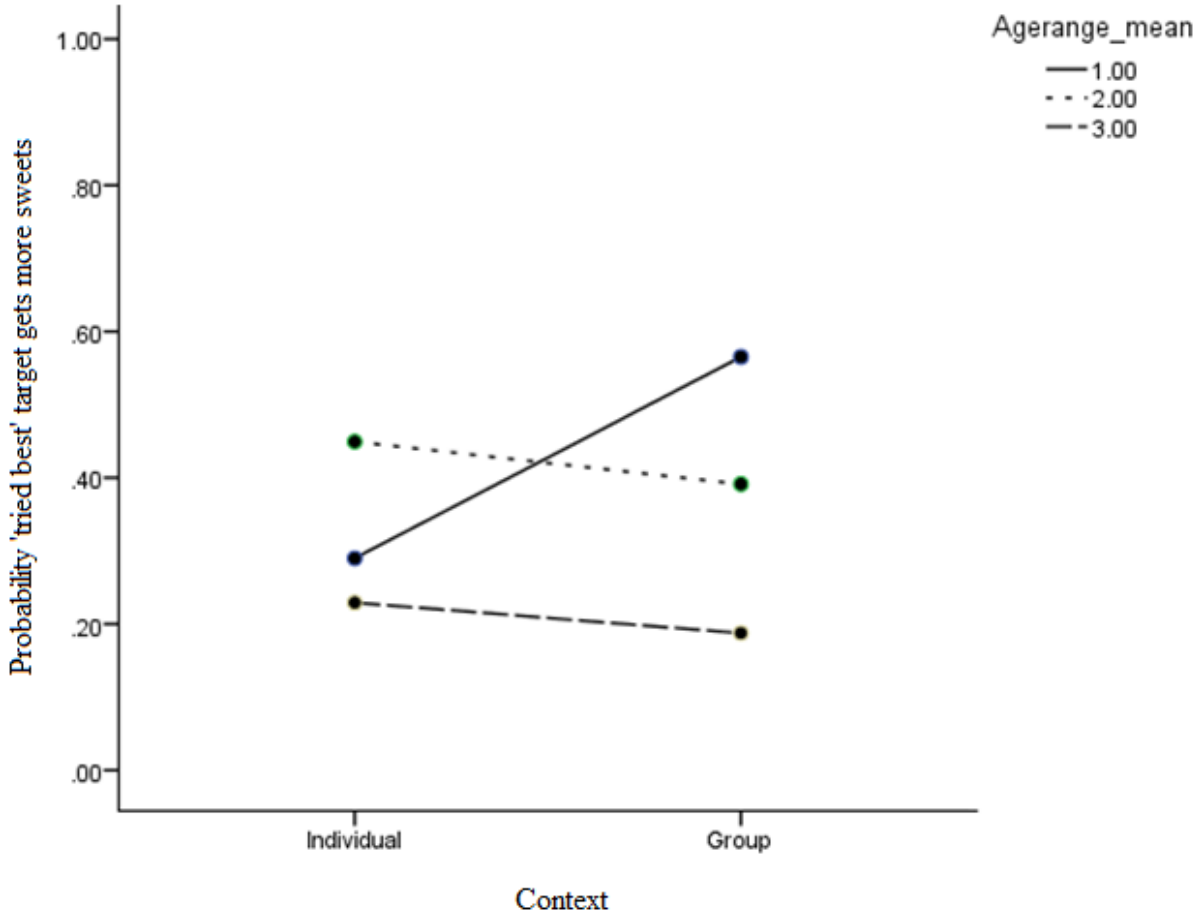


Figure 4.5. Age x context interaction among male participant's allocation of sweets to the 'tried best' target

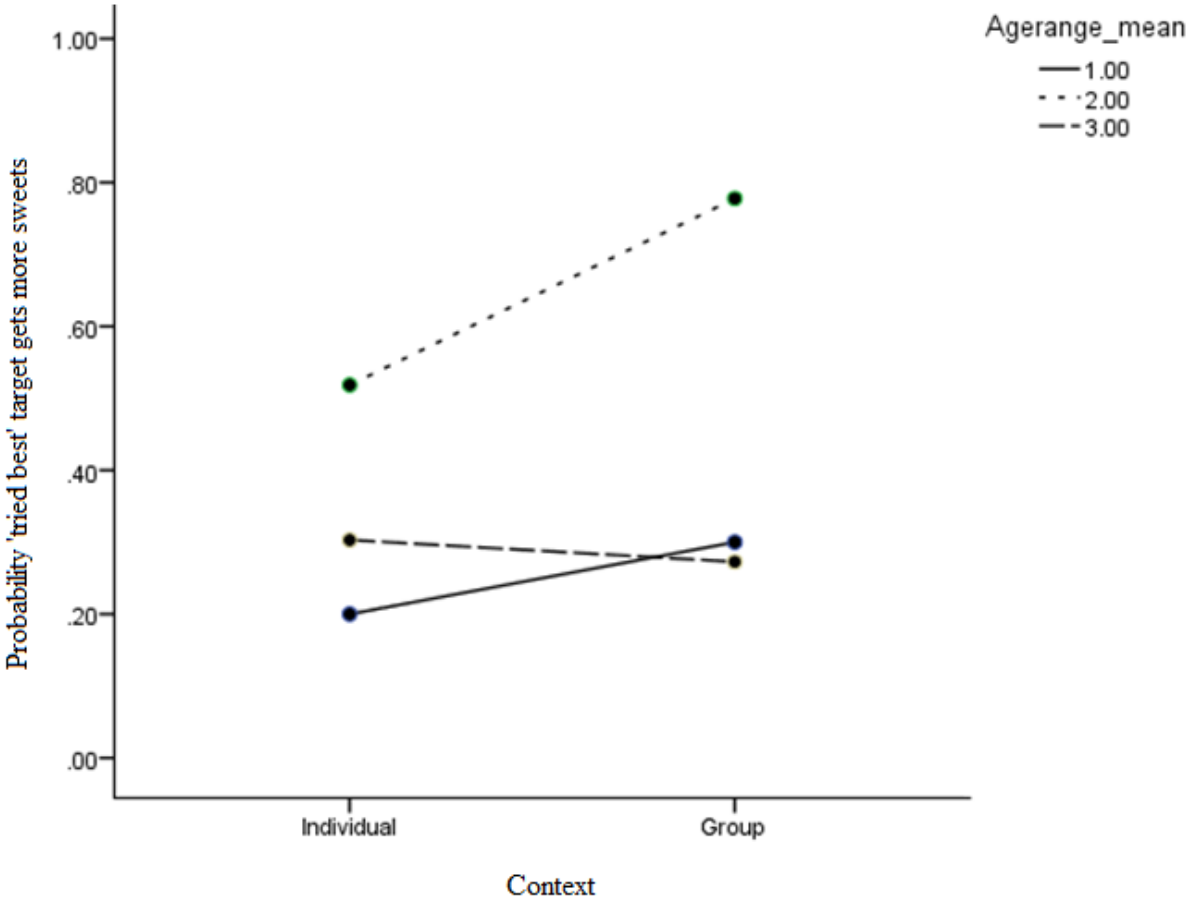


Figure 4.6. The interaction effect of age and context on female participants' allocation of sweets to the 'tried best' target

Girls at the individual level in age range 2 had significant differences between both age ranges 1 and 3 (*MD*=.16, *p*<.05, *MD*=.22, *p*<.05). This suggests that individually, girls were more likely than at any other age to give more sweets to the tried best target. At the group level this difference disappears between age ranges 2 and 1 & 3, with a significant difference occurring between only ages 1 and 3 (*MD*=.38, *p*<.05). This suggests that in groups, younger children are more likely to give more sweets to the tried best target than older children. For boys, at the individual level, the same pattern was seen where boys at age range 2 were significantly more likely to give more sweets to the tried best target than ages 1

and 3 (*MD*=.32, *p*<.001 and *MD*=.22, *p* <.01 respectively). This pattern remains in the group stages however with age range 2 still giving more sweets than ages 1 and 3 (*MD*=.48, *p*<.01, *MD*=.51, *p*<.001).

SDS

SDS models were conducted using a Dos programme to attempt to uncover what decision rules children were using when making their group decisions. SDS enables the testing of various types of decision rules to see which rule significantly fitted the data. Using the same premise as the ANOVA models, Rejection, Inclusion and Preference models were conducted using SDS and were all looked at within levels of age. As three person groups were used, it limited the number of different decision rules the SDS could be applied to. For example, the SDS allows you to distinguish between two thirds majority, majority, and truth supported decision rules (where one person plus a supporter influences the group decision). All three of these models are identical in a three person group and so only one could be tested. Additionally the plurality model, which is when the solution with the most votes win but no absolute majority occurs, could not be tested as it would not be possible to distinguish as no outcome in a three person group could reflect this rule.

The models chosen to be looked at were the proportional model, which suggests that the final group decision is based on the number of group members advocating it, majority wins model and the equiprobability model, where each answer suggested has equal chance of being chosen. In Table 4.1 are the D matrices of each model, demonstrating the probability of the group answer based on the distribution and the decision scheme rule. The reason for selecting the majority model was because research into children and conformity have demonstrated children follow a majority rule when making decisions (Corriveau, Fusaro, & Harris, 2009). The equiprobability model was chosen as it would suggest children chose their

final group decision by chance; as the task was not related to class work children may have simply picked an answer at random. The last model, proportionality, was included in case some groups failed to follow the majority rule; this model allows for some groups to choose differently from the majority.

Due to several factors in the methodology, multiple decision schemes came out as non-significant (see Table 4.2). First, the use of three person groups meant that a two thirds majority and majority rule were identical so the full predictive power of the SDS was not used to its full extent. Another factor was limiting the choice of the number of sweets that could be shared out amongst three people to seven sweets. Although this prevented children from being able to be equal in their decision making and forced them to make a preference, it limited the variability of the individual choices. Initially, using nCr(n,r) = nPr(n,r) / r! (which calculates the number of different, unordered combinations of *r* objects from a set of *n* objects) there are 35 possible ways to share out the sweets, however this did not take into account the likelihood of these choices being made. Of the 400 participants who answered the sweet distribution question individually, 65.3% chose the distribution 2, 2, 3. This meant there was less variation of individual answers which is what the SDS looks at to distinguish between different models. Due to the lack of variation, multiple models were non-significant meaning the information that could be gained from using SDS did not help differentiate the types of decision rules used in groups.

Table 4.1

This table shows the probability a group will choose a certain outcome based on the group member's initial individual decisions and the group rule hypothesised by each model

Individual Preference Distribution		**Proportionality Model**		**Majority Wins Model**		**Equiprobability Model**	
Choosing A	Choosing B	Choosing A	Choosing B	Choosing A	Choosing B	Choosing A	Choosing B
3	0	1.00	.00	1.00	.00	1.00	.00
2	1	.67	.33	1.00	.00	.50	.50
1	2	.33	.67	.00	1.00	.50	.50
0	3	.00	*1.00*	.00	1.00	.00	1.00

Table 4.2

Table showing the findings for SDS models on data; models given an X were non-significant (therefore fit the data). Models with a – were significant and therefore did not explain the data

		Majority	Equiprobability	Proportional
Inclusion Model	Ill target Age 1	-	X	-
	Ill target Age 2	-	X	-
	Ill target Age 3	X	-	-
	Smart target Age 1	X	X	X
	Smart target Age 2	X	X	X
	Smart target Age 3	-	-	-
	Tried best target Age 1	X	X	X
	Tried best target Age 2	X	X	X
	Tried best target Age 3	X	X	X
Rejection Model	Ill target Age 1	X	-	-
	Ill target Age 2	X	-	-
	Ill target Age 3	-	X	-
	Smart target Age 1	X	X	X
	Smart target Age 2	X	X	X
	Smart target Age 3	X	X	X
	Tried best target Age 1	-	-	X
	Tried best target Age 2	X	X	X
	Tried best target Age 3	X	X	X
Preference model	Ill target Age 1	-	-	-
	Ill target Age 2	-	-	X
	Ill target Age 3	-	-	X
	Smart target Age 1	-	-	X
	Smart target Age 2	-	-	X
	Smart target Age 3	-	-	X
	Tried best target Age 1	X	-	-
	Tried best target Age 2	X	-	-
	Tried best target	-	-	X

Age 3

Discussion

Overall the results largely support the initial predictions. Older children were shown to favour the smart target more than did the other two age groups and allocated the ill target the least compared with other age groups. Given that the scenario mentioned that the ill target did not do as much work as the other targets, this result was expected. Not only have older children been shown to prefer using equity reasoning when dealing with distributive justice scenarios (Sigelman & Waitzman, 1991), meaning the ill target would get less because they did less work, they also have a tendency to focus more on socio-conventional reasoning (Killen & Stangor, 2001). As the ill target did not benefit the group in any way and it was implied they did not do as much work as the other group members, socio-conventional reasoning, which focuses on social norms and rules of interaction, would deem their behaviour and therefore the ill target as undeserving.

In addition, the findings that older children focus more on individual merit (Killen, 2007) explain the particular liking of the smart target in this scenario. Almas, Cappelen, Sorensen and Tungodden (2010) also found that with age, individual merit became increasingly important when considering fairness and older children were more able and likely to accept inequalities based on individual achievement. The middle age group demonstrated a strong preference for the target who tried best which does fit with socio-conventional reasoning expected in older age groups as the target worked hard for the benefit of the group.

This finding however, does not fit entirely with the predominance of social-conventional reasoning, as it was implied that the quality of work produced by this target was not as good as the smart target and so they would not have been as beneficial to the group in terms of the

quality of work produced. The differences of preference in the two older age groups seems to demonstrate a change in their overall beliefs in that for younger children, trying one's best seems the most important factor but once older, ability becomes the main focus. This may be a consequence of the norms found in schools, where children are encouraged by teachers to do their best. Yet, as children get older and take more tests, it becomes apparent that trying your best does not get as good a grade as being clever. Therefore a clever person may be viewed as more useful for the group than an effortful one.

In line with predictions, young children did favour the ill target more than the other age groups. Although overall, the ill target was still liked the least, this apparent preference for the ill target may demonstrate children in this age group attempting to be more equal in their distributive decisions. Fehr, Bernhard and Rockenbach (2008) found that children aged between 7- to 8-years predominately used egalitarian sharing preferring to give equal amounts of sweets to themselves and another child. Nucci (2001) noted the development of moral domain reasoning develops from a concern with harm to others with young children, a concern with equality during middle childhood and focuses on issues of equity for pre-adolescent children.

Given that overall the ill target was liked the least but that younger children were more likely to give them sweets it could be interpreted as an egalitarian preference as there was no reason (given the overall unpopularity of the ill target) to give the ill target more sweets unless children were attempting to be equal. Although young children are able to make decisions based on socio-conventional reasoning (Smetana, 2006) they are more able to make these types of reasoning in familiar situations than unfamiliar situations and are not able to reliably make socio-conventional decisions across multiple social events (Davidson, Turiel,

& Black, 1983; Smetana, 2006). It remains likely then that a fairness principle of equality was used in young children's decision making.

In terms of groups versus individuals, groups were more likely to include and prefer the tried best target as predicted. There were no significant differences between individuals and groups, however, in terms of the rejection or preference of the smart target. It may be that when individually making decisions individual merit is more salient and so children choose the smart target both at the individual level and group level. In groups, however, trying hard to benefit others may be seen as more desirable and so preference for this target increases in group settings. The tried best target was significantly more likely to be rejected by individuals than groups but no differences were found for the smart target in terms of rejection by individuals and groups suggesting that in groups the preference for the smart target remains constant but trying hard becomes more important.

A limitation of the study is that there was not as much variability in individual preferences as had been hoped for. The current analysis conducted using the SDS has not been as fruitful as expected because of this issue. Although manipulating the groups by putting individuals together with different preferences was considered by the researcher, it was decided that it would not be practical given the constraints of working in a school environment. It may not have worked either, however, as there would not have been enough variability in the individual preferences to create the groups desired. To solve this problem, a different scenario should be used creating more compelling arguments for each target to ensure that individuals are more divergent in their preferences. Additionally, more sweets could be given to the children so that there would be more ways to share the sweets out. Due to this problem and the varying results from the SDS, these findings will not be discussed as it is felt that they may not be wholly accurate.

Another problem with the study was that the sequence in which the sweets were given out was not recorded. As the number of sweets each target received was dependent on the number of sweets other targets were given, the order of sweet sharing may have been an interesting factor to measure. The order of sweet sharing may have also given further insight into the fairness preferences children were using. If the children for example gave two sweets to all targets and then chose which target to give the extra sweet to, it would imply children were more focused on equality reasoning. If however, children gave more sweets immediately to the smart target, it may suggest equity was the preferred method of distribution. For future studies, it is recommended that this is measured.

A further limitation of the study is that the children themselves were not involved in the scenario and so did not gain anything from the sweet distribution they chose. This may not reflect their actual behaviour in situations where distributive justice affects them directly. As the research was more focused on the group process however, it was not considered to be an important factor given the direction the research was going to take. Also, the children were all known to one another so other factors may be been in play that could not be controlled for. For example children have been shown to be selective as to who they choose to give them information (Pasquini, Corriveau, Koenig, & Harris, 2007). This would be a problem when attempting to predict the group processes taking place as what may initially appear to be a majority influence, may actually be children choosing to follow one child in particular who is viewed as a more capable peer, trusting them to be correct.

Study 2: Intergroup context and children's resource allocation

Killen, Margie and Sinno (2006) argued for the importance of understanding how intergroup scenarios affected morality reasoning in children. Despite research into moral

development and research into intergroup relations, research combining these two topics is still relatively new (Killen, 2007). When looking at society however, it is evident that although people support the idea of justice and equality for all, some groups are deemed 'more equal' than others. Killen et al. use the example of the founding fathers of the United States of America who espoused the idea of a nation of equality, with rights for all members including liberty and the pursuit of happiness, whilst being slave owners.

Moral reasoning development

Moral reasoning development initially argued that children develop moral reasoning through three broad stages (each made up of two sub-stages) which were preconventional, conventional and postconventional (Kohlberg & Hersh, 1977). At each stage children justify acts of right and wrong differently; first based on consequences to themselves, then in relation to group norms and finally using individual principles on how to treat others. However more recent research has suggested that these stages are redundant and that children as young as preschool age use reasoning containing each of these considerations (self, group norm and justice) (Theimer, Killen, & Stangor, 2001).

Despite the idea that these develop simultaneously, there are still developmental patterns found in terms of the extent to which each is used and when. In straightforward scenarios such as excluding someone from joining a group because of their gender, children of all ages focus on moral reasoning (Killen & Stangor, 2001). When scenarios become more complex, and differing levels of individual merit are introduced, older children (12- to 13-year-olds) are more likely to view exclusion as acceptable and give socio-conventional reasoning to explain their decision than younger age groups (6- to 7- years, 9- to 10-years, Killen & Stangor, 2001). This could suggest then, that older children are more likely to favour their in-group over an out-group in terms of resource allocations because they

consider social conventional reasoning more so than younger children. Having more resources would be beneficial to their in-group and, although it can be considered a type of exclusion (Mulvey, Hitti, Rutland, Abrams, & Killen, 2014), older children may find it more acceptable to be biased in their allocations.

Sharing behaviours

When looking at the development of distributive justice and resource allocation in general, with age children's inequality aversion increases (Fehr, Bernhard, & Rockenbach, 2008), egalitarianism peaks at 8-years when altruistic motives take over (Fehr, Rutzler, & Sutter, 2011), an overall preference for fairness increases particularly between 7- and 18-years (Harbaugh et al., 2003) and meritocratic fairness increases (Almas, Cappelen, Sorensen, & Tungodden, 2010). If given a scenario where meritocracy is made redundant (individual achievement is not included or relevant to the scenario), these findings would suggest children would be more likely to share equally as they get older, at least at an interpersonal level.

