Social Dilemmas: Group Discussion, Group Decision, and Demonstrability

Tim Hopthrow

Centre for the Study of Group Processes
Department of Psychology
University of Kent, Canterbury

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Memorandum

The research for this thesis was conducted at the Department of Psychology, University of Kent, whilst the author was a full-time postgraduate student receiving funding from the Economic and Social Research Council.

The theoretical and empirical work presented within the thesis is the independent work of the author. Intellectual debts are acknowledged within the text and referenced. The studies reported in the thesis were conducted with limited practical and technical assistance from others.

The author has not been awarded a degree by this, or any other, university for the work included in this thesis.

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This thesis is dedicated to the memory of Lorne Hulbert. He started out on this project with me, and he inspired me to start working with social dilemmas. Sadly, he died before he could see the end.

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Abstract

A social dilemma is defined as a scenario in which a person must decide between an individually rational choice and a collectively rational choice. These two choices are referred to as the non-cooperative choice and the cooperative choice. These dilemmas are ubiquitous in society, for example, the decision to use public transport or not, recycle, or conserve energy. A robust finding in social dilemma research is that a period of group discussion prior to choice making increases cooperation. (e.g. van de Kragt, Orbell, Dawes, Braver, & Wilson 1986). Subsequent research offered two explanations for this effect. Specifically that group discussion either, elicits higher levels of group identity (Dawes, McTavish, & Shaklee, 1977), or enables a consensus process to occur (Boaus & Komorita, 1996).

This PhD research investigated the group discussion effect in more detail. Evidence from Hopthrow and Hulbert (2005) suggests that groups treat a social dilemma as a problem to be solved and, as such, groups are influenced by the demonstrability of the cooperative choice. Demonstrability refers to the level to which the correct answer to a problem can be shown to a doubting but capable group member (Laughlin, 1980). The doctoral research presented is unique and original as it uses a group problem solving methodology to gain fresh insights into factors that affect cooperation in social dilemmas. This thesis presents four experiments exploring group level phenomena, measuring cooperative choice by means of six-person face-to-face groups playing a prisoner's dilemma game and one experiment measuring the impressions and understanding of individuals (meta-cognitions) when asked about group level phenomena (and associated pilot work). The main aim of the thesis is to outline the previously neglected link between the well-defined processes of group problem solving and the processes occurring when groups discuss a social dilemma. Moreover, the thesis examines in detail the concept of demonstrability and the impact of a cooperative group decision upon cooperation in social dilemmas.

Throughout the thesis participants were given a social dilemma and asked for their preference for cooperation or non-cooperation before they were exposed to a group context. This enabled the measurement of the effect of group processes on individual choice making. Strong support was found for the consensus model of the group discussion effect. Groups that did not make a group decision did not show the group discussion effect unless exposed to decision imitating voting. Moreover, the impact of demonstrability on this process is moderately robust. High demonstrability was shown to protect the group from a composition of entirely non-cooperative group members, in that groups became cooperative. These important findings specify more closely the mechanisms driving the group discussion effect. They also impact on the way work-groups should be organised for maximum cooperation. A consistent theme throughout the thesis was that demonstrability had no effect upon individual pre-discussion choices even when participants were asked to imagine the way they would behave in the context of a group discussion. Evidence from the final experiment of the thesis suggests that this process is moderated by participants' level of meta-cognition of group process. Moreover, people may be more likely to be able to predict potential group process in a dilemma that is less abstract. The meta-cognition findings suggest demonstrability does not merely change the attractiveness of the cooperative payoff as participants indicate no awareness of the differences between the two types of dilemma. Continued exploration of meta-cognitive processes on real-life social dilemmas would allow the development of solutions to large scale dilemmas.

Thesis Overview

Chapter 1 explains in detail the features of a social dilemma and the structural mechanisms that govern it operation. It provides a broad based review of current social dilemma literature and the basic principles behind group problem solving. Chapter 1 identifies that participants may view a social dilemma as a problem to be solved. This sheds a new light upon the finding that group discussion increases cooperation. Therefore a link is possible between group problem solving and mixed motive research. This PhD research aimed to investigate the group discussion effect in more detail. Evidence from Hopthrow and Hulbert (2005) suggests that groups treat a social dilemma as a problem to be solved and as such groups are influenced by how demonstrability of the cooperative choice. This thesis aims to outline in more detail the previously neglected link between the processes involved in group problem solving and the processes occurring when groups are discussing a social dilemma. Moreover the thesis examines in more detail the concept of demonstrability (Laughlin, 1980) and the impact of a cooperative group decision upon cooperative choice in a social dilemma.

The thesis presents four experiments exploring group level phenomena. Three experiments measured cooperative choice by means of six person groups playing a prisoner's dilemma game, one experiment measured the impressions and understanding of individuals when asked about group level phenomena and one pilot study that explored the subjective impressions of participants regarding the main factors in the thesis.

Study1 was a pilot study designed to determine whether participants felt that the factors we proposed to study in the thesis would be relevant and important. Using

a questionnaire asking forty one people for their subjective expectations of various factors when playing a dilemma, we found support for our variables of discussion, demonstrability and voting.

Study 2, was designed as an extension and test of the demonstrability hypothesis. Two hundred and eighty one participants were asked to play a prisoner's dilemma game. The demonstrability of the cooperative choice in this game was either low or high depending on condition. After being instructed in the dilemma participants were assigned to groups based upon their choice preference. Groups were formed consisting entirely of participants that preferred the non-cooperative choice or entirely of participants that preferred the cooperative choice. Participants were then asked to discuss the dilemma and reach a group decision before making their individual choice. The results indicated that a dilemma high in demonstrability can to some extent protect a group from its composition. That is there was no difference in the level of cooperative choice displayed by group members in the high demonstrability conditions regardless of their initial composition. In low demonstrability there was significantly more cooperative choice for groups consisting members that initially preferred the cooperative choice. These findings imply that high demonstrability groups are undergoing a group process that enables non-cooperators to change their opinion.

Study 3 was designed to test the assertion that the group discussion effect is driven by a cooperative group decisions rather than an under defined discussion process. Two hundred and Forty one participants were randomly assigned to 6-person face-to-face groups and presented with either a high or low demonstrability dilemma. Groups were instructed in one of three discussion styles. No discussion, discussion only in which they were instructed to discuss the dilemma but <u>not</u> to make a group

decision, or they were instructed to discuss the dilemma and decide as to the best course of action to take. Group members were then asked to make their individual choice. After leaving the group, participants were asked for their preference on the dilemma again to determine the level to which they had changed their opinion as to the best way to choose. This experiment provided evidence that the group discussion effect stems from a group decision (cooperative). This cooperative group decision was shown to have a lasting positive impact upon the choices of the participants.

Study 4 was designed to explore possible limitations to the positive effects of group decision, and ask can its benefits be replicated in another way. Study 4 therefore, examined the effect of informational processes on the findings of Study 3 by manipulating voting style. Two hundred and fifty participants were formed into 6-person face to face groups and asked to play an iterated prisoner's dilemma game. Two factors were manipulated, the discussion style factor found in Study 3 and voting style. Participants were asked during each trial of the dilemma too vote on how they intended to choose. This vote was either anonymous or not. Study 4 found that the group decision effect could be replicated by increased information in discussion only groups, however in groups that made a decision it could be attenuated by increased information.

Over the course of the thesis no effect of demonstrability was found on the choices made by individuals before they had the opportunity for group interaction. This raised the question whether participants have any meta-cognition of the group process involved in discussing a dilemma.

Study 5 was an individual based study and examines this issue in more detail. Eighty one participants were asked to imagine a group based dilemma and answer questions on how the viewed the processes involved and whether they would choose

cooperatively or non-cooperatively. Study 5 finds evidence to support the idea that there are differences in choice making depending on a person's meta-cognition of the dilemma and that this meta-cognition can be improved.

Chapter 7 outlines the main theoretical and empirical questions of the thesis. It summarises the results according to the main factors manipulated or measured over the course of the thesis. The findings of the studies conducted over the course of this thesis provide support for the view that the group discussion effect (Caldwell, 1976) can be explained in terms of a group decision. This suggests that groups view a dilemma as a problem to be solved and indeed the results of Study 2 indicate that this is the case. Evidence indicates that participants are open to changing their choice if the correct choice can be demonstrated to them. Evidence also indicates that if participants do solve the problem of the dilemma then they are likely undergo lasting opinion change as to the correct answer. However group decision should not be viewed upon as a panacea. Evidence from Study 4 indicates that if given too much information participants could become exploitative. The final study of the thesis begins a promising line of research looking at how we can use the findings from our group based studies to improve cooperative choice for individuals that do not directly interact with one another. Future research would benefit from examining dilemmas in the context of this thesis that have greater real-world validity.

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Chapter 1: Theoretical approaches to Social Dilemmas and Group Problem Solving

Summary

The first chapter of the thesis provides a thorough background into social dilemmas. We start by describing social dilemmas through real-world examples and we outline the empirical nature of social dilemmas. Chapter 1 then goes on to explore some relevant research areas into social dilemmas. The various theoretical elements that form the basis for the experimental studies within this thesis are critically discussed. We also outline the principle factors to be investigated within this thesis and provide the background necessary to put the research into the framework of current research and developments.

Social Dilemmas

In a newspaper article about a drought in the UK and the consequent hose pipe ban, enforced so as to reduce water consumption, The Times talks of 'self appointed water vigilantes' members of the public that actively seek out people using hosepipes in order to report them to the relevant authority. One of these 'water vigilantes' gave a direct quote (Iredale & Leake, 2006):

> 'These people that flout the ban are immoral because if everyone did it, it would make the whole situation a whole lot worse'

This is an example of a real world social dilemma, and whether the 'water vigilante' knows it or not she has a strong grasp on two interesting elements of a social dilemma: that everyone is worse of if they all are non-cooperative than if they are all cooperative and the morality of the choices made.

Social dilemmas are a useful tool that researchers can use to examine factors involving individual and group interaction. Over the next two sections the concept of social dilemmas will be introduced, along with some of the fundamental parameters that govern their use. We will introduce the concepts of the index of cooperation, and fear and greed in the realm of social dilemmas because of their importance in the derivation of some of the fundamental theory for this thesis.

Imagine a situation in which you have to make a decision about whether to recycle or not. The decision to recycle carries with it some inherent costs. For example, while many people have general refuse collections direct from their door, they do not for recycling and, therefore, would have to make several time consuming and cost inducing actions that they may not normally have to. These could include separating recyclable materials and taking them to the local recycling centre. However, the benefit of recycling is that the amount of landfill waste is reduced and the drain on natural resources reduced, thereby reducing the environmental impact of our waste production. On the other hand individuals may choose to put all of their waste into general refuse, which while beneficial to the individual because of the immediate cost savings, is detrimental in the long run and to individuals as a group, because the aggregate of all actions would incur a significant environmental penalty.

This scenario is a type of social dilemma. A social dilemma is defined as a situation whereby an individual choosing a non-cooperative choice will always be better off than one choosing a cooperative choice. But, as a group individuals are all worse off if they all choose to be non-cooperative than if they choose to be

cooperative (Dawes, 1980). People encounter many varieties of social dilemmas in everyday life. These range from long term and large scale resource dilemmas such as the recycling example above, to dilemmas with far fewer actors that have more immediate and obvious costs linked to the mutually non-cooperative outcome and likewise more immediate rewards linked to the individually non-cooperative outcome. An example in an organisational setting would be of a work group assigned a particular task. The task's outcome is not reliant on everybody in the work group contributing to the solution of the task. Therefore, the individually rational choice would be to contribute nothing to the completion of the task because the individual would still benefit from the rewards to the group on task completion. However, if no individual contributed to the group output then the task would not be completed and all would suffer.

Looking at these scenarios it is evident that their solution would benefit from an examination of the factors that would promote individuals to move from the individually rational choice to that of pareto-optimality (mutual cooperation)[1]. If these factors could be specified more closely then researchers would be able to advise the groups how to increase the cooperation levels and improve task performance. Dawes' (1980) criteria along with other important factors such as the index of cooperation (which will be defined in more detail later in this chapter), K (Rapoport, 1967), and K' (Komorita, 1976) enable the researcher to turn the real world dilemmas above into matrices of points payoffs that can be easily controlled and tested in the laboratory and give the researcher a versatile tool for examining cooperation in group settings.

[1] These two ideas are not always the same outcome for groups, but in the case of a social dilemma, they are.

Table 1.1: Example Experimental Social Dilemma

Number of People in the Group choosing J				
Your Choice	0	1	2	3
J	n/a	0	8	16
P	10	18	26	n/a

Table 1.1 is an example of a 3 person, laboratory social dilemma with J being the cooperative choice and P being the non-cooperative choice. Table 1.1 shows the number of points that a group member will receive as a function of the choice that they make (rows) and as a function of the number of the total number of people in the group that choose J (columns). For example, if a group member chose P and all the other group members chose J that person would receive 26 points. Likewise, if a group member chose P and no other group members chose J (i.e. all group members chose P) then that group member would receive 10 points. Therefore, we can see that the number of points that a person receives depends not only on their choice but the choices that the other group members make. Additionally, as Dawes (1980) outlines, there is a conflict between collective interest and personal interest, that is, as an individual you are always better off if you choose P but as a group everyone is better off if everyone chooses J than if everyone chooses P.

Current Research in Social Dilemmas

The term social dilemma covers a number of different games that are used as measures of cooperation. Three of the most common forms of social dilemmas used are the prisoner's dilemma game, the public good game, and the social trap. All three games measure levels of cooperative choice, however, in the public good games this level of cooperative choice is more of a continuous variable. The prisoner's dilemma

game limits participants to a choice between two options, cooperate or not cooperate. The outcome depends upon both their choice and the choice of the other participants. In the public good games participants are given an amount of money and told they may spend it or hold on to it. If a certain level of investment is reached every one benefits from the public good. Komorita and Parks (1996) point out that public goods games can be summarised in terms of rewards, in that for a small immediate negative outcome they provide a larger positive outcome in the longer term. Social traps are similar to public goods but differ in the reward structure. In that they offer a small gain to the individual in the short term in return for a much larger loss to the group in the long term. An example that emphasises the payoffs to an individual would be smoking, that is for a small immediate reward (having a cigarette) there is a much more serious negative long term consequence (e.g. contracting a smoking related disease). The negative group payoff in this case, at least in the case of the UK, is higher demand upon the public healthcare system. The problem for people trying to solve a social trap is that despite its serious consequences the negative outcome is often so far removed in time from the behaviour that people are unable to make their decision based on a rational cost benefit analysis.

Public good games are very useful as a research tool because they have a high level of external validity; but it could be argued that there is a level of bias in built into the system. That is if a person does not cooperate they do not contribute to the public good. However, it can be argued that even a small level of contribution is a *level* of cooperative choice and, therefore, the measure is of the level of cooperation only. They do not measure so precisely the level of *non*-cooperation.

Komorita and Parks(1996) outline the basic principle of social dilemma research namely "how can we encourage people to be more cooperative?" (p. IX). If we compare the accounts of the current directions of social dilemma research between those written at different times in the last 25 years we can see some common themes emerging, for example, communication (Caldwell, 1976), strategy (Axelrod, 1984), and structural solutions (Van Vugt, 1999), but also a change in focus.

Dynamics

Suleimen, Budescu, Fischer, and Messick (2004) outline four main areas of interest in current social dilemma research. The first area covers the dynamic properties of a dilemma such as movement. This type of research often examines consequences of behavioural changes, or the application of different rules to very large groups that are comparable to the size of dilemma that we would commonly find at a community or society level. The problem for researchers is that it is often not practical to work with such large groups and, therefore, much of this work is performed using computer simulations (Suleiman et al., 2004). These simulations, while not entirely new in social dilemma research (note the influential work of Axelrod, 1984), have become increasingly popular in social dilemma research within social psychology in recent years (Brewer & Schneider, 1999). However, Brewer and Schneider (1999) are careful to highlight that these methods do not supersede but compliment more traditional methods of conducting social dilemma research. That is, the simulations can explain phenomenon on a scale not possible in the lab but can be very useful in hypothesis generation or in identifying new variables to study (Brewer & Schneider, 1999).

Indeed, Davis (1973) argues that thought experiments enable us to save valuable lab resources by identifying areas of study that will not produce interesting results. For instance, researchers may feel that they need to examine group size as a variable in a certain context. However, a thought experiment might indicate that group size would not have an effect, and thereby saves time and participant resources for a variable of greater expected utility. Indeed some researchers argue (e.g. Davis, 1973) that in fact it is unethical to use a participant's time for a purpose that has an outcome that is unlikely to have much utility. As a consequence studies based on simulations are useful in many areas of psychology (e.g. Latané, 1996) not just in the field of social dilemma research.

In the simulations used to study the dynamic aspects of social dilemmas certain simple rules are specified. These include the specification of the dilemma and the experimental factor of interest and then the simulated actors interact over many iterations. The investigator could compare the impact upon a large scale dilemma of various structural solutions. For example, if the government wanted to encourage greater adoption of green technology such as personal wind turbines (fitted to a private house to reduce electricity drawn from the national grid) they may implement an incentive scheme. Flache (2004) explains that the incentive scheme may only need a finite life to encourage a critical mass of adopters. Initially people need financial incentives to adopt the technology but then after a certain number of people adopt it the mere fact that others are adopting the technology becomes sufficient. The types of simulations outlined here can help us to determine the proportion of people that need to be persuaded with incentives before the 'critical mass' is reached.

One example of this work is Flache (2004) who used a version of cellular automata (Hegselman & Flache, 1998). This enables the researcher to simulate a community of people in which people reside together in adjacent spaces and that these spaces all have some degree of overlap so influence from a person or neighbourhood can spread via contact across the system. In the case of Flache (2004) this system is used to model an environmental dilemma. Air travel is typical of this type of dilemma. Initially the payoffs for people using cheap air travel are high either in terms of business use or for leisure purposes. The consequences are limited to noise and air pollution for those people living close by the flight paths. However, in the longer term the consequences of the increased air pollution could be far ranging, for example, contribution of aircraft emissions to sea level change.

One of the noticeable attributes of an environmental dilemma of this size is that individual participants are often highly distant from the consequences either in time or space. In addition, the size of the dilemma means that it is more difficult for an individual to see or benefit from the effects of their cooperative behaviour until there is a substantial body of cooperative behaviour (Flache, 2004). Flache (2004) found evidence that reducing people's expectation of others' rates of cooperation can improve cooperative behaviour. He also found that a strong cluster/s of cooperative behaviour can significantly improve cooperative behaviour across the whole environment. These findings, while only simulated, can help policy makers understand their broad aims more clearly. If we re-examine the case of wind turbines, Flache's (2004) findings suggest that a policy maker would gain greater acceptance of the technology as a function of the money spent if the incentives were concentrated in localised pockets rather than being countrywide.

Individual Differences

The second area Suleiman et al. (2004) outline is the effect of individual differences upon dilemma behaviour, for example, risk preference (van Assen & Snijders, 2004; Parks, 2004) or trust (Kramer, 1998). Parks (2004) argues that individual differences are very important in social dilemmas, as structural solutions such as changing the payoff structure (Hopthrow & Hulbert, 2005; Komorita, 1976; Rapoport, 1967) or imposing a leader (De Cremer & Van Vugt, 2002) on to a group will not be able to have a universal effect, some of the differences in responding can only be down to the way different people approach a dilemma. Parks (2004) argues that it is important to understand the individual difference factors that are most important and to understand how they interact with structural solutions to promote increased rates of cooperative choice.

Social value orientation (SVO) is the aspect of individual differences probably most studied at the moment (McClintock, 1978; van Lange, De Bruin, Otten, & Joireman, 1997; van Lange, 2004). SVO is often measured by presenting participants with a number of decomposed games that measure participants' attraction to three broad orientations: pro-social, individualist, and competitor (van Lange et al., 1997).

Pro-social people tend to favour the cooperative choice but also favour equality between participants. Individualists tend to seek the highest outcome for themselves without regard for the outcomes of the other participants. People with a competitive orientation are likely to want to maximise their possible outcome but also want to gain more relative to other participants. Studies indicate that pro-socials have a tendency towards the cooperative choice and individualists and competitors have a

tendency towards the non-cooperative choice (van Lange & Kuhlman, 1994). As a result of behavioural trends of people with these orientations and the fact that it is often difficult to distinguish between competitors and individualists, people can be classified on just two dimensions; pro-social and pro-self (i.e. individualists and competitors are classified under the same orientation - that of pro-self).

Social value orientation gives us an indication of an individual's preferences separate to any structural aspects of the dilemma or situation that might be influencing choice making. SVO can also be useful in predicting behaviour in other aspects of social dilemma over and above the basic dependent variable of cooperative choice. For example, SVO predicts whether a group playing a social dilemma would prefer a leader or not and of what style that leadership should take (De Cremer, 2000).