Leman, Keller, Takezawa and Gummerum (2008) incorporated an intergroup scenario into their research paradigm. They involved children aged between 7- and 17-years in either a dictator game or ultimatum game and asked them to make a decision on how to share out money individually and then as part of a three person group. They found that the group decisions mimicked that of the individual's decisions although no direct comparisons were made. The results demonstrated that between 8- and 10-years, there is a shift in distribution of resources, with children giving less as they age, due to a greater understanding of the strategy involved in each game and because of an appreciation of gender group membership. Girls tended to make more generous offers overall than boys.

Due to restrictions in sample size, the paper did not look at the intergroup context of the decisions to see how sharing resources from one group to another would affect the distribution of money. The 'other' group in the study was not manipulated either, so although it was a different group, the out-group context was not highlighted. Additionally, the rules of each game restricted the way children distributed money and the paper was more focussed on the outcome these different games provided than any other variables. The paper does demonstrate however, that when self-interest is present, sharing actually decreases rather than increases with age. This may mean, given that children identify with their in-group (Bennett & Sani, 2008a, 2008b), that when they or their in-group stand to benefit from a decision, they will engage in more self-favouring resource allocation.

Development of in-group bias

According to Social Identity Theory (Tajfel & Turner, 1979), people are motivated to belong to groups that are superior to others as this enhances their self-esteem. This can lead to individuals believing themselves to be similar to other members of their group and having more favourable opinions, attitudes and behaviours toward members of their own group. Out-groups on the other hand are viewed as different from members of the in-group and 'less good' and it is through these mechanisms that prejudice and discrimination can occur (Tajfel & Turner, 1979). The theory itself, however, did not concern the development of such in-group biases and how they may affect children and their behaviour.

Bigler, Jones and Lobliner (1997) demonstrated the existence of in-group bias in children as young as 6-years with temporarily created groups (children were divided into two different teams for 4 weeks) with others reporting in-group bias in children as young as 5-years (Nesdale, 2004). This suggests that children, like adults, are motivated to belong to a group and have favourable attitudes toward the group they belong to. In a resource allocation

task, children may allocate more resources to an in-group member due to this in-group bias taking precedence over their inequality aversion.

Vaughan, Tajfel and Williams (1981) conducted a resource allocation task looking at interpersonal and intergroup contexts. Children were asked to either give out money to members of the 'red' group and 'blue' group (their membership to one being previously disclosed) or to share money between a friend and a 'not friend'. They found high levels of in-group bias with no age (they tested 7- and 11-year-olds) or sex effects nor did the patterns change significantly depending on condition (intergroup or interpersonal). Their simple priming of group membership (using a minimal intergroup situation) was enough to produce the same level of favouritism shown when considering how to share sweets out to a friend and someone who was not a friend.

Current study (Study 2)

The purpose of the next study is to look at how different intergroup/interpersonal scenarios impact on the distributive justice of children (rather than inclusion/exclusion principles which are normally the focus) thus further bridging the gap between intergroup research and distributive justice. Vaughan et al.'s study was extended by looking at how children would share sweets in different contexts; intergroup sharing (in-group/out-group pupil), intragroup sharing (themselves and in-group members), self-out-group sharing and interpersonal sharing (themselves and another person without group context).

Intergroup scenarios were created by giving the children a short passage explaining 'Pretend that pupils are playing a game. Some pupils will play the game with people their own age from their own school. Other pupils will play with people their age from a different school called Orchard Park. You have 5 bags of sweets and can give each bag of sweets to

yourself/ingroup or you can give it to another pupil from Orchard Park School/your own school. On the line next to each picture of sweets write an M if you want to give the bag to yourself or an O if you want to give it to the pupil from Orchard Park school/your school‘. In the interpersonal condition, children were simply told pupils were playing a game and no outgroup was mentioned. Rather than using a real stigmatised group, an out-group of a different (imaginary) school was created so that all children tested would belong to the in-group. Other studies have used similar minimal intergroup situation paradigms and have found it to work effectively (Vaughan et al., 1981; Bigler et al., 1997).

Although studies have not found age differences in in-group bias (Bigler et al., 1997; Vaughan et al., 1981), given the differences in moral reasoning and the fact that the distribution of resources is considered a moral issue, age differences were expected. It was hypothesised that as children get older, they will be less likely to give sweets to another pupil (when they were part of the sharing scenario) or out-group member (in the intergroup sharing scenario) as their socio-conventional reasoning will take precedence and self-interest is involved. It is also predicted that significantly fewersweets will be given to the ‘other’ pupil (either interpersonally or intergroup) in any scenario containing an explicit out-group member, rather than another in-group member or pupil (intergroup sharing or self-outgroup-sharing).

Method

Participants

271 participants took part in this study with 100 year 2s (*M*= 6.28, *SD*= 0.45), 82 year 5s (*M*= 9.30, *SD*= 0.46) and 106 year 8s (*M*= 12.61, *SD*= 0.50). In year 2 there were 56 males and 44 females, in year 5, 41 males and 41 females, and in year 8, 55 male and 51 females.

All participants were recruited from schools in the South East of England, Kent. Schools were contacted by letter or e-mail and then by phone. Follow up meetings were arranged to discuss the procedure and materials with senior staff (usually the Head teacher) and to arrange testing dates with the schools. The schools chose the Opt-Out method for gaining parental consent so a Loco Parentis was signed by the Head teacher (or senior staff member in charge of liaising with the researchers)

Design

The experiment was a 4 (Condition: intergroup sharing, intragroup sharing, self-out-group sharing, interpersonal sharing) x 3 (Age: Year 2, year 5, year 8) between subjects design. The dependent variable was the number of sweets given to each pupil in the scenario.

Materials

Participants were given a scenario on a piece of paper: 'Pretend that pupils are playing a game. Some pupils will play the game with *X*. Other pupils will play with people their age from *Y*. You have 5 bags of sweets and can give each bag of sweets to *X* or you can give it to *Y*. On the line next to each picture of sweets write a M (for Me/My school) if you want to give the bag to yourself or an O if you want to give it to *X*. Start at the top and work your way down'. The contents of the scenarios were changed depending on the condition so that X either depicted themselves or an in-group member and Y depicted another pupil or an out-group member. They were then given five pictures to sweets to write the letters against.

Procedure

On the mornings of the experiment, the researcher met with the class teacher to discuss the procedure of the study. When the children arrived, they were introduced to the experimenter by the teacher and informed that the experimenter had been given permission by the school to come and talk to them about how they would share out sweets. The children

were asked if they would be willing to take part in the study and they were told they could stop taking part and leave any time they wished. They were also told that their answers would remain a secret and that no one would be allowed to see them. Only children who agreed to take part in the study were spoken to.

The children were then either taken out of the classroom (the younger two years) or given a piece of paper with the scenario on, and instructed to fill in the form whilst remaining in class (the year 8 participants). The younger children were spoken to on a one-to-one basis with the researcher and talked through the scenario. They were then asked who they would like to give each of the sweets to and the experimenter filled in the answers for them. This was done to prevent any confounding issues with reading ability on the part of the children and to enable children to ask if they did not understand the scenario fully. Once completed, they were debriefed, given a sticker and certificate to thank them for their time and taken back to class. The older children were debriefed together as a class and given a chocolate for their participation. All children were given debrief letters to take home to their parents.

Results

The data were entered into SPSS and the dependent variable scored to represent the total number of sweets given to the out-group/other pupil. Data were analysed using an ANOVA with condition, gender and year group as independent variables.

There was no main effect of gender $F(1, 247)= .19$, $p= .66$, but main effects of year group, $F(2, 247)= 6.96$, $p<.005$ and sweet condition $F(3, 247)= 14.70$, $p< .001$, were significant. Looking at the descriptive statistics for year group, year 8's gave the least number of sweets with an average of 2.30, followed by year 2s with an average of 2.59 and year 5s with an average of 2.95. Looking at the pairwise comparisons, year 8s gave significantly

fewer sweets to others/'out-group' than any other year group. Year 5 gave significantly more sweets to others/'out-group' than both year 8 and year 2 children (see Table 4.3 for pairwise comparisons). The results demonstrate that the eldest age group were the least likely to share sweets with an out-group/other, supporting the hypotheses but the most generous age group was year 5 rather than the youngest children, contrary to expectations.

As the literature strongly suggests that children have an inequality aversion (Fehr et al., 2008), it was decided to test whether these scores were significantly different from 2.5, the average number of sweets if divided into two (therefore representing a different distribution other than equality). The overall mean number of sweets shared to 'others' was compared to the average of 2.5 using a paired sample t-test. There was no significant difference between year 2 means and the equality mean suggesting that they may have tried to use equality when sharing out the sweets. However year 5 pupils gave significantly more sweets to others than equal $t(64)= 4.64$, $p<.001$ suggesting they did not share the sweets out equally. A marginally significant effect was found for year 8 pupils where they gave marginally fewer sweets to others than equal $t(105)= -1.71$, $p= .09$ again suggesting that a different form of sharing was used.

Table 4.3

Pairwise Comparisons of the Main Effect of Year Group on Sweet Distribution to Others/Out-group

Year group (i)	**Year group (j)**	**Mean difference (i-j)**	**Significance**	**Partial Eta squared**
5	2	0.36	$p<.05$	.05
8	2	-0.29	$p<.05$	.05
8	5	-0.65	$p<.001$	.05

When looking at the pairwise comparisons for the main effect of condition, significantly fewer sweets were given to an out-group member in the intergroup sharing

condition than in any other condition (including self-out-group sharing). The only other significant pairwise difference found in the data was between interpersonal sharing (no group scenario) and the self-out-group sharing condition where significantly more sweets were given to the 'other' pupil in the interpersonal sharing condition than the self-out-group sharing condition (see Table 4.4 for pairwise comparisons). This is in line with expectations, when in an intergroup situation participants will give fewer sweets to an out-group member than themselves or an in-group member.

Table 4.4

Pairwise Comparisons of the Main Effect of Sweet Condition on Sweet Distribution to Others/Out-group

Condition (i)	**Condition (j)**	**Mean difference (i-j)**	**Significance**	**Partial Eta Squared**
Intergroup sharing	Self-out-group sharing	-0.79	p<.001	.15
Intergroup sharing	Intragroup sharing	-1.07	p<.001	.15
Intergroup sharing	Interpersonal sharing (no group)	-1.29	p<.001	.15
Self-out-group sharing	Interpersonal sharing (no group)	-0.50	p<.01	.15

No interaction effects were found between year group and condition $F(6, 247)= .95$, $p= .46$ because, as can be seen from the Figure 4.7, the participants in each age group acted in a similar way across each condition. This was not expected as it was thought that older children would be more sensitive to differences in intergroup scenarios than younger children.

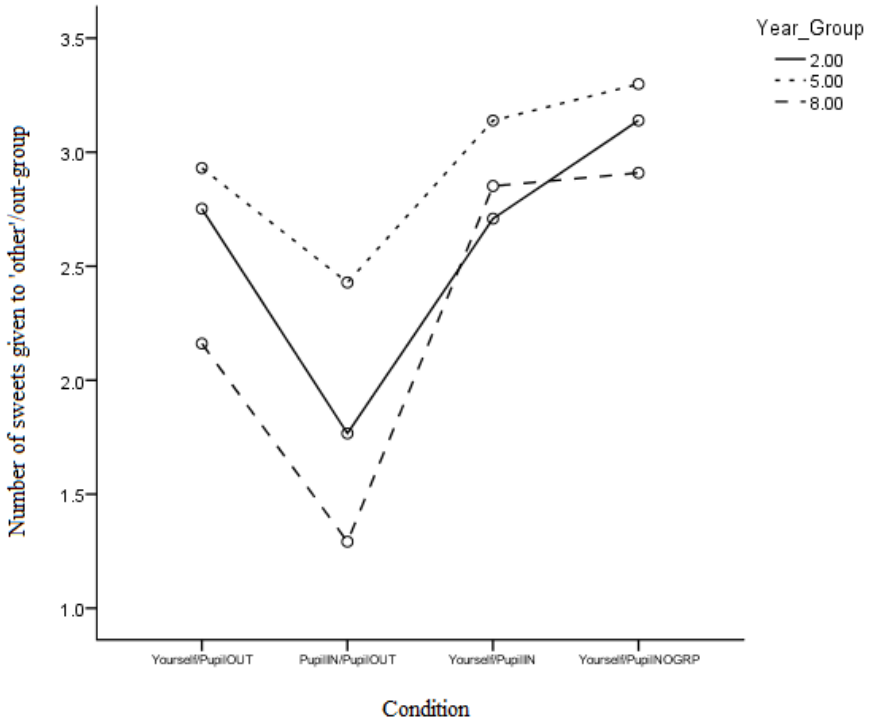


Figure 4.7. The interaction between year group and condition on the number of sweets given to 'other'/out-group pupil

Discussion

The purpose of the current study was to understand the effects of intergroup context on resource allocation. The findings support the first hypothesis that older children would be less likely to share out sweets to another pupil/out-group member. In the study, year 8 children gave significantly fewer sweets than both year 5 and year 2 pupils. However, the gradual decline of sweet sharing (as children get older) was not supported as generosity peaked at year 5 with this age group giving significantly more sweets than both year 2 and year 8 pupils.

The results could reflect the peak of egalitarianism which other studies have suggested occurs around the age of 8 years (Fehr et al., 2011). Looking at the means however, year 5 shared on average 2.92 of their sweets to others which was significantly higher than the 2.5 expected if it was simply a peak in egalitarian sharing. In fact the only age group who shared less than equally was the eldest group (year 8) who only shared on average 2.29 sweets to others (although this difference was only marginal). Likewise, if it was because of altruistic motives developing then it does not explain the drop in altruism as it is argued that this line of reasoning continues to increase with age (Fehr et al., 2011).

A potential methodological explanation might be that of self-presentation bias. Rutland, Cameron, Milne and McGeorge (2005) found that younger children (below 10 years), when placed in high public self-focus conditions, inhibit their in-group bias more than compared to low public self-focus conditions. When children in year 5 (9-10 years) were asked to share out sweets to themselves/in-group and others/out-group, they may have acted in a more pro-social way because the experimenter was helping them fill in the questionnaire making it a more public decision. As the opportunity for them to share sweets equally was removed, they may have felt that the only other desirable option was to give more sweets to the 'other' pupil. The youngest age group (who also received help filling in the questionnaire) did not express this same bias with their sharing reflecting that of egalitarian principles instead, but as they have a preference for fairness (Harbaugh et al., 2003; Fehr et al., 2008) they may not have considered their answers socially undesirable as they tried as best they could to be as equal as possible within the confines of the experiment.

Year 8 participants on the other hand filled in their questionnaires alone meaning they may have been freer to express more biased opinions than the other two age groups, hence sharing out fewer sweets overall. However, given that they are more likely to use socio-

conventional reasoning (Killen & Stangor, 2001) and previous studies using group based or self- interest scenarios have also seen a decline in sharing with age (Leman et al., 2008) this result does seem to reflect a psychological phenomenon rather than a methodological one.

It was also predicted that significantly fewer sweets would be given to the 'other' pupil (either interpersonally or intergroup) in any scenario containing an explicit out-group member, rather than another in-group member or pupil with no group affiliation (intergroup sharing or self-out-group sharing conditions). This was also supported with the intergroup sharing condition resulting in significantly fewer sweets given to the 'other' (in this case an out-group member) than all other conditions. Significantly fewer sweets were also given to the 'other' in the self-out-group sharing condition compared to the interpersonal sharing condition demonstrating again the negative impact of out-group categories on sharing behaviour.

Interestingly however, there was no significant difference in sharing between intragroup sharing scenario and the self-out-group sharing scenario despite there being a difference between interpersonal sharing and self-out-group sharing. This could be due to the fact that both of the people receiving sweets in the intergroup context were in-group members so the distribution of sweets between them was irrelevant. What was of main focus for the children was that their group received more, meaning that their in-group bias, according to researchers present in children from the age of 5 (Nesdale, 2001), would have been satiated. A mediator in this relationship could have been group identification, with children who have low in-group identification (in this case their school), giving fewer sweets to the in-group pupil than themselves. As this result was not predicted however, a measure of in-group identification was not included as a measure which is something that will be considered in future studies.

It is unclear whether these results support a positive in-group bias effect or negative out-group bias effect (giving more sweets to the in-group because you like them more or fewer sweets to the out-group because you dislike them). Unfortunately it was not possible to distinguish between the two choices with the variables included in the current study. However, if the findings were due to a positive in-group bias, it would be expected that significantly fewer sweets went to the 'other' pupil in the interpersonal sharing condition than the intragroup sharing pupil condition and that there would be no difference in the number of sweets given to the 'other' in the self-out-group sharing and interpersonal sharing condition.

The results found seem to imply that an out-group bias was present in the sample leading them to exclude pupils from a different school by giving them fewer resources. Nesdale (2004) distinguishes between in-group bias and out-group bias in his Social Identity Development Theory (SIDT). Although applied to ethnic prejudice, it may reflect the development of any intergroup bias and certainly seems applicable here. Nesdale argues that in-group bias occurs once the child is able to categorise people based on group membership and that out-group bias is not an inevitable feature. Children simply prefer their own group and the focus of decisions in terms of distribution of resources for example, would solely focus on the benefits of the in-group with no real consideration of out-group disliking being present.

In the fourth stage of this theory, Ethnic prejudice, Nesdale argues that from the age of 7-years children begin to develop prejudiced thoughts and attitudes (but this does not occur for all children). It is at this stage that the out-group are not simply liked less than the in-group but are actively disliked and hated because of their group membership. As it was initially applied to ethnic prejudice development, Nesdale argued that not all children develop this out-group hatred. It would seem however from the current study's findings that when

other intergroup scenarios are considered, out-group dislike does develop as a matter of course. It may be because children are aware of the inappropriateness of ethnic prejudice (Rutland et al., 2005) whereas a dislike for children from other schools is not something society has particular rules about so all children develop an out-group dislike without fear of repercussion.

Some of the limitations of the study include the types of scenario used in the methodology. Children were simply asked to share pictures of sweets between two children meaning that there was no real resource allocation present. At no point were real sweets given to the child or promises made that the child would receive the sweets they gave to themselves. Had this been part of the experimental paradigm, there may have been a reduction in the number of sweets given to others, particularly by the year 5 sample. The results then, may have reflected more extreme in-group/self-interest principles as the child would have had a tangible reward for choosing this behaviour.

Additionally, using sweets as the resource may have led to a certain set of results arising if compared to using a different resource. Sweets are not something that is needed in order to survive but rather seen as a luxury item. In real world scenarios, intergroup resource distribution is rarely so straightforward or concerns such unimportant resources. Things such as general wealth, food and access to public services and housing are the focus of dispute or inequality between groups and the simplistic scenarios presented to children here may not reflect such complex considerations. However, it is rare that children would be placed in such a position to have to reason about these situations or in fact have the cognitive ability to consider such complex scenarios. Looking at how children initially decide on their resource distribution may give clues as to the building blocks of these more complex decisions they would face later in life.

Another issue with using sweets is that not all children like them. When testing, some children gave all their sweets away citing that as the reason and others said that they were not allowed sweets because they were bad for them. With an ever increasing focus on healthy eating and obesity, children may have less access to sweets or more negative opinions of them instilled in them by their parents. Future studies should focus on using other resources such as money (provided the scenario is mathematically simplistic enough for young children to understand) or using the latest craze (such as Pokemon cards or Ben 10 stickers) in order to ensure that the resource is something considered important and valuable to the children being tested.

Conclusions

The purpose of the chapter was to investigate the effects of groups on children's decision making on resource allocation tasks. Taken together, the studies have demonstrated both intergroup and intragroup contexts can affect the ways in which children allocate resources. When put into groups, children prefer more socially beneficial behaviour over intrinsic ability suggesting that group contexts increase the salience or importance of this behaviour. Individuals on the other hand are less likely to include and prefer these individuals and more likely to reject them when making decisions alone. This would suggest a positive shift in children's decision making as intrinsic ability is not something others can control. Rejecting or failing to include or prefer children, in terms of resource allocation because of their lack of intrinsic ability, does seem to violate fairness principles or more moral considerations.

Despite a seemingly positive effect of intragroup contexts on decision making, intergroup contexts seem to have the opposite effect. Intergroup contexts led to less sharing

of resources in children overall and particularly for children in the eldest age group. Decisions in this task however were made alone rather than in groups so it would be interesting to see how intragroup processes could affect this type of decision making in intergroup contexts. Before the combination of intra- and intergroup processes is investigated further, it is important to continue to establish a clearer picture of the intragroup processes occurring first. The focus of this thesis in the following chapter therefore will be on investigating how the group effects children's decision making on a different task.

Chapter 5

Decision making in groups using a vigilance paradigm

Overview

The purpose of the following study was to investigate how children would come to a final group decision when initial preferences differed using a different paradigm than the previous studies. Due to the methodological issues highlighted in the previous chapter (and again briefly below), a new task was designed not only to improve on these limitations, but also to investigate decision making in a new context which could be directly compared to studies in adult literature. Based on previous research by Frings, Hopthrow, Abrams and Julbert (2008), a cumulative estimation task was used to investigate what decision rules children used to come to a group decision and whether the rules used changed with age.

The key findings from Study 3 were that older children (12-13 years) were significantly more likely to use the mean when coming to a group decision compared to any other age group. Additionally, the youngest age group (6-7 years) were significantly more likely to use an individual's answer as the final group decision and the answer was chosen based on who they thought the most popular person in the group was, rather than the most intelligent. This study demonstrates that group scenarios do have an impact on children's decision making and that there are age trends affecting this impact.

Introduction

Given the problems in the previous study of trying to assess the decision rules that groups chose, a different methodology was used to look at this problem. A cumulative estimation task was thought to be a good method of looking at group decision rules because of the potential variability of the answers at the individual phase of testing. Therefore, unlike the previous study, it would be possible to distinguish between a mean and median rule for example because the initial pool of numbers would not be so restricted (as it was in Study 1). A cumulative estimation task requires participants to keep track of an amount (the exact nature of this can vary); in the study reported below, participants were asked to count the number of times they heard the word 'the' in a spoken passage.

The SDS models could not be used in Study 3 because the nature of the methodology prevents it. The SDS cannot be used for decisions that occur on a continuous scale such as cumulative estimation tasks (for more on the theory see Chapter 3, pp. 51). The Social Judgement Scheme (SJS; an extension of SDS) however is designed specifically for dealing with continuous dependent variables as it weights individual participants' answers in the group, depending on how far away their initial judgment is from the group mean; that is judgements in closer proximity (indicating more consensus) carry greater weight in determining the group decision. Using the SJS in the current study will add to the little research there is currently using this method within child populations.

It is predicted that with age, children will be more likely to use the mean as they develop more mathematical understanding. Using the mean in mathematics is not introduced in schools in the UK until Key Stage 2 which is the curriculum taught in UK schools for children aged 7- to 11-years. Therefore, the youngest children in the experiment (who are 5- to 6-year-olds) may not have the ability or knowledge needed to conduct the averaging of initial answers in this way. It is also predicted that younger children will use SJS because

outlying answers will be more obvious at this age than at other ages. Working memory, which involves our ability to store information while simultaneously completing a task, is needed in order to complete the task in the following experiment as children will need to store the number of 'the' words they have heard already, whilst also listening out for more.

Research into working memory has found that children have a limited capacity and that this capacity increases with age, alongside other developments and changes in brain activity and memory strategy (Towse, Hitch, & Hutton, 1998; Klingberg, Forssberg, & Westerberg, 2002). Therefore, it is thought that younger children will find this task harder than older children and are more likely to guess their initial answers rather than having a more accurate estimate. This would mean that their initial answers will have a greater range and be less reliable than those given by children who are better able at the task.

Study 3: Individual and group vigilance in children

Method

Participants

252 participants took part in the study with 99 year 2s (M= 6.28, SD= 0.45), 58 year 5s (M= 9.29, SD= 0.46) and 95 year 8s (M= 12.61, SD= 0.49). Overall 147 males and 105 females participated and within year 2, 55 males and 44 females participated, in year 5, 37 male and 21 female participants and in year 8, 55 males and 40 females took part. Participants were recruited from several schools (both Primary and Secondary) in the South East of England, Kent. Schools were initially contacted by letter or e-mail and then contacted by phone. Meetings were made with the Head teacher (or Deputy Head/ Head of Years where appropriate) to discuss the study and procedure. Those who agreed to work with the

researcher were given informed consent letters to hand out to parents. All schools chose to Opt-Out so Loco Parentis forms were signed by the Head teacher for those students who did not return their letter. The testing for this experiment took a year in order to get the sample size required as due to the nature of the study, some schools refused to take part or simply did not have the space to accommodate the research.

Design

The study employed a 3 (age: 6- to 7-years, 9- to 10-years, 13- to 14-years) x 2 (context: individual decision or group decision) design with context being a within subjects variable and age a between subjects variable. The dependent variable was the number of 'the' words children counted when listening to a spoken script.

Materials

A news article on the Queen's Jubilee from 'The Sun' newspaper was used as the stimulus for children to count instances of the word 'the'. The story was selected from a choice of two which were all pilot tested on other children for their difficulty. On the basis of the pilot study, this story was chosen as the most straightforward and the length varied slightly for the different age groups to prevent them from giving up because the task was too hard and to avoid ceiling effects because the task was too easy.

A questionnaire was also given to the children to assess their opinions on other members of their group, their social theory of mind and their categorisation ability. The three questions relating to other group members asked the child to rank the group members on 'who would get the highest score in a test', 'who has the most friends' and 'who is the most liked'. They were asked to put in order the first 3 group members not including themselves. This way, children did not have to explicitly select a member of the group as being the worst

at anything, but this information could be gained by the experimenter by looking at the name of the child that was not listed.

Procedure

The class was arranged into same sex groups of 5 and seated at tables by the teacher who was instructed to place students together at random. Participants were introduced to the experimenter by the classroom teacher. The experimenter requested verbal informed consent from pupils to participate once the basic tasks of the experiment were explained. Once verbal consent was given, the researcher proceeded to explain in detail the nature of the vigilance task giving all pupils the same instructions 'I will shortly be reading a news story. Whilst reading this story, I would like you to count the number of times you hear me say the word 'the'. When I have finished reading, write down on the piece of paper in front of you how many times you think the word 'the' was said. You are not allowed to count on your fingers or write anything down. If you are not sure of the answer, then put down your best guess. It is important that this part of the task is your own work. Please keep your answers secret and do not copy anyone else's.'

They were then given two practise examples to ensure all participants understood the task. The first was 'the queen ate the apple' and then 'the princess and the frog is a popular children's story. The princess kisses the frog and the frog turns into a prince'. These examples were done as a class and when the right answer was given by students, the experimenter went on to read the news extract. This extract was slightly different in length depending on age group to ensure that no children gave up because the task was too difficult.

Once the news story had finished, the experimenter raised her hand to signal the end and the pupils were asked to right down the number they had. Once this was completed the experimenter then asked the children to share their numbers with the rest of their group and

come to a group decision on what the answer was, using their initial guesses. Unlike previous studies in this thesis, the group part of the experiment was conducted with the whole class at the same time, so research assistants were used to help keep the groups on track and the class generally under control. They were given 2 minutes to come to a decision and during this time the experimenter and research assistants went around the classroom and ensured that the children were on task and collected the individual and group answers once a final decision had been made. Research assistants were instructed to give no advice as to how the children should come to a decision and for groups who had trouble reaching a final answer, time pressure was used and they were told that they only had one more minute to decide before their answers were collected.

The next part of the study involved the children filling in the questionnaire. This was either done by themselves (for the oldest age group) immediately after the experiment or conducted one-on-one with the experimenter in another room in the school who wrote their answers down for them. Once the questionnaire was completed, the children were debriefed, thanked and given a sticker and certificate (or a chocolate bar for the older age group) and a written debrief for their parents.

Results

The individual and group answers for the vigilance task were entered into an excel spreadsheet (as used in Frings, Hopthrow, Abrams, & Hulbert, 2008) which computed the mean and median of the individual group members' answers, to create an expected variable if the group decision was based around these mathematical rules (see Table 5.1 for descriptive

statistics from the data). The SJS was also calculated using this spreadsheet, using the formula as described in Chapter 3 (pp.54-55). This then weights the answers of each individual in the group, depending on how far away their initial guess is from the group mean.

Once these variables were calculated (mean group, median group, SJS group) they were then put into a Kolmogorov-Smirnov (KS) test calculator to determine if any of these variables differed significantly from the observed data collected. The KS calculator provides the value *D* which is maximum vertical difference between the two variables when plotted on a cumulative fraction plot. If there is no difference between the observed data and one of these variables, we can use this information to gain an insight into how the groups came to their overall group decision. The KS test is advantageous as it does not make any assumptions about the distribution of the data unlike other more conventional tests such as the t-test.

Table 5.1

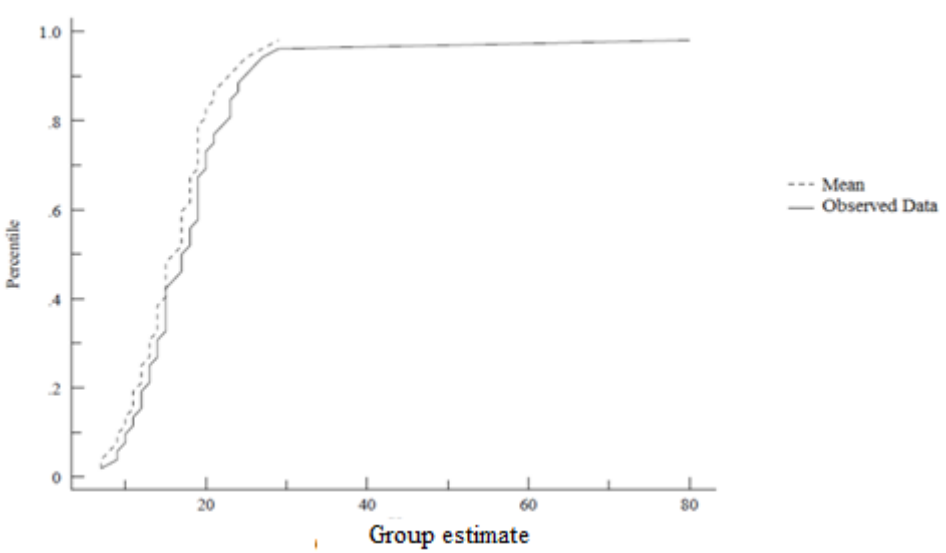
Descriptive Statistics Showing Mean Guesses and Standard Deviations by Age Group

Year Group	Mean	Standard Deviation	Range
Year 2			
Individual	16.76	20.34	99
Group	16.44	15.41	73
Year 5			
Individual	17.04	4.92	27
Group	17.79	2.71	10
Year 8			
Individual	19.96	5.57	41
Group	20.53	3.78	14

Overall Data

First, the KS test was conducted on the dataset as a whole comparing the observed group variable (actual group answers) to the mean group variable. The variables did not differ with a p-value of .96 suggesting a good overall fit. The *D,* which is the maximum deviation

between the two variable scores, was 0.10. Similar findings were found for both the SJS (D=0.16, p=.52) and the median (D=0.12, p=.85) suggesting that all models provided a good fit of the data (see Figure 5.1). This meant it was not possible to determine which rules the group used when making their final decision based on this calculation


1.0
.8
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Percentile
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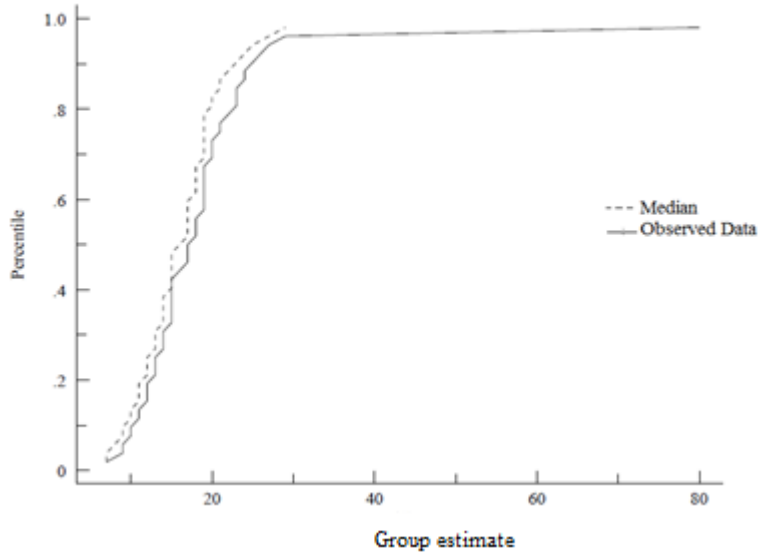
60
80
Group estimate
Mean
Observed Data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Percentile
20
40
60
80
Group estimate
Median
Observed Data

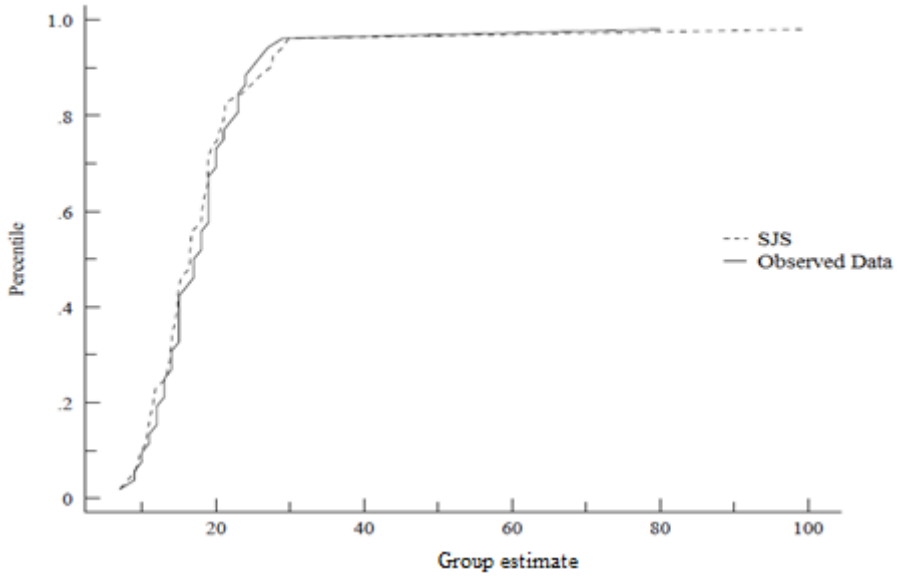

Figure 5.1. Cumulative fraction plots depicting the model fit of the mean, median and SJS models on the observed data

It was decided to try and distinguish between these models (mean, median and SJS) to see if one fitted the data significantly better than the others. In order to achieve this, bivariate correlations were conducted between the observed data and each of the three variables (see Table 5.2 for *r* values for each correlation). These correlations were then entered into a spreadsheet using t-tests (Steiger, 1980) to calculate if there was a significant difference between the correlation coefficients (thus suggesting that one variable provided a closer fit than the others). This produced the dependent correlation coefficient (dependent because the variables were all developed using the same data set) with a significance value (to see t-test results see Table 5.2). As the table demonstrates, the SJS was significantly more highly correlated with the actual decision than were either the mean and median variables, suggesting SJS was the rule the groups used when coming to their decision.

Year 2 data

Following the same procedures as described above the KS was conducted on the year 2 data only. Again as the table demonstrates, all variables were not significantly different from the observed data so the dependent correlation coefficients were compared to each other to see if one was significantly better than the others. It was shown that for this year group, the SJS was significantly more correlated than the mean and median variables. This shows that for this age group, the SJS best described the group decision

Table 5.2

Table depicting the K-S statistic results, the t-tests involved in the dependent correlation coefficient and the correlations between each model and the observed data both overall and within age

	K-S statistic			**Dependent correlation coefficient**			***r***					
	Mean	Median	SJS	SJS vs Mean	SJS vs Median	Mean vs Median	SJS-Obs	Mean-Obs	Median-Obs	Mean SJS	Median SJS	Mean Median
Overall	D=0.10 p=.96	D=0.12 p=.85	D=0.16 p=.52	t(48)=7.54, p<.001	t(48)=6.92, p<.001	t(48)=1.75, p=.08	.93**	.65**	.47*	.75**	.42**	.59**
Age 1	D=0.21 p=.74	D=0.16 p=.96	D=0.26 p=.46	t(16)=6.27, p<.001	t(16)=5.24, p<.001	t(16)=0.88,p=.39	.95**	.62**	.46*	.75**	.49**	.59**
Age 2	D=0.23 p=.83	D=0.31 p=.49	D=0.38 p=.25	t(10)=.74, p=.47	t(10)=0.82, p=.43	t(10)=0.39, p=.71	.70**	.59*	.51	.79**	.49	.67*
Age 3	D=0.16 p=.96	D=0.32 p=.25	D=0.32 p=.25	t(16)=-3.66, p<.005	t(16)=-1.79., p=.09	t(16)=2.33, p<.05	.79**	.90**	.84**	.95**	.98**	.96**

** Significant at .01

*Significant at .05

Year 5 data

For this age group, the KS demonstrated that all variables (mean, median and SJS) were not significantly different from the observed data. However, unlike the year 2s, the correlation coefficients were not found to be significantly different from each other either. This means, then, that all 3 decision rules fit the data equally well.

Year 8 data

For this age group, the KS demonstrated that all variables were not significantly different from the observed data. However, as can be seen in the dependent correlation coefficients, the mean variable was significantly more correlated than the SJS and the median. This suggests that for this age group, the mean fit the data better than other models.

Hierarchical Linear Modelling was not used for this study as no variance was expected between individual and group answers as the answers given by the group should reflect some averaging of the individual guesses. Additionally, as all age groups were given the same task and their aim was to get a correct answer, little variance was expected at the group level. A repeated measures ANOVA was conducted which confirmed this. Participants' individual and group decisions were entered as the within subjects (repeated measures) variable and year group as the between subjects variable. Results showed that there was no significant difference between individual/group decisions $F(1, 45)= .12$, $p= .73$ or of age group $F(2, 45)= .97$, $p= .39$.

Individual Variables

During the experiment individuals were asked to rate other group members on how smart they were, how liked they were and how many friends they had. This meant that for each participant, there were four ratings of these variables from their fellow group members. Variables of perceived intelligence, perceived liking and number of friends estimate were

created by adding all the scores given to the participant by the rest of their group. The variables 'perceived liking' and 'number of friends estimate' were correlated $r = .70$, $p < .01$ and were both used to get a sense of each participants' popularity, so the two variables were collapsed (added together and the mean taken) into one variable of overall popularity. Overall perceived popularity and perceived intelligence variables only correlated $r = .22$, $p < .01$ so were kept separate in the remaining analyses.

To examine whether a group member's overall perceived popularity or perceived intelligence gave them more influence in the group, an additional dichotomous variable was created; this variable measured whether the group's final answer matched that of the individuals (a score of 0= no and a score of 1= yes). This was then entered into a logistic regression along with overall perceived popularity, perceived intelligence and age to examine whether any of these variables predicted whether or not the group chose a participant's individual answer as the final group decision.