Intergroup Relations

The third area that Suleiman et al. (2004) outline refers to intergroup social dilemmas, in which the whole group takes on the role of an individual in a normal social dilemma. Each group decides whether to choose cooperatively or not, the payoffs are based on these group decisions. Intergroup dilemmas display significant intuitive appeal due to their highly applicable nature. Particularly in politics and international relations, individuals are often faced with intergroup dilemmas ranging from the simple, such as a local council deciding upon resource allocation to a local park, to the highly complex, such as decision making at the United Nations. These highly complex dilemmas involve more than just a basic group level difference of belonging to a different group that does not vary on any major factor, in that factors such as cultural differences also play a part. The classic work that has driven much

work in this field is the study of the individual-group discontinuity effect (Insko et al., 1987). This effect refers to the finding that groups show lower levels of cooperative choice when playing against one another than when individuals are playing against one another in a social dilemma. The paradigm is designed so that two groups play the same prisoner's dilemma as two individuals. Therefore, the group must make a decision as to whether they are going to cooperate or not with the other group and it is this group decision that indicates the payoffs for the individual group members.

The individual-group discontinuity effect is remarkably stable across different conditions. It is not affected by gender (McCallum et al., 1985), number of trials (Schopler et al., 1993), or size of outcomes (Schopler et al., 1991). The effect is not solely constrained by group decision; participants from two groups playing against one another also displayed the discontinuity effect when they had control over individual choices (Insko et al., 1994).

Uncertainty

The fourth and final area that Suleiman et al. (2004) refer to is the effect of uncertainty on cooperative choice in social dilemmas. According to Messick, Allison, and Samuelson (1988) uncertainty in social dilemmas can be regarded as falling into two categories. Firstly, participants may be uncertain about the dilemma, for example, in a resource dilemma (a real world example is fishing stocks) participants may be unsure about the size of the resource - this is referred to as environmental uncertainty. The second category is called social uncertainty. Messick et al. (1988) term the uncertainty an individual may experience about the choices that their other group members might make as social uncertainty. A large proportion of social dilemma

research is performed under conditions of social uncertainty (van Dijk, Wit, Wilke, & Budescu, 2004).

This thesis will be predominately concerned with examining social dilemmas and the behaviour of individuals and groups under conditions of social uncertainty, in that participants will be unsure as to the choices of the other group members. The level of uncertainty that people experience will be manipulated as part of the programme of studies within this thesis. For example, having a group discussion may reduce uncertainty because it may give participants the opportunity to gather information about the preferences and choices of other group members. Uncertainty may not always have a beneficial effect on a group playing a dilemma (van Dijk et al., 2004). If participants were to find out that the other group members were exploiting them then cooperative choice making may drop further. In that case, the group as a whole might have been better off at a group level with continued uncertainty between group members.

Van Dijk and Wilke (1999) re-examined communication in public goods dilemmas in the context of social uncertainty. They studied the properties of promises that may be made in a group discussion setting. Specifically conditional promising, that is when a participant undertakes to contribute to the public good on the condition that the other participant(s) also contribute(s) to it. In the context of their study these conditional commitments were unbreakable in that if the conditions were met then the contribution to the public good would be given.

Van Dijk and Wilke (1994) proposed the idea that the motivation of the participants in a particular group is influenced by time. Participants take into account the previous acts of the other group members when they are assessing the motivation behind the conditional contribution statements (see also Parks, Sanna, & Posey, 2003). They argue, based on the work of Schelling (1960), that promise-making may in effect alter the payoff structure of the dilemma, one possible consequence (but not the only one) is that participants may be more strongly drawn to making the cooperative choice. In line with the idea that reducing uncertainty may not only increase cooperative behaviour but also reduce it, Van Dijk and Wilke (1994) found that participants contributed less when told that another person had contributed to the public good versus not contributed to the public good. They conclude the paper with a discussion of the motivations of participants and the circumstances in which participants are motivated by fairness or self-interest (they note that in this context self-interest does not automatically indicate non-cooperation). The study supported the view that, of the two, the fairness motivation seemed to be of most importance to participants. Whilst they discuss the mechanism by which the dilemma in this scenario is structurally changed they do not study this in more detail. They instead concentrate upon the motivations and perceptions of the group members. It is interesting to note here though that they believe that a group level factor may impact the structure of a social dilemma. Later in this thesis we will be looking in more detail at an alternative group level factor, namely demonstrability.

Other Structural Features – Leadership and Sanctioning

These four areas outlined above give us a useful overview of the current state of social dilemma research. However, not all research will fit into one of these four

areas. More specifically some structural aspects of the dilemma require further considerations. Messick and Brewer (1983) were in favour of classifying social dilemmas research into two broad areas; individual differences and structural solutions. One fruitful area of research looking at a possible structural solution to social dilemmas is that of group leadership. Two main questions arise when looking at the role of leadership. Firstly, does having a leader affect rates of cooperative choice, if so does the type of leader make a difference? Secondly, do the other members of the dilemma respond positively to the leader (i.e. do they want a leader?)? This second question is important because it helps explain whether a group is likely to spontaneously adopt a leader to help them solve the dilemma.

These questions are examined by the research of, for example, De Cremer, (2000), Van Vugt and De Cremer (1999), and Messick et al. (1983). Messick et al. (1983) found that when a group is taking part in a public goods dilemma they are more likely to want to appoint a leader to assist with managing the resource when the management of the resource is failing (i.e. when the group is failing in its management without a leader). The type of leader adopted in this work was of an autocratic style; prescribing the actions of the other group members. However, according to Van Vugt and De Cremer (1999), there are many examples in which individuals in similar contexts would rather maintain some level of individual control over their choice making.

Van Vugt and De Cremer (1999) extended the work of Messick et al. (1983) by examining the type of leader, the method of appointment, and the source of the leader. They found support for Messick et al. (1983) in that participants preferred a

leader when the public good was not being met (i.e. the group were not contributing a sufficient amount for the public good to pay out). They also found that groups preferred a democratic leader who was elected (rather than appointed) from within the group. Of note here is that these preferences may be due to cultural norms and, therefore, may differ between different nation groups. A follow up study found that contrary to the preferences of the group members an autocratic leader was in fact most likely to increase contributions towards the public good. However, they found that this difference in contributions under the two different leaders disappeared when the group members were highly identified with their group.

So we can see that in answer to our two questions, groups do respond well to leaders in terms of increases in cooperative choice. However, they are more favourably disposed to a democratic rather than an autocratic leader, despite the fact that this latter type of leader is more likely to increase contributions and, therefore, payouts to and from the public good.

De Cremer (2000) examined the motives behind selecting a group leader in a social dilemma in more detail. He hypothesised that the desire to adopt a leader came more from a pro-social orientation than a desire to maximise self-interest. In this study participants were asked to imagine that they would be taking part in a public goods dilemma as part of a group of six people. They were asked whether they would contribute to the public good or not and then given false feedback regarding the success of their contribution. He found support for the previous findings; participants preferred to have leader when the public good was not being successfully managed. He also found that pro-socials preferred to adopt a leader over pro-selfs under

conditions of group failure. These findings indicate the importance of individual differences, or at least pre-existing preferences, in participants' response to, or willingness to adopt, a structural solution to a social dilemma.

The most successful method of leadership is autocratic; this form of leadership can often involve some form of sanctioning system i.e. a form of punishment given to a group member that does not comply with the wishes of the leader. Research on sanctioning is popular at the current time, particularly as there are a number of cases of sanctioning, or its failure, salient in international relations at this time. The latest being the possible threat that is perceived by some in response to the Iranian nuclear program.

Research has shown that the adoption of a sanctioning system can improve the level of cooperation in a social dilemma, when the non-cooperative choice has sanctions attached (e.g. Eek, Loukopoulos, Fujii, & Garling, 2002; Yamagishi, 1992). This would be viewed as a structural solution to the dilemma, as sanctions have the effect of altering the matrix of payoffs in the dilemma (Mulder, van Dijk, De Cremer, & Wilke, 2006). An example of a possible sanction is that if an individual wanted to make the non-cooperative choice they would have to pay a fee (Eek et al., 2002). The outcome is that with an increase in the fee the payoff structure of the dilemma changes so that it becomes less of a dilemma until such a point where it is not a dilemma at all. It would be interesting to examine the changes to the Komorita (1976) K' parameter when examining the effects of sanctioning as it allows us to determine likely levels of cooperative choice based upon the payoff matrix. Sanctioning is in effect changing the K' but by adding a cost that is external to the matrix.

Eek et al. (2002) looked at the effects of sanctioning when only a portion of the group members face sanctions. They argue that this way the payoff structure is not changed so as to violate Dawes (1980) criteria of what a dilemma is. They found a small increase in cooperative choice even when the costs of defection would be transferred to others, this was particularly noticeable for people who had a pro-social orientation. They give the example of the Greek system of traffic regulation for Athens in which cars with even numbered number plates are only allowed into the city on even numbered days and vice versa for odd numbered number plates at the threat of a large fine. This example introduces an interesting added component to the sanctioning system, namely the perceived morality of a particular choice. There is often some implied moral wrongdoing in receiving a large fine. Interestingly Tenbrunsel and Messick (1999) argue that sanctioning actually reduces participants' considerations of the moral side of the dilemma and encourages them to think of the dilemma purely in terms of mathematical payoffs which would appear to be at odds with the view that a fine comes with some form of implied moral penalty.

Mulder, et al. (2006) argue that the change away from seeing a dilemma choice as a moral one under sanctioning could have a detrimental affect upon the dilemma, or the people playing the dilemma certainly, when examined over time. They found that using a sanctioning system had the detrimental effect of reducing the level of trust group members had in the other group members. They also found that when participants initially had a large amount of trust in their fellow group members, sanctions could actually have a negative impact on levels of cooperative choice.

To more fully understand the possible detrimental effects of sanctioning we can use the insights given by Gurerk, Irlenbusch, and Rokenbach (2006). They argue that sanctioning is not necessarily the preferred choice, as there is a competitive advantage to the cooperators that have not been sanctioned over those that have been sanctioned to cooperate. In an iterated social dilemma they looked for which type of dilemma would be most successful in a given environment - a sanctioned dilemma or a non-sanctioned dilemma. They found that despite a majority preference in the first instance for a non-sanctioned dilemma over time more and more participants chose to join the sanctioned system. Eventually over 90% of participants join the sanctioned dilemma and made fully cooperative contributions to the public good. Interestingly, the mechanism described to explain this effect is very similar to the idea of the Schelling (1973) tip point. Gurerk et al. (2006) explain that at some point in the dilemma (after the 5^{th} iteration) a cooperator in the sanctioning system receives a higher payoff than a non-cooperator in the non-sanctioning system, this means that it pays to switch to being a cooperator in the sanctioning system. We will see later in this chapter that this is very similar to the ideas of Schelling (1973), in which he points out that there is a point whereby cooperators can threaten non-cooperators because if they defect the payoffs of the non-cooperators will drop significantly (i.e. cooperators can, in effect, ransom non-cooperators to cooperate).

Clearly the examples given so far indicate that the concept of leadership and the subsequent sanctioning that may come with it are somewhat context dependent in their effects upon the levels of cooperative choice displayed by individuals in dilemma groups. Generally, the use of a leader and/or a sanctioning system is seen to increase the levels of cooperative choice. These methods at least in the early stages of

a given situation are less popular with participants, however, once the benefits become clear they receive almost universal acceptance.

The literature review presented so far indicates that communication research and more specifically research examining discussion and its related group process has not been at the forefront of social dilemma research in the last decade. However, as will be explained later in this chapter, there are some aspects of discussion that remain unexplained and would benefit from renewed interest and a change of focus. Specifically, we will be examining the group discussion effect, in which participants given the opportunity to discuss a dilemma are more likely to choose cooperatively than those not able to have a discussion (e.g. Caldwell, 1976). We will also be examining this effect in more detail drawing on techniques and theoretical knowledge from the group performance/group problem solving literature (e.g. Laughlin, 1980). This will be explained in more detail later in this chapter.

Pruitt and Kimmel (1977) outlined the goal expectation hypothesis as a theory of cooperation. They argue that if a person chooses the cooperative choice it is in order to attain the target of mutual cooperation. This seems a very likely motivation for making the cooperative choice but is not the only conceivable motivation, for example, a person's social value orientation may also have a part to play that is not explained by this theory. There is a risk attached to the strategy of choosing the cooperative choice in the hope that others will, in that other players may not choose the cooperative choice and, therefore, the initial participant's goal is not fulfilled. This defection by the other player/s is potentially very damaging to the participant choosing the cooperative choice. Based on this, Pruitt and Kimmel (1977) argue that

to ensure cooperation a person must not only have the *goal* of the mutually cooperative outcome but must also have the *expectation* that the other group member/s will also make the cooperative choice.

An Index of Cooperation

Re-examining the example of whether or not to recycle, it could be argued that people within that situation could be encouraged to recycle more effectively (cooperate more) if the structure of the dilemma was changed somewhat. For instance, what would happen if recycling was made easier by collecting recyclables direct from the doorstep? Likewise what would happen if householders were given a financial incentive to recycle or a financial penalty for producing too much landfill waste? Indeed this is a topical example see http://news.bbc.co.uk/1/hi/uk/5074558.stm. This example in the news media provides evidence that policy makers are considering taxing households for the amount of landfill waste they produce, in an attempt to encourage more recycling. It could be argued that with all these possible scenarios, cooperation in the dilemma would increase with more households contributing more recycling. The situation remains a social dilemma, fulfilling Dawes (1980) criteria, but the payoff structure within it has changed to promote an increase in cooperation.

If we look at this phenomenon in terms of a laboratory social dilemma such as that shown in Table 1.1 what we are doing is changing the points values in each cell of the table relative to each other. In the case of financial incentives for recycling we are increasing the payoff for J (cooperation) while holding the payoff for P (non-cooperation) steady. In the case for landfill penalties we are reducing the payoff for P while holding the payoff for J steady. This ability to change the actual dilemma is

interesting in itself, however, if we were examining other factors that may affect cooperation rates external to the structure of the dilemma we would want to make sure that the points matrices were rationally equivalent. An example would be the study of the effect of group size (Marwell & Schmitt, 1972). In this study different matrices of points were used for different size groups, but in order to ensure that any differences were due to group size the dilemmas had to be rationally equivalent.

Rapoport (1967) defined a function K, an index of cooperation where $0 \leq K \geq 1$. The higher the value of K the more cooperative individuals playing the dilemma are likely to be as there is a greater points incentive for cooperation. Rapoport (1967) defined K as $K = \frac{C_2 - D_0}{D_1 - C_1}$ where C_2 is the value of C (the cooperative choice) when everyone chooses C, D_0 is the value of D (the non-cooperative choice) when everyone choose D. D_1 is the value of D if there is only 1 person choosing D and C_1 is the value of C if there is only one person choosing C. However, this index is restricted to 2-person dilemma games.

Komorita (1976) defined an index of cooperation K' where $0 \leq K' \geq 1$. K' is defined as $K' = \frac{C_N - D_0}{O_{max} - O_{min}}$ where C_N is the value of C when everyone is choosing C and D_0 is the value of D when everybody is choosing D. O_{max} is the maximum possible outcome i.e. the value of the D choice when everyone else is choosing C. O_{min} is the minimum possible outcome or in other words, the value of C when everyone else is choosing D. This index of cooperation is largely similar to the Rapoport K, the important difference being that K' is not confined to 2 person dilemma games but can be used as an index for dilemmas with unlimited group size.

More simply K and K' can be defined as the ratio between the group incentive to cooperate in the dilemma (as the numerator) and the combination of the group and individual incentives on the denominator. It is important to note here that the group incentive can be altered without changing the overall K value as long as the size of the denominator is altered also and vice versa.

Komorita and Parks (1996) argue that K' can be used to predict the group size effect. A good example of the group size effect in an N-person dilemma is that of Marwell and Schmitt (1972) in which they found that over a large number of trials larger groups were more likely to descend into mutual non-cooperation than smaller groups. They argued that if the Schelling (1973) K remains the same, that is the point at which if there is a coalition of players of a certain size (K) the players may as well switch from the non-cooperative choice to the cooperative choice as they will be no worse off, and indeed above that coalition size they would be better off than if they had stayed in their original position of mutual non-cooperation (see Figure 1.2 for a more detailed explanation and graphical representation). Then as group size increases the value of K' will fall, thereby decreasing the incentive for cooperation.

Komorita and Parks (1996) outline a number of explanations for this effect of group size. Marwell and Schmitt (1972) answer the question in terms of probabilities. They argue that people respond to non-cooperation with non-cooperation and that as group size increases so does the chance that the group will contain a non-cooperative member. However, Olson (1965) and Messick (1973) propose a different explanation. They argue in favour of a diffusion of responsibility model in which as group size increases so the individual's influence over the outcome reduces, and so if the group

is not showing high cooperation rates individual group members do not feel responsibility for the outcome. These ideas pertaining to group size will be revisited later in this chapter where it will be argued that in the case of groups discussing a dilemma an increase in group size should in fact enhance rates of cooperative choice making.

Group Discussion Effect

We have explored some factors so far that influence the outcomes of, and choices within, social dilemmas. However, we have not yet taken into account the effects of communication. If we look at the example of the work group it seems unlikely that they will be able to complete their task without some form of communication and indeed it seems likely that this will take the form of a face-to-face discussion. The effects of face-to-face discussion are reliable in the social dilemma literature. When group members are offered the opportunity of a period of discussion the rate of cooperation is increased (Caldwell, 1976; Rapoport, 1974; van de Kragt, Orbell, Dawes, Braver, & Wilson, 1986). This finding would appear to be fairly intuitive, however, there is some disagreement in the literature as to the underlying process behind the group discussion effect.

We will see over the course of this thesis that the work surrounding the concept of the group discussion effect is not complete, and in fact in the light of research into group problem solving and group decision making, some of the explanations given are not easily justified. This indicates that in fact the group discussion effect deserves further theoretical analysis and empirical work. From this we will see that parallels can be drawn between group problem solving and the group

discussion effect, enabling us to examine social dilemmas in the light of factors that are of interest in group problem solving research.

Explanations for the effect of group discussion fall into two broad categories (Bouas & Komorita, 1996), namely group identity and consensus explanations. The group identity explanation (Dawes, McTavish, & Shaklee, 1977) argues that a discussion group is more than a minimal group and, therefore, the interaction with the other group members will increase the members' group identity. This increase in group identity, it is argued, will increase the salience of the mutually beneficial choice (cooperative) and increase rates of cooperation.

This effect could also be explained in terms of Dawes (1980) criteria of what a participant needs to become more cooperative. The participant by entering into a period of group discussion is given the opportunity to discuss the game and arrive at a more complete understanding of the complexities involved and also ascertain some knowledge of the course of action the other members in the group are intending to take. This knowledge may come in the form of a commitment norm (Kerr & Kaufman-Gilliland, 1994). However, this process could be based more on a system of consensus and co-ordination.

If we look at the work of Bouas and Komorita (1996) we can see an examination of the processes behind the discussion effect. One explanation of the increase in cooperation found during a group discussion is that of perceived consensus. Bouas and Komorita (1996) examined different discussion conditions designed to elicit group identity only or to give participants the opportunity to discuss

their strategy within the game. Interestingly, they found that group identity alone was not sufficient to elicit high levels of cooperation. They argued that perceived consensus is the major factor in increasing levels of cooperation. Therefore, participants must expect that others will cooperate in order for a mutually cooperative strategy to emerge. Bouas and Komorita (1996) discuss the size that this consensus needs to be for it to have the effect of increasing cooperation.

Orbell, van de Kragt, and Dawes (1988) argue that the consensus needs to be unanimous to increase cooperation and in terms of Marwell and Schmitt's (1972) ideas this does seem plausible in the respect that one non-cooperator may have a disproportionately large effect on the group outcome. However, Bouas and Komorita (1996) take a less conservative view. They propose that a simple majority consensus for the cooperative choice is sufficient for the effect to be present. This line of argument holds intuitive appeal as groups in many real problem solving settings (Davis, 1973) do naturally fall into majority decision making. However, this view does not take account of two important points. Firstly, the nature of the task (as we will see later) and secondly, the nature of a social dilemma. It would be extremely rare that a group playing a social dilemma game would contain a majority of people that advocate the cooperative choice. For example, individuals that were asked for their preference before entering a group discussion in an experiment by Hopthrow and Hulbert (2001) showed only approximately 43% preferred the cooperative choice. Therefore, a majority preferred the non-cooperative choice which would mean that according to Bouas and Komorita's (1996) arguments, the group discussion effect would likely result in a *reduction* in the levels of cooperation.