Overall model fit in logistical regression is conducted using a chi-square test. This test assesses the difference between the null model (the model that includes only the constant) and the model containing one or more predictor variables. The chi-square examines the improvement of the models' ability to describe the data once you add predictors into the model. The model for the analysis was significant with a chi-square value of $\chi^2(4, N=255)=10.06$, $p < .05$. The Nagelkerke $R^2 = .059$ meaning that the model significantly predicted 5% of the variance in the data. Looking at the odds ratios, overall perceived popularity was not a significant predictor overall of whether the group chose the same answer as the individual Exp(B)=1.05, $p = .369$. The perceived intelligence variable was also not a significant predictor overall Exp(B)= 1.08, $p = .12$. Year group overall was a marginally significant predictor ($p = .057$). Using year 8 as a reference group, the results demonstrated

that being in year 2 (compared to year 8), increases the odds of a group agreeing with an individual's initial answer by Exp(B)=2.04, p<.05. The comparison between year 5 and year 8 however proved non-significant. In order to compare year 2 and year 5, another analysis was conducted with year 2 as the reference group. When looking at year 5 compared to year 2, results demonstrated that being in year 5 significantly decreased the likelihood of the group agreeing with an individual's answer Exp(B)= 0.46, *p*= .05. The results show overall that participants in year 2 were significantly more likely when in groups to choose an individual group member's original answer as the final group decision.

As year 2 children were significantly more likely to copy an individual's initial judgment as the final group answer than any other age group, another logistic regression was conducted separately on each year group, to see if there were any significant predictors in year 2 that were being missed due to noise in the data from the other two year groups. Year 2 was the only model that was significant $\chi^2(2, N= 95)= 8.43$, $p< .05$ with Nagelkerke $R^2= .12$ which means the model significantly explained the 12% of the variance seen in the dependent variable. Looking at the odds ratios, the perceived intelligence variable did not significantly predict whether the group chose the individual's initial answer Exp(B)= 1.00, *p*= .98, however participants' overall perceived popularity scores did Exp(B)= 1.39, *p*< .01. The results suggest then, that in year 2, for every increase in an individual's popularity score, the group are significantly more likely to copy their initial guess by 1.39 (39% more likely to do so).

Vigilance in groups

To see how accurate (vigilant) participants had been, their individual and group answers were subtracted from the correct answer (how many times they reported the word 'the') which was either 17 (for the youngest age group, or 25 for years 5 and 8. As both

underestimates and overestimates demonstrate poor vigilance on the part of the participant both types of deviation from the correct answer are of interest. However leaving the variables in their natural state may mean the null is wrongly rejected as an underestimation of 3 could be seen as cancelling out an overestimation of +3. Absolute error considers the amount of deviation from the correct answer without considering the direction (over- or underestimation) therefore removing this problem and reducing the risk of type II error. Therefore an absolute error score was computed, both for individuals and for the group aggregate.

The data file was split by group number, using the aggregate function in SPSS. Year group, individual answers, group answers, absolute error group variable, absolute error individual variable and correct answer were aggregated. The remaining analyses were conducted on the newly aggregated data file.

A repeated measures ANOVA was conducted comparing the absolute error for individuals and the absolute error for groups. An ANOVA was used rather than a t-test because the GLM output for ANOVA provides an estimate of effect (using partial eta squared). There was a significant difference between individual and group error levels $F(1, 51)= 5.87$, $p< .05$, partial eta squared= .10. The absolute error for individuals was significantly higher ($M= 8.89$, $SE= .86$) than the absolute error for groups ($M= 6.92$, $SE= 1.18$). This suggests that groups converged to a less erroneous estimate than had been provided by individuals, on aggregate.

Analyses were then conducted on each year group separately. When analysing the data this way, the only significant difference between individual absolute error and group absolute error was found in year 8 participants $F(1, 18)= 5.75$, $p< .05$, partial eta squared= .24 ($M= 6.31$, $SE= .66$, $M= 4.79$, $SE= .79$, respectively). The lack of significant difference

found in the other age groups suggests that being in a group did not significantly improve levels of vigilance for those participants.

Discussion

The aim of this study was to investigate the methods that children use to come to group decisions when individual group members' answers are different. As predicted, there was an increasing use of the mean, with children in the oldest age group (year 8) being significantly more likely to use the mean than SJS or median decision rules. When looking at the data set, the range of individual answers in year 8 was much smaller at 41 than the range of individual answers in the youngest age group at 99. This may mean that SJS wasn't used because outlying answers were less obvious in the year 8 sample compared to the year 2 sample however the range in year 8 answers is still quite sizable.

By approximating to the mean, older children could be trying to account for outlying positions in individual guesses. Rather than excluding answers that seem inaccurate (therefore using SJS), they seem to be incorporating everyone's answers into the final group decision. This may be because of social factors as previous studies have shown that older children have a need to be correct (Hoving, Hamm, & Galvin, 1969) when giving answers, especially in ambiguous tasks. If they were guided by a need to be correct, this would suggest that the older children would exclude outlying answers rather than attempting to include them. However the conflict surround the needing to be correct and needing peer approval have been well documented in conformity literature (Deutsch & Gerard, 1955; Haun & Tomasello, 2011) and it would appear that in this sample, the need of peer approval or other social considerations dominated their decision making process.

Children's concerns about peer group acceptance increase during middle childhood (Rubin, Bukowski, & Parker, 1998) and the amount of time spent with peers continues to increase from middle childhood into adolescence (Rubin, Bukowski, & Parker, 1998). Csikszentmihalyi and Larson (1984) found that adolescents spend approximately one third of their time with their peers and only 13% of their time with parents or other adults. The increase in contact with their own peer group may make older children, such as the year 8s in this sample, more concerned with peer relationships. This increased focus in their relationships may make older children prone to using methods such as the mean when attempting to come to a final group decision so as to preserve standing friendships and peer approval.

Given that year 2 children were significantly more likely to use an individual's answer as the final group decision and the likelihood of selecting an individual answer was predicted by how popular the child was, it suggests that children at this age are being influenced by normative concerns. This is surprising especially given that the children were told in the instructions of the study that they needed to be accurate in their guessing. Previous research has demonstrated that children are preoccupied with conforming to those who are likely to help them give a correct answer (Corriveau, Fusaro & Harris, 2009; Pasquini, Corriveau, Koenig, & Harris, 2007).

Huan and Tomasello's (2011) research does suggest children will conform for social reasons however. In an adaptation of the Asch paradigm they manipulated the level of privacy across trials and asked children to judge the relative size of pictures of animals. They found that when answers had to be shared publicly, there was a drop in accuracy as children were more likely to give the wrong answer in line with an incorrect majority. Given that the task in the current study also required the public sharing of answers, social pressures may

have overridden the desire to be correct leading to children copying the more popular group member but only in the youngest age group.

A potential problem with the study is the small sample size of year 5 participants. Due to time constraints, it was not possible to get more participants of this age which could be the reason behind a lack of significant difference between the correlation coefficients. Thus, in this study, it is not possible to distinguish between the different decision rules the groups may have used at this age. This is unfortunate as it prevents a clearer developmental picture of the decision rules that children use and if a replication was to be made, this would be something that would need to be examined.

Additionally, it is not possible to tell whether children in year 2 excluded group members completely when their guesses were considered outliers or whether those children were included in the group discussion but their guess rejected. Further studies should record group discussion in an attempt to look at how children attempt to deal socially with the problem of outlying answers. Having a group member with a perceived incorrect answer is an interesting problem for children to have to deal with. Whether they ignore the individual or make attempts to include them within the discussion but disregard their guess when making a final decision would give us insight into how children handle differences within groups and whether this changes with age.

So far in this thesis, different types of decision making have been considered along with how intragroup and intergroup settings impact on children's decisions. Whilst there is more work to be done in this area, a different intragroup process will be looked at for the remainder of the thesis. The next part of the thesis focuses in particular on the productivity of brainstorming groups first reviewing the literature and then presenting two empirical studies investigating the impact of the group on productivity in children of different ages.

Chapter 6

Applying brainstorming theory to child populations

Overview

This chapter will review the brainstorming literature and discuss some developmental theories that may account for the way children work in groups on this task. The Brainstorming literature recently has focussed on specific ways of improving adult performance, cognitive aspects of brainstorming and the purpose of brainstorming; the selection of a good idea from the pool generated (Rietzschel, Nijstad, & Stroebe, 2006). As there is no literature on children and brainstorming groups, it was felt that the focus of the literature review should be on the problems found within adult groups and whether these could be accounted for by developmental factors in children. Therefore, some of this recent research will not be considered in this chapter.

Initial findings with adult participants

Osborn (1957) was the first researcher to propose the idea of brainstorming; the generation of ideas in groups with the aim being to produce as many ideas as possible (Paulus & Dzindolet, 1993). He believed that working in a group to solve a problem would lead not only to a greater number of ideas but also a higher quality. In order for brainstorming groups to be successful, Osborn (1957) argued that certain instructions should be given to enable the group to reach its full potential. These instructions include: do not be critical of others' ideas,

say any ideas that come to mind (the wilder the better), quantity over quality of ideas is important and combine/elaborate on previous ideas to make new ones. Osborn believed that brainstorming in groups would double the number of ideas created against using other methods.

Brainstorming has been found to generate more ideas than other strategies not involving brainstorming (Bartis, Szymanski & Harkins, 1988) but its success may be limited. Taylor, Berry and Block (1958) were the first to empirically test Osborn's theory that groups would facilitate brainstorming performance. They asked participants to brainstorm individually or in 4-person groups and created nominal groups (combining 4 individuals ideas together and removing any repeated ideas) to compare the performance against. They believed that nominal group scores acted as a baseline measure for the number of ideas a group would come up with if group interaction neither facilitated nor inhibited performance. Contrary to Osborn's predictions, they found that nominal groups outperformed real groups, coming up with nearly twice as many ideas.

Since this study, several others have replicated the findings that nominal groups produce more ideas than interactive groups (Diehl & Stroebe, 1987; Mullen, Johnson, & Salas, 1991; Paulus, Dzindolet, Poletes, & Camacho, 1993) and also, developing on from this point, that nominal groups produce ideas of a higher quality than interacting groups (for a review see Lamm & Trommsdorff, 1973). Since these results have been replicated, research has focussed on trying to find the reasons for this productivity loss in interactive groups. It is unlikely that interactive groups run out of ideas as they only come up with about half the ideas nominal groups think of. One of the problems may be that groups feel they have generated a sufficient number of ideas and stop which is plausible given that groups rate their own performances highly (Paulus, Dzindolet, Poletes, & Camacho, 1993).

Overall, three types of mechanisms have been identified in relation to the poor performance of interacting groups in brainstorming tasks (Camacho & Paulus, 1995). Economic mechanisms focus on social loafing (the idea that people make less effort when working together than they do working alone) and free-riding (not working hard because one can benefit from the work others do) as explanations for poor group performance. Social psychological mechanisms include issues that arise due to the presence of other group members such as arousal and evaluation apprehension (the concern that other group members will make negative judgements about the ideas shared). Procedural mechanisms are aspects of procedure that interfere with information pooling. Most relevant of these is production blocking which includes having to wait one's turn before speaking and trying to generate ideas whilst others are talking.

Economic mechanisms

Economic mechanisms such as free riding and social loafing may arise in brainstorming groups as the focus of the task is on the group's generation of ideas meaning that individual performances are less noticeable, reducing individual accountability (Paulus, Dzindolet, Poletes, & Camacho, 1993). There may be a tendency to allow other group members to come up with the bulk of the group's ideas and studies have shown that when group members are made accountable, their performance does increase (Borgatta & Bales, 1953). This is supported by Harkins and Petty (1982), who found that increasing the indispensability of participants increased their productivity. They told participants that they were the only ones brainstorming on a certain task with the rest of the group working on something different, or that all group members were working together on the same problem. Those participants who thought they were working on a unique component produced more ideas than participants who thought they were working on the same problem with the rest of the group.

Harkins and Petty (1982) did not compare this performance increase to nominal groups meaning that their study does not directly test free riding. Paulus and Dzindolet (1993) argue that free riding alone is not sufficient in explaining the discrepancy between interacting and nominal groups, an argument supported by the meta-analysis conducted by Mullen, Johnson and Salas (1991). These authors concluded that economic mechanisms lacked support overall arguing that given the nature of the tasks, with the experimenter and other group members being present, social loafing was unlikely to occur (Harkins & Jackson, 1985). Social loafing tends not to occur when individuals can be identified with their ideas (Williams, Harkins, & Latane, 1981) so it seems unlikely to occur in interactive brainstorming groups as all members can both see and hear one another.

Social mechanisms: Social Facilitation

Social mechanisms that influence interacting brainstorming groups have been argued to have both positive and negative effects. Zajonc (1965) argued that the mere presence of others increases levels of arousal and drive in individuals. This arousal can lead to an enhanced performance on simple, well learned tasks but can impair performance on complex and novel tasks (Zajonc, 1980). Harkins (1987) demonstrated this effect in brainstormers, finding that when others are present and acting as independent coactors, participants generated more ideas than when they were alone.

Street (1974) however, working from the same premise as Harkins, compared groups of individuals working in the same room and individuals working alone on a brainstorming task but found no difference between individuals working alone and in the same room. Indeed Street argued that one of the reasons that interacting groups may underperform compared to their nominal counterparts is because brainstorming is an unusual task with several possible solutions, not all of them well known. Reviews of social facilitation literature

have suggested that the effect of the presence of others, is actually quite weak (Bond & Titus, 1983) and so may not be a major part of the explanation into productivity loss found in interacting brainstorming groups.

Social mechanisms: Evaluation apprehension

Evaluation apprehension is another social mechanism that has received a lot more attention than other social mechanisms. Mullen, Johnson and Salas (1991) found that productivity loss (in terms of number of ideas) increased, therefore reducing the number of ideas shared when the experimenter was present, the contributions were tape recorded and when individuals in nominal groups performed in the same room together rather than alone. This apparent concern at the presence of others and its detrimental effect on idea generation lends strong support to evaluation apprehension being a factor in brainstorming groups. The basic assumption of evaluation apprehension is that group members may experience anxiety over potentially being negatively evaluated by other members of the group for their ideas (Paulus, Larey, Putman, Leggett, & Roland, 1996). This anxiety can lead to group members withholding ideas or making it harder for them to think of ideas in the first place (Camacho & Paulus, 1995).

Colaros and Anderson (1960) demonstrated evaluation apprehension by manipulating the perceived expertise of other group members. Participants were either told that all group members were experts in brainstorming tasks, only one group member was an expert or group expertise was not mentioned at all. They found that performance was poorest in the all-expert condition and strongest when expertise was not mentioned at all. Participants in both expert conditions also reported a greater reluctance to share ideas supporting the idea that evaluation apprehension inhibits interactive group performance.

Not all research supports evaluation apprehension as Maginn and Harris (1980) found that telling participants they were being watched and rated on the quality of their ideas by three judges, did not influence individual brainstorming. Diehl and Stroebe (1987) however found that telling participants they would be judged in their ideas did influence productivity both in individual and group brainstorming conditions but only when individual performance comparisons were mentioned. These inconsistencies in research also reflect the debate on the importance of evaluation apprehension as an explanation of productivity loss in interactive groups with Diehl and Stroebe (1987) arguing that it is not enough of an explanation and Mullen, Johnson and Salas (1991) suggesting that it is the most important explanation of productivity loss. Although the importance of evaluation apprehension is debatable, it is important to note that it still does seem to play a part in interactive group brainstorming.

Social mechanisms: Social comparison

Another socially based idea on brainstorming productivity loss comes from Paulus and Dzindolet (1993) and their social comparison theory. They suggested that group members adjust their performance to be similar to that of other group members they are working with. Factors such as production blocking (mentioned below), evaluation apprehension and social loafing are all initially present in the group interaction and ensure initial low levels of performance. These low levels are maintained, despite evaluation apprehension and blocking reducing with time during the interaction. The maintenance of this low performance level may be due to high performers initially matching their behaviour to low performers in the group as there is no incentive in brainstorming tasks for high individual performances. As their performance is similar to others they don’t feel uncertainty about how good their performance was because they can compare it to others- something individual workers cannot do.

The authors tested their theory in the same paper and found that productive group members do match down their level of behaviour as the brainstorming session continues. Camacho and Paulus (1995) looked at interaction anxiety and found that it had a strong impact on the performance of interactive brainstorming groups. In low-anxious participants, there was no significant difference between interacting groups and nominal groups. When the groups were mixed with high and low-anxious participants together, they found evidence of performance matching: low anxious participants dropped their performance level until it more closely resembled that of high anxious participants. It may be that low anxious people do not feel pressure to perform well especially given that other group members' performances are not good. They may have also dropped performance noting their group members' high anxiety, in an attempt to keep pressure off of them. Whatever the interpretation of results however, it is clear that performance matching does occur.

Dugosh and Paulus (2005) also found that participants were more motivated to improve performance when told they were seeing a high number of ideas generated from another participant compared to ideas generated by a computer. This suggests that the theory of social comparison can be used to improve group performance, perhaps to a level matching the performance of nominal groups.

People are motivated to match their level of performance to that of others (Seta, Seta & Donaldson, 1991). It would be expected then, that group members aim to produce a similar number of ideas as one another making interactive group members' performance more similar than that of nominal group members. In another study, Paulus and Dzindolet (1996) used participants in pairs and groups of 4 and demonstrated a greater similarity in the performance between interactive participants than nominal participants. They also looked at groups across brainstorming sessions (temporal similarity) and found that performance in one

brainstorming session was similar to that in other sessions. In an attempt to use this comparison mechanism as an intervention, they informed interacting groups of the typical levels of performance nominal groups achieved. Interactive groups attained similar levels of performance accordingly in that condition. The studies demonstrate not only the influence others have on group members' performance but also introduced a new intervention for group brainstorming performance.

Procedural mechanisms

The last and most researched mechanisms are the procedural mechanisms and in particular production blocking. Lamm and Trommsdorff (1973) argued that the most important factor reducing productivity in interacting groups was production blocking; in particular the problem that only one person can speak at a time. They argued it was unlikely the problem was due to less speaking time as often interacting groups run out of ideas before the allocated time is up (see paper for a review of these studies). Ideas put forward to explain how production blocking works include participants forgetting their ideas or choosing not to say them as they sound too similar to someone else's and listening to group members ideas distracting idea generation (Lamm & Trommsdorff, 1973).

Bouchard and Hare (1970) attempted to test production blocking by increasing group size. Their reasoning was that in larger groups, there are more group members and so more things to listen to and longer to wait in between speaking turns. They found that as group size increased, the performance of interactive groups decreased which supported their argument. The study cannot be considered a direct measure of production blocking however, as increasing group size alone may have also impacted on other factors such as an increase in evaluation apprehension due to the larger number of people present.

Diehl and Stroebe (1987, 1991) also supported the argument that production blocking was mostly responsible for the gap between interacting and nominal groups. They manipulated production blocking by controlling the speaking opportunities of participants and found that performance dropped significantly. The study demonstrated that by blocking someone's ability to express their ideas, their performance drops but the study itself was very artificial. It only involved individual participants in controlled settings and not actual interacting groups so it cannot be considered a direct measure of production blocking. Paulus and Dzindolet (1993) also pointed out that production blocking cannot account for the impact of variables that influence group brainstorming without changing the nature of the interaction. Changing levels of evaluation and accountability for example do not change the group procedure but do affect group performance. Attempting to measure production blocking would require the procedure to be manipulated thus making it artificial.

Researchers and corporations have put forward the idea of electronic brainstorming (EBS) as a way of overcoming the limitations of group brainstorming (Jessup & Valacich, 1993). EBS involves getting individual group members to generate ideas on computers which are connected to a central processor. This then displays all the ideas typed on each individual's computer screen. It is believed to prevent production blocking as participants can share ideas as they have them rather than having to take turns (Dugosh & Paulus, 2005). EBS groups have been shown to outperform real interacting groups and also rate their experience positively and feel they have achieved a lot which is similar to real interacting groups (Gallupe, Bastianutti, & Cooper, 1991).

Recent studies on brainstorming have begun to look at the possible cognitive factors involved in brainstorming. When someone says an idea, it may stimulate others to think of ideas, especially if the idea is different to that of the majority view (Nemeth, 1985). Although

interactive brainstorming groups are not associated with increases in novel ideas relative to nominal groups (Diehl & Stroebe, 1987) it does not mean that this stimulation does not occur; it may be overridden by other factors.

Cognitive aspects of brainstorming

Dugosh, Paulus, Roland and Yang (2000) added a cognitive aspect to Paulus and Dzindolets (1993) social comparison model of brainstorming. In their new theory, not only do group members compare each other's performances and converge to lower levels of performance but exposure to ideas can stimulate idea generation. Based on Associative Theories on cognition they argue that concepts and ideas are stored in an interconnected network of cognitive nodes called a semantic network (Dugosh, Paulus, Roland & Yang, 2000). Concepts and ideas that are similar to one another have stronger connections than those that are different and when a particular node is activated, nodes surrounding it with a strong connection to it are also activated. This would then lead to 'trains of thought' with similar ideas being clustered together. This is a process called Spreading Activation (Anderson & Bower, 1973).

Brown, Tumeo, Larcy and Paulus (1998) posited that people generate ideas from the most accessible nodes first, followed by weaker nodes until they run out of ideas altogether. Exposure to others' ideas can stimulate idea generation as the ideas may make accessible other ideas that would not have otherwise been activated. Real groups then, should generate ideas they would not have had when alone.

Connolly, Routhieaux and Schneider (1993) looked at the effects that being exposed to rare and common ideas had on participants' idea generation. If this cognitive theory was accurate, it would be expected that participants exposed to rare ideas would generate more

ideas than those exposed to common ones, as it would activate a whole range of ideas not previously accessible without this cue. They found no difference however, in idea generation between either condition or the control condition (where no ideas were shared) suggesting that idea exposure had no effect at all.

A problem with the study however, is that participants were not told to attend to the ideas being shown, so their exposure to the ideas may have been limited. Dugosh, Paulus, Roland and Yang (2000) believed that attention was vital to the influence of idea exposure. They gave participants a recording of another brainstormer giving their ideas. They told some participants to memorise the ideas for a recall test later and told other participants nothing. After brainstorming themselves, participants told to memorise ideas generated significantly more ideas than participants who were simply exposed to ideas and the control (where no ideas were heard). The more ideas participants remembered in the recall test, the more ideas they managed to generate in their brainstorming session. This demonstrates the importance of attention and the impact of idea exposure on cognition.

The results of this could also be explained however, by social comparison effects. Participants attending to the ideas would be more aware of the typical performance on the task by other brainstormers and so may have matched their performance accordingly. Another problem is that it is a very artificial manipulation of this effect as in typical group interactions, ideas but also irrelevant conversation is shared by group members.

Production blocking the best explanation?

Nijstad, Stroebe and Lodewijkx (2003) maintained however, that it is production blocking that is the main cause for poorer performance rather than social comparisons. Citing a study by Gallupe, Cooper, Grise and Bastianutti (1994) they found that when groups electronically brainstormed and were blocked from saying their ideas when they wanted to,

productivity loss was found that was similar to that of verbally interacting groups. They argue that production blocking leads to productivity loss in two ways: the length of delays and predictability of delays. During a time delay (referring to the point in time a participant has the idea and to the time which they are given the opportunity to express it), ideas may become deactivated due to decay or the replacement of the idea with a new one. When this occurs, the idea lost cannot then be used to generate more ideas meaning that a new memory search for ideas is necessary.

Additionally, the predictability of time delays causes problems. In order to think of ideas attention is required and therefore some cognitive capacity. When ideas have to be remembered it adds additional load to working memory meaning the process of coming up with new ideas is negatively affected. One of the biggest problems is that in groups there aren't fixed turn taking or speaking patterns and the speaking time varies from person to person. Monitoring turn taking and speaking time is another process requiring attention and thus placing working memory under additional load, leaving less capacity for new idea generation. They looked at their theory using 3 experiments designed to test different aspects of their overall model (named Search for Ideas in Associate Memory; SIAM) and found that productivity (in terms of number of ideas generated) decreases with longer delays and fewer clusterings of ideas demonstrating that participants' trains of thought get interrupted (Nijstad, Stroebe, & Lodewijkx, 2003).

Despite all this evidence to the contrary, practitioners still continue to suggest that group brainstorming is effective in generating a high volume of ideas (Rickard, 1993). Paulus, Dzindolet, Poletes and Camacho (1993) looked at the problem of individuals overestimating group productivity. They asked participants to predict productivity on a brainstorming task alone and in a group of four and then conducted the brainstorming task.

As expected, participants thought they would come up with fewer ideas alone than in a group. They did estimate however, that they would generate more ideas alone than the number of ideas a four person group would generate divided by four. Most participants thought they would generate a better quality of ideas in groups than alone and participants perceived their performance as more favourable in interactive groups than alone despite the productivity losses present in the interactive group. Given the previous research on social comparisons of participants' own performance to that of group members, their favourable feedback may be due to participants being able to judge their performance against the average performance of others on the tasks. They conducted a third study to look at the impact of social information on participants' perceptions of their performance and found that participants were more positive about their own performance when given feedback on their pair's performance.

Research into brainstorming has been quite comprehensive and newer directions on the topic have focussed not only on more cognitive aspects of brainstorming but also on the purpose of brainstorming; coming up with a good solution to a problem which would also involve idea selection (Rietzschel, Nijstad, & Stroebe, 2006). Despite this, little is known of the development of these group processes that lead to productivity loss in interacting groups. Whilst researchers may expect that groups of children brainstormers fall foul of the same problems as adult populations, developmental literature suggests this may not necessarily be the case particularly for two key domains in productivity loss: production blocking and evaluation apprehension.

Collaborative learning and production blocking in children

Vygotsky (1978) was one of the first researchers to stress the importance of social interactions for children's cognitive growth. Although his work was not known until sometime later, Vygotsky believed that cognitive/cultural development occurred on two

planes: the social plane and the psychological plane. It first occurs between children through interaction and dialogue and then within the child where the information is internalised and the child can reflect and think about the information they have received (Dillenbourg, Baker, Blaye, & O'Malley, 1996). Vygotksy (1978) argued that children learn most when taking part in collaborative or cooperative dialogues with a more skilled person (be that a mother or more capable peer). The skilled person acts as a tutor, demonstrating to the child how to solve a problem. The child then internalises the information and uses it to guide their own performance later. Vygotsky (1978) labelled this the zone of proximal development which refers to the distance between a child's current independent problem solving ability and the potential development the child could achieve via parental guidance or by working with a more capable peer.

The theory suggests then, that interacting with others is beneficial for children's cognitive growth which may mean children's interactive group performances in brainstorming tasks may actually be better than that of nominal groups. Evidence supporting Vygotsky's theory can be found by Wegerif, Mercer and Dawes (1999) who looked at the role of exploratory speaking (speaking style that emphasises joint reasoning) in groups of children. They found that just by training children to express themselves differently using language, their group reasoning scores improved which also impacted on their later individual scores. The study demonstrates the importance of language/dialogue and social reasoning on children's individual reasoning development.

Rumelhart and Norman (1978) suggested that through verbalising ideas, feedback from peers can be given which may highlight various problems in the child's original solution. The highlighting of these shortcomings can lead to the child refining their knowledge of the problem and correcting themselves. Rogoff and Gauvain (1989) also found

that collaborating with peers under certain conditions can lead to gains in children's planning abilities. The theory and research suggest that, whereas adult literature on brainstorming highlights interaction as blocking production, this same interaction for the child facilitates their cognition.

Other theories on collaborative learning, although different in the process by which it occurs, also support the idea that collaborative learning aids children's development. The socio-constructivist approach, based on Piaget, suggests that conflict and coordination of points of view in interactions was important in collaborative learning (Dillenbourg, Baker, Blaye, & O'Malley, 1996). They believed that through these interactions, children become exposed to others' opinions and knowledge which allows them to develop and incorporate these new opinions and knowledge with their own (Doise, 1990).

Peer interaction has been shown to lead to better performances on children's post-tests than scores that are achieved by individual training (Doise & Mugny, 1984). It is thought that the conflict produced from children having different solutions to the same problem and a desire to remove this conflict, lead to an eventual resolution. Although Vygotsky (1962) stressed the importance of children working with more competent partners, Piaget (1932) did not believe that this mattered. Glachan and Light (1981) found that two children who initially had the wrong answer to a problem, have been able to reach the correct solution by working together and Mugny, Levy and Doise (1978) have demonstrated that children with the same cognitive development but different perspectives (due to spatial positioning) can also benefit from conflictual interactions. Collaborative learning has also been shown to enable students to retain information for longer periods of time than students who work alone (Johnson & Johnson, 1986) and is seen to be pivotal in cultural development (Tomasello, 1999).

Evaluation apprehension in children

Despite the potential for children to be unaffected by production blocking, the problem of evaluation apprehension remains for this population. Research into social influence has found that children are sensitive to the criticisms of their peers and children as young as 3 have been shown to 'punish' other children for gender inappropriate behaviour (Lamb, Easterbrooks, & Holden, 1980). Those children who were punished ended the behaviour significantly sooner than those whose behaviours were reinforced by peers, demonstrating the importance of peer approval and their ability to influence children.

Haun and Tomasello (2011) also demonstrated that children, when faced with a majority, will give knowingly wrong answers. When asking children to judge the relative size of pictures, children performed the task well until they had to share their answers publicly. This demonstrates conformity to an incorrect majority on tasks where the children knew the correct answer. Overall their studies showed children conform more in public than private settings suggesting that children conform for predominantly social reasons. If they conformed due to a desire to be correct, the same level of conformity would be found regardless of whether the answers given were public or private. Huan and Tomasello (2011) argued that children conformed to avoid conflict by going along with the rest of the group which suggests that peer relations are important to children and can influence their publicly expressed decisions.

In Vasey, Crnic and Carter's (1994) study on worrying in children, they found that worrisome thoughts become more prevalent with age in particular from ages 8 and upwards. They also found an increase in concerns about social evaluation and their behavioural competence with age. The importance of social evaluation at later ages has even been incorporated into models of friendship, whereby it is argued that at ages 8 and upwards, children become focused on peer acceptance and achieve this by following group norms

(Parker & Gottman, 1989). This increase in concerns over social evaluation and competence may also impact on the potential for children to experience evaluation apprehension. As these studies imply that younger children are less concerned with social and competency evaluations from others, it would be expected that evaluation apprehension would increase with age as children become more concerned with what others think of them.

Social comparisons and children

Alongside an increased concern in others' evaluations of themselves, it could be expected that children would begin to use social comparisons to ensure that what they are doing is considered acceptable. This has been shown to be the case in several studies which have found that children from around the age of 8 not only start to compare themselves to others but also start to make use of this information (Ruble, Boggiano, Feldman, & Loebl, 1980; Ruble, Feldman, & Boggiano, 1976). This may be of significance in interacting brainstorming groups given the theory put forward by Paulus and Dzindolet (1993) that social comparisons play a key role in interacting groups' productivity loss. Logically, it would be expected that children from the age of 8 would begin to compare their own performance to that of other group members and reduce their productivity to match that of the rest of the group.

In the context of school however, where working hard and improving performance are implicitly and explicitly encouraged by both teachers and parents, children may be motivated to improve their own performance and therefore compare upwards. In two more recent studies, children have been shown to naturally compare themselves to students who perform slightly better than them and that this upward comparison improves their own performances over time (Blanton, Buunk, Gibbons, & Kuyper, 1999; Huguet, Dumas, Monteil, & Genestoux, 2001). This tendency in school children to compare upwards, may mean that in

brainstorming groups, the level of group performance may be elevated to match that of the most competent member as other students upwardly compare and strive to match that of better performers.

A different take on evaluation apprehension in children

Whilst evaluation apprehension may exist for children, it may not be present in the same way in brainstorming tasks as it is for adults. Children often play with one another in quite abstract ways such as make-believe play which often involves pretending and creating imaginary scenarios (Gillibrand, Lam, & O'Donnell, 2011). Being creative and thinking of new ideas would not necessarily be as embarrassing for children as it would be for adults who may feel such notions are inappropriate. The norms of acceptable behaviour are very different for adults and children and so whilst they may be vulnerable to evaluation apprehension, it may occur in different domains and for different reasons. It would be unacceptable for an adult to talk into a banana as if it were a telephone, yet for children this behaviour would be seen as quite natural. To a certain extent, thinking of strange and unique ideas, using imagination and potentially coming up with silly ideas may be more acceptable to a child audience than an adult one, reducing levels of evaluation apprehension for children in this setting.

Another point to make in relation to evaluation apprehension is that it stems from an anxiety of being negatively evaluated by other group members or being criticised for their ideas (Paulus, Larey, Putman, Leggett, & Roland, 1996). Whilst children may be concerned about others' evaluations of themselves, such criticism in brainstorming settings may not be such a problem for children as the socio-constructivist approach believes that conflict between children on tasks is part of their learning process (Dillenbourg, Baker, Blaye, & O'Malley, 1996). Such exposure to others' ideas and evaluations help the child to refine their

own ideas and improve them suggesting that such critique may even be beneficial for children. Additionally, children are often instructed to work in groups as part of their school work due to the benefits of group work, so their anxiety about working together on a brainstorming task may be lower as it is a situation they are quite familiar with. Studies into the effectiveness of collaborative learning have led to some departments of education to make this type of learning method obligatory, so group work should be familiar to most children of school age (Tomasello, Kruger, & Ratner, 1993; Webb, Troper, & Fall, 1995).

The aim of the current study is to look at brainstorming in a sample of children to see whether the same patterns of superior nominal group performance will be found. It is hypothesised that there will be a significant difference between the number of unique ideas created in nominal and interacting brainstorming groups. Given the developmental literature cited with regard to improvement of cognitive ability when working with others, it was predicted that younger children's real groups would outperform their nominal group. It is also predicted that with age, children's performance in interacting groups will decrease as social evaluations become more prevalent and children are less reliant on others to aid with their learning.

Chapter 7

Brainstorming in groups of children: A look at productivity

Overview

This chapter will present two empirical studies on brainstorming in groups using child participants. The aim of these studies was to examine the productivity of children in brainstorming groups and look at whether they suffer from the same production loss reported in the adult literature. First, an explanation of methodological changes will be discussed, outlining the reasons for any deviation from the methodology found in adult literature. Study 4 focuses on children aged between 7- and 11-years and the differences between their individual performance and nominal group performance by age. Study 5 looks at children aged 6-8-years, 9-10-years and 12-14-years and compares their nominal group performance to their real group performance in terms of the number of ideas generated. The findings of both studies are discussed in the context of the literature and limitations of each highlighted.

Introduction

Given the vast amount of empirical research into the area of brainstorming with adults, it was felt best to keep the methodology of the current studies as similar as possible to existing ones. Due to the nature of the population, some changes did have to be made. In line with other brainstorming studies that typically use between 2- to 4-person groups (Mullen,

Johnson, & Salas, 1991) and consistent with the definition of groups used in this thesis, 3-person groups were used which also maximised the use of available participants.

The aspect of methodology that is particularly important to note was the inclusion of the experimenter in all parts of the experiment. As younger children's writing ability could be considered a confound given that it would slow their idea production and may prevent them from saying certain ideas because they could not spell them, the experimenter acted as a scribe. In previous studies however, the presence of the experimenter has been seen to have a detrimental effect on idea productivity (although this has been debated; see Maginn & Harris, 1980) because of an apparent increase in evaluation apprehension (Mullen, Johnson & Salas, 1991). The experimenter was therefore present in both the alone and group condition so that any effects of the experimenter's presence would be consistent in both conditions therefore removing the confound.

Additionally, when taking into consideration the social comparison literature in this area, it was vital that the experimenter did not say any positive or negative phrases during the experiment in order to avoid boosting/reducing group performance by implying they were doing well or badly. Research has shown that having feedback of any kind on performance motivates participants and leads to a change in behaviour (Dugosh & Paulus, 2005; Seta, Seta & Donaldson, 1991). The experimenters were instructed to remain as quiet as possible but were called upon to keep the children under control. When the children were being too loud the experimenter asked them to be quiet and if they spoke off topic for any length of time, the experimenter was instructed to say 'do you have any more ideas' in order to refocus the group discussion.

The topic of the brainstorming task needed to be something that young children and adolescents alike would have ideas about. Adult brainstorming tasks use topics which were considered too hard for the age groups in the study ('list possible uses for a paperclip' and 'imagine that everyone after 1995 would have an extra thumb on each hand. Generate ideas concerning the practical benefits and difficulties associated with the use of these new thumbs' as examples) Developmental differences in problem solving ability could dominate the age differences found rather than differences within the processes of the group. Therefore the topic of 'things you would need in space' was chosen as it is something both young and older children would have an idea about. As it could be expected that the quality of ideas would improve with age, alongside cognitive development and increasing vocabulary, the quality of ideas was not considered. Instead the focus of the study was on productivity alone.

It was also decided that groups would be single-sex at all age groups. Although no gender effects were expected nor were gender differences a particular focus of this thesis, research has suggested that girls and boys behave differently when interacting with members of the opposite sex (Leaper, 1991). Additionally, self-segregation along gender lines is commonplace in children, so making single-sex experimental groups more closely reflects the interactions children typically engage in (Maccoby, 2002). Using single-sex groups also removes gender as a confound in the results so any group interactions are the effects of the age of the children alone, rather than how many girls or boys make up each group.

As mentioned in the previous chapter, the hypotheses of the study were that there would be a significant difference in the number of ideas generated between nominal and interacting brainstorming groups. The direction of this difference was specified for younger children as real groups outperforming nominal groups, due to the cognitive improvement children gain when working with others. The second hypothesis was that with age, children's

performance in interacting groups would decrease as social evaluations become more prevalent and children are less reliant on others to aid with their learning.

Study 4: Brainstorming in primary age children

Method

Participants

A total of 78 participants took part in the study forming 21 3-person and 4-person groups. There were 20 participants in year 3 (*M*=7.75, *SD*= 0.44), 21 in year 4 (*M*= 8.62, *SD*= 0.50), 13 in year 5 (*M*= 9.69, *SD*= 0.48) and 24 in year 6 (*M*= 10.88, *SD*= .34). In year 3, 8 boys and 12 girls took part, year 4 had 13 males and 8 female, year 5 had 7 males and 6 females and year 6 had 11 males and 13 females. Participants were recruited from a school in Leeds, Northern England who were initially approached by letter and then contacted by phone. Informed consent letters were given to all parents and a Loco Parentis was signed by the Head teacher as the school agreed to Opt-Out of the study.

These data were originally collected as part of a Master's degree project by the author. The following analyses are both original and reflect a substantial piece of work. None of the following analyses were conducted or used as part of the Master's degree.

Design

This was a 2 (Group type: nominal or interacting) x 4 (Age group: Year 3, year 4, year 5, year 6) mixed design. The dependent variable was the number of unique ideas the group came up with.

Procedure

The experimenter was introduced to the children by the teacher. Children were informed of the nature of the study- that they would be taking part in a brainstorming session both individually and in groups and would be asked some questions about their group. They were told that if they did not want to take part they did not have to and only children who agreed to take part were spoken to. Children were initially seen individually by the experimenter and asked to do a brainstorming task. They were told to think of as many things as they could on 'Things you need in space' and the experimenter wrote down all their answers.