Social Decision Scheme Analysis

Davis (1973) theory of social decision scheme analysis gives us the tool to quantify this effect. This theory creates predicted group choice outcomes based upon applying theoretically driven decision rules on the distribution of preferences found naturally in the sample population. Researchers with the relevant measure of individual preference in the population can test a number of theory-driven hypothesised rules against the actual observed group outcomes. Using null hypothesis testing researchers can then determine which specified models fits the actual data most completely and from there draw inferences regarding the decision processes used by the group (Davis, 1973; Stasser, 1999). From a theoretical and empirical standpoint we will see that, the outcome of the group is not just based upon the number of people in the group having a preference for a given outcome but also the nature of the task, as this determines the rule that the group will use (Laughlin, 1980). This rule may be adopted by the group either implicitly or explicitly. One major advantage of this approach is that the researcher does not need to undertake the complicated and labour intensive approach of recording and classifying spoken statements to understand the way a group makes a decision in certain contexts (Davis, 1973; Levine, 1999)

Social decision scheme analysis first identifies a number of theoretically derived decision schemes. For example 2/3rd majority or truth wins (a rule in which the group decision matches the correct answer to a problem if one member of the group knows that answer). These rules specify a given group decision based upon the distribution of individual preferences within a group. Table 1.2 shows three such decision schemes for groups deciding between option A and option B. These rules

often consist of a primary and a secondary decision scheme (e.g. majority equiprobability). In the case of a majority decision rule, the rule cannot explain what the group will decide if there is an equal split in preferences for the two options, for example, in a six person group three people advocating option A and three people advocating option B. To overcome this problem a secondary rule is specified, for example, equiprobability, this rule states that if there is an equal split in preferences the probability of one of the two outcomes over the other is 0.5. The analysis uses multinomial theorem to work out the probability of each preference distribution for a given distribution of preferences in a sample population (e.g. 55% of respondents prefer the cooperative choice over the non cooperative choice). The decision rule is then applied to give a predicted proportion of groups indicating their preference for option A over option B. This predicted outcome can be modelled against an actual outcome to make accurate estimations of the decision rule used in any particular condition.

Table 1.2: Three example social decision schemes

Distribution of individual preferences	A wins		Majority		Majority, equiprobability	
A, B	**A**	**B**	**A**	**B**	**A**	**B**
4, 0	1.0	0	1.0	0	1.0	0
3, 1	1.0	0	1.0	0	1.0	0
2, 2	1.0	0	??	??	.50	.50
1, 3	1.0	0	0	1.0	0	1.0
0, 4	0	1.0	0	1.0	0	1.0

Table 1.3 shows the results of an SDS analysis using the value found in the Hopthrow and Hulbert (2001) experiment that illustrates this decision scheme point for a 6 person group.

Table 1.3 shows that the probability that a group will make a cooperative group decision is very low if the group is using a majority for 'C' based decision rule. However, if the group is using a decision rule based on a minority of group members advocating 'C' the probability of a cooperative group decision is high. Hopthrow and Hulbert (2005) showed that a cooperative group decision elicits cooperative individual choice. Therefore, it is likely that the group discussion effect will only occur if the implicit or explicit group decision is based upon a minority for 'C' decision rule (i.e. J wins shows the highest proportion of cooperation, Table 1.3).

Table1.3: SDS simulation of group outcomes

	Proportion of people choosing cooperatively (J)	Proportion of people choosing non-cooperatively (P)
Proportion of Individual choice	0.430	0.570
Proportion of cooperative Groups		
2/3 majority-equiprobable otherwise	0.434	0.566
J supported wins (2 people in the group advocating J)	0.810	0.190
J wins (1 person in the group advocating J)	0.966	0.034

Looking at the group identity and consensus explanations of the discussion effect in social dilemmas we can envisage them at two ends of a spectrum of ideas about group process. The process implied by the group identity explanation has almost no assumptions about individuals' opinions and ideas. Instead a person's actual opinion is assumed to be subservient to the group process involved, rather group identity causes the person to act for the mutually cooperative solution. On the other hand, the perceived consensus explanation appears to focus too heavily on the importance of the individual's preference, supposing a consensus develops without attempting to explain how this consensus is reached. Moreover, the explanation does not explain why the consensus is for all to choose cooperatively, rather than not.

Two questions remain to be answered in respect to the group discussion effect. Firstly, if the effect is due to some form of consensus process why would it be for the cooperative choice rather than, more intuitively, the dominant or non-cooperative choice? This is interesting because if the consensus were for the non-cooperative choice then we would expect to see a decrease in cooperative choices post-discussion. Secondly, how can we explain the fact that cooperation increases despite the argument that a majority of cooperative choosers is needed for the effect to be present? This is especially difficult to explain because, as we have seen, a majority of pre-choice cooperators is unlikely. Rather, we would expect to see an increase in cooperation under group discussion when a minority of group members advocating the cooperative choice are persuasive (as Table 1.3 indicates). To formulate an answer to these two questions we need to examine the group problem solving and minority influence literature. In these literatures we will be able to see examples of situations where this minority influence is possible.

Hopthrow and Hulbert (2005) argue that the group discussion effect in fact stems from an implicit or explicit group decision for the cooperative choice. It will be shown later, that without a group decision for the cooperative choice that is based on a minority of group members advocating that choice, the group discussion effect cannot be easily explained.

Furthermore, when groups are making a decision the nature of such a decision, in the absence of an imposed rule, is dependent on the nature of the task. Hopthrow and Hulbert (2005) demonstrated that a social dilemma can operate under similar processes. The next subsection will describe and explain this process based upon the group problem solving literature.

Task Type and Demonstrability

Laughlin (1980) argues that when faced with a problem to be solved groups create a set of plausible solutions. From these solutions they arrive at the one that is correct or that best fits the problem set them. To arrive at this final solution Laughlin (1980) states that groups will utilise a decision rule. These rules dictate the outcome of the group as a function of the rule used and on the number of members advocating that outcome. For example, many natural decision making groups rely on a majority decision rule for their decision making. That is the solution chosen from a set of plausible alternatives that the majority of group members advocate. An example of this process would be the legislative process in the houses of parliament where members vote yes or no to a particular proposal. Laughlin (1980) argues that if the means-by-which the group implicitly determines the decision rule used is not set out

by some form of constitution, it is dependent on the type of task that the group is attempting to solve. To this end he outlined a continuum of task type ranging from intellective at one end to judgemental tasks at the other.

Intellective tasks have demonstrably correct answers: that is their answers can be shown to be correct to a doubting group member that is doubting of the proposed correct answer but capable of perceiving that the answer is correct (Laughlin & Ellis, 1986). Laughlin and Ellis (1986) defined three other criteria for demonstrability, firstly the group must agree on how a correct solution can be obtained, for example in the case of 2+2 the group must agree on the meaning of addition. Secondly, there must be sufficient information available to the group for members to be able to arrive at the correct answer. Thirdly, those members that have the correct answer should have the time, motivation and ability to show that the answer is correct to the doubting members of the group. A judgemental task, however, does not have a demonstrably correct answer and as such the group outcome is based more upon opinion judgements. An example would be the group trying to choose the winner in an art competition where the judgement needed is an aesthetic one for which there is no correct answer.

Closer examination of Laughlin's (1980) continuum, using verbal intellective tasks as the problems set to the groups, found that two decision rules out of nine examined could not be rejected when modelling the group outcome (Laughlin, Kerr, Davis, Halff, & Marciniak, 1975; Laughlin, Kerr, Munch, & Haggarty, 1976). These rules were truth supported wins (i.e. two members of the group advocated the correct answer) and majority correct equiprobable otherwise, a more conservative rule than

truth supported wins. Majority correct equiprobable otherwise is a rule that consists of a primary and secondary rule, the primary being that the group outcome is decided if a majority of the group members advocate that choice. However, if the group is evenly split then the secondary rule is used, which in this case indicates that there is a 50% chance of the group deciding for each one of the two alternatives (correct/incorrect). Of these two, the decision scheme 'truth supported wins' was the best fit. Indicating that with an intellective task, groups only need a minority of group members (but at least two members) to advocate the correct choice for the group output to be correct.

At the alternative end of the continuum are judgemental tasks, in which there are no demonstrably correct answers. Davis, Kerr, Atkin, Holt, and Meek (1975) examined the way in which juries make decisions. It can be argued that the decision of whether a defendant is guilty or not can be regarded as a judgemental task i.e. evidence can be presented in favour of guilt or innocence but the jury can never unequivocally know the correct answer (although some cases may offer evidence that makes the case less of a judgemental task than others). Davis, et al. (1975) examined mock juries, they told half the groups that their decision must be unanimous and the other half that their decision should be based on a majority of members. Despite these assigned decision rules Davis, et al. (1975) found that the only rule that could not be rejected in the model testing was '2/3^{rds} majority otherwise hung'. This decision rule states that the group decision is the opinion of 2/3^{rds} of the group members, if this is not possible then the jury will deliver a hung verdict. So in a group of 12 jurors, eight or more would have to hold the same opinion for the group decision not to be hung. Therefore, we can see that as the demonstrability (i.e. the ability to be able to demonstrate that an answer is correct to a doubting but capable group member) of a

task decreases the number of people in the group needed to hold a particular opinion for the group output to be that opinion increases.

If we look back at the work of Orbell, et al. (1988) and Bouas and Komorita (1996) we can see that they implicitly viewed a social dilemma at the judgmental end of the Laughlin (1980) continuum by hypothesising that the consensus would have to be unanimous or a majority for the cooperative choice for that choice to be adopted by the group. Indeed the pure fact that a social dilemma is thought of as a dilemma (Dawes, 1980) leads us to intuitively believe that they fall at the judgemental end of the scale because different individuals will perceive the benefits of the different outcomes in different ways. A look at the social value orientation literature supports this argument (Kortenkamp, 2001; Parks & Rumble, 2001; Van Lange, 1999). This literature finds that people can have different personal opinions regardless of manipulation. Some are pre-disposed to being cooperative and some are pre-disposed to be competitive.

The group discussion effect cannot be easily explained if we are viewing a social dilemma as a judgemental task. If it is a judgemental task and a majority process is needed, then a majority of group members choosing the cooperative choice is needed in order for there to be an increase in cooperation after discussion. This, as described above, is an unlikely occurrence. Therefore, we would only expect to see evidence of the group discussion effect if the group is using a minority process to choose the cooperative choice. This evidence suggests that groups regard a social dilemma as an intellective task (i.e. one with a demonstrably correct answer). To empirically examine this we would have to be able to alter the demonstrability of the

dilemma without changing the index of cooperation, so that we could determine whether demonstrability does indeed have an effect of the group discussion effect. In explanation, we would expect to see the group discussion effect disappear if the dilemma was regarded as low in demonstrability (a judgemental task) as group outcomes would depend upon a majority of group members supporting the cooperative choice in this case.

This argument pre-supposes that the group decision will have a direct effect on individual cooperative choices. Hopthrow and Hulbert (2005) conducted an experiment in which group members were asked their preference for the cooperative or non-cooperative choice before a period of group discussion. Then, during the discussion participants were instructed to make a group decision for all J (all cooperative), or all P (all non-cooperative, or mixed (something in between). Participants were then asked to make their individual choice. We found that cooperative group decisions significantly increased group member cooperative choices post discussion. This would indicate that group decisions do indeed have an effect on individual choice.

If it is the case that the group discussion effect is driven by the effect of a group decision we should be able to look at other research pertinent to group decisions in other contexts and draw inferences about the processes involved in social dilemma groups. One area that is rich in understanding is the group problem solving literature from which the concept of demonstrability (as seen above) comes. However, one potential problem can be found when looking at the nature of problem solving groups and those faced with a social dilemma. In group problem solving groups, the

groups have a common goal and, therefore, these tasks are regarded as cooperative tasks. Whereas, social dilemmas are in their nature mixed motive tasks, without one particular outcome that can be shown as correct (although the perception of correctness can be manipulated, see below).

One method of tackling this problem is to vary the perceived demonstrability of the social dilemma administered to a group. If this is possible, and we find results that correspond to those of Laughlin (1980), then we would be able to examine more decision making factors taken from the problem solving literature (e.g., Davis, 1969; Laughlin et al., 1975; Steiner, 1972) with the knowledge that for at least one of those factors (demonstrability) the results are comparable. This is intrinsically interesting because the crossover between the two types of groups enables us to understand more about the inherently complex nature of social dilemmas. For example, it may be that, while social dilemmas are mixed motive tasks (and this is commonly accepted; Dawes, 1980), under certain circumstances groups may behave as though they are in fact a cooperative task. This enables us to not only manipulate increases in cooperation but also to more easily predict when these increases may occur in many everyday situations such as those outlined at the beginning of the chapter.

How can the perceived demonstrability of the dilemma be altered? The purpose of the K parameter is to give social dilemma researchers a tool that enables them to determine that two games are rationally equivalent; changes in cooperation are not due to changes in the payoff matrix but instead due to the change in experimental factors. It is very important that the method for changing the perceived demonstrability of a social dilemma does not affect this K parameter in any way.

Therefore, the changes to the payoff matrices that determine demonstrability should not change the levels of cooperation observed in pre-discussion individual choice. However, post group discussion we would expect demonstrability to have an effect on choice.

Coombs (1973) explains the prisoner's dilemma paradigm in terms of two basic psychological parameters - fear and greed. These psychological constructs are developed from a re-examination of the prisoner's dilemma in the light of theories about risk. He created a set of parameters for changing the payoff matrices in the prisoner's dilemma, he then theorised as to how changes in these parameters would change participants' responses. Looking at these changes he was able to name the two parameters of fear and greed. Note, however, that these were thought experiments and did not use real participants in dilemmas. These two parameters make up the individual incentive in a social dilemma. We have already seen that cooperative choice in a social dilemma depends upon the relationship between the individual incentives and the group incentive in the parameter K' (Komorita, 1976). Hopthrow and Hulbert (2005) propose that by changing these incentives without changing the K' relationship between them we also vary the perceived demonstrability of the mutually cooperative solution.

Figure 1.1: Reward Structures of High and Low Demonstrable Matrices

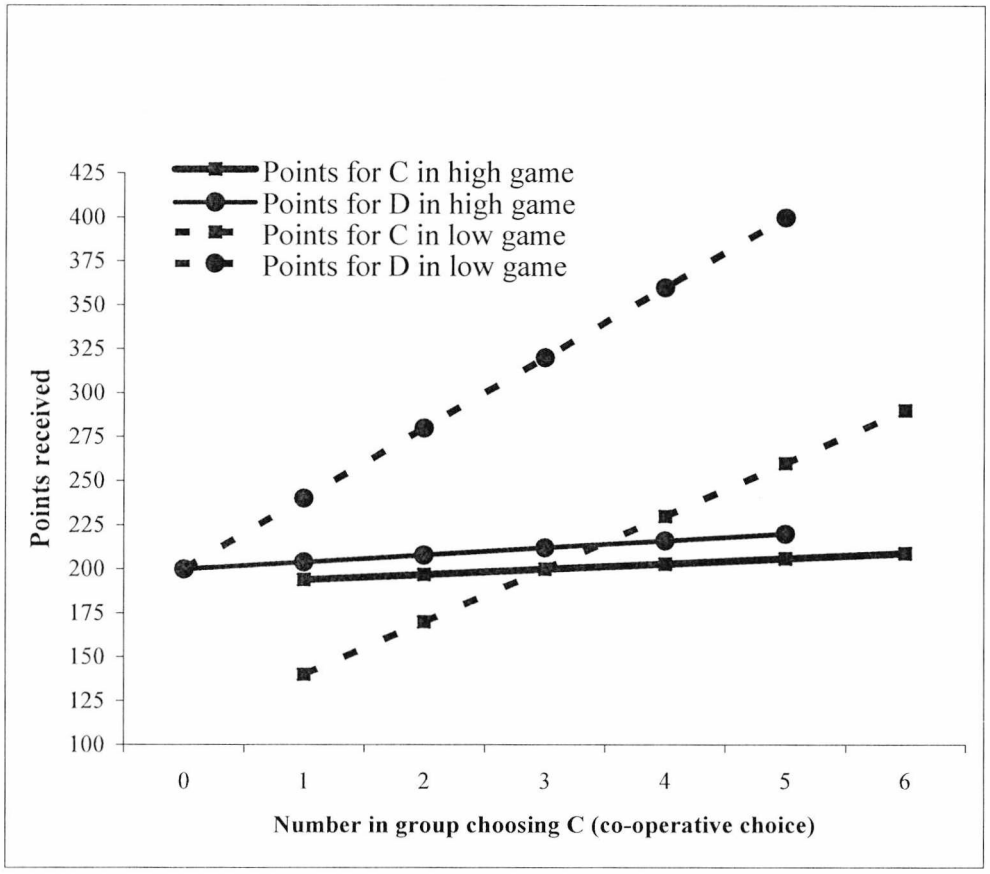


Figure 1.1 is a graphical representation of two social dilemmas, the dotted lines represent a low demonstrability social dilemma and the solid lines a high demonstrability dilemma. The lines marked with squares indicate cooperative choices and the lines marked with circles non-cooperative choices. The X- axis specifies the number of people in the group choosing the cooperative choice. The Y- axis specifies the number of points a participant would receive if the combination of their choice and the other group members' choices placed them at that point of the line. For example, suppose a participant is playing the low demonstrability dilemma and decides to make the cooperative choice and one other group member makes that choice also (meaning a total of two group members choose cooperatively) they would receive 170 points.

Examine the two dilemmas in Figure 1.1, it is evident that both dilemmas are rationally equivalent in that they both have K' values of 0.346. Therefore, the level of individual cooperative choice should not differ. However, Hopthrow and Hulbert (2005) contended that this only holds true before a period of discussion, because after discussion the other differences in the dilemmas will have an effect. The figure illustrates that while K' is the same for both the games, the individual incentives of fear and greed, and the group incentive, are ten times higher in one of the dilemmas in comparison to the other. We claimed that the low demonstrability dilemma will be low in perceived demonstrability of the mutually cooperative solution because the dominance of the non-cooperative choice is more salient. This is indicated by the difference in size of the distance between the C (cooperate) and D (not cooperate) curves for the two games. One indication of this is the absolute size of the payoff to the non-cooperative group member when all the other group members choose the cooperative choice. It is possible that this outcome has such a high value in the low demonstrability game that players are unable to see that it is not out of proportion relative to the other payoffs. One possible explanation for this phenomenon comes from the research on anchoring (e.g. Epley & Gilovich, 2006; Tversky & Kahneman, 1974). This research shows that an anchor point will affect peoples' estimations of the magnitude of a number/commodity/payoff. One example is when participants are asked to estimate the number of inhabitants in the city of Chicago. They are told to estimate the exact magnitude as well as asked to say whether it is greater or less than an anchor point (200,000 or 5 million people in this example) (Jacowitz & Kahneman, 1995). They found that people in the 200,000 anchor condition estimated the population of Chicago significantly lower than those in the 5 million anchor

condition. Epley and Gilovich (2006) found that participants' estimations were significantly skewed towards the anchor point, suggesting that as soon as they reached a plausible value they stopped the estimation process. This process could be influencing the way people view the two different dilemmas in Figure 1.1. If participants look at the payoff for being the only non-cooperator (220 in high demonstrability, 400 in low demonstrability) they could take this as an anchor point. Epley and Gilovich (2006) found evidence that reducing participants' motivation reduced the amount they would move from their self generated anchor point. Hopthrow and Hulbert (2005) argue that people find the 400 payoff very attractive. Therefore, it is likely that unless participants are highly motivated to engage in more effortful processing they are unlikely to entertain options other than aiming for this payoff. It is conceivable that this phenomenon would affect participants pre-disposed to non-cooperation to a greater degree.

As a consequence of these arguments it is plausible to argue that, players in low demonstrability subsequently strive to obtain the payoff for being the only non-cooperator, unaware that the strategy is likely to end in mutual non-cooperation in the group. This manipulation of demonstrability could conceivably be conceptualised as a new parameter similar to K, but only applying to dilemmas in group decision making situations.

Hopthrow and Hulbert (2005) found that groups playing a dilemma high in demonstrability were significantly more likely to make a mutually cooperative group decision than those playing a low demonstrability dilemma. Using SDS analysis we found that this was due to the groups using a 'C-supported wins (cooperative choice

supported wins)' decision rule in high demonstrability games (a minority based rule) and a majority rule in the low demonstrability games. Intuitively this appeals because there is more likely to be two cooperative choosers in any group than four. We also found that a cooperative group decision will significantly increase the level of post-discussion individual choice. Therefore, those groups with high demonstrability games showed greater levels of cooperative choice post-discussion compared with pre-discussion while those groups with a low demonstrability game did not. These findings help us to see the role of demonstrability in explaining how the group discussion effect appears to be driven by group decision making.

However, these findings are contrary to the position of Olson (1965) and Messick (1973) who argue that as group size increases so levels of individual cooperative choice should decrease because individuals have a greater freedom to free ride. The findings of Hopthrow and Hulbert (2005) suggest that if groups are given the opportunity to make decisions about the dilemma then the level of individual cooperative choice would actually be expected to increase as group size increases, in dilemmas that have high demonstrability. Therefore, the presence of discussion and group decision appear to reverse the findings of Olson (1965) and Messick (1973), this is due to a minority rule decision scheme. Why might this be so? As group size increases so the probability of having two natural cooperative choosers also increases and, therefore, because of the nature of the decision, the level of free riding should not increase. These ideas are also linked with the concept of whether the minority decision is changing the opinion of the doubting group members or whether they are merely acquiescing to a powerful position, and as such these ideas will be explored later in the thesis.

One potential problem is why the group sees the group outcome as the best when there is no other group involved in the situation. Maybe it is because, as Parks (personal communication, 2003) believes, demonstrability is making it clear to the group that all C is much better than all D, and that the chances of being a D chooser when some, or in particular, all of the other group members are choosing C is very low. This situation is obviously advantageous to the individual choosing D because their payoff is significantly higher than the other group members. However, in the case of multiple trials Marwell and Schmitt (1972) show that this position is very unstable, with the group quickly shifting to mutual D. Therefore, an increase in perceived demonstrability may enable the group to come to the realisation that starting at all C is beneficial and easier to achieve than starting on not all C and shifting back to all C.

Indeed it is possible that increasing the demonstrability of the dilemma is achieving the same increase in the group's understanding of the dilemma that it would achieve over multiple trials, but for the first trial only and using a different method. However, this last point does not appear to be supported by data that we already have. Hopthrow and Hulbert (2005) found that over multiple trials the effect of demonstrability disappeared, arguably because over multiple trials the effects of more strategic based factors such as tit for tat style exchanges (Komorita & Parks, 1996) overpowered the beneficial effects of high demonstrability. We will be looking at decision making over multiple trials more carefully in Study 4 within this thesis, to assess the influence of an individual's choice making on adherence to subsequent group decisions.

In sum, evidence suggests that social dilemmas under certain circumstances behave in a similar way to cooperative problem solving tasks despite their mixed motive nature. When groups make a group level decision about the dilemma, the levels of cooperative individual choice increase when the demonstrability of the dilemma is high. This evidence suggests that the group decision has a significant effect on individual choice (Hopthrow & Hulbert, 2005). It is possible to argue that theoretically demonstrability should not have an effect when groups are told not to make an explicit decision. However, this has not been explicitly tested, would demonstrability have an effect when groups are merely discussing the dilemma? This point will be examined more closely in Study 3 of this thesis.

Minority Influence

The evidence reviewed thus far demonstrates that a minority decision rule is utilised when group tasks or dilemmas are high in perceived demonstrability. Therefore, the minority influence literature can offer insights into understanding how a minority of cooperative choosers could influence a majority of non-cooperative choosers.

Latané (1981) argued for a multiplicative model of influence within a group. This model included strength of the sub-group's position, the immediacy, and the number of its members. Conceivably the cooperative minority in a group are perceived as coming from a greater standpoint of strength, or are advocating more immediate rewards than the non-cooperative majority and, therefore, have more influence despite the fact that they are a minority. However, this would only work if

the group members *perceived* the cooperative choice as being in some way the correct one. In order to understand whether the cooperative choice can be perceived to be correct we have to examine the might versus morality literature (Liebrand, Jansen, Ruken, & Suhre 1986; Beggan, Messick, & Allison, 1988; Sattler & Kerr, 1991).

The literature on social value orientation (e.g. van Lange et al., 1997) shows that people can be classified as cooperators, individualists, or competitors. It has led to an influential body of research examining the way participants perceive the two choices in a prisoner's dilemma setting (Liebrand, et al., 1986). This perception could be in the form of a moral dimension through the use of descriptors such as good and bad or in the form of a power dimension by using descriptors such as strong and weak (Osgood, Suci, & Tannenbaum, 1957).

Kelley and Stahelski (1970) outline the potential that Americans are more likely to emphasise the power dimension and Europeans the moral dimension. However, they found evidence that the perception of choice on one of these two dimensions depended upon the social value orientation of the participant. In an experiment using decomposed games, Liebrand et al. (1986) aimed to examine the extent to which people view the cooperative and competitive choices in a prisoner's dilemma game in terms of morals or power. Decomposed games are scenarios in which participants are presented with a series of paired outcomes. Each outcome consists of a proposed payoff for the participant and for a supposed other dyad member participants are asked to choose their preferred own/other combination from each of 16 pairs. After these were completed participants were asked to complete another series that simulated the choices of the other player in the dyad. Participants

were also asked to rate their own and other players' personalities using a series of adjectives given to them by the experimenters.

Liebrand et al. (1986) found that participants' social value orientation did impact the way they perceive cooperate/not-cooperate, in that people classified as cooperators viewed this dimension in terms of morality and competitors viewed it in terms of power. However, the authors note that this is limited to a decomposed game scenario rather than actual matrix based choice making. Whilst there is little doubt that social value orientation closely predicts actual choice behaviour it is not the only factor affecting peoples' choices. Indeed factors such as discussion (e.g. Dawes et al., 1977) and others' strategy (Axelrod, 1984) could be seen as having more immediate influence.

A follow up study by Beggan et al. (1988) used a different methodology to evaluate the findings of Liebrand et al. (1986). They again classified participants as either cooperators or competitors using decomposed games. They then asked participants to write a series of statements, 10 describing behaviours relating to themselves or others that they deem to be cooperative and 10 that they deem to be competitive. Participants were asked to begin the statement with 'I' if they corresponded to their own behaviour and 'they' if it corresponded with other people's behaviour. They found that cooperators showed more egocentric bias, in that they attached more cooperative behaviours to themselves and more competitive behaviour to others. Competitors showed no such difference. The authors interpreted this as evidence that cooperators evaluate cooperation as morally good and competition as bad and, therefore, want to associate themselves more with the good behaviour.

Moreover, when raters were asked to evaluate the statements on the two dimensions a difference between the two social value orientations was only found on the morality dimension. Beggan et al. (1988) argue that the difference between cooperators and competitors is not necessarily morality versus power, but rather more versus less morality.

The results of a study by Sattler and Kerr (1991) also appear to support this viewpoint. They proposed and tested two models of social motives. The first, the goal model, was based on the findings of Liebrand et al. (1986). This predicts that cooperators will evaluate others choices more on a dimension based upon morality and competitors will evaluate others choices more on a dimension based upon power. The second model, the schema model, is somewhat more complex. They argue that participants enter a social dilemma situation with a certain schema that provides participants with predictions of others motives and behaviour and guides the participants' own behaviour. Information (in the case of this experiment in the form of messages) that is consistent with this schema will prime it. They tested their ideas using a public goods dilemma. Participants' social motives were measured using the same decomposed games as the previous studies. They were then asked to read a 'moral' message that emphasised the morality of fairness and the importance of not being selfish, or a 'power' message emphasising the desire not to be beaten by anyone or a control message, before playing a 'give some take some' game. They found evidence to support the idea that a moral message would prime a cooperator's schema and promote more cooperation. But, they did not find that a power message would prime schemas of individualists so individualists were not more susceptible to messages of power than cooperators. As well as these interactions they also found a

main effect of message such that participants who heard the moral message were more cooperative than those that heard a control message or a power message. In addition, the moral message seemed to elicit evaluation concerns in both cooperators and individualists.

In sum, a moral message was powerful in making cooperators more cooperative when their partner's strategy was consistent with cooperation (i.e. tit for tat) but a power message was not influential in the choices of individualists when the partner strategy was consistent with the message. Indeed there was some evidence that moral messages also influenced the views of individualists. Although more research is needed it appears that a pattern of 'less versus more morality' as opposed to might versus morality would be a reasonable explanation of the phenomenon. In that, cooperators view a dilemma in terms of the morally correct choice, individualists less so but are not immune to the persuasiveness of the moral message.

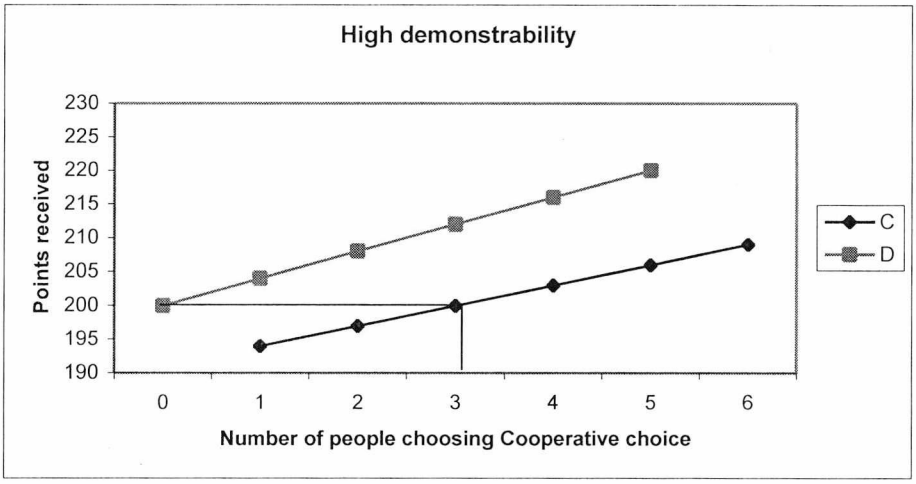
Sattler and Kerr (1991) argue that a moral prime can affect the evaluations of the participants whether they be cooperators or competitors although it is more so for cooperators. This mechanism could be triggered by a group discussion as cooperators may advocate a moral message. Equally competitors may advocate a power message but the evidence appears to show that in general power attributions are not as influential.

Arguments in favour of the dominance of the non-cooperative choice are often strong (Komorita, & Parks, 1996). However, the might/morality literature indicates a mechanism by which those advocating the cooperative choice might be influential.

Demonstrability is likely to be an additive process in this (i.e. by increasing the perceived correctness of the cooperative choice those advocating cooperation have more strength in their position). This is because Laughlin (1980) argues that correctness of a choice can be a function of the group consensus. Therefore, when faced with an opportunity for coordination it is conceivable that cooperators will drive the consensus process in favour of the mutually cooperative choice. Although, Kelley and Stahelski (1970) found evidence that cooperators assimilated to the behaviour of competitors in certain situations, this change in behaviour is not permanent. Indeed it may be merely in reaction to a desire not to be repeatedly exploited when faced with a consistent non-cooperative strategy. In light of these arguments it could be argued that if demonstrability is high and those advocating the cooperative choice can demonstrate its correctness then from the standpoint of Latané (1981) the cooperative choosers have increased strength of position because they can also argue that they are correct morally.

Interestingly, there is a parallel to this idea in the social dilemma literature that theorises about the power that the cooperative choosers have in any group, despite the fact that intuitively we would expect the non-cooperative choosers to be the powerful ones. Schelling (1973) proposed an index also named K, in which he outlined the size a coalition needs to be before people choosing the cooperative choice are no worse off than if everyone in the group had chosen the non-cooperative choice. Figure 1.2 shows this graphically for a dilemma high in demonstrability.

Figure1.2: Graphical representation of high demonstrability matrix used in thesis with indication of Schelling (1973) K



The graph shows that the value of the Schelling (1973) K in this dilemma is 3. Therefore, a coalition of 3 cooperative choosers could switch to the non-cooperative choice and not be worse off in terms of individual points outcomes. Schelling (1973) argues that because of this, those cooperative choosers are in a position of power, with the ability to threaten those people making the non-cooperative choice. If they changed to the non cooperative position the non-cooperators would be worse off. This power suggests that a full majority is not needed in order for the group to see the cooperative choice as the correct one.

However, it should be noted at this point that the Schelling (1973) K is the same for the low demonstrability game. Therefore, the results of Hopthrow and Hulbert (2005) suggest that Schelling (1973) K is not sufficient to give the minority the necessary power but more that the Schelling (1973) K supports the minority under conditions of high demonstrability.

An alternative minority influence explanation to the single process model (e.g. Latané & Wolf, 1981) is the dual process model of Moscovici (1980). Moscovici

(1980) argues that people faced with a strong majority position are likely to acquiesce to that position due to some form of social comparison process. In other words, the majority induces conformity in those members who do not agree to the majority position. However, this is a public change and is not supported by private opinion change, group members are likely to revert to their initial opinion once the immediate influence of the majority is removed (Wolf, 1985). Alternatively, if an individual is faced with a minority that fulfils the criteria of consistency, an innovation process will be invoked (Moscovici, 1980). During this process group members examine the arguments of the minority very carefully in an attempt to validate the minority's position. That is to say, the process that the minority invokes is more informational rather than the normative pressures brought about by the majority. This minority induced process is more of a private process but the group member is likely to undergo a process of opinion change that is long lasting (Wolf, 1985). The conformity process is, according to Wolf (1985), affected by variables which govern the level to which a group member is dependent on their group. An example would be of a group with a high level of cohesiveness. In this case it is likely that a group member will be under increased pressure to conform to the majority position. Innovation is mediated by variables that govern the minority's level of commitment to the position that they are advocating (Wolf, 1985). It is possible, therefore, that high demonstrability will lead to higher commitment of a minority to the cooperative choice.

Nemeth (1986) extends the standpoint of differential processing for those faced with a majority position compared with those faced with a minority position, espoused by Moscovici (1980). Nemeth (1986) argues that minorities encourage more

issue led thinking than Moscovici (1980) allows for in his theory. This means that group members think more carefully not only about the arguments presented by the minority but also about alternative arguments and explanations that have not necessarily been aired in the group discussion up until that point. This process will lead to a greater level of private attitude change amongst the group members (Maass, West, & Cialdini, 1987). Nemeth (1986) also gives us another explanation for the power of the minority for J (the cooperative choice) over the majority for P (the non-cooperative choice), aside from the morality of the J choice, that is consistency is regarded differently when displayed by the minority in comparison to when shown by the majority. According to Maass, West, and Cialdini (1987) the consistency of the minority is perceived to be more a function of the minority's belief in their correctness, whereas consistency for the majority could just as easily be perceived as a function of conformity to the group standpoint. Therefore, the idea that a dilemma high in demonstrability makes the perceived correctness of the J choice more evident to the group should interact with a minority's consistency to create a very persuasive argument.

The ideas of systematic and heuristic processing can shed more light on why minority influence may illicit more long lasting opinion change than the influence of a majority viewpoint. According to De Vries, De Dreu, Gordijn, and Schuurman (1996), systematic processing is a form of processing that demands a high cognitive load as the individual concerned examines a position by thinking carefully about the arguments presented and comparing the message contained within those arguments with other information regarding the topic at hand that they may possess. On the other hand, heuristic processing requires less cognitive effort and relies on more normative

information. Examples would be deferring to the viewpoint of an expert because as an expert they must be correct, or using decision rules to make a decision (e.g. if a majority of members believe one viewpoint then they must be correct). De Vries, et al. (1996) argue that systematic processing will, if a change occurs, lead to much more stable and enduring opinion change amongst the group members than heuristic processing. However, under what circumstances are group members motivated to use systematic as opposed to heuristic processing?

De Vries, et al. (1996) argue that for minority influence to occur participants must be motivated to undertake systematic processing, they must also have the cognitive ability, understanding of the task, and the time to be able to complete the process. De Vries, et al. (1996) argue that the motivation to embark on systematic processing arises when a group member does not feel that they have sufficient confidence in the judgement of the majority. It could be argued that a dilemma high in demonstrability is reducing majority members' confidence in the D choice.

Furthermore, Kaplan and Miller (1987) seem to support the view that the demonstrability of the dilemma will affect the way in which the participants process the information that surrounds it. Demonstrability may in fact promote more informational as opposed to normative influence (i.e. the increased readiness to validate arguments based on the information that they contain rather than the desire to conform to the group norm).

The information above and the evidence provided by Hopthrow and Hulbert (2005, see below for review) show that high demonstrability dilemmas elicit a high

level of minority influence for the cooperative choice. The reasons for this could be explained in several ways. For example, the morality of the cooperative choice, when supported by the perceived correctness of it induced by high demonstrability, could increase the power that the minority has and, therefore, tip the balance in their favour. The theory of conversion (Moscovici, 1980) gives us the basis for a greater understanding into how the minority may be able to persuade the majority of non-cooperative choosers to rethink their position. The consistency of the members advocating the cooperative choice allied to an element of doubt as to the validity of the non-cooperative choice would suggest that group members use a systematic processing method to look at the arguments for and against the cooperative choice. If convinced of the validity of the cooperative choice this would in turn lead to a greater level of lasting opinion change than a decision for the cooperative choice that is based on a majority decision. Therefore, we would expect to see more opinion change under conditions of high demonstrability when the groups are making a decision for the cooperative choice based on the opinion of a minority.

Voting and Opinion Change

To examine the effects of communication and commitment Chen and Komorita (1994) examined the concept of pledging in the context of a 'public goods dilemma', this type of dilemma differs from the standard prisoner's dilemma. In a public goods dilemma participants are given an initial amount of money and told that they can invest as much as they like into a central fund. At the end of the trial, all members keep the money they have left over after contributing to the fund. Then the money in the central fund has interest applied and is split equally between all players, regardless of whether they have contributed to it or not,. In a similar way to the

manipulation of K, the expected levels of individual cooperation can be altered by altering the level of interest applied to the central fund. Therefore, the level of cooperative choice is measured via contributions to the central fund.

Chen and Komorita (1994) used the action of pledge making to fulfil two roles. Firstly, as a form of communication; by making a pledge as to the amount to be contributed, the individual is giving the other participants information about his/her position. Secondly, by making a pledge the individual is making a commitment that he/she is going to honour the stated position. The level to which this pledge is binding is manipulated by Chen and Komorita (1994) by instructing participants differently before the actual contribution to the fund. In their first experiment participants either did not pledge (no pledge condition), or they were told to make a preliminary, tentative pledge that would have no impact on their actual contribution (non-binding pledge), or they were told they had to contribute at a minimum whatever the minimum pledge within the group was (minimum binding pledge). The results showed that the non-binding pledge did not have any more affect on cooperative behaviour than no pledge at all. However, the minimum binding pledge did enhance the levels of cooperative behaviour. They found that there was also more consistency between the amount pledged and the amount contributed in the minimum binding condition.

In experiment two, Chen and Komorita (1994) varied the level to which the pledge was binding with three conditions. According to condition, each pledging group member must pay at least: the minimum amount pledged in the group (minimum pledge), or the average amount pledged in the group (mean pledge), or the

actual amount they pledged (binding pledge). The binding pledge condition actually provoked the lowest amount of cooperative behaviour (i.e. showed the lowest amount of individual contribution to the central pool). They argued that this is because this condition only gave participants one real choice as the pledge was basically the same as their contribution. Whereas, in the other two conditions they argued that participants were able to reciprocate any positive behaviour displayed during the pledging phase when it was time to contribute to the central fund. The problem with this argument is that the participants in the binding pledge condition were still free to contribute *more* than their pledge if they chose too.

Chen and Komorita (1994) offer a more plausible explanation for this. In the first two conditions a group member's contribution is dependent not only on their own pledge but also on the pledges that others make. Therefore, participants are unable to take advantage of the other group members by promising to contribute a high amount to the central fund to encourage them to give a high amount, and then contribute a low amount. Therefore, the group members have nothing to gain by being non-cooperative. Chen and Komorita (1994) interpret this as the removal, or at least reduction, of fear and greed in the dilemma. Examining the concept of demonstrability in Hopthrow and Hulbert (2005) shows that the low demonstrability condition has levels of fear and greed that are higher than in the high demonstrability condition. If it is these factors of fear and greed that are driving the ability for groups to perceive the cooperative choice as the correct answer, then it is plausible to assume that the pledging factor that reduces these individual incentives in Chen and Komorita's (1994) work is in fact increasing the perceived demonstrability of cooperative behaviour, or in the case of a straight prisoner's dilemma the cooperative

choice. Therefore, we could hypothesise that in the context of free communication such as a discussion about the dilemma we would expect that some form of pledging may in fact promote more cooperation as it would promote a more minority based system in a similar way to the manipulation of demonstrability.

One method of creating a system of pledges that are not totally binding in a free communication setting such as group discussion would be via a system of voting. Participants would be asked to vote during the free discussion phase as to the choice that they are going to make. Through the manipulation of the public or private nature of the vote the level to which a vote is considered to be binding would be altered. This point will be discussed and examined empirically later in the thesis.

It could be argued that while Orbell, et al. (1988) did not find that promising increases cooperation in contexts of free communication, the alternative perspective of decision making that is presented here lends itself to the conclusion that promising/pledging may or may not be in fact a contributory factor depending on whether doubting participants are merely acquiescing to the group decision or actually changing their opinions as to the correctness or persuasiveness of the cooperative choice.

Davis, Holt, Spitzer, and Stasser (1981) examined the effects of different decision rules on opinion change and acquiescence, in an experiment looking at the decisions of mock juries[2]. In a 2 by 2 design they compared groups that were asked to reach a decision (verdict) versus those not (discussion only), and also instructed that

[2] Researchers are unable to use real juries for empirical study due to the rules governing the interactions that are allowed with jurors. So mock juries are used, these are groups that are exposed to very similar evidential material and asked to reach similar decisions.

they would have to reach a decision about a sentence in the case of a guilty verdict after their deliberations or not. They found that both the knowledge of a future sentencing decision by the group and also the requirement to reach a verdict increased the likelihood that jury groups would render a guilty verdict. Participants were assessed for their preference for guilt or not individually after the study. Davis, et al. (1981) found that groups asked to make a verdict, tended to use a majority rules decision scheme to reach that verdict. Looking at the distribution of preferences in the jury groups when deliberating or reaching a verdict and comparing them to the distribution of preferences found when group members were asked for their opinion post-deliberation, gives some indication of the level of acquiescence or opinion change brought about by the group. Davis, et al. (1981) found from this method that there was more opinion change in juries not asked to make a decision. It is possible that because of the fact that verdict making juries were using a majority based decision scheme, dissenting group members could acquiesce easily to the group decision. Whereas non-verdict juries, as discussion groups, are more of a unanimous device and, therefore, acquiescence is less of an option.

While this position seems counterintuitive to the predictions made earlier in this chapter that were derived from the minority influence literature it could potentially be explained in terms of systematic processing. A group tasked with reaching a verdict will use some form of normative decision rule to reach their goal (Davis, 1973) and, therefore, group members or more likely to use heuristic processing to reach their judgement, which as we have seen results in less private opinion change than the alternative, systematic processing. A group that is not asked to reach a verdict but merely discuss the decision would be more likely to use

systematic processing to examine the issues as there is no decision rule for them to fall back on, resulting in a greater level of opinion change.