Later on in the day, the children were taken out of the classroom in groups of 3 or 4 and sat around a table. They were instructed that they would be doing a brainstorming task again but this time together. The topic was kept the same ('things you need in space') and the children were informed that they would be audio recorded to ensure that the experimenter did not miss any of their ideas. The experimenter again wrote down all their ideas for them and stopped groups after 4 minutes. The experimenter gave no negative or positive comments on the ideas the children put forward but simply wrote them all down. When the children spoke off topic, the experimenter prompted them by asking if they had any more ideas. Once this task was finished the children did some other work together for a different study before being thanked for their time and given a full debrief. All children received a sticker and certificate for taking part in the study.

Results

In order to be able to compare the productivity of interacting groups, nominal groups had to be created. Nominal groups were created post hoc by randomly sampling individual ideas into groups of three and four children (to match the groups in the original data set)

removing any repeating ideas. In order to increase the power of the study, the individual ideas were repeatedly randomly sampled until there were 50 nominal groups for every year group in the study. The mean of the nominal groups was then taken and compared to interacting groups (matching them by year group and group size). A univariate ANOVA was conducted on the data set with year group and group type (nominal or real) as independent variables and the number of ideas as the dependent variable. A between-subjects ANOVA was chosen because, as the nominal groups created did not match the real groups in terms of the individuals included, it was considered to be an independent condition (for descriptive statistics see Table 7.1).

Table 7.1

Descriptive Statistics for Nominal and Real Groups by Age

Year group	Group type	Mean	Standard deviation
Year 3	Nominal	32.85	5.54
	Real (N=5)	28.80	6.83
Year 4	Nominal	30.15	6.92
	Real (N=6)	33.00	6.90
Year 5	Nominal	29.35	6.911
	Real (N=4)	30.50	3.69
Year 6	Nominal	30.03	5.50
	Real (N=6)	34.50	6.09

No significant differences were found overall between nominal and real groups $F(1, 413)= .61$, $p=.44$ or between year groups $F(3, 413)= .48$, $p= .69$. No interaction effect was found between group type (real or nominal) and age $F(3, 413)= 1.76$, $p= .15$. It was decided to look at nominal and real groups separately to see if there was an age effect occurring in either type of group. A univariate ANOVA was conducted again but this time nominal and real groups were separated (using the split file function in SPSS). Year group was entered as an independent variable and the number of unique ideas as the dependent variable. No significant effects were found for real groups $F(3, 17)= .90$, $p= .46$ (possibly due to the small sample size) but there was an effect of age on nominal groups $F(3, 396)= 6.09$, $p< .001$.

Looking at pairwise comparisons, it was found that year 3s produced significantly more novel ideas in nominal groups than all other year groups (see Table 7.2 for mean differences)

Table 7.2

Pairwise Comparisons of Nominal Groups Ideas by Year Group

Year group (i)	**Year group (j)**	**Mean difference (i-j)**	**Significance**
3	4	2.70	$p<.005$
3	5	3.50	$p<.001$
3	6	2.82	$p<.005$

Given that nominal groups are formed using individual ideas, the results would seem to imply that year 3s come up with more novel ideas individually than their older counterparts. Looking at the means for the number of ideas each year group came up with year 3 had on average $M= 32.85$ ideas, year 4 $M= 30.15$, year 5 $M= 29.35$ and year 6 $M=30.03$. To investigate this result further, another univariate ANOVA was conducted with individual unique ideas the dependent variable and year group as the independent variable. There was a significant effect of year group as expected $F(3, 74)= 4.48$, $p< .01$, however when looking at the pairwise comparisons year 6s came up with significantly more ideas individually than the other year groups (see Table 7.3)

Table 7.3

Pairwise Comparisons of Individual Ideas by Year Group

Year group (i)	**Year group (j)**	**Mean difference (i-j)**	**Significance**
6	3	2.62	$p< .05$
6	4	3.57	$p< .005$
6	5	3.67	$p<.01$

When looking at the mean number of ideas individuals produced by year group year 3 had on average $M= 11.05$ ideas, year 4 $M= 10.10$ ideas, Year 5 $M= 10.00$ ideas and year 6 $M= 13.67$ ideas. The results seem to suggest that although individually year 6s have more

unique ideas than other year groups, these ideas are the same as each other so that when they are put into nominal groups, the number of unique ideas is less.

To compare these two scores directly, a univariate ANOVA was conducted using standardised scores of the number of unique ideas variable for both individuals and nominal groups across all age groups. This was done to ensure the results were accurate as the sets of scores from nominal groups would have been much higher than individuals overall as nominal groups consisted of three people instead of one. This means any significance found in the results could be due to this difference in number rather than actual differences in performance. By standardising the variable, all scores are given a mean of 0 and so can be compared across these two conditions. Year group and condition (nominal or individual) were entered as independent variables into the model.

No main effect of condition was found $F(1, 152)= 0.17$, $p=.68$ suggesting that the number of unique ideas produced in both nominal and individual conditions were similar. A marginally significant main effect of year group was found $F(3, 152)= 2.48$, $p=.064$, which, when looking at the pairwise comparisons, represented significantly more ideas being produced in years 4 and 6 when compared to year 5s ($MD= .48$, $p<.05$, $MD= .57$, $p<.01$ respectively). This could be due to the smaller sample size of year 5 participants compared to the other year groups, rather than a particular effect. Looking at Figure 1, a clear drop in the number of unique ideas year 5 nominal groups came up with may also explain this finding as this sizeable drop in nominal group performance would impact on the overall novel ideas score for this year group.

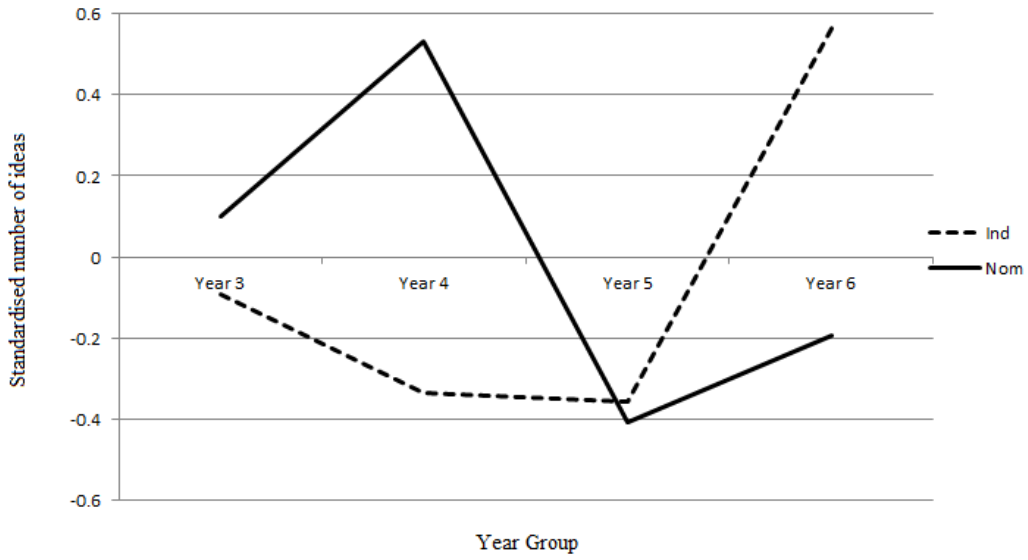

Figure 7.1. Graph showing the relationship between year group and the number of ideas individuals and nominal groups produced using standardised scores

A significant interaction was found between condition and year group $F(3, 152)= 5.37$, $p<.005$ (see figure 1) Pairwise comparisons show that in year 4, nominal groups significantly outperform individuals in the number of unique ideas produced $MD= .87$, $p<.005$. In year 6 however, the opposite is found with individuals significantly outperforming nominal groups $MD= .76$, $p<.01$. Within nominal groups, year 4 significantly outperform year 5 and marginally outperform 6 in terms of the number of ideas produced ($MD= .94$, $p<.005$, $MD= .73$, $p<.02$ respectively).

Discussion

The findings of this study did not support any of the hypotheses. The first hypothesis was that there would be a significant difference in the number of ideas generated between nominal and interacting brainstorming groups; the findings however suggeset no such difference. These findings are different from the typical results reported in the adult literature

where nominal groups regularly outperform real groups (Diehl & Stroebe, 1991) however these data were unexpected when taking into account research on children.

The interesting finding from this study is that the year 3 nominal groups significantly outperformed all other age groups, yet when looking at the results of individual performance, year 6 were significantly better. This would suggest that, with age, children converge on similar ideas meaning that although children in year 6 were much more productive, their ideas were the same as one another. When put into nominal groups, the repeating ideas were removed so the overall performance of nominal groups would have been poor for this age group. Year 3s however, have fewer ideas but much more varied ideas so that when entering them into nominal groups, fewer ideas are repeated and therefore removed.

Another finding from the study is the apparent drop in the number of ideas produced by year 5s. This may be a reflection of what is known as the 'fourth grade slump' in creativity initially found by Torrance (1968). The precise developmental trajectory of children's individual creativity is disputed within the literature but several studies refer to a slump occurring at around this age (Charles & Runco, 2001). Some of the reasons put forward for this slump are that at this age conformity is encouraged in schools; following classroom etiquette is important and socialisation becomes more salient (Kim, 2011). Torrance (1968) argued that the classroom environment inhibits creative thought and discourages innovative thinking, preferring children to learn set facts and knowledge in a regimented manner. Once children get used to these demands of schooling, their curiosity is said to increase again, and improvements in creative thinking increase into adolescence (Kim, 2011).

Previous research also suggests that children benefit from working together in groups or pairs (Doise, 1990). The findings here found no such benefit- Groups of children working

together performed no differently from children working alone. It could be that the participants in the study were suffering with evaluation apprehension as literature suggests that children as young as three both feel pressure from their peers and change their behaviour in accordance to their peers desires (Lamb, Easterbrooks, & Holden, 1980). The children may have been nervous about sharing all of their ideas because of a fear of ridicule, especially given the public nature of the sharing of ideas. Haun and Tomasello (2011) found that children will give knowingly wrong answers when faced with an incorrect majority, particularly if they have to give their answers publicly. This normative pressure as shown in this study, outweighed children's desire to be correct suggesting that in the current study children may have rather withheld their ideas than risk being seen as silly.

Another impact of implied or actual peer pressure might be that children reduced their performance to that of the lowest performing member, as shown in adult studies (Paulus & Dzindolet, 1993). This explanation seems unlikely however given the lack of significant improvement in nominal group performance and when considering the descriptive means for both nominal and real groups at each age. In all age groups with the exception of year 3, real groups had more ideas than their nominal counterparts. Although not significant, this finding and the lack of significant improvement in nominal groups suggests that children were not lowering performance.

In fact, when looking at the descriptive statistics, the means are in the direction predicted by the hypothesis that real groups would outperform nominal groups. The means do not suggest that with age interacting group performance decreases, but this may be because the age range in the current study is not broad enough to capture this predicted decline. Using a larger age range may offer more of an insight into what happens developmentally on this task than the current age range used.

An additional problem to note is the small sample size. Due to time constraints and the complex nature of the testing, it was hard to get access to children as schools were not keen to take part with such a disruptive methodology. It was not possible to counterbalance the order of brainstorming, so all participants brainstormed first individually and then as a group. This means any differences found in the real group stage could be due to practise effects and children remembering their ideas from the previous session. Also, no measures were taken of phenomena such as production blocking or evaluation apprehension which would have given an interesting insight into the group processes occurring for these age groups.

Further research is needed to replicate these findings and ensure that non-significant findings are due to psychological phenomena rather than methodological issues. A study, not only with a larger sample size but with additional variables in an attempt to assess what mechanisms are occurring in interacting groups of children would improve the research into this topic. To rectify the problems in this study, a further study was conducted.

Study 5: Brainstorming in middle childhood and adolescence

The second study conducted aimed to further the findings in the first study. Group and individual brainstorming was counterbalanced so that order effects would no longer be an issue. In study 4 any improvement found in the group phase of the experiment could be due to practise effects, rather than group processes. It was also decided that the sample size should be much larger than in Study 4 to improve the power of the analyses and thus the reliability of the results. Specific age groups were also selected that were three years apart (year 2, year 5 and year 8) rather than one year (as in the previous study), so that the developmental pattern of performance for groups could be mapped over a broader age range.

Additional information was also gathered on the individuals and groups to be used in later analyses including evaluations and predictions of group performance, measures of evaluation apprehension and measures of group experience.

Additionally in the current study, experimenters were instructed to say 'shall we stop there then?' whenever participants spoke off topic (otherwise the children would not go back to class). This phrase was used as Nijstad, van Vianen, Stroebe and Lodewijkx (2004) found that adults tend to stop their brainstorming when they felt they had done enough or couldn't think of more ideas. Asking children if they wanted to stop therefore reflected their feeling of completion rather than asking for 'any more ideas?' which would perhaps imply to the children there were more ideas to guess or that they had not done enough.

The hypotheses for this study remained the same as the initial study; that there would be a significant difference in the number of ideas generated between nominal and interacting groups and that, with age, children's real group performance would decrease and their nominal performance increase. As an extension to this hypothesis, it was predicted that real group performance would decrease with age due to an increase in production blocking and evaluation apprehension.

Participants

A total of 321 children took part in the full experiment forming 107 3-person groups in total. 105 6-8 year olds (M= 6.71, SD= .57), 117 9-10 year olds (M= 9.64, SD= .48) and 99 12-14 year olds (M= 13.07, SD= .43) were recruited from primary and secondary schools across the South East of England, Kent as this area was local to the researcher. There were 162 boys and 159 girls in total with 57 boys and 48 girls in ages 6-8 years, 69 boys and 48 girls in ages 9-10 and 36 boys and 63 girls in ages 12-14 years.

Schools were approached by letter and then contacted by phone. Meetings were set up with the relevant teachers at the school and the experimenter explained the study and what the children would be required to do. Once the teachers (always the Head teachers but sometimes the teachers in charge of the classes we would be working with were spoken to) agreed to work with us, informed consent letters were given to all parents. In schools where Opt-Out was chosen as a method, a Loco Parentis was signed by the Head teacher. The testing for this experiment took a year and a half in order to get the sample size obtained. Due to the nature of the study, schools did not always have the space or inclination to be able to accommodate the research.

Design

The experiment was a 2(Order: individual first/group first) x 2 (Condition: alone/group) x 3 (Age: 6-8, 9-10, 12-14 years) design. The dependent variable was the number of unique ideas produced. The study was a mixed design with condition being within-subjects factors and age and order between a between-subjects factor.

Materials

Participants' brainstorming ideas were recorded by the researcher on a single sheet of paper (both in the group and alone condition). Interview questions were also given to the pupils during the individual phase of the experiment. These were either spoken to the participants (in year 2 and for some of year 5 participants) or in questionnaire format (for some year 5 and all year 8 participants) depending on their age (and therefore reading ability). Questions were 'When you were put into a group with other students to do the brainstorming task, do you think you worked harder in the group, worked harder on your own or worked just as hard in both and why?', 'Do you think you were embarrassed and did not say all the ideas you had or were you not worried and why?', 'Did you have any ideas during

the group task that you kept to yourself?', 'Do you think that brainstorming in a group helped you to think of more ideas or do you think you'd work better on your own and why?' and 'Do you think that the students in your group had the same ideas as you or very different ideas?'.

The first two questions were repeated, asking the participants about what they thought their group members did during the group phase. This was done to avoid self-presentational bias as it was felt that participants may be less likely to admit that they didn't try hard or were embarrassed. Assigning these negative traits to others however, if they felt these issues existed in the group, may yield more truthful responses. It was hoped that participants' answers would shed light on any production blocking, evaluation apprehension or social loafing that they may have observed within their groups. In the group stage of the experiment, the participants were asked to do an additional task as part of a different experiment. Participants were given a sheet of paper with a scenario on it, in which they had to decide how to share sweets out amongst other fictional children.

Procedure

On the mornings of the experiment, the researcher met with the teacher whose class would be involved in the research. Each teacher was fully informed of the procedure and asked for the best way to conduct the research whilst causing minimal impact to their lessons. Children were introduced to the researcher by the classroom teacher. They were told that the experimenter had been given permission by the school to come in and talk to them and to do some brainstorming tasks. The children were all asked if they would be willing to take part in the study and it was explained that if they wished they could leave at any point. The children were also informed that their answers would remain a secret and that no one would be allowed to read them. Only children who agreed to take part in the study were spoken to.

The children were then tested in a separate room somewhere in the school, with up to four children being tested at once (depending on the number of research assistants available to help). This room was usually the library or a family room which was secured for us by the school for the full day. On the occasions where this was not possible, children were spoken to individually in school corridors to minimise the amount of time needed in the room. During the individual phase of the study, children were either interviewed or given a questionnaire (depending on their reading and writing ability) asking them some basic questions about their views on group work. It was during this part of the study that the children brainstormed individually. To try and keep the study comparable, children brainstorming by themselves on paper were made aware that the experimenters were present and would be looking at their ideas. Those being interviewed told the experimenter their ideas and the experimenter wrote them down for the child without making any evaluative comments. The instructions for all children during the individual brainstorming task were that they could stop at any point whether they felt they had enough ideas or could not think of any more.

The group part of the study involved taking children out of the classroom in same-sex groups of three. The children did a short decision task as part of another experiment and were then asked to brainstorm on the same topic 'Things you need in space'. They were again instructed to stop when they felt they had enough ideas or could not think of any more. The experimenter was present for all groups and wrote down the ideas they had. The group brainstorm was also audio recorded so that further analysis could be done at a later date. When the children finished, they were fully debriefed and thanked for their participation. They were given a certificate and a sticker, or sweets to thank them for taking part. The order of the group and individual part of the experiment was counterbalanced to avoid order effects.

Results

The data were entered into SPSS and any incomplete groups (groups with people missing from the alone condition of the experiment) removed as it would not be possible to calculate nominal group scores with a group member's individual brainstorm ideas missing. Nominal group scores were calculated for each group by adding up the number of unique ideas the individuals in the group had during the alone condition. The data were then aggregated to avoid triplicating the group data and a repeated measures ANOVA was conducted with group type (nominal or real groups) as the within subjects variable and age and order (group first or alone first) as the between subjects variables. The dependent variable in the analysis was the number of novel ideas the group came up with.

Table 7.4

Table showing the means and standard deviations for the number of ideas nominal and real groups produced when brainstorming both overall and by age.

	Mean	Standard Deviation
Overall		
Real	26.07	13.01
Nominal	20.88	9.31
Age range 1 (years 2-3)		
Real	25.66	14.11
Nominal	19.29	10.01
Age range 2 (year 5)		
Real	28.88	13.05
Nominal	21.23	8.79
Age range 3 (years 8-9)		
Real	23.19	11.34
Nominal	22.15	9.18

ANOVA results

A main effect of group type $F(1, 101)= 27.06$, $p<.001$ was found demonstrating that real groups significantly outperformed nominal groups overall (for means and standard deviations see Table 7.4). There was no main effect of condition suggesting that

counterbalancing did indeed remove practise effects and there was no main effect of age overall. This was surprising given that it was hypothesised that older children generally would outperform younger children at the brainstorming task given their wider vocabulary and simplicity of the task. There was a significant interaction effect between age and group type $F(2, 101)= 4.93$, $p<.01$ with 6-8- and 9-10-year-old real groups performing significantly better than their nominal counterparts. This significant difference is not found in the oldest age group however as their real group performance decreased and their nominal performance increased. There was a significant interaction between group type and condition $F(1, 101)= 38.85$, $p <.001$ however this interaction appeared to be driven by the significant interaction found between age, group type and condition.