These ideas are supported by Hulbert, Parks, Chen, Nam, and Davis (1999) in an extension of the above study examining these ideas of normative influence and the effect of decision rule upon opinion change. In an experiment examining normative influence on civil jury decision making, using mock juries Hulbert et al. (1999) manipulated three factors: Groups vs. individuals, decision making groups (in which groups were instructed to use a $2/3^{rds}$ majority rule) vs. discussion only, and information presented by line graph vs. table. They hypothesised that group members would show more sign of opinion change in follow up tests in the discussion only condition as the members would be forced into discussion of the outcome. Whereas, a group decision, such as majority, enables the group to quickly reach a conclusion when not all the members agree as the group can fall back upon a normative based process to reach an output, that all members agree with even though they might not agree with the actual decision per se (i.e. an output can be reached that everyone is comfortable with even if they do not all agree with it). This implies that the discussion only condition is in effect imposing a unanimity decision rule. A comparison of graphs versus tables was used because according to Lawrence and Makridakis (1989) groups will find it easier to quickly reach a consensual understanding of the information in graphical format. No effect of this factor was found. They found that groups that were asked to make a decision were inclined to award the plaintiff a higher settlement than individuals asked to make the same decision and than groups that were asked to only discuss the dilemma.

Of great interest in the current context Hulbert, et al. (1999) also found that discussion groups were inclined to be influenced by 'normatively biased social influence' (Hulbert et al., 1999, p.73), in other words they were more likely to undergo lasting opinion change due to the influence of certain social norms within the group. Whereas evidence indicated that in decision making groups dissenting members were more likely to acquiesce to the majority preference while maintaining their original beliefs about the situation. However, this evidence was not wholly conclusive as there was the suspicion that discussion only groups were using some form of decision process that would have at the consequence of attenuating the effect.

These ideas would suggest that, although demonstrability is likely to increase cooperation and under certain circumstances may promote a greater level of opinion change, we would actually expect most opinion change in a group that is not being asked to make a decision but merely to discuss the social dilemma that they are faced with.

An overview of Hopthrow and Hulbert (2005)

We have thus far outlined in detailed terms the theoretical viewpoint behind the main aims of this thesis. The thesis is designed partly as an extension of Hopthrow and Hulbert (2005). Moreover, in this 2005 paper we provided a theoretical synthesis of some of the key issues and provided an empirical base from which our ideas, about the effects of group decision making, demonstrability, and minority influence in a

social dilemma, stem from. As such the next section will provide a detailed overview of that paper including a review of the goals and a detailed summary of the findings.[3]

The rationale for our experiment was born from two perceived problems with the explanatory power of previous studies looking at the group discussion effect. In effect we felt that there was an explanatory step missing. (Dawes et al., 1977) described the increase in cooperative choice found after a group discussion as a result of an increase in group identity, in that group members become more concerned about group level outcomes than individual level outcomes. Bouas and Komorita (1996) described this increase in terms of perceived consensus (i.e. group members have the opportunity to develop and commit to a consensus). Hopthrow and Hulbert (2005) argued that these lie at opposite ends of a spectrum of ideas about group process. The group identity perspective de-emphasises the importance of group members' individual preferences, whereas the perceived consensus explanation does not explain how the consensus is reached. To more closely specify the consensus building process, Hopthrow and Hulbert (2005) hypothesised that a group decision to be cooperative would increase post-discussion cooperative choice. Indeed a group decision, albeit implicit, is implied by both (Orbell et al., 1988) and Bouas and Komorita (1996) but there is disagreement as to how many people are needed to reach consensus. Orbell et al. (1988) argue that consensus is reached by unanimous opinion, whereas Bouas and Komorita (1996) advocate a less stringent rule, one that requires a majority agreement.

[3] A complete chapter including all the empirical data is not possible as the data have been examined for a previous degree.

Examining these ideas in probabilistic terms would suggest that these decision rules are unlikely to produce the increase in cooperation found .They would require a large number of group members to be pre-disposed towards choosing cooperatively. The probability of any given group containing a majority of group members that prefer the cooperative choice is small. Given the reliability of the group discussion effect, it appears more plausible that the agreement to cooperate would be based on a minority of group members advocating the cooperative choice. There is a precedent for this idea to be found in the group problem solving literature (e.g. Laughlin, 1980), i.e. tasks that have an answer that can be demonstrated to be correct to other group members. This point is illustrated in Table 1.3 (see p.26) with data from a previous experiment (Hopthrow & Hulbert, 2001). This table shows that expected post-discussion cooperative choice would only increase above the levels of pre-discussion cooperative choice if the decision rule is a minority based rule.

Laughlin and his colleagues (Laughlin et al., 1975) have shown reliably that groups very often use minority based decision rules to solve intellective tasks (those that have a demonstrably correct answer). However, an inescapable feature of a social dilemma is that arguments which favour mutual cooperation or non-cooperation can always be rebutted. Indeed the social value orientation and might versus morality arguments suggest that some group members will be strongly in favour of the non-cooperative choice. However, in all but the most extreme, demonstrability is a perception and as such tasks can vary in perceived demonstrability independently of whether they are objectively solvable.

Hopthrow and Hulbert (2005) argued that altering the demonstrability of a dilemma is altering the ease with which participants can determine the utility of the mutually cooperative outcome. We aimed to show explicit evidence that the consensus building process that forms the basis of the group discussion effect is based upon a cooperative group decision. Moreover, we argued that a group discussion/decision phase results in a cooperative group decision because it increases the perceived demonstrability of the mutually cooperative choice. Therefore, to test this assertion we aimed to reduce the perceived demonstrability of the dilemma. We attempted this in two ways, first by instructing participants either that there was a definite correct solution, or that there was no correct solution. Second, we varied the structure of the payoff matrix. As discussed previously in this chapter the K'value was kept the same across two matrices that differed in the absolute magnitude of the individual versus group incentives. We argued that in the low demonstrability game the dominance of the non-cooperative choice appears much more attractive and, therefore, it is more difficult for the (changing the strength of the morality argument) advocates of cooperation to persuade the advocates of non-cooperation to cooperate.

Hopthrow and Hulbert (2005) assigned 132 participants to six person groups. The study utilised a 2 (demonstrability of matrix) by 2 (instruction type) mixed model design with demonstrability of the matrix as the repeated measure factor. After participants were instructed in the dilemma, participants were asked prior to discussion to indicate their preferred choice. This data was used as a baseline measure of the distribution of individual preferences in the sample population. Participants were asked to discuss the dilemma and reach a group decision as to the best way to choose. These decisions were classified as 'all cooperate' or 'not all cooperate'. After

the group decision participants were asked to make their actual choice alone. They were informed that the point received from this choice would be individually converted into school supplies at the end of the experiment.

No effects of instruction type were found; neither did any effects of the manipulations persist beyond the first trial of the dilemma (might have been biding their time). As a result the bulk of the analyses treated demonstrability as a between participants factor, with the only the first trial as the dependent variable.

In order for the perceived demonstrability of a task to have an effect a group must have the opportunity of interaction (i.e. group members have to have a chance to demonstrate an answer to other group members). Consistent with this idea and the constant K' Hopthrow and Hulbert (2005) found no effect of demonstrability on cooperative choice pre-discussion. Consistent with our hypothesis and previous research (e.g. Orbell et al., 1988) we found a strong overall effect of group discussion with significantly higher rates of individual cooperative choice post-discussion compared with pre-discussion. The interaction between pre /post-discussion choice as a repeated measure and demonstrability was significant. The effect of discussion in the high demonstrability condition was higher than in the low demonstrability condition.

To determine the impact of group decision, group decisions were entered into the previous analysis as a random factor. The results of this analysis showed that the previous significant pre/post-discussion interaction was no longer significant. Moreover, there was a significant interaction between pre/post discussion choice and

group decision. This interaction showed that the increase in cooperative choice after discussion was higher for group members whose group had made an all cooperative group decision than for those that had made a group decision that was not all cooperative. A logistic regression examined the influence of demonstrability and instruction type on group decisions and found demonstrability to be the only significant factor. A follow up cross categorisation indicated a significant relationship between demonstrability and group decisions. Eighty percent of group decisions in the high demonstrability condition were for 'all cooperate' versus 27.3% for 'all cooperate' in the low demonstrability condition.

In sum, Hopthrow and Hulbert (2005) replicated the group discussion effect, but also found evidence that it was being driven by a cooperative group decision. Moreover, we found that groups exposed to a dilemma high in perceived demonstrability were more likely to make cooperative group decisions than those exposed to a dilemma low in perceived demonstrability.

The theoretical standpoint of Hopthrow and Hulbert (2005) is that high perceived demonstrability promotes minority 'for cooperate' processing which promotes more 'all cooperate' group decisions. In turn, these decisions are a significant explanatory factor in the group discussion effect. In order to test the idea of minority processing, Hopthrow and Hulbert (2005) used social decision scheme analysis (Davis 1973) to model various decision rules. These models were tested against the actual data to determine the likely decision rule used by the groups. In the low demonstrability condition, group members made their decisions based upon a

majority rules decision scheme. However, in the high demonstrability condition they found that group members make their decision based upon a minority decision rule.

Hopthrow and Hulbert (2005) found evidence to support the idea that a minority based group decision for the cooperative choice can explain the group discussion effect. We manipulated the perceived demonstrability of the cooperative choice in the dilemma and found that dilemmas high in perceived demonstrability (in line with Laughlin, 1980) promote high levels of cooperative group decision.

Summary and Aims

The group discussion effect in social dilemmas (Caldwell 1976; Rapoport, 1974; van de Kragt, Orbell, Dawes, Braver, & Wilson, 1986) reliably shows that when group members are given the opportunity to discuss a social dilemma they are more likely to be cooperative than if they have not had this opportunity. Two broad explanations for this effect have been presented, the group identity explanation (Dawes, McTavish, & Shaklee, 1977) and the perceived consensus explanation (Bouas & Komorita 1996). However, this chapter has indicated that there are some problems with these explanations. In fact from the theoretical perspective outlined over previous pages we would expect a decrease in cooperation not an increase after group discussion when using the premise that consensus needs to be based on a majority of group members advocating the cooperative choice. A conclusion stemming from this is that the group discussion effect research is not complete.

We have previously argued in favour of group decision making as an explanation of the group discussion effect (Hopthrow & Hulbert, 2005). We showed

that a group decision for the cooperative choice significantly increased the level of post discussion individual cooperative choice. However, this effect was dependent on the decision for J (the cooperative choice) being based on a minority of group members advocating it. We argued that the perceived demonstrability of a social dilemma could be altered and that this would change the decision rule used by the group in deciding about the dilemma. This finding dovetails with similar work by Laughlin (1980) looking at group problem solving tasks.

Our previous evidence that the ideas of demonstrability can be applied not only to group problem solving research but also used to inform future research in to social dilemmas, informs the main aim of this thesis. Namely, to examine further variables stemming from the group problem solving literature and test the level to which they apply to social dilemmas. This aim should be interpreted within the specific framework of this research, namely specifying more closely the factors and processes behind the group discussion effect. Issues that arise from these aims will be investigated experimentally in the thesis. This will include the role of minority influence and the effect that it has on subsequent opinion change. The factor linking the group problem solving literature and the group discussion effect in social dilemmas, namely demonstrability, will be further explored as an extension and replication of Hopthrow and Hulbert (2005).

Specifically, the introduction has highlighted some limitations in explanations of the group discussion effect and how group decision might impact upon cooperative choice. Hopthrow and Hulbert (2005) have shown that group decision and demonstrability impact upon cooperative choice making. The precise role of group

decision (versus just discussion or no discussion) will be further investigated (Chapters 4 and 5). In addition, the role of the individual upon group process will be examined in more detail (see Chapter 3). The effect of perceived demonstrability appears to be an almost entirely group level phenomenon, that is the demonstrability manipulation only has an effect as a factor if participants are part of a discussion group. Therefore, it is very likely that the impact of an individual's preference is attenuated by the group process. To expand we will examine whether demonstrability is more important as a factor determining individual post-discussion choice than an individual's preference prior to discussion (Chapter 3). We have discussed literature which examines the role of the group process in the form of changes to demonstrability, and this will be further examined through manipulations of voting structure (see Chapter 5). Follow up work will examine the idea that demonstrability only applies to group level phenomena further by exploring whether participants have a sense of what will happen during a group discussion phase (i.e. whether they have meta-cognitive theories of group process; see Chapter 6).

The empirical work within this thesis will commence with an exploration of individuals' ideas about group process, group decision making, and cooperation. The previous work by the author (Hopthrow & Hulbert, 2005), and the literature reviewed above, theoretically drive the rationale behind the experiments reported in this thesis. However, it was thought that some understanding of individuals' subjective perceptions of group process would inform this empirical research and Chapter 2 reports the findings of this pilot study.

Chapter 2: Subjective Perceptions of Factors Related to Social Dilemmas

Summary

This chapter presents the first study within the thesis. Study 1 is a pilot study designed to determine whether individuals have a subjective understanding of factors related to social dilemmas. Moreover, we aimed to provide support for the main variables of theoretical interest addressed in the introduction. Results from a questionnaire are reported in which we asked participants about factors we intend to empirically investigate over the course of this thesis, namely discussion, demonstrability, and voting. We also asked participants about aspects such as group context and procedure to provide validity for the control we maintain in our face-to-face group research. Results are predominantly analysed using one sample t-tests. The findings do suggest that the factors we empirically focus on in this thesis are subjectively perceived as having an impact. We discuss these findings in the light of our empirical focus and we conclude by outlining the following studies within the thesis.

Study 1: Investigating subjective perceptions of factors related to social dilemmas

Introduction

In the previous chapter the concept group problem solving view of social dilemmas was introduced. We argued that the group discussion effect in social dilemmas (an increase in individual cooperative choice post-discussion) is driven by an implicit or explicit group decision to be cooperative. The findings of Hopthrow and Hulbert (2005) indicate that participants under certain circumstances treat a social

dilemma as a problem solving task (i.e. one that has a potentially correct answer), rather than the more traditional viewpoint that classifies a social dilemma as a mixed motive task. If this is indeed the case then we would expect to be able to see parallels between aspects of social dilemmas in a group discussion context, and the group problem solving literature (e.g. Caldwell, 1976; Laughlin, 1980). We have, in the previous chapter, outlined some variables of particular interest in the context of the social dilemmas that are derived from factors that are important for group problem solving, an important example being the influence of demonstrability (Laughlin, 1980; Hopthrow & Hulbert, 2005).

Study Overview and Aims

Study 1 is designed to gather information regarding individuals' subjective perceptions of social dilemmas and the factors that we intended to empirically investigate later in the thesis – namely discussion, demonstrability, and voting.

Study 1 examines the level to which people felt that the factors of interest in this thesis were likely to be important in a social dilemma scenario. In the interests of parsimony and generalisability participants were asked about a general situation rather than a specific social dilemma. Subjective perceptions were tapped using a series of questionnaire items.

Method

Participants

Data were collected by means of a questionnaire from 40 participants recruited via opportunity sampling from the campus of the University of Kent. Participants were offered chocolate as a reward for taking part in the study.

Materials and Procedure

Participants were first given a sheet informing them of their right to withdraw before they were asked to complete the questionnaire. Upon completion participants were thanked and given a written debriefing. Participants answered 19 questions via Likert type scales. Participants were instructed to imagine that they are asked to join a group that has to make a decision about how to share out rewards between its members. These rewards were termed as things that would be of value to the group members. They were told that the each person's reward was based not only on their decision but also the decisions of the other group members.

Discussion. Three items tapped the construct of discussion. Perceptions of discussion importance were measured by asking "To what extent do you think having a group discussion among the group members would be important in helping you to determine your decision" (1 = *not at all*, 7 = *totally*). Perceptions of discussion time were measured by asking "To what extent do you think that the amount of time spent discussing would affect your decision?" (1 = *not at all*, 7 = *totally*). Perceptions of the speed of discussion were measured by asking "In general terms, if you make decisions in groups, do you feel the decision is better if it is reached quickly, with little discussion, or slowly with a lot of discussion?" (1 = *best if made quickly*, 7 = *best if made slowly)*.

Demonstrability. One item tapped the concept of demonstrability asking "To what extent do you think the ease with which others could point out the best choice would be important in helping you make your decision?" (1 = *not at all*, 7 = *totally*).

Voting. One item tapped voting importance asking "Do you think the outcome of a vote within your group would affect your personal view about the right decision?" (1 = *not at all*, 7 = *totally*). Two further items asked about voting anonymity, "How much would peoples' personal view be affected if this vote was conducted publicly (e.g. a show of hands)?" or "...privately (e.g. writing down on slips of paper)?" (1 = *would not affect my decision at all*, 7 = *would affect my decision strongly*). Related to voting we also asked participants about the influence of a majority, "If the decision was quite difficult, how likely is it that you would just go along with the view of the majority?" (1 = *not at all*, 7 = *totally*).

Choice Preference. One item tapped choice preference, "If you joined a group of people who all had separately held the same view about the best decision, how likely is it that the group's joint decision would remain the same or change from that view?" (1 = *definitely remain the same*, 7 = *definitely change*).

Group Context. Three items asked about the influence of group context. One item asked about sitting together, "To what extent do you think sitting together as a group (rather than each person being anonymous) would be important in helping you to determine your decision?" (1 = *not at all*, 7 = *totally*). One item asked about acquaintanceship, "Do you think that whether or not you knew the other group members in advance would affect how you made your decision?" (1 = *not at all*, 7 = *totally*). One item asked about the intergroup context, specifically, "To what extent would your decision be affected if you were in competition with another group?" (1 = *not at all*, 7 = *totally*).

Motivations. Three items asked about motivations. Self interest was tapped by asking "Do you think that you would just try to get the biggest possible reward for yourself?" (1 = *not at all*, 7 = *totally*). Concern about others was measured by asking "Do you think that you would be worried by the decisions of others?" (1 = *not at all*, 7 = *totally*). The reward incentive was measured by asking "To what extent do you think the size of the reward would affect your decision?" (1 = *not at all*, 7 = *totally*).

Procedure. Two items asked about procedural matters in dilemmas. One asked "Do you think having to make your decision more than once with the same group of people would affect your decision?" (1 = *not at all*, 7 = *totally*), and the other asked "In general terms when do you think people are more likely to consider the details of their decisions more carefully, when they make them on their own or when they make them in groups?" (1 = *most careful if alone*, 7 = *most careful in groups*).

Personality. We asked participants whether they thought their decisions would be affected by their own personality, "Do you think your personality will be an important factor in the decision you make?", and about other group members' personality, "To what extent do you think the personality of the other group members would affect your decision?" (1 = *not at all*, 7 = *totally*).

Results

The data was explored using descriptive statistics and a series of one sample t-tests (against the mid-point and/or base, depending on the item) to determine whether participants perceived particular factors to be important.

Discussion. Participants generally believed that factors involved in group discussion were important in social dilemma decision making processes. Participants believed that discussion was important in decision making ($M = 5.75$, $SD = 1.28$), this was significantly higher than the midpoint of the scale (4), $t\ (39) = 8.87$, $p < .001$. Furthermore, participants also believed that the length of time discussing a dilemma was important, ($M = 4.68$, $SD = 1.25$), this was significantly higher than the midpoint of the scale (4), $t\ (39) = 3.42$, $p = .001$. In general, participants felt that decisions should be made slowly in groups with a lot of discussion ($M = 5.18$, $SD = 1.43$), this was significantly higher than the midpoint of the scale (4), $t\ (39) = 5.20$, $p < .001$.

Demonstrability. Participants felt that the concept of demonstrability would be important in their decision making, indicating that the ease of which the best choice could be pointed out would help them ($M = 4.70$, $SD = 1.38$), this was significantly higher than the midpoint of the scale (4), $t\ (39) = 3.21$, $p = .003$.

Voting. Participants did not perceive the issue of voting to be very influential on their decision making ($M = 4.00$, $SD = 1.78$), $t = 0$, although this was significantly above the complete base of the scale, $t\ (39) = 10.64$, $p < .001$. The same pattern was found for public voting ($M = 4.28$, $SD = 1.63$), when compared to midpoint, $t\ (39) = 1.07$, $p = .293$, when compared to base, $t\ (39) = 12.69$, $p < .001$; and for public voting ($M = 3.68$, $SD = 1.53$), when compared to midpoint, $t\ (39) = -1.35$, $p = .186$, when compared to base, $t\ (39) = 11.09$, $p < .001$. Interestingly, participants believed that public voting would be somewhat more influential on their decision making than private voting would be, $t\ (39) = 1.96$, $p = .057$. Participants also did not strongly believe that they would be influenced by the majority ($M = 3.83$, $SD = 1.63$) and this

was not significantly different from the midpoint, $t = 10.68$, although it was different from the base (1), $t\ (39) = 10.95$, $p < .001$

Choice Preference. Participants generally thought that if all group members had the same initial choice preference then the group decision would remain the same rather than change ($M = 3.05$, $SD = 1.66$), this was significantly lower than the midpoint of the scale (4), $t\ (39) = -3.61$, $p = .001$.

Group Context. Participants generally believed the group context would alter their opinions. For example, they thought that sitting together would be important ($M = 4.80$, $SD = 1.56$), this was significantly higher than the midpoint of the scale (4), $t\ (39) = 3.25$, $p = .002$. They also thought that if they knew people in the group previously their decision would be affected ($M = 4.65$, $SD = 1.86$), this was significantly higher than the midpoint of the scale (4), $t\ (39) = 2.21$, $p = .033$. Furthermore, they thought that being in competition with another group would impact upon their decision making ($M = 5.00$, $SD = 1.80$), this was significantly higher than the midpoint of the scale (4), $t\ (39) = 3.52$, $p = .001$.

Motivations. Participants showed mixed reactions to motivations. For example, they believed self-interest would not be important in their decision making ($M = 3.03$, $SD = 1.79$), this was significantly lower than the midpoint of the scale (4), $t\ (39) = -3.45$, $p = .001$. There seemed to be little concern about others' choice, ($M = 4.35$, $SD = 1.59$), this was not different to the midpoint, $t = 1.39$ but it was significantly higher than the base of the scale (1), $t\ (39) = 13.29$, $p < .001$. Participants tended to believe that the size of the reward would affect their decision

making ($M = 4.60$, $SD = 1.78$), this was significantly higher than the midpoint of the scale (4), $t\ (39) = 2.12$, $p = .041$.

Procedure. Participants did not think the two elements of procedure we asked them about were important. In terms of making more than one decision there was no difference from the midpoint ($M = 3.73$, $SD = 1.94$), $t\ (39) = -0.89$, $p = .374$, although it was significantly higher than the base (1), $t\ (39) = 8.90$, $p < .001$. Furthermore, no difference was seen in whether decisions were made individually or in a group ($M = 3.70$, $SD = 1.86$), $t\ (39) = -1.02$, $p = .313$.

Personality. Participants thought that decision making was affected by personality. Their own personality as influential, ($M = 5.60$, $SD = 1.74$), this was significantly higher than the midpoint of the scale (4), $t\ (39) = 5.83$, $p < .001$. Also, other group members' personality as influential, ($M = 4.90$, $SD = 1.50$), this was significantly higher than the midpoint of the scale (4), $t\ (39) = 3.80$, $p < .001$.

Discussion

The data in general indicate support for the factors that were identified as of interest in the previous chapter. For example, participants were subjectively aware that a group discussion would have a significant impact upon the way a group behaved in the conditions described earlier in Chapter 1.

Furthermore, participants indicated support for our demonstrability manipulation (Hopthrow & Hulbert, 2005), in that they believe that the ease with which a 'best choice' could be demonstrated would affect their decision. Furthermore,

they realise that a group comprised of individuals' with the same prior beliefs about a dilemma would affect the decision making.

Participants did not subjectively perceive such great effects of voting, although whilst these did not show significant differences from the mid-point they did show significant differences from the negative end of the scale. This would indicate that participants did attach some importance to this factor. Furthermore, there was a significant difference perceived between public and private voting, with public voting being perceived as having more influence on decision making than private voting.

These principle factors of the discussion effect, demonstrability, choice preference, and voting are all going to be empirically investigated within this thesis. It is interesting that the participants in this study show some level of meta-cognition about these factors, and this is something we also address in this thesis (see Chapter 6), as we believe it to be an important avenue for future research.

The results of this study also demonstrate that participants are aware of the importance of procedural issues and the group context. In light of previous research conducted in the area (see Chapter 1) and these findings, the studies within this thesis will ensure that group context is maintained constant (groups will be randomly allocated, acquaintances will not be in the same group, and their will be no intergroup competition). Much empirical work has been conducted looking at the presence of another group, for example, Insko et al.'s (1987) work on the individual/group discontinuity effect in which groups show lower levels of cooperative choice than individuals when playing against another group/individual. Although these ideas are

outside of the scope of this thesis, we do investigate the role of group identification and group cohesion within the studies presented in this thesis. This is to determine whether these variables explain cooperation following a discussion.

Participants in this study also show some subjective perception of motivations, they realise that self-interest and the size of rewards may affect their decisions. Although in general participants felt that they would not be just trying to get the biggest reward for themselves, but they thought that the size of the reward would have a small impact upon their decision. Interestingly, previous research by Schopler, et al., (1991) showed that the size of the reward can be magnified ten fold and not impact on choice making. For the reason that these elements may affect decision making, the payoffs (in terms of K') are maintained constant across studies within this thesis and some potential motivations are also measured.

The participants in this study felt that their own and other group members' personality would affect their decision making. This is an interesting concept and does tie in with work on individual differences within social dilemma research (e.g. Parks, 2004). An empirical investigation of personality is, however, beyond the scope of this thesis, although we do address it as a potential source of future research.

Participants were asked about what they thought would happen in a particular context. Therefore, their answers had to reflect either direct experience of the type of scenario described, or their answers would have to be based on some level of meta-cognition about likely group processes. The first possible explanation would be somewhat unlikely due to the generic nature of the instructions. The accuracy of a

participant's meta-cognition about a group process is a potentially interesting source of inquiry. Some factors that influence groups only influence groups and not individuals, an important example being demonstrability (Laughlin, 1980). Therefore, it is interesting to determine whether individuals that are naïve to psychological theory can predict the potential influence of these factors. A possible example of this at work is the relative lack of importance placed upon our voting factor by participants in this pilot study. Lories, Dardenne, and Yzerbyt (1998) talk about the meta-cognitive process and we will be visiting this idea in more detail later in the thesis.

Limitations

The participants in this study were asked to imagine a scenario where they and other members of a group had to decide how to share out rewards. Due to the pilot nature of this study this was done to try to simulate a dilemma without having to provide detailed instructions i.e. to reduce the participant time needed. However, the consequence of this is that the meta-cognitions displayed by the participants may not be directly related to a social dilemma scenario.

A problem facing Likert type scales is of response acquiescence in which participants tend to agree with any statement regardless of the statement content and their actual opinion. In this questionnaire not all questions used the same anchor points (some used not at all – totally, other examples include definitely remain the same - definitely change). Participant responses also showed a reasonable range. However, future research might benefit from the use of random question order or implicit techniques to try to eliminate this form of bias.

Summary and Conclusion

Study 1 yielded clear evidence that the following elements of individual and group decision processes are subjectively relevant in social dilemmas: discussion, demonstrability, voting, choice preference, group context, motivations, procedure, and personality. Accordingly, this thesis will focus on a subset on these, namely discussion, demonstrability, voting, and choice preference. Of course we do not assume that other factors or processes are irrelevant, but merely that some are more likely to engender meta-cognitive activity and reflections. These meta-cognitions will be revisited in Chapter 6. Prior to that, Chapter 3 focuses on choice preference and demonstrability, Chapter 4 focuses on group discussion and demonstrability, and Chapter 5 focuses on group discussion and voting.

Chapter 3: The Effects of Demonstrability and Group Composition on Cooperation

Summary

This chapter presents the results of an experiment designed to test the robustness of demonstrability in social dilemmas. More specifically, this chapter looks at whether demonstrability can improve the level of cooperative choice in a group that consists entirely of participants that prefer the non-cooperative choice. In Study 2 ($N = 281$), demonstrability is manipulated through the use of the matrices of points payoffs. Participants were instructed in the dilemma and asked to indicate their preference for the cooperative or non-cooperative choice before being formed into 6-person groups based on this choice. Whilst in their groups participants were asked to discuss the dilemma before making a group decision about the dilemma. The results showed that there was a significant effect of discussion and decision on cooperative choice. The main finding of interest in this study is that high demonstrability groups showed no effect of choice preference. That is groups that entirely preferred the non-cooperative choice prior to discussion became cooperative post-discussion in the high demonstrability dilemma. The study also showed no significant effects of group identity or cohesion upon cooperative choice. The findings show some support for the robustness of the demonstrability manipulation and suggest that it can initiate a form of choice shift.

Study 2: Investigating the effects of demonstrability and group composition on cooperation

Introduction

Study 2 is designed as an extension and test of the main concept of the demonstrability effect in social dilemmas from Hopthrow and Hulbert (2005). In this study they asked groups of 6 people to play a Prisoner's Dilemma game. Participants were presented with a dilemma that was either high on the continuum of demonstrability (Laughlin, 1980) or low. Before playing the game individuals were asked whether their personal preference was for the cooperative choice or the non-cooperative choice. Participants were then asked to discuss the dilemma and make a group decision as to the best course of action before asking for their individual choice that determined their reward outcomes.

They found that a cooperative group decision during a group discussion phase had a significant positive effect on post discussion individual cooperative decisions. One explanation for the effect of group decisions lies in the finding that altering the demonstrability of a dilemma altered the group process used to make the group decision. The use of social decision scheme analysis (Davis, 1973) made it possible to understand the group decision making process. A dilemma of high demonstrability promoted more cooperative group decisions than did a dilemma of low demonstrability. The groups that were given a highly demonstrable dilemma tended to base their group decision upon the opinions of a minority of group members advocating the cooperative choice. Groups presented with a low demonstrability dilemma tended to make a cooperative group decision only if theory was a majority of group members advocating the cooperative choice. Therefore, group decisions were

more likely to be cooperative in the high demonstrability conditions as groups had a greater chance of containing two participants that were advocates of cooperation than containing four or more advocates of cooperation (groups of six were used).

Demonstrability

The main premise of demonstrability is that a member with the correct answer to a problem the group has been charged with solving is able to demonstrate the correctness of that answer to a doubting but capable group member (Laughlin, 1980). Therefore, changing the demonstrability of the dilemma should change the level to which a group can perceive the correctness of every group member choosing to cooperate. As discussed in the previous chapter, demonstrability will be manipulated through changes to the absolute values of fear and greed the ratio between them will remain constant as will the K' value.

In this experiment will be using the dilemma matrices used in Hopthrow and Hulbert (2005) in which the values of fear and greed are 10 times higher in the low demonstrability dilemma than they are in the high demonstrability dilemma. K' remains the same in each dilemma at 0.346. The outcome of these changes means that the value of the temptation to defect (1 person choosing non-cooperatively and the remaining group members choosing cooperatively) in a dilemma of high demonstrability appears to be relatively low compared to the low demonstrability dilemma. The group is able to determine the 'correctness' of the mutually cooperative choice for maximising outcomes more easily in a dilemma of high demonstrability. In addition, they are able to determine the problems associated with accepting the

temptation to defect, that is the likelihood that all group members will aim to be in the same position and by doing so the group becomes mutually non-cooperative (personal communication, Parks). In summary, altering the demonstrability of the dilemma alters the extent to which a group is able to perceive the mutually cooperative solution as the correct answer with out changing the structure of the dilemma in such a way that it is perceived differently by an individual.

The goal of social dilemma researchers is often to determine methods of improving levels of cooperative choice amongst group members (Komorita & Parks, 1996). This takes many formats from the manipulation of K (Rapoport, 1967) and K' (Komorita, 1976) to changes in group size (Marwell & Schmidt, 1972), leadership style (Van Vugt & De Cremer, 1999), strategy (Axelrod, 1984), and intergroup factors (Insko et al., 1988). Demonstrability is another factor that can be used to attain this goal (Hopthrow & Hulbert, 2005).

Hopthrow and Hulbert (2005) have outlined the effects of demonstrability on cooperative choice with specific emphasis upon the role of demonstrability on group process. However, one key factor in this question that has so far not been explored, is the preconceived ideas of the individual regarding whether they should cooperate or not. Seibold, Meyers, and Sunwolf (1996) argue that a large amount of work on group communication has looked at the process within the group whilst they are communicating, but relatively little has focused upon the important factor of the input to the group. This input is likely to have a significant effect upon the group process and on the subsequent group output. Moreover, Jarboe (1988) found that a model used to describe group productivity explained more variance when it accounted for the

group input, as well as the group process and output, instead of only the group process and output.

The advantage of altering the demonstrability of the dilemma is that group members have the potential to see the correctness of the cooperative choice. This is possible even if they are doubting members and without altering the fundamental structure of the dilemma as with K or K', structure of the groups as with a leader (Van Vugt & De Cremer, 1999), imposed strategy (Axelrod,1984), or the size of the groups (Guyer & Fox, 1975; Marwell & Schmitt, 1972). Therefore, the potential applicability of a demonstrability factor is relatively high.

Hopthrow and Hulbert (2005) showed that in groups consisting of a mixture of cooperators and non-cooperators high demonstrability helped improve cooperative choice because groups only needed to consist of a minority of cooperators to make a cooperative group decision. These findings raise a number of questions that are interlinked. Firstly, is demonstrability when applied to social dilemmas a robust phenomenon? Secondly, can demonstrability still improve cooperation when all the group members are initially pre-disposed towards the non-cooperative choice? And thirdly, to what extent is the group process and outcome based upon the pre-conceived ideas of the individuals that comprise a given group?

Preference Distribution

Parks and Nelson (1999) examined the effect of initial preference distribution and the content of group discussions upon group decisions regarding either university budget cuts or the Rwandan civil war. In line with the prediction of Laughlin (1980),

they found that groups that consisted of members that entirely preferred one alternative prior to discussion, made a group decision for that alternative post discussion. However they also found that groups that consisted entirely of members with the same preference still spent time discussing the possible alternatives and the decision that they were going to make. Therefore, it is plausible to argue that groups have the potential to decide upon an alternative not previously supported by the individual group members as they allow themselves time to reprocess the information available to them.

We argue that by increasing the demonstrability of the dilemma we are increasing the ease to which a group can identify the cooperative choice as the correct answer. Therefore, it is rational to assume that when a group consists entirely of group members that advocate the non-cooperative choice the group still has the potential to identify the correctness of the mutually cooperative choice in a high demonstrability dilemma.

A particular choice may have aspects that have a greater level of desirability due to certain attributes than an alternative choice. Davis (1973) argues that the desirability of a particular choice can increase when that choice is publicised in the context of a group interaction such as a period of discussion. In the case of the social dilemma this choice could be conceived to be the cooperative choice i.e. it has the desirable aspects of being morally correct (Beggan, Messick, & Allison, 1988) and the potential to give a better outcome. However, the non-cooperative choice may also have the potential to give a better outcome. It is only when group membership allows coordination that the desirability of the cooperative choice increases because the

increased payoff from everybody choosing the cooperative choice becomes more likely. It is also possible that due to the fact that the mutual C choice is extremely unlikely without coordination it is not considered until people are in a setting in which its consideration could have positive effects to the group outcome. This process may explain the plausibility of first shift (Pennington, 2002) in which a group consisting entirely of members that preferred one alternative when entering the group make a group decision for the other alternative.

A high demonstrability dilemma may instigate some from of first shift phenomenon (Davis, 1973; Pennington, 2002) in which the group decision is consistent with the first change of opinion displayed by one of the group members, in this case with only two choice alternatives a change of opinion would have to be to a position that advocates a cooperative choice.

The work of Bouas and Komorita (1996) and the ideas of first shift (Pennington, 2002) give us a plausible prediction and explanation for the scenario in which a mutually non-cooperative group is given a high demonstrability dilemma. Bouas and Komorita (1996) showed evidence for a consensus building process during group discussion of a dilemma. If participants are given the information that they are all going to be non-cooperative they may realise that they are not going to benefit in the way that they had hoped from taking the non-cooperative position (i.e. gaining more rewards than other group members due to the cooperative choices of those other group members). It is plausible to surmise that in this case they would be prepared to reassess their choices. The combination of this reassessment process and a dilemma of high demonstrability, that is making it easier for them to determine the utility of the

mutually cooperative position, is likely to promote a significant increase in cooperative choice. This increase would be a function of two factors: group membership and the demonstrability of the dilemma. Moreover, a group consisting entirely of advocates of cooperation faced with a high demonstrability dilemma would not have any structural reason to change their opinions and, therefore, are unlikely to change from the mutually cooperative position that they have adopted.

In sum, groups have the potential to revisit information presented to them even if they consist entirely of members that prefer the same alternative. We also know that information may appear more or less attractive when presented to a group than when it is presented to an individual. For example, the benefit of the mutually cooperative outcome could be more attractive when presented to a discussion group because they are able to see through consensus building that the alternative is worse. The group may therefore change its preference. A mechanism by which this would be possible would be that of first shift.

It is plausible to argue that when faced with a dilemma high in demonstrability groups are protected by the dilemma from the possible detrimental effects of the individual group members' preconceived ideas about the choice they should make. The consequence of these ideas is that, if true, a high demonstrability dilemma would be a robust method of improving individual cooperative choice post-discussion.

Hopthrow and Hulbert (2005) indicate that group decision has a significant positive effect on individual post-discussion choice; this study aims to replicate that effect. We expect that groups deciding cooperatively will show significantly greater

levels of individual cooperative choice than groups who choose non-cooperatively. In line with Hopthrow and Hulbert (2005) we would not expect to see any effect of demonstrability on individual pre-discussion choice as demonstrability is seen as a group based phenomenon (Laughlin, 1980) i.e. doubting members need to be in a position in which they can be shown the correct solution, alone there is no one to fulfil that function. The central experimental hypothesis for this experiment is that individual choice preference will only affect group decisions and individual dilemma choices post-discussion when the dilemma is low in demonstrability.

Post Choice Measures

Dawes et al. (1977) argue that the increases in cooperative choice seen as a function of group discussion occur because the discussion process promotes a greater group identity. This increase in identity in turn increases the motivation of an individual to work for the benefit of the group in favour of purely their own benefit. The structure of the dilemma indicates that one is better off if one chooses the non-cooperative choice but every one is better off if everyone is cooperative rather than non-cooperative (Dawes, 1980) therefore working for the benefit of the group would mean making the cooperative choice (Komorita & Parks, 1996). However self categorisation theory (Turner, Hogg, Oakes, Reicher, Wetherell, 1987) argues that for there to be an increase in group identity there should be a referent group available that takes the role of a perceived outgroup. Without this reference factor the group does not become a 'sufficiently minimal device' to increase group identity. However, other processes may foster identity with a group rather than a referent group. For example, Tyler and Blader (2002) found that an alternative source of the group identity could be within-group status that is an individual group member identifies more strongly

with their group if the status of the group members is such that it increases their self-esteem.

The nature of the groups and dilemma used in this experiment do not appear to fulfil these criteria and, therefore, we would not necessarily expect an increase in group identity. More specifically the dilemma only concerns group members and as such although other groups are taking part in the experiment their choices and outcomes are completely separate from one another. As a consequence we would expect to see no significant effects of group identity i.e. we should not see any change in group identity between conditions and neither should we see any relationship between group identity and individual choice making, Group identity will be measured in order to try to assess its role in the increase of cooperation post discussion[4]. Indeed, Dawes et al (1977) found evidence to suggest that groups high in identity were more likely to have a mutual goal of cooperation (similar to a cooperative group decision), therefore, we do not preclude the idea that identity would have an effect, just that it less likely in the context of the experiments presented here.

It appears that group identity is an unlikely explanation for the group discussion effect because of, in this context, the lack of a referent group. However, the group may by working together become more of a close knit team rather than just a collection of disparate individuals. This phenomenon can be classified as group cohesion (Carron, 1982). Increased group cohesion is likely to bind group members more closely together, make them more interdependent on one another and they are more likely to have increased feelings of responsibility for their group's outcomes

[4] Greenwald (1975) argues that it is detrimental to research to avoid accepting null hypotheses. Therefore we have formulated this prediction in the way that makes logical sense in the broader argument of consensus based decision making.

(Widmeyer, Brawley, & Carron, 1992). Interpreting these findings in the context of group and individual outcomes (Komorita & Parks, 1996) and Dawes' criteria (1980) the logical conclusion is that changes in group cohesion may increase the rates of individual cooperative choice due to the increase in group members' desire to work to maximise the group's collective outcome. In other words, the mechanism is very similar to that specified by Dawes et al. (1977). More specifically group members are more likely to make the collectively rational choice because they have increased feelings of responsibility for the group's outcome. Therefore, group cohesion will be measured in Study 2 to assess this as a possible explanation for the predicted effects.

Method

Participants

Two hundred and eighty one 1st year psychology undergraduate students recruited from the University of Kent took part in this experiment as partial fulfilment of their course requirements (40 males, 235 females, 6 gender unreported). They were assigned to experimental groups of 6 on the basis of their preference for the cooperative or non-cooperative choice in the social dilemma used.

Design

A 2 (choice preference; all cooperative/ all non-cooperative) x 2 (Demonstrability; High/Low) between participants factorial design was used. Participants were randomly assigned to demonstrability conditions. Demonstrability had two levels high and low and was manipulated using different payoff matrices (see Appendix A1). Participant preference also had two levels, all J and all P. The matrices were given to participants and explained. The participants were then asked to

indicate their preference between J (cooperative choice) and P (non-cooperative choice) in a single shot prisoner's dilemma game. They were then assigned to 6 person groups based upon this preference. Groups consisted entirely of people who had individually preferred the J choice, or entirely of people that preferred the P choice. On the occasions that there were not enough people left to make a group that entirely preferred one choice, a mixed group was used. For theoretical reasons these were excluded from the analysis.