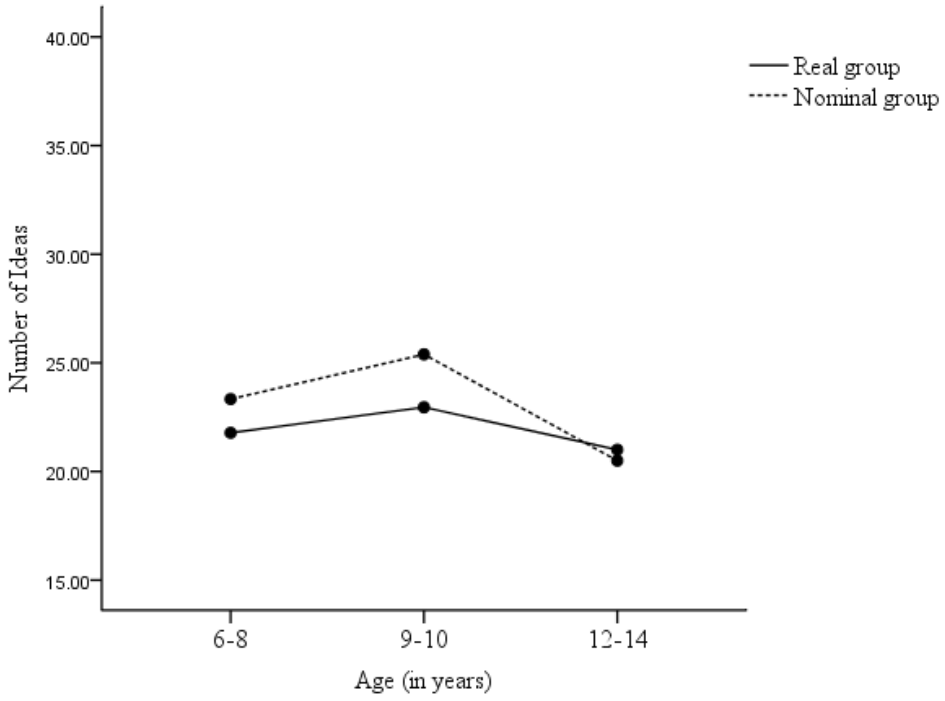

Figure 7.2: Line graph showing the number of ideas real and nominal groups came up with, by age, when real groups brainstormed first.

As shown in Figure 7.2, when real brainstorming groups go first, no significant differences were found in performance either across age or between group type. Nominal

groups do not appear to benefit from the initial practise of brainstorming in groups. When individuals brainstorm first however (Figure 7.3), there is a significant difference in real group performance for the two younger age groups with real groups significantly outperforming nominal groups. This difference disappears for the older age group due to a significant increase in nominal group performance (compared to the younger age groups) and a significant decrease in real group performance (when compared to 9-10 year olds).

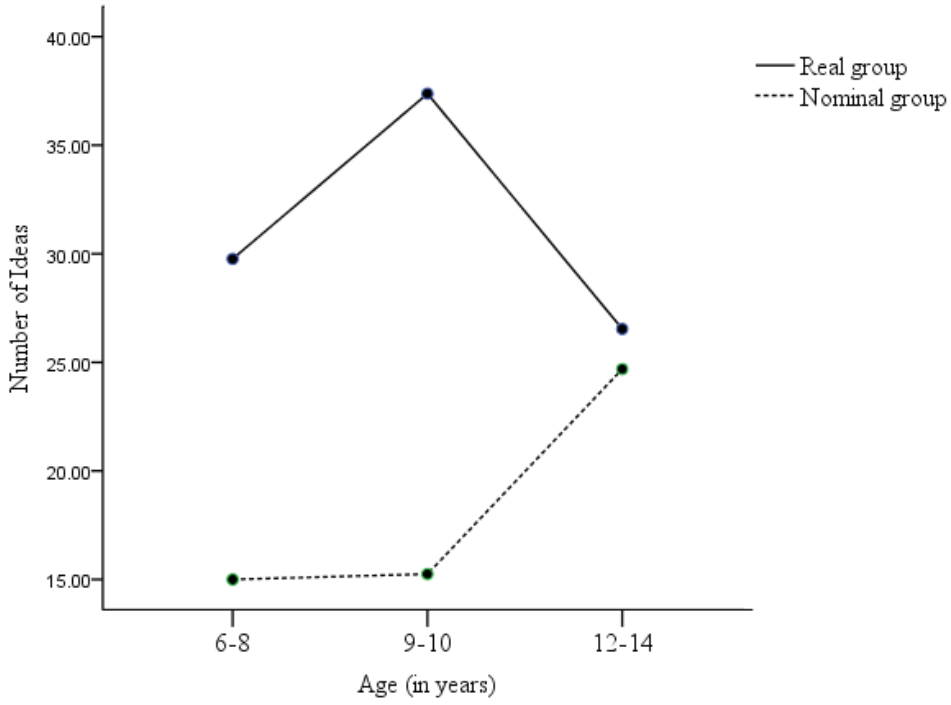

Figure 7.3. Line graph showing the number of ideas real and nominal groups came up with, by age, when nominal groups brainstormed first.

Interview Data

Due to time constraints when testing children, a decision was made to interview only one child from each group in ages 6-8-years meaning the total number of participants for this part of the experiment was 30 in this age group. For age 9-10-years, 78 children were interviewed/given questionnaires and at ages 12-14-years, 144 children in total filled in questionnaires. This was done so that more data could be collected at each school in the time frame given to the researcher by the schools, as typically, only one day with each class was

given. The interview/questionnaire answers given by the participants were coded into two new variables: production blocking and evaluation apprehension. Production blocking was defined as any comments relating to the issue of sharing speaking time with others, concentration problems, the forgetting of ideas and having to do two things at once (being part of the group discussion and coming up with novel ideas). Evaluation apprehension was coded for answers relating to feeling worried/anxious about sharing ideas, negative comments about their own/others ideas and mentioning possible negative reactions of others because of their ideas. Each answer was given a score of 1 for either variable if those topics were mentioned. The overall interview therefore had a cumulative score for each variable.

Overall, 15.8% of participants reported production blocking issues and 36.8% reported evaluation apprehension within their groups. As there were so few scores for each variable, the two variables were collapsed into one overall variable labelled ‘production loss’ which overall was reported by 45.3% of participants (see Table 7.5 for a breakdown of percentages by age group). This was then put into a weighted regression (to reflect the difference in sample sizes) using the total number of group ideas as the dependent variable. The final model showed that production loss significantly predicted the total number of group ideas for 12-14 years only $F(1, 135)= 3.92$, $p = .05$, beta= -.17. The year 2 model was not significant $F(1, 28)= 2.98$, $p= .10$, beta= -.310 nor was the model for year 5 $F(1, 76)= .42$, $p= .52$, beta= .08.

Table 7.5

Table showing the percentages of participants reporting production blocking, evaluation apprehension and production loss by age range.

Age range	Production Blocking	Evaluation Apprehension	Production Loss overall
Years 2-3	13.3%	33.3%	43.3%
Year 5	12.8%	34.6%	42.3%
Years 8-9	18.2%	39.4%	48.2%

Discussion

The first hypothesis for the study was that there would be a significant difference in the number of ideas generated between nominal and interacting groups which were supported by the findings. Real groups of brainstorming participants significantly outperformed nominal groups in the number of novel ideas they produced. Additional support was found for the predicted direction of this difference with participants' real group performance decreasing with age and nominal group performance increasing with age.

Whilst this finding is at odds with Study 4 (which found no significant differences) it does make theoretical sense. Younger children's cognitive ability is improved when working with others whether it be a more experienced peer (Vygotsky, 1978) or another peer with a different viewpoint (Doise, 1990). When in a brainstorming group, two different factors could be at play; all group members' performances might improve to match more closely that of the highest performing member via the zone of proximal development. An additional more Piagetian explanation is that, through exposure of different ideas and opinions from other group members, a different way of thinking/set of ideas is triggered in the child that without the stimulation of others would never have been accessed (Doise, 1990).

Although there is no real way to distinguish the precise method from the data, the Piagetian explanation fits well with current literature on adult populations as Dugosh, Paulus, Roland and Yang (2000) argued that exposure to ideas can stimulate idea generation. They posited that concepts and ideas are stored in a semantic network with similar concepts/ideas having stronger connections. When a particular idea (node) is activated, surrounding ideas (nodes) are also triggered leading to a 'train of thought'. Exposure to other people's ideas may trigger nodes that, without the initial stimulation, would not have been thought of.

Results from the current study lend themselves to the idea of children benefitting from group interaction as opposed to being inhibited by it. This supports previous research which has found that through verbalising ideas children can refine their knowledge of a problem, improve their planning abilities, improve later post-test scores than individual training and enables children to retain information for longer periods of time (Rumelhart & Norman, 1978; Rogoff & Gauvain, 1989; Doise & Mugny, 1984; Johnson & Johnson, 1986).

An explanation for the increasing productivity of nominal groups (therefore individuals) with age could lie in children's vocabulary ability. Biemiller (2003) find that on average, a child learns 2.2 new root words (words that must be learned) per day between the ages of 1- and 8-years. Between the ages of 9- and 12-years, this increases to 2.4 words a day (Biemiller & Slonim, 2001). Although the precise numbers are contested in the literature, taking these numbers as guidance, 12-year-olds on average would have approximately 1,800 more words available to them than 9-10-year-olds. This increase in vocabulary would aid in brainstorming tasks given that the task itself requires participants to think of words and name appropriate items related to the brainstorming topic.

This idea of increased competence in children as they age may also explain the loss of benefit in older children when placed into groups with their peers. Collaborative learning

theorists focus on the idea that working with others improves children's cognitive development (Tomasello, 1999; Doise, 1990; Vygotsky, 1962; Piaget, 1932) but if the child is already in the final stages of development, there may be little benefit left to gain. Instead, what may happen for these older children (and what the findings suggest) is production blocking, something that is seen in adult populations. Rather than aiding or stimulating their own thought, being in a group may prevent them from sharing their ideas or distract them from thinking of their own ideas (Diehl & Stroebe, 1991).

In a similar vein, it was noted by the researchers that younger children tended to interrupt each other and talk over each other in order to share their ideas in a group setting. As well as these interruptions, ideas in the groups were often repeated by different group members which could suggest a lack of listening to each other's ideas. These two things directly impact upon production blocking as turn taking and being distracted are two of the features of this phenomena (Diehl & Stroebe, 1991). This may suggest then, that the way children behave in groups could reduce production blocking where as similar behaviour by adults would be frowned upon. Unfortunately, it is not possible to test these observations with using the current data set. Future studies should take note of the amount of interruptions that take place and the number of times ideas are repeated in groups and compare this with adult populations to investigate this further.

In an attempt to test production blocking and evaluation apprehension in the current study, self reported measures of both variables were recorded. The prediction that real group performance would decrease with age due to an increase in production blocking and evaluation apprehension was partially supported by the data. Although, when looking at the percentage of participants who reported both production blocking and evaluation apprehension, these numbers remained relatively stable across the three age groups, the two

collapsed variables (production loss) only significantly predicted performance for the oldest age group. This suggests that, by age 12, children are beginning to resemble their adult counterparts in brainstorming groups and also implies that younger children's improvement in performance in real groups is due to a lack of these factors.

A problem with the study is the way in which production blocking and evaluation apprehension were recorded. Paulus, Dzindolet, Poletes and Camacho (1993) found that participants failed to report evaluation apprehension or production blocking despite its being evident during their studies. They concluded that these effects may occur without people being consciously aware of them or being able to explain them fully. Although children in this study did report both evaluation apprehension and production blocking, suggesting that this may not be an issue, the actual presence of both may be much higher due to a similar failure to be consciously aware of them. Given that the performance of real groups was high, the lower levels of reporting may actually reflect a lack of either effect on this population however it is important to be aware of these limitations when interpreting results and designing future studies.

Another point to consider from the findings is that groups seem to provide little benefit to children's productivity when children are asked to brainstorm in groups first and then alone. The main benefits found in this study where when children first brainstormed alone and then in groups. There could be a motivational explanation for this occurrence; when brainstorming in a group first, the group comes up with more ideas and (as reported in adult literature) is probably experienced as more fun. When it then comes to brainstorming alone, children may feel like they are unable to produce a similar number of ideas as they did previously and so are unmotivated to try as hard. When brainstorming alone first however, children have no comparison in terms of the number of ideas a different context could

produce. When they then enter a group and hear other children's ideas they may become excited and trigger ideas in themselves they did not have previously. Paulus, Dixon, Korde, Cohen-Meitar and Carmeli (unpublished) have suggested similar benefits in adult brainstorming groups, when the type of brainstorming (alone and in groups) is varied.

Another issue to resolve are the different findings from the two studies. The first study found no significant differences between real and nominal group performance overall or in any specific age group. The current study however did, even when testing children that were the same age as present in the initial study (year 5s were sampled in both). Given the theoretical support for the findings of Study 5 and the more robust nature of the sample size and methodology (counterbalancing and additional variables) it would seem that Study 5 provides more accurate findings although additional studies should be carried out to confirm this.

The topic used for the study 'things you need in space' may have been a confound as older children may have found it more embarrassing to talk about as it could be seen as a 'young' task. It was kept the same as the previous study in order to maintain consistency however older children may have found this subject too simple or silly and so were demotivated to work hard at it and reach their full potential. Older children may have also understood the purpose of the task differently from young children; when young children are asked to do something by an adult they may work harder at it whereas older children may have recognised that the task did not have any ramifications for them and so they did not need to try.

An additional limitation of the current study was a lack of an adult sample for direct comparison. This would enable researchers to compare directly adult performance and child performance on the same task, using the same methodology. Unfortunately, including an

adult sample was beyond the scope of the current research due to time constraints and the problematic data collection (trying to get multiple participants to turn up at the same time). Future studies should include an adult sample to ensure that differences found between current findings and adult literature are due to psychological phenomena rather than methodological reasons.

Conclusion

Taken together, both studies demonstrate an interesting new area of research for group processes and developmental psychology. Additional research needs to be done to further strengthen the findings reported here and the chapter itself offers more questions than answers at this stage. Focussing on the second study, the results seem to suggest that group work yields the best results when children are initially instructed to do the task alone first. This could have important implications in classroom settings where group work is a common feature. In terms of the adult literature, the chapter lends support to certain arguments in the field. It would seem that productivity loss is not an intrinsic part of being in a group as suggested by some, but due to other psychological processes we develop as we age.

Chapter 8

General Discussion

The purpose of this thesis was to attempt to address a gap in the literature that currently exists on children's intragroup processes. This area of research is important because it can aid our understanding of adult group processes, support or refute current models of group behaviour and help explain a significant portion of children's social experiences. Children often work in groups, play in groups and belong to several different types of groups and understanding the processes involved in how these groups work can give us a fuller picture of children's psychology.

The thesis focused particularly on group decision making and group productivity in the form of brainstorming for several reasons, the first being that these two literatures are well developed in social psychology (for reviews see Isaksen, 1998; Kerr & Tindale, 2004). This provided a framework to apply this research to children; the methodologies of both areas are established as are the theoretical considerations and findings for the behaviour when expressed in adults. This meant that there was an established base to work from in terms of developing a methodology that would work with children and clear pattern of what to expect, if children behaved as adults in these scenarios.

Additionally, children have to make decisions all the time; who to play with, what games to play, whether to share their toys and with whom, whether to follow an adult's instruction or whether they like broccoli or not. Several of these decisions often occur in social environments such as the school playground or the classroom and the outcomes of these decisions can have a major impact on others around them (such as whether to exclude someone). Understanding how social situations can affect a child's initial reasoning on a

situation can provide the groundwork for better understanding ostracism, bullying and other negative social behaviours.

The assumption that working in groups will be productive is embedded in the national curriculum in the UK (National Curriculum, 2013). Work on collaborative learning suggested that children benefit from working in a group (Dillenbourg, Baker, Blaye, & O'Malley, 1996; Doise,1990; Glachan & Light, 1981; Piaget, 1932; Vygotsky, 1978) but since this initial work was conducted, little has been done to investigate exactly how and why this happens, at what age, if any, this stops happening and whether or not different methods of working could increase the benefit of group work for children further. Alongside this consideration is research in social psychology that suggests adults are actually better off working alone than in groups (Diehl & Stroebe, 1987; Steiner, 1972). By attempting to empirically test the same types of behaviour in children, further explanation and insight into the patterns of behaviour found in adults could be gained.

Key Findings

The first study presented in Chapter 4 (intragroup contexts and children's resource allocation) looked at how children decided to share resources (in this case sweets) amongst three target children, first individually and then in groups of three. The findings showed that the oldest children (12 to 14-year-olds) gave the target described as smart significantly more resources and the target who was described as being ill significantly less resources compared to the two younger age groups. The middle age group (9 to 10-year-olds) gave significantly more resources to the target who worked the hardest despite the implication that this targets work would not have been to the same standard as the smart target. The youngest children gave significantly more resources to the ill target than any other age group suggesting a preoccupation with fairness. When making the same decision in a group, it was found that

overall, children gave significantly more resources to the target who worked the hardest than when they decided individually. Groups did not give any less resources to the smart target compared to individuals which suggests an increase in liking of the target who worked the hardest rather than a decrease in liking for the target who was smartest.

The second study in this Chapter (intergroup context and children's resource allocation) looked at the effects of intergroup contexts on children's sharing of resources. Children were exposed to either an interpersonal scenario or intergroup scenario and asked to share sweets out between themselves and another pupil, an ingroup member or an outgroup member. It was found that the eldest age group (12 to 13-year-olds) gave significantly fewer sweets to the other person whether that was another pupil, an ingroup member or an outgroup member than any other age group. The middle age group (9 to 10-year-olds) gave significantly more sweets out to others (regardless of context) than both the youngest and eldest age groups. When looking at the impact of intergroup contexts on the participants sharing behaviour, it was found that the presence of an outgroup led to fewer sweets being given to another pupil (ingroup or outgroup) than all other conditions. When comparing to a baseline condition, it was found that the results reflected a negative outgroup bias (giving fewer sweets to the outgroup) rather than a positive ingroup bias (giving more sweets to the ingroup).

In chapter 5, another decision making task was given to children (Individual and group vigilance in children) both individually and in groups of five but this time, the task used was a cumulative frequency task rather than a resource allocation task. The aim of the study was to see how children dealt with group members whose initial guesses were much higher or lower than other group members. It was found that the oldest children (12 to 13-year-olds) used the mean when coming to a final group decision rather than the Social

Judgment Scheme (SJS; which would have taken into account outlying positions) or the median of the initial answers. The youngest age group (5 to 6-year-olds) were significantly more likely than the other age groups to use the SJS and use an individual group member's answer as the final group's answer. The factor demonstrated to influence whose answer they chose was the popularity of the child rather than their ability.

In chapter 7, two more studies were presented looking at brainstorming and group productivity. The first study (Brainstorming in primary age children) attempted to compare nominal and real groups' performances and found no significant difference between the two types of groups' performance. The youngest age groups (7 to 8-year-olds) nominal groups outperformed all other nominal groups and the eldest age group (10 to 11-year-olds) had the best individual performance in terms of number of novel ideas. These findings suggested that although older children are better at developing ideas than other age groups, their ideas are similar to one another so that, when put into nominal groups, there are fewer novel ideas between them.

The second study in the chapter (Brainstorming in middle childhood and adolescence) also looked at real and nominal group brainstorming performance but this time using a broader age range and larger sample size. The study found that real groups significantly outperformed nominal groups and that, with age, real group performance decreased and nominal group performance increased. Additionally, it was found that real groups of children performed much better having brainstormed on a topic individually first but that this benefit did not significantly enhance the performance of the eldest age group (12 to 13-year-olds).