Participants were given the opportunity to discuss the game in their groups and make a group decision as to the best course of action to take before choosing between J (cooperative) and P (non-cooperative). Participants were told that their points score and therefore their level of reward would be based upon this post discussion choice. They were informed that the points they earned would be converted into school supplies at the end of the experiment and that their choices would remain anonymous. The main dependent variable was the proportion of J choices post discussion.

Between the group decision and the subsequent individual decision participants were given a short questionnaire consisting of 5 items measuring their level of group identity (see Appendix A2). Group identity was measured by asking participants to indicate whether they thought the statements were presented were true or not on a 7 point scale, with '*very true*' indicated with '7' and '*not all true*' with '1'. (e.g. 'I identify with other members of this group', 'I am glad to be a member of this group', 'It is important to me to be a member of this group'.)

After the participants were informed of their point's scores they were asked to complete questionnaires measuring motivation, and group cohesiveness (see Appendix A2). Motivation was measured by asking participants to indicate to what extent they agreed or disagreed with 5 statements, on a 7 point scale. For example: 'I do not want to lose more points than other members of the group'. For all motivation items '1' indicates total agreement with the statement and '7' total disagreement. The other scales were administered in the same way asking for levels of agreement with certain statements using 7 point Likert type scales.

Procedure

On the day of the experiment participants arrived at an allotted time slot in groups of up to 60 people. They were briefed as the purposes of the experiment and given a personal code before being given the opportunity to withdraw. They were then randomly assigned to one of either the high or low demonstrability conditions. These conditions were separated into two rooms in which the participants were given instructions explaining the matrix of points and the purpose of the game (see Appendix A3 and A4). These instructions were also recorded on tape and the participants were asked to read the instructions whilst listening to the tape, in order to better their understanding. After the instruction phase participants were asked to indicate their preferred choice from looking at the points matrix (J, cooperative or P, non-cooperative). Participants were told to make this choice without any interaction with other participants. They were then assigned to 6 person groups on the basis of their answers. Therefore, groups were constructed in which either all members preferred J or all preferred P. Any remainders were put into groups containing a mixed number of J and P preferences.

Once seated groups were given 5 minutes to discuss the matrix of points, and reach a group decision as to the best course of action to take. This decision could be for either All-J, All- P or a mixed decision which is some combination of J and P choices. Participants were then given the group identity scale. Once completed these were removed and the participants were asked to make an individual decision for J or P they were told that this choice should be made privately and would determine their points score and consequently their level of reward for the experiment. After completing this phase participants were informed of their point score anonymously, i.e. the experimenter determined the number of group members choosing J (cooperatively) and P (non-cooperatively) and explained to the group X (X being the number of people in that group choosing J) number of people in the group had chosen J and received the corresponding number of points and Y(Y being the number of people in that group that had chosen P) people had Chosen P and received the corresponding number of points.

Participants were then asked to fill in questionnaires individually and privately measuring motivation, and, group cohesiveness (See Appendix A2) before being given their school supplies and taken down to the holding room for the debriefing. It was pointed out to the participants that instead of their points being converted point for point to school supplies they could in fact just take as many as they wanted. They were given both verbal and written debriefings, thanked and dismissed.

Results

Data from 281 participants were collected and aggregated into 47 experimental groups. The proportion of cooperative choices was calculated for each group. One group was excluded from the analysis because it contained only 5 members leaving a total of 46 groups for analysis. There was no significant effect of Gender on initial choice, t (264) = 1.59, p = .11 (M_{males} = .54 (SD = .51); $M_{females}$ = .40 (SD = .49)). Therefore, this variable was not included further in the analysis (see Endnote). Means and standard errors for actual cooperative choice by condition were calculated and are displayed in Table 3.1.

Table 3.1: Means and Standard Errors for Actual Cooperative Choice by Condition.

	Low Demonstrability		High Demonstrability	
	Mean	Standard Error	Mean	Standard Error
All P	.533	.129	.653	.086
All J	.938	.031	.833	.063
Mixed	.389	.134	.833	.167

From this point on mixed groups were excluded from the analysis due to the unequal nature of their composition leaving 38 groups for analysis.

To validate the assumption that the points matrices were of equal K' (Komorita, 1976) and that demonstrability does not affect individual choice making, pre-discussion choice was analysed by demonstrability. No difference between high and low demonstrability was found t(36) = -.270, p = .789 (Respective means: .40, .44). A paired sample t-test of pre-and post discussion choices showed a significant group discussion effect with levels of post discussion cooperative choice significantly higher than pre-discussion t(37) = -4.066, p < .001 (respective means: .719, .421).

A 2(Demonstrability, High/Low) x 2(Choice preference, All J/All P) Independent samples ANOVA showed a significant main effect of choice preference, those In groups of all J sayers were significantly more likely to choose cooperatively post discussion $F(1,34) = 9.815$, $p = .004$ (respective means: .885, .593) no overall significant effect of demonstrability (means: High = .743, Low = .735) and no significant interaction effect. Cell means that are in the direction expected and indicate that it is meaningful to perform simple main effects analysis (Howell 1992). This analysis shows, consistent with expectations, a significant difference in cooperative choice between all J groups and all P groups only in the low demonstrability condition. All J groups show significantly more post discussion cooperative choice than all P groups in low demonstrability $F(1,34) = 9.032$, $p = .005$ (respective means: .938, .533). No such difference was found in the high demonstrability condition.

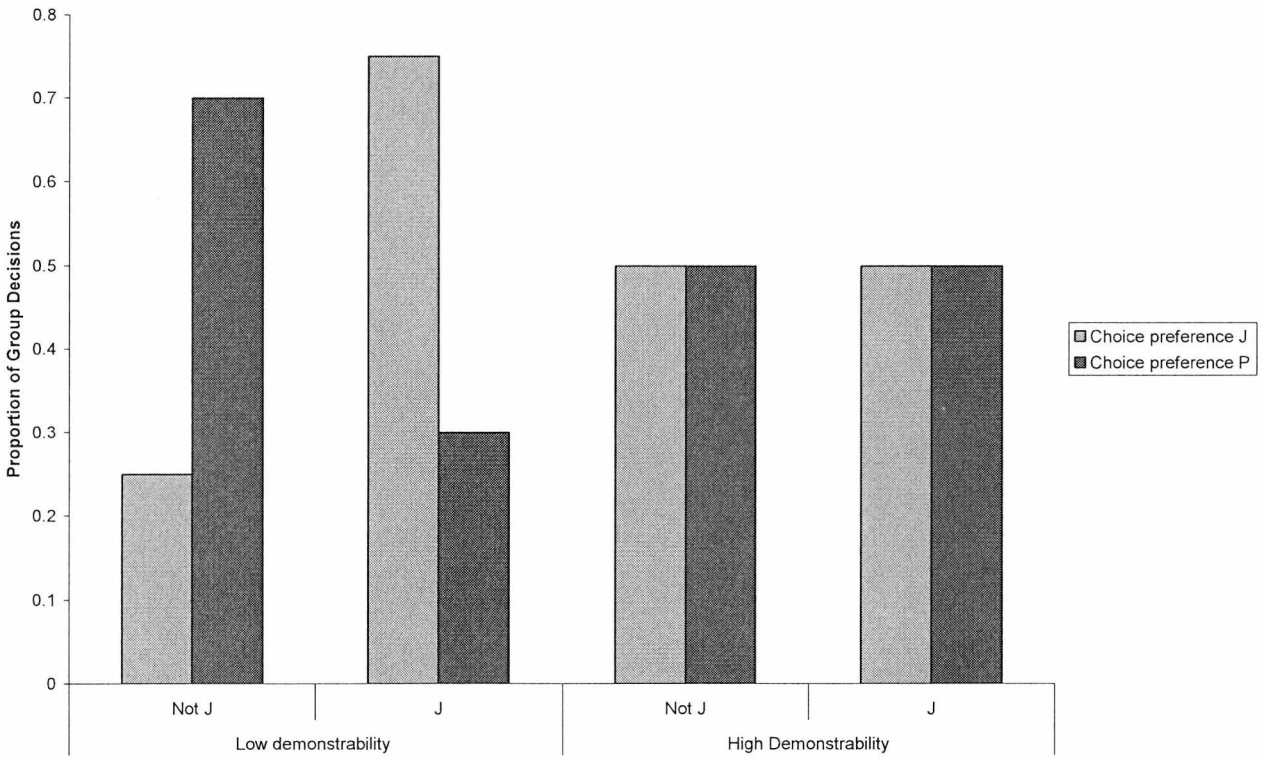
Group Decisions

Group decisions were classified as J or not J decisions (Hopthrow and Hulbert 2005) and to test our questions the file was split into high and low demonstrability and $Z_{\text{contrasts for proportions}}$ performed on group decision x choice preference. This analysis was used because it enables the testing of an apriori directional hypothesis that is based on proportions of (in this case) groups choosing cooperatively or non-cooperatively (Rosenthal and Rosnow 1985). Figure 3.1 shows the frequency counts in each cell of these analyses.

The analysis showed no difference in the proportion of group decisions for J or not J based upon choice preference in the high demonstrability condition $Z_{\text{contrasts for}}$

$_{\text{proportions}} = 0$. However in the low demonstrability condition the proportion of groups making an all J (cooperative) group decision was significantly higher when the group choice preference was All J (cooperative) than when the choice preference was all P (not cooperative) $Z_{\text{contrasts for proportions}} = 2.14$, $p = .016$. Therefore, consistent with our expectations, there was an effect of choice preference in the low demonstrability conditions but not in high demonstrability conditions.

Figure3.1: Proportion of Group Deciding J or not J According to Choice Preference



Consistent with expectations, there was also a significant effect of group decision upon actual choice. Individuals that were members of groups that chose cooperatively were significantly more likely to choose cooperatively themselves than

members of groups making a non-cooperative group decision, F (1,36) = 12.775, p = .001 (respective means, .877, .561).

Post Choice Measures

A five item scale measuring group identity showed good internal consistency with a Chronbach's α = .88. Consistent with predictions a 2 (Demonstrability, High/Low) x 2(Choice preference, J/Not J) ANOVA on the mean of the 5 items showed no significant effects. Table 3.2 shows the means and standard error by condition for group identity.

Table 3.2: Means and Standard Error by Condition for Group Identity

	Low Demonstrability		High Demonstrability	
	Mean	Standard Error	Mean	Standard Error
All P	4.29	.157	4.28	.143
All J	4.17	.175	4.01	.175

The same analysis conducted upon the question: 'To what extent do you think the group decision accurately reflects the views of the group?' Showed a significant effect of choice preference F(1,224) = 10.294, p = .002. All J choosers showing greater agreement with this statement (respective means: 2.68, 3.48). No effect of demonstrability was found neither was there an interaction effect. In both cases F< 1 A 5 item questionnaire designed to measure the participant's motivation analysed as separate items with a 2 (Demonstrability, High/Low) x 2(Choice preference, J/Not J) ANOVA.

Item 1: 'I want to earn as many points as possible' Showed a significant effect of choice preference, not J choosers showing greater agreement with this statement $F(1,223) = 9.452$, $p = .002$ (respective means: 3.33, 4.02). No effect of demonstrability and no interaction effects were found.

Item 2: 'I only take my group's interest into account' showed no significant effects.

Item 3: 'I only take my own interest into account' showed that J choosers disagreed with this statement significantly more than not J choosers $F(1,221) = 10.287$, $p = .002$ (respective means: 5.31, 4.67).

Item 4: 'I do not want to lose more points than other members of my group' showed a significant effect of Demonstrability only. Participants showed significantly more agreement in High demonstrability than in Low demonstrability $F(1,224) = 5.81$, $p = .017$ (respective means: 3.53, 4.11).

Item 5: 'I do not trust the other members of my group' showed a significant Demonstrability x Choice preference interaction $F(1,223) = 4.07$, $p = .045$. Table 3.3 show the means and standard errors by condition.

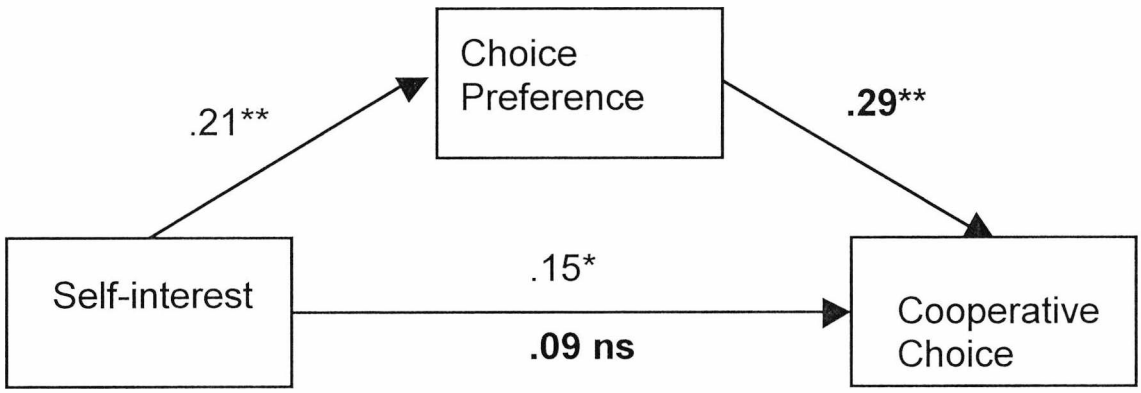
Table 3.3: Means and Standard Error by Condition for Trust

	Low Demonstrability		High Demonstrability	
	Mean	Standard Error	Mean	Standard Error
All P	5.37	.213	4.99	.192
All J	5.29	.236	5.79	.236

Simple main effect analysis indicates that the difference lies within the High demonstrability condition. Participants showed a greater level of indicated trust in the all J condition than in the all P condition $F(1,223) = 7.009$, $p = .009$.

To test for possible mediation we looked for motivation questionnaire items that significantly correlated with Actual choice (our dependent variable measuring cooperation). Only item 3 correlated significantly and therefore was the only item to be explored further. Item3 'I only take my own interest into account' (self interest) correlated significantly with actual choice $r(224) = .15$, $p = .026$. The effect of choice preference on this item was tested for mediation.

Figure 3.2: The mediating role of choice preference on the effect of self-interest on cooperative choice



Beta co-efficients, **bold** refer to multiple regression * $p < .05$, ** $p < .01$.

Following Baron and Kenny (1986) we computed a series of regression analyses between these variables. These revealed, as expected that self interest did predict cooperative choice, as did choice preference condition. Furthermore, there was a significant reduction on the effect of self interest when choice preference condition was entered as a simultaneous predictor, *Sobel* $Z = 2.63$, $p < .01$. Indeed, when the predictors were entered together self-interest no longer significantly predicted cooperative choice. This mediation analysis is presented in Figure 3.2 above and

demonstrates that the prediction of cooperative choice by self interest is only present when the choice preference condition is taken into account.

Reliability analysis of the 9 Item questionnaire measuring group cohesion indicated good internal consistency Chronbach's $\alpha = .83$. A 2 (Demonstrability, High/Low) x 2(Choice preference, J/Not J) ANOVA on group cohesion showed no effects of our independent variables.

To test our hypotheses regarding group identity and cohesion we conducted a multiple regression analysis. Time 1 choice (intended choice), group identity and group cohesion were entered as simultaneous predictors of Time 2 choice (actual choice). The group cohesion and group identity scores were constructed by taking the mean of all items on each scale. Table 3.4 shows the correlation between variables and regression statistics. Table 3.4 shows that there was a significant positive correlation between Time 1 and Time 2 choice and there was a significant negative correlation between group identity and group cohesion, greater levels of cohesion are associated with greater levels of group identity. The model predicted 11.9% of the variance in Time 2 choice this was significant $F(3,220) = 9.95$, $p < .01$. Table 3.4 shows that, consistent with our hypotheses, Group identity and group cohesion did not significantly predict Time 2 choice. Time 1 choice did significantly predict Time 2 choice.

Table 3.4: Assessment of Group Cohesion and Group Identity

	Time 2 choice	Time 1 choice	Group Identity	Group Cohesion	*B*	β	*sr*2
Time 1 Choice	.318**	-	-	-	.298	.326**	.105
Group Identity	.107	-.081	-	-	.046	.122	.013
Group Cohesion	-.089	-.046	-.334**	-	-.017	-.033	.001
M	.710	.420	4.20	3.06	$R^2 = .190$		
SD	.453	.495	1.22	0.86	Adj.$R^2 = .107$		

Note: Group identity low score corresponds to low identity
Group cohesiveness low score corresponds to high cohesiveness
* $p<.05$, ** $p<.01$

Discussion

Aims

The aim of this experiment was to further our earlier work (Hopthrow & Hulbert, 2005) and investigate the role of demonstrability and group decision making in improving cooperative choice in an *n* person social dilemma. More specifically to gather evidence as to the effect of individual preference on group output and to test the level to which the demonstrability effect (Hopthrow & Hulbert, 2005) is a robust phenomenon. We wanted to test whether a dilemma that is high in demonstrability is adversely affected by a group that consists entirely of people that prefer the non-cooperative choice. The concept of demonstrability applied to social dilemmas was adapted from Laughlin's (1980) continuum of demonstrability in the context of task orientated groups. Demonstrability was manipulated through changes to the matrix of points presented to participants. Groups were formed according to participant's

preconceived ideas about the dilemma. Groups consisted entirely of individuals that all preferred the cooperative choice or all preferred the non-cooperative choice.

Main Findings

Demonstrability and Choice Preference

Consistent with our predictions we found no effect of demonstrability on pre-discussion individual choice. Our theoretical standpoint that the different dilemmas should be rationally equivalent and, therefore, appear to be the same to individuals is supported. Consistent with previous work (for example, Bouas & Komorita, 1996; Caldwell, 1976; Kerr & Kaufman-Gilliland, 1994) we found significantly higher levels of cooperative choice post-discussion than pre-discussion indicating the replication of the group discussion effect in which a period of discussion increases levels of cooperative choice. This is an important replication as our rationale for demonstrability is based upon the group having the opportunity to have a discussion and make a group decision as to the best course of action to take when playing the dilemma.

There is a significant effect of choice preference that is, consistent with expectations individuals that were in groups of people that all preferred the cooperative choice were more likely to choose cooperatively than those individuals in groups that all preferred the non-cooperative choice. At this stage no overall effect of demonstrability on post discussion choice was found. However the direction of the cell means indicated that demonstrability was indeed having some influence. Howell (1992) outlines that as we have cell means in the direction of our hypothesis we are able to perform simple effects analysis without having a significant interaction term.

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Simple effects analysis showed that in the case of a dilemma high in demonstrability there was no difference in cooperative post-discussion choice between cooperative (groups in which all group members preferred the cooperative choice pre-discussion) and non-cooperative (groups in which all group members preferred the non-cooperative choice pre-discussion) groups. However, there was a significant difference between these two groups for dilemmas low in demonstrability. Non-cooperative groups showed significantly lower levels of post-discussion cooperative choice than cooperative groups.

It is worth noting at this point that there is some change in level of pre-post discussion cooperative choice for the non-cooperative low demonstrability groups. This is not counter intuitive, a low demonstrability dilemma does not mean that the correct answer cannot be demonstrated to doubting members just that it is more difficult to do so and therefore it is less likely. However, these results indicate that in line with predictions demonstrability is an effect that is to some degree immune from the effects of the preconceived ideas of the individuals involved in a given dilemma. This gives us further evidence in support of the idea that groups view a dilemma as a problem to be solved i.e. they are, as a group, actively looking for a plausible correct answer as opposed to a merely preferred answer.

Group Decisions

Groups in this study were asked to make explicit group decisions as to the best course of action to take. Consistent with the results for individual choice group decisions were found to be unaffected by the individuals' pre-discussion preference for dilemmas high in demonstrability. Also consistent with our predictions in low

demonstrability dilemmas groups were more likely to make a cooperative group decision when its constituent members preferred the cooperative choice pre-discussion than when it contained members that preferred the non-cooperative choice. Consistent with Hopthrow and Hulbert (2005) group decision had a significant effect upon post-discussion/decision choice. Individuals that were members of groups that made a cooperative group decision were more likely to make a cooperative decision post discussion/decision than members of groups that had made a non-cooperative group decision. In sum cooperative group decisions elicited more individual cooperative choice than non-cooperative group decisions and high demonstrability removed the effect of individual preference on the group decision.

It appears that group decision making has a substantial role in the process behind the group discussion effect. This study replicates the finding of Hopthrow and Hulbert (2005) that a cooperative group decision significantly increases the level of post-discussion cooperative choice. However, neither study contained an explicit comparison between groups that merely discuss the dilemma before the individual group members make their choice and groups that are asked to make an explicit group decision before the individual choice making phase. Future research could compare dilemma groups that do not discuss the dilemma with those that merely have a dilemma based discussion and those that have a discussion and make a group decision. Bouas and Komorita (1996) give evidence for a consensus building process; it seems likely that given the effects we have seen of group decision that the critical aspect of the consensus process is a group decision and more specifically a group decision to be cooperative. The evidence from this study would suggest that group

decision is an important factor in the group discussion effect but that demonstrability also has a role.

Looking at the results of this study from an individual choice perspective we see that pre-conceived ideas about the correct choice do not necessarily dictate the decision the group is going to make and to some extent the participants' later choices. This study gives further evidence of the positive role of demonstrability in improving cooperative choice post-discussion. We can see that demonstrability appears to be a relatively robust phenomenon as a completely doubting group does not remove all of its effect.