Discussion of findings

Across the two brainstorming studies there appeared to be different effects of group processes on performances. Whereas group process has no effect on performance in Study 4,

it did affect performance in Study 5. Although both studies demonstrate different findings than those typically found in adult populations the lack of significant difference found in the first study between nominal and real group performance is thought to be due to sample size. In the initial study individuals always brainstormed before groups and no counter balancing was enforced, however the findings from the second study suggest that this should increase the difference found between nominal and real group performance rather than hinder it. In the second study, the three-way interaction found between age, group type and condition showed that when individuals brainstorm alone first, their subsequent real group performance significantly differed in all but one of the age groups.

Distinct age differences and also similarities have been found throughout the thesis and it would appear that the group affects children differently depending on their age. Older children were not more sensitive to intergroup scenarios as all age groups were similarly affected in their resource allocation by the presence of an outgroup member. In terms of their intragroup behaviour however, older children (12 to 14-years-old) did not experience the same benefits of group work on their productivity than younger children, failing to show the same significant difference between their nominal and real group scores as both 6-7-year-olds and 9-10-year-olds did. Older children were more likely to use the mean when trying to decide on a final answer in the cumulative frequency estimation task where as the younger age group decided in a manner consistent with the SJS model. This may be due to less obvious outliers or because of an increased pressure to include all group members in the decision.

The findings from the thesis overall (both decision making studies and productivity studies) demonstrate the impact that children's social environments can have on both their decision making and performance on tasks. When making decisions, the group can change

the focus from intrinsic ability to more socially beneficial behaviour (working hard for the benefit of the group) resulting in a shift of resource allocation to reward those who engage in such behaviour. These intragroup processes also work to improve productivity in children's idea production and increase children's levels of moral reasoning to reflect that of an older child. In intergroup scenarios, children have been shown to be less generous in terms of the amount of resources they are willing to share with another child, especially when that child belongs to a different group (in this case a different school). Again a difference was demonstrated between the conditions where the intergroup was present and when the decision to be made was at an interpersonal level.

Groups do seem to have an influence on children's behaviour and the thesis does provide some explanation as to the mechanisms occurring within these groups although it is recognised more research needs to be conducted on this area. First, children seem to suffer less evaluation apprehension and production blocking which enables them to perform better when working in groups. These two phenomena have been shown with adults to prevent their brainstorming groups reaching the potential of their nominal groups (Camacho & Paulus, 1995; Nijstad, Stroebe, & Lodewijkx, 2003) and here, reportedly in absence of these phenomena, children's groups perform better. Furthermore the findings in this thesis show that young children appear to be more influenced by a single group member and therefore accept their decision as the final group decision. The influence a group member has over the group appears to be dependent on their popularity rather than any ability other children perceive them to have. Older children however have not been shown to do this and rather reach a consensus by taking into consideration all group members' answers.

Implications

The empirical chapter on brainstorming raises some interesting points when considering current literature both in developmental and social psychology. The first being that these studies demonstrate support for the collaborative learning literature, showing that working in groups can improve children's productivity. This has been demonstrated in groups of three rather than dyads which are often used when attempting to measure collaboration amongst children (Dillenbourg, Baker, Blaye, & O'Malley, 1996). Interestingly, the benefits of working together were shown to 'wear off' with age as children in the eldest age group (12-14-years) no longer showing significant benefits to working in groups. If we are to assume that collaboration in children improves their level of cognitive development, this finding may suggest that, in terms of the demands of the task given, the eldest age group already possessed the necessary skills to complete the task competently alone. Therefore, no additional benefit to the task was gained by being with other students. If the complexity of the task were to increase however, there may still be a benefit for this age group working together.

This is certainly a point to consider when thinking about the educational benefits of group work for children. Whilst exposure to others' ideas and problem solving strategies is beneficial, group work may not always aid older age groups in the same way it can for younger children. It is important to consider the complexity of the task carefully before deciding whether group work is the best method of learning for that age group. The study also demonstrated additional explanations for why older children benefit less from group work than younger children. Self-report ratings of production blocking and evaluation apprehension predicted the number of ideas produced in groups for this age group. This would imply that not only could there be no potential cognitive benefit for a task of this complexity but that also social factors begin at this age, to take precedence.

It has certainly been demonstrated that the importance of peers increases throughout childhood and into adolescence and this may be reflected in an increase in evaluation apprehension (Kuttler, Parker, & LaGreca, 2002). Although there was no correct or incorrect answer per se for the task, saying something considered to be a 'silly' idea by others was quite possible. This may lead older children to vet their ideas before sharing, slowing the process of idea sharing down but potentially leading to a higher quality of ideas. Quality was not measured in this thesis but it is certainly something that should be looked at in future studies. The increase in the number of participants reporting production blocking is also an interesting factor to consider; what is qualitatively different about children of this age or groups of this age that lead to more production blocking? One of the things noted by the experimenters was that young children did not tend to take turns in sharing their ideas but rather shouted them out as they had them. It could be that by ignoring group behaviour norms, they spare themselves some cognitive load which can then be used to focus on idea generation. Older children may be more aware of appropriate group behaviour however and focus more on ensuring they behave in a good way. Again, this is an avenue for future research- the number of times interruptions occur and turn taking occurs could be indicative of these processes taking place.

In terms of the adult social psychology literature these studies offer a completely new look at brainstorming processes as well as production loss. Steiner (1972) argued that production loss was an inherent part of being in a group but if that claim is true, then groups of children should have also demonstrated this same loss. The lack of self reported production blocking and evaluation apprehension in groups where real groups outperformed the nominal counterparts adds support to the literature that looks to these phenomena as explaining the production loss seen in adults (Diehl & Stroebe, 1987). It is important to consider replicating the study using a wider age range including adults to find at what age the

pattern of productivity between real and nominal groups changes and to try and pinpoint what factors may be the cause at that age.

What these studies demonstrate to social psychologists is the importance of considering developmental trends and patterns in intragroup behaviour to better understand these same behaviours shown in adults. If it is possible to pin point the exact age at which nominal groups outperform real groups, further research can be done with that age group to work out exactly what occurs at this age that is not present at earlier ages. Interventions can also be introduced to counter any potential causes of negative intragroup behaviour to make people more effective at group work in the future. Additionally developmental studies can provide support for existing theories as these studies have done for the ideas that production blocking and evaluation apprehension are two things involved in brainstorming groups.

The brainstorming studies also provide support for the 4th grade slump, an effect that has been recorded previously in other studies (Charles & Runco, 2001). Interestingly, there was no evidence of this slump in the second study of the chapter that focussed on nominal and real groups. Some of the theorised explanations for this slump include an increase in conforming behaviour reducing children's creative tendencies (Kim, 2011). It could be that because they were instructed to work together in the group, the conforming behaviour in that context would be to create more ideas if they were to conform with the group they were in.

The decision making studies provide more information on intragroup processes in children's decision making to the existing literature. The literature on intragroup processes is limited as discussed in chapter 2 and the studies in this thesis provide further demonstration of the ways in which researchers can apply and make use of decision making models typically seen in adult literature. Unlike Gummerum and colleagues studies (2006, 2008), which used SJS as a baseline for decision making, the studies in this thesis looked at the SJS

and other decision making options developmentally to see if children of different ages had different preferences in terms of how they came to a decision. It was shown that older children prefer to use the mean when making decisions on cumulative tasks suggesting that when testing baseline models on adolescents an averaging model might be more appropriate.

Another finding that requires further consideration is the way that groups impacted and changed children's individual decisions, particularly on who to include or reject when sharing sweets. Groups were still shown to reject targets (by giving them one sweet rather than two) suggesting that exclusion type behaviours do also occur in group scenarios, but the target of rejection changed. Individuals were more likely to reject targets who tried their best compared to groups and groups were more likely to reject the ill target than individuals. Similar changes can be seen in the inclusion model presented in chapter 4 where groups were more likely to include the tried best target and less likely to include the smart target compared to individuals. This suggests that when considering literature on bullying or exclusion in children, group behaviour should be considered as it may change the target of exclusion although not necessarily the proclivity of exclusion.

The resource allocation study also demonstrates support for the developmental trends in moral reasoning; all age groups were shown to make choices that reflected social conventional reasoning (preferring the smart target and rejecting the sick target) but the eldest age group did this significantly more than the other two age groups. This supports the Social Domain Theory of moral reasoning (Smetana, 2006) that different types of moral reasoning are available at an earlier age but that the emphasis on which type of reasoning to use changes with age.

Introducing the intergroup context into distributive justice attempted to bring together the two literatures and further the work by Vaughan et al., (1981) who found high levels of

ingroup bias with no age differences. The intergroup study presented in this thesis attempted to further this work, introducing a wider range of ages and scenarios. Similarly to Vaughan et al's., study, intergroup contexts seemed to impact on all age groups in the same way suggesting a sensitivity toward intergroup scenarios from as young as 6-years-old. The eldest age group however were most affected giving fewer sweets to others than the other age groups.

Strengths and Limitations

The studies presented in the thesis are some of the first looking at intragroup processes in children with the view of using the findings to further research and understand group processes in adults. Due to the novelty of the research, there was limited methodology to use as a reference when conducting these studies so a lot of methodology used was developed from scratch. This involved using innovative ways of including multiple studies within a single testing session, for example using brainstorming tasks to strengthen group identity before asking children to make a group decision. This enabled me to improve the quality of data I collected and also meant I was able to collect the large amounts of data needed for the group analysis of the data.

A further strength of the thesis is that it has demonstrated the importance of asking questions about children's intragroup processes. It has shown that these processes cannot be assumed to be similar to that of adults and that there is a lot we still don't know about children's social experiences. Furthermore, it has highlighted new avenues of research and has provided the foundations for further work into the areas of children's decision making and group productivity. It has also demonstrated that there may be a need for specific intragroup theories depending on the behaviour being studied. Overall, no clear developmental pattern of behaviour presented itself across the decision making and

productivity studies. Whilst intragroup processes still seemed to affect older children's decision making, it had no impact on their productivity in groups. This suggests that rather than developing an overarching theory of children's intragroup processes, separate theories focussing on specific areas may best capture children's behaviour.

As studies using groups of children are relatively rare and the areas studied in this thesis are some of the first of their kind, some methodological flaws did arise throughout when attempt to collect and analyse the data. When attempting to run an SDS analysis on the decision making data collected for Study 1 for example, it was noted that the type of decision making scenario used did not have enough variability to be able to tell apart different decision rules. Additionally, the use of three-person groups meant that the full explanatory power of the model was not used. Another problem to address is the disruptive nature of the data collection. As children needed to be spoken to both in a group and then individually, the time taken out of the classroom was significant. Added to that the disruption of losing at times single children and then multiple children at once, the impact of conducting this research on the school day was significant despite actions taken to reduce this impact. These actions additionally impacted on the amount and type of data that could be collected.

Due to the difficult nature of accessing children on a large scale to conduct research, the studies were designed in such a way that data for multiple studies could be collected at once. This meant that the larger numbers needed for group data could be more easily obtained in the period of time given to complete this work. As lowering the disruption for the schools was key in the researcher's mind, some variables that would have been interesting to include were removed in an attempt to shorten the procedure and encourage more schools to get involved. Variables such as a measure of cognitive development, working memory, and so on, would have been good to include to observe their potential correlations and explanatory

power directly. A compromise had to be made however, and it was decided to cut these measures given the strong literature already in place on these aspects of child development and so their application to the current studies were only inferred.

As there is hardly any previous research to build upon, this thesis chose to look at two different types of decision making tasks, as well as a task looking into the productivity of groups which may be considered a little broad. Although there were strong theoretical arguments for the predictions and ideas put forward, I could not be certain what we would find, so decided to follow a more exploratory approach with the intention on building more detailed pictures as part of later post doctorial work. The studies presented here do not hold a complete picture of the processes detailed and nor was its intention; instead, what was hoped was to establish methodology in these areas and elicit an interest in the topic more broadly by demonstrating what could be done and found.

Another limitation of the thesis is that a lot of the methodology was developed for the purpose of these studies as adult measures typically used in social psychology were considered too advanced for children. This means that the measures do not have the same kind of reliability or validity seen in more established measures that can be gained through repeat testing. This also poses a problem when attempting to compare these findings to the adult literature; are the decision and brainstorming scenarios presented to children here really the equivalent of the types of scenarios that are presented to adult populations? It wouldn't be suitable to give children adult scenarios or adults children scenarios as these would produce ceiling and floor effects so any measures taken from social psychology do have to be adapted.

It should also be noted that in the decision making studies, the decisions children were involved in did not directly impact them. At no point were they going to be receiving the sweets that were shared nor be punished or rewarded for getting the correct answer on the

cumulative estimation task. As there were no ramifications for the children, they could have been more generous with their sharing behaviour or less vigilant when attempting to decide a final answer in the estimation task meaning the behaviour recorded here may not be an accurate reflection of what would happen in real world situations. Due to the financial restraints of the thesis and problems in giving children sweets (allergies, healthy eating and so on) no real rewards were given to the children which is something that would be changed in future studies. Anyone attempting to look into this topic should consider adding this to their research budget to make their studies more applicable.

It is also important to consider including adult samples when carrying out this type of data collection. By including adult groups, direct comparisons can be made in the findings ruling out any bias the individual researcher may have imposed on participants or through the methodology. Although materials would need to be adjusted to reflect the participants' age, the way the study is introduced and the procedure enacted would be the same controlling for as many potential differences as possible when comparing across different research.

At times it was hard to get schools on board, especially with the nature of the data collection this thesis undertook and this is a problem that should be addressed by all developmental psychologists. For schools to take the time to allow us to work with their children and use their facilities, more standardised forms of reciprocation should be introduced across departments not just for members of staff but also student researchers. Universities have access to a lot of resources that could be of use to schools, such as up-to-date knowledge on child development and educational literature which may be of benefit to teachers, expertise in specific areas of science which could be worked into sessions and given to children directly. For secondary schools (which often have colleges attached) UCAS

sessions could be offered or expert talks given to young people to educate them on subject and career choices.

Future research

Children's intragroup decision making processes need to be investigated further using a wider variety of decision making scenarios to give clearer understanding about what happens in groups. Recordings of group discussions would be important to look at to gain an idea of the content of discussion rather than simply focussing on the outcome. In addition to this more developmental variables should be tested within each experiment so that direct relationships between observed behaviour and developmental factors can be explained.

Further attempts to use SDS models on groups of children should also be considered as the potential data from this research could be invaluable. To ensure a methodological design that would work with a SDS analysis, the scenario given to children could be similar to jury decision making, an area SDS has been used extensively in (Davis, 1973; Stasser, 1999). Children could be presented with an ambiguous scenario where X may have stolen cookies for example and then be asked whether they think X is guilty or not guilty. Using such a similar paradigm to those used with adults again lends the data to more direct comparisons across these two groups.

Research may also want to look at using a task that is cognitively harder than brainstorming for children to see if benefits of group work still drop off at 12-14-years or whether, by increasing the complexity of the task, the older age groups still have cognitive benefits. This may also help pick apart social and cognitive processes- if eldest age group do still benefit, it suggests social factors are less of an issue. If they do not, it would seem that despite the potential cognitive gains, social factors too are important. Alternatively, a different brainstorming task could be used. The same task was used throughout the

experiments in the thesis to maintain consistency but by changing the topic to one with more of a problem solving nature might be more applicable to the research conducted with adults which usually have a problem solving element to them. Asking children for example of 'ways that you could improve your school' have problem solving elements to it but is a topic that is relevant to children of any age group.

Future studies on brainstorming should also develop a scale that measures aspects of evaluation apprehension and production blocking. The development of a scale that thoroughly measures all of the theorised aspects of both phenomena would lead to a more reliable and valid measure of these constructs that could be applied to both adults and children alike. Being able to compare these two populations directly would mean that researchers could be more confident in their findings on any differences found across adults and children rather than the differences potentially being explained by methodology.

In the thesis intragroup and intergroup effects were studied separately from one another but it would be interesting to look at how intragroup scenarios affect the decisions children make on intergroup contexts. The thesis has already demonstrated the impact both intra and intergroup scenarios have independently of each other on children's decision making but looking at how they work together could prove both useful and interesting. Using scenarios that look at exclusion more directly would also be an important development from the work presented here. Although rejection and inclusion were looked at when analysing the data, the scenarios the children were asked to consider were not overtly about these behaviours. Investigating exclusion more explicitly in these circumstances could provide useful insight into how intragroups effect exclusion decisions which could further inform intervention strategies.

The application of developmental studies to other areas of social psychology is also important; the hidden profile effect was recently studied by Gummerum et al. (2014), but the study and ones presented in the thesis could be improved. Gummerum and colleagues only considered children at ages 7- and 9-years meaning a clear developmental pattern as to how the hidden profile changes could not be investigated thoroughly. Other areas for potential investigation include leadership and leadership deviance, production loss using different tasks, research looking at extremity in groups (aspects such as group polarisation and risky decision making) or at individual motivation in group tasks. Given the vast amount of literature in social psychology on intragroup processes, the potential for new research is ubiquitous and given initial findings presented so far in the thesis and in the literature, potentially very fruitful.

Final Thoughts

The aim of this thesis was to investigate the intragroup effects on children in decision making and brainstorming tasks and to highlight the value of researching intragroup processes in children. Intragroup research can not only inform developmental literature but also provide supporting or contrasting evidence for theories of group behaviour in social psychology. Ensuring that psychologists fully understand children's social experiences means that researchers must consider the impact of intragroup processes and how these can affect children.

The empirical work in the thesis has demonstrated both intergroup and intragroup effects on children's decision making and performance. When put into groups, children choose different targets to include and exclude using resource allocation, opting to include targets who demonstrate more socially beneficial behaviour than individuals. Groups are also more likely to exclude targets who threaten the group productivity (the ill target) even though

the target in question has no control over their predicament. Intergroup contexts also affect the resource allocation of children, with children giving less to others who belong to an outgroup. Older children (12- to 13-years) are more affected by these scenarios giving fewer resources to others than any other age group.

When making decisions involving estimation tasks, intragroup processes again have an effect on children's decision making. When attempting to come to a final group answer, 12- to 13-year-olds use the mean of the group members' initial guesses whereas 6- to 7-year-olds used the SJS model when selecting their final group answer. This youngest group were also more likely to copy an individuals initial guess and selected the most popular group member's answer rather than the most capable. This seems to suggest that young children are more concerned with social factors when making decisions in a group than accuracy as if they wanted to be accurate, it would be logical to select the smartest person in the group's answer.

When looking at the impact of the group on children's productivity, it was found that unlike adults, being in a group enhances children's levels of productivity. The benefit from group work however seems to reduce for older children (12- to 14-years-old) who also report experiencing more production blocking and evaluation apprehension than other age groups. Additionally, working on brainstorming tasks in groups avoided the '4^{th} grade slump' which typically happens to children's creativity ability suggesting that group work can counter this effect.

Taken together, the findings from this thesis demonstrate the importance of investigating developmental intragroup processes both for developmental and social psychology literatures. Social psychology often assumes group processes are the same for all or at least does not consider the development of group behaviour. This thesis has

demonstrated that, when using methodology and analysis taken from social psychological literature, children's intragroup processes work differently from those of adults. It cannot be assumed therefore, that by simply testing participants of University age and above, social psychology has a clear and full picture of intragroup processes as a whole.

With regards to the developmental literature, this thesis offers new questions and areas to be further investigated within this topic. Looking at how groups of children work within themselves can further knowledge on intergroup behaviour, bullying and exclusion, how groups improve cognitive development and how social contexts impact on children's decision making. As yet, no theoretical framework exists tying together developmental factors and intragroup processes nor are there any theories as to how this behaviour may develop. It is hoped that from the work presented here, new research and theoretical development on this topic will occur.

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