Post-choice Questionnaires

Post choice questioning can help us explain these effects. Participants indicated a greater desire not to lose more points than their other group members in high demonstrability than low demonstrability. If we look at this item in the context of equality we can see how it dovetails with the ideas portrayed by Parks (personal communication).

Parks believes that changing the demonstrability of a dilemma makes it clearer to participants that they are not going to be able to be the only non-cooperator in a group of cooperators (i.e. get the highest payoff). What is more likely to happen is that they would aim for that position as would all the other players and the group would merely fall into the trap of mutual defection. Increasing the demonstrability of the dilemma would help participants to understand that if they do not aim for mutual cooperative choice they are likely to end with mutual defection. In the context of the

question 'I do not want to lose more points than the other members of the group' we can argue that in high demonstrability the participants are seeing the benefit of equality (i.e. they are taking a more pragmatic view as to the outcome of the dilemma, they understand that they are at risk if everyone does not act together).

Other motivation items support our predictions, pre-discussion, non-cooperators indicated that they were more interested in maximising their outcomes than, pre-discussion, cooperators. A similar pattern was found in regard to own interest, i.e. people that preferred the non-cooperative choice pre-discussion were more concerned with their own interests than people that preferred the cooperative choice pre-discussion. The mediation analysis indicates that as expected self-interest and choice preference are linked. Those high in self interest are more likely to prefer the non-cooperative choice. More than anything these two results indicate that the participants understood the dilemma prior to discussion as the Dawes (1980) criteria state that one is always better off if one chooses the non-cooperative choice. This line of questioning matches this argument, i.e. people that want to maximise their points score and who only have their own interest at heart (as opposed to the collective interest) would want to choose the non-cooperative choice.

Examining trust we found that there was a significant interaction between demonstrability and choice preference on the item 'I do not trust the other members of my group'. Looking closer we see that the basis of this is in the high demonstrability condition. In high demonstrability dilemmas participants showed a greater level of trust when in groups of cooperative choosers than when in groups of non cooperative choosers. It is plausible to argue that group members are more trusting of cooperative

choosers in high demonstrability than non-cooperative because of the incongruity of choosing non-cooperatively on a dilemma high in demonstrability when in a group. A high demonstrability dilemma makes the benefit of the mutually cooperative choice more salient to group members. Therefore, if a group member indicated a non-cooperative strategy their motivation maybe one of exploitation and therefore would not warrant a high level of trust.

The measure of group identity showed consistent with predictions that group identity had no significant effects. This is contrary to Dawes, McTavish, and Shaklee (1977), who argued that the cause of the group discussion effect was an increase in group identity and therefore concern for the collective good that arose from merely having a period of group discussion. However taking into account the premise of social categorisation theory that a referent group needs to be present to elicit the kind of levels of group identity needed to inspire group members to work for the collective good over and above any other motivation (Turner et al., 1987) we would not have expected any large impact of group identity in this study. Indeed although issues of status were not measured the results imply that there were no status effects (Tyler & Blader, 2002). The findings of this study support this rationale in the respect that there were no effects of group identity on individual choice making. However more evidence is needed as all groups in this study were discussion groups and therefore we are unable to completely discount the idea that changes in identity may have some role to play as we are not comparing groups that discuss with groups that do not discuss. Further research testing explicitly this distinction would enable us to be more convinced about the role of group identity in the group discussion effect.

The lack of a referent group on the context of this experiment indicates that we may not find an effect of group identity. However, the fact that the groups are spending time together ostensibly solving a problem would indicate that they may develop some level of group cohesion. Group cohesion can lead to a greater concern for the collective outcome (Turner et al., 1987). We did not find an effect of group cohesion on the level of cooperative choice.

Limitations

In this study choice preference was measured by asking participants to make a preliminary decision about the dilemma. This procedure gave a dichotomous classification of participants as either cooperators or non-cooperators. We wanted to test the extent to which high perceived demonstrability could affect a group consisting entirely of non-cooperators. This procedure allowed this test, however, an alternative methodology could have been used. We could have used participants' social value orientation to allocate them to groups. Whilst their social value orientation may predict choice making in the dilemma situation we feel that asking participants to decide about the actual dilemma in question is a more direct approach. The inclusion of a social value orientation measure may have helped understand more fully the process by which some members of non-cooperative groups in the low demonstrability condition chose cooperatively.

The reasons behind this process are underspecified in the design and results of this study. One possible explanation is that personality is impacting upon choice making. Indeed, we have some support for this from study 1 as participants indicated that they felt personality was an important factor in consensus generation. For

example, some members of non-cooperative groups maybe more committed, insistent or aggressive with their advocating for the non-cooperative choice. Other group members may wish to distance themselves from this orientation because either they do not like what they see and do not want to be classified in the same way (Parks, personal communication, 2007), or because they have a different value orientation. Social value orientation can be classified as having three levels, pro-socials who try to maximise joint outcomes, individualists who try to maximise their own out come and competitors who want to ensure they receive more than others (Van Lange et al., 1997). This latter strategy could be seen as more aggressive and as such we could conceive of a situation in which individualists (or pro-socials that feel pushed into competition) become cooperative to distance themselves from the competitors in social terms. Future research is needed to try to specify the processes driving cooperative choice in groups consisting initially of entirely of non-cooperators.

Mixed groups were not included in this study as there were not a sufficient number of groups to include as separate conditions and were not part of the theoretical rationale for the study. However, the use of mixed groups may have enabled us to better determine the relative influence of cooperators and competitors in this scenario, and could be included in future investigations.

Summary

In sum, this study indicates that groups under certain conditions may over ride an initial unanimous position and produce a group decision favouring an alternative outcome to that preferred at the beginning. In this particular scenario the factor that precipitated the change with in groups from a mutually non-cooperative standpoint to

a cooperative one was demonstrability. A social dilemma high in demonstrability is sufficient to enable groups to change from a unanimous position of non-cooperation to a cooperative one. This indicates that demonstrability for social dilemmas could be viewed as a relatively robust device that can withstand the effects of doubting group members. The results show that a level of influence from an individual's pre-conceived ideas is still present but that demonstrability has a significant impact. Follow up tests indicate that group identity was not a significant factor.

This experiment provided evidence that non-cooperative group members were changing their opinion in a dilemma of high demonstrability. Future research would benefit from examining whether group members that were non-cooperative at the stage they indicated their choice preference, and then became cooperative after the group discussion were undergoing lasting opinion change regarding their preferences in the dilemma. Study 3, Chapter 4 will look in greater detail at this phenomenon.

Chapter 4: Group Discussion, Group Decision, Demonstrability, and Cooperation

Summary

This chapter presents the results of an experiment designed to determine the role of group decision making in group discussion effect. A period of group discussion has been shown to increase the level of cooperative choice of members of a group participating in a social dilemma (e.g. Caldwell, 1976). This chapter examined the effect of discussion type on cooperative choice, comparing a period of no discussion, with a period in which participants were only allowed to discuss the dilemma not reach any form of decision, with a period in which participants were asked to discuss the dilemma and reach a group decision as to the best course of action to take. Participants were presented with a social dilemma either low or high in demonstrability. Findings indicate that the group discussion effect is driven by a cooperative group decision. Participants in the no discussion condition became less cooperative after a period thinking about their choices. Participants in the discussion only condition showed no change between their choice before and after discussion (Time 1 and Time 2). However, after a period of group discussion that included a group decision participants showed an increase in the level of cooperative choice. A follow up showed that this effect was consistent over time. No effects of cohesion or group identity were found. The findings are discussed in terms of the implications for understanding group discussion as a mechanism in social dilemmas.

Study 3: Investigating the effects of group discussion type and demonstrability on cooperation

Introduction

The design of the experiment presented here aims to extend and replicate the findings of Hopthrow and Hulbert (2005) and to examine the role of a group decision in promoting lasting opinion change to the cooperative choice in small group social dilemmas. The group discussion effect is a reliable phenomenon in social dilemma research (Caldwell, 1976; Rapoport, 1974; van de Kragt et al., 1986). Groups that have the opportunity to discuss the dilemma before making their individual choice show greater levels of individual cooperative choice.

Group Discussion

Discussion however is not always of benefit to a group (Sunwolf & Seibold, 1999), they argue that if discussion has no limits or rules (based upon group process) it can often have a detrimental effect upon the functioning of the group. Indeed Maier (1970) suggests that groups under rules of free discussion may skip to choice making quickly without sufficient analysis of the problem they are faced with. In the context of the research of the current thesis the problem would be solving the social dilemma. Useful information may not be shared (Stasser, 1992), group members may have difficulty attending to task relevant information (Brenner, 1973) and groups often end up making their decision based upon a majority process (MacCoun & Kerr, 1988). We can see from this that it is conceivable that in a free discussion of a dilemma a possible minority of cooperative advocates may not share their knowledge/preference or may have their preference overruled by the majority even if mutual cooperation is the correct solution to the dilemma. Frey (1995) suggests that to overcome these

problems discussion groups need some form of moderating process imposed upon them to facilitate the discussion. This could be in the form of a physical facilitator such as a person placed in the group to act as a moderator or it could be in the form of an imposed rule such as group decision.

Research by Hopthrow and Hulbert (2005) has indicated that the group discussion effect can be explained in terms of a group decision. More specifically groups were found to be using a Cooperative choice-supported wins decision scheme i.e. only two group members were needed to advocate the cooperative choice for the group decision to be cooperative. This cooperative group decision was found to increase the number of individual cooperative choices in line with the findings of the group discussion effect. However, previous research has found evidence of the group discussion effect without asking for a specific group decision.

If the group discussion effect is driven by the group making cooperative group decisions, then we would not expect to see any evidence of an increase in cooperative choice after a group discussion phase that does not include a group decision. Previous research has not asked for an explicit group decision; however that does not rule out the possibility that a group decision is not present albeit potentially implicit in its nature. One important aspect of this experiment will be to explicitly compare no discussion with discussion only and discussion and decision. Participants will be prevented from making any form of group decision in the discussion only condition, and will be prevented from any form of communication in the no-discussion condition. We would expect that, if a cooperative group decision is the critical factor

behind the group discussion effect, there would be no effect of discussion only on cooperative choice.

A cooperative group decision can be explained in terms of the decision scheme adopted by the group. Changing the perceived demonstrability of the social dilemma changed the decision scheme used by the group and the subsequent level of individual cooperative behaviour. Hopthrow and Hulbert (2005) showed that in line with the group problem solving research of Laughlin (1980) social dilemmas could be presented at different points along a continuum of demonstrability. Like Laughlin's (1980) findings altering demonstrability altered the decision rule used by the group. Hopthrow and Hulbert (2005) showed that groups used a C-supported wins rule for dilemmas high in demonstrability and a majority rule for dilemmas lower in demonstrability.

The previous study showed that the effect of demonstrability can offer some protection from defection. It showed that despite starting from a position of mutual defection groups could show good levels of cooperative choice under conditions of high demonstrability. However, it only examined groups that were making an explicit group decision and therefore the question remains as to whether the group discussion effect and the allied effects of demonstrability rely, as Laughlin (1980) suggest they might, upon the presence of a group decision. In addition it is not clear whether the group decision promotes lasting opinion change in the individual or merely acquiescence to the group decision.

Social Decision Scheme analysis

Orbell et al. (1988) argued for unanimity of choice preference in order for groups to display the group discussion effect, and Bouas and Komorita (1996) argued for a less conservative view, which is that a majority preference for the cooperative choice would be sufficient. However, we argue that if this is true we would not see any effect of group discussion as there would rarely be enough cooperative choosers to form the majority. In fact the group should be acting based upon a minority preference. Indeed if this is the case it is possible particularly under conditions of high demonstrability that doubting group members will change their preference position under the influence of the minority of group members that prefer the cooperative choice. We argue that in order for this effect to be present the group must make a group decision as to the best course of action to take. If this group decision is based upon a minority decision rule we would expect to see evidence of the group discussion effect whereas if it is based upon a majority rule we would not expect to see any increase in cooperative choice. In fact under certain circumstances we would actually expect to see a reduction in cooperative choices in comparison to the pre-discussion choice.

In order to test this assertion we will use social decision scheme analysis (SDS, Davis, 1973). Social decision scheme analysis is a social combinatorial approach to the study if the groups decision making process. The idea behind this process is the ability to make the connection between the inputs to a group, i.e. the initial preference of the group members and the output i.e. the group decision (Baron & Kerr, 2003). In other words, we are using this approach to determine the manner in which groups make their decisions based upon the distribution of starting preferences

within a sample population. Taking a theoretical perspective we can specify a number of decision rules. These decision rules describe the decision making process. Based upon the distribution of preferences within a sample population SDS analysis produces a predicted group outcome for each of the decision rules tested. The actual group outcome can then be compared with the predicted outcomes using a model testing procedure and the closest match indicates the decision rule that the group was using.

Decision rules describe the number of people needed to advocate a particular position for that position to be adopted by the group. An example would be 'truth-supported wins' in which the group solves a given problem correctly if two group members advocate the correct answer (Laughlin, 1980; Stasser, 1999). It is important to note that this rule is independent of group size. Other rules are dependent on group size for example 'majority' under this rule the group solves a given problem if the majority of group members advocate the correct answer (Laughlin, 1980). Under certain circumstances this rule cannot apply e.g. a 3-3 split in a 6 person group, under these conditions a secondary rule is applied e.g. 'equiprobabilty otherwise' in which there is a 50 % chance of the group deciding one way or another when faced with two choice alternatives.

A group may use a different decision rule due to a number of different factors, but the most interesting to us is that of task type (Laughlin, 1980) as described in previous chapters. The decision rule that a group uses will have a significant impact upon the group decision. Therefore, we could, for example, explain differences in

decisions brought about by changes in task type in terms of the changes to the group decision making *process*.

In this experiment we will be testing four theoretically derived decision rules with the aim of explaining more fully the group process involved in decision making about a social dilemma. Bouas and Komorita (1996) suggest that groups create a consensus based upon a majority rule. In order to test this and to test idea and the assertion that groups will only use a majority rule when faced with a dilemma of low demonstrability the first of the decision rules we will test will be 'majority-equiprobable otherwise'. Orbell et al. (1988) suggest a universal promising model of consensus in that all participants have to agree that the correct choice is the cooperative choice. If this holds true we would expect that as soon as an individual advocates the non-cooperative choice the group decision reverts to one on non-cooperation. We refer to this rule in the context of social dilemmas as 'P-wins' i.e. one vote for the non-cooperative choice would be sufficient to elicit a non-cooperative group decision. A representation of this rule and 'Majority-equiprobable otherwise' can be seen in Table 4.1 below.

Table 4.1 Majority based decision rules

Number of people intending to choose J or P		Actual Group Decision			
		P-wins		Majority equiprobable otherwise	
J (cooperative choice)	**P** (non-cooperative choice)	**J** (cooperative choice)	**P** (non-cooperative choice)	**J** (cooperative choice)	**P** (non-cooperative choice)
6	0	1	0	1	0
5	1	0	1	1	0
4	2	0	1	1	0
3	3	0	1	0.5	0.5
2	4	0	1	0	1
1	5	0	1	0	1
0	6	0	1	0	1

The third rule that we will test is based on the premise that the group discussion effect can only be present if the group decision making process is based upon a minority principle (Hopthrow & Hulbert, 2005), that is if a given sample population contains a minority of cooperative chooser (albeit a large one) a majority based rule will result in a decrease in rates of cooperative choice. Therefore, we propose two minority based rules to test this argument and to test the hypothesis that dilemmas high in demonstrability will promote minority based decision making and therefore increased rates of cooperative choice. The rule 'truth-supported wins' can be adapted for a social dilemma to be 'cooperative choice-supported wins'; if two people, regardless of group size, advocate the cooperative choice the group decision will be cooperative. We will refer to this rule as 'J-supported wins' The second of these rules (and the fourth rule that we are going to test) is merely a more conservative version of 'truth-supported wins'. This rule 'truth-wins' is

operationalised in a social dilemma context as 'cooperative choice wins' i.e. one person advocating the cooperative choice is sufficient to elicit a cooperative group decision. We will refer to this rule as 'J-wins'. These two minority based rules can be seen in the table below.

Table 4.2 Minority based decision rules

Number of people intending to chose J or P		Actual Group Decision			
		J-wins		J-Supported Wins	
J (cooperative choice)	**P** (non-cooperative choice)	**J** (cooperative choice)	**P** (non-cooperative choice)	**J** (cooperative choice)	**P** (non-cooperative choice)
6	0	1	0	1	0
5	1	1	0	1	0
4	2	1	0	1	0
3	3	1	0	1	0
2	4	1	0	1	0
1	5	1	0	0	1
0	6	0	1	0	1

Opinion Change

The conformity literature can give us some insight into the process that maybe occurring between the group making a decision on the best course of action to take and the individuals actually making their choice. Moscovici (1980) found that for individuals to undergo lasting opinion change the source of influence promoting the changed attitude or behaviour must be perceived by the individual as one of power. The question is whether a group decision is powerful enough to promote opinion change or whether for whatever reason individuals merely acquiesce to the group decision. Lewin (1947) was interested in encouraging housewives to increase the level

of offal in their family's diet. He found that in follow up studies later more families had increased their offal intake if the house mother had taken part in a group discussion that had resulted in a group decision to eat more offal versus those that had merely been exposed to a lecture espousing the virtues of eating more offal. Lewin's (1947) finding indicates that group decision making may be an important process in promoting opinion change.

Looking more closely at the effect of group decision upon opinion change we need to examine the effects of different decision schemes. Group decisions can take many forms from simply one person in the group advocating the adopted outcome to complete unanimity. It is likely that if as a group member you are not required to agree with the advocated choice you are unlikely to feel any pressure or need to change your opinion. Davis et al. (1981) conducted an experiment using mock juries in which half the groups were asked to make a group decision about the guilt of the defendant. The other groups were asked merely to discuss the case with out reaching any conclusions. They found in follow up that those ex-jury members in the discussion only groups were less likely to attribute guilt to the defendant than those in the decision making groups and less likely to attribute guilt than found before the group phase of the experiment. Davis et al. (1981) argued that the period of discussion only invoked the defendant protection norm, i.e. that it is better to free a guilty person than convict an innocent one. This highly normative rule they argued accounts for the greater levels of opinion change to not-guilty in the discussion only groups. While no decision scheme was imposed on the decision making groups it was found that they tended to use the two-thirds majority scheme. In which only two-thirds of the group members are needed to agree upon the advocated choice. Approximately this level of

guilty sayers was naturally present in the pre-group population suggesting that the remaining group members did not need to change their opinion.

This view in part is supported in the minority influence literature, although expanded upon. If a group making a decision is faced with a minority (of, in this case, cooperative choosers) we would expect them to engage in more systematic processing, especially if the power of the minority is enhanced by a high demonstrability dilemma. This would in turn be likely to show an increase in private opinion change. In sum a non-decision making group will be expected to undergo systematic processing of arguments and subsequent opinion change, whereas a decision making group will only undergo this process if the minority is sufficiently consistent and powerful to promote the necessary motivation amongst the majority of Non-cooperative choosers, to re-examine the arguments for the cooperative choice.

Aims and Hypotheses

The design of this experiment will test two main factors as an extension of Hopthrow and Hulbert (2005). The first being a discussion manipulation (no discussion, discussion only, discussion and decision), participants in the discussion only condition will not be able to make a group decision on the dilemma and therefore will only be able to undergo an information gathering process, rather than a group decision. We would expect to see that group decisions will promote the greatest level of cooperation, followed by discussion only and the no discussion. This is a more direct test of the influence of group decisions than Hopthrow and Hulbert (2005). Demonstrability will also be manipulated, with the expectation that it will alter the decision rule used in the decision conditions, with high demonstrability promoting the

use of a minority based decision rule. We would also expect high demonstrability to beneficially affect the discussion only condition as we would expect group members to be using systematic processing in this condition, if that is the case then as the cooperative choice is demonstrably correct they should see this.

The second part of this experiment aims to find evidence for lasting opinion change. Therefore, in addition to a measure of individual preference being taken before and after the discussion manipulation, participants will also be asked for their preference on a third occasion when not in the company of their groups, to measure whether their opinion has been changed by group membership or not. Participants will be given the same matrix that they had before and asked to reassess their choice.

However, opinion change could just be due to the imposition of some form of group norm. Baron and Kerr (2003) outline the importance of social norms in promoting cooperative behaviour in social dilemmas. Examples of these norms include reciprocity (Gallucci & Perugini, 2003; Perugini, Gallucci, Preshagi, Ercolani, 2003; Wilke & Braspenning, 1989), or norms that are created and enforced on an ad hoc basis based upon factors important to the particular group in question at the time of its conception. These ad hoc norms tend to be less formal and are created by the group for that particular situation. According to Baron and Kerr (2003) in order to ensure that the norms being used are adhered to the group must be able to keep a check on behaviour so that the group can register any group member that breaks a norm and '...social sanctions the group uses to punish norm violations must be salient' (p.151) (i.e. the participant must be available to and influenced by techniques that the group may use to prevent anti-normative behaviour). It could be argued that

two events could reduce the group's effectiveness at enforcing its norms. Firstly, any change to the physical cohesion of the group may reduce the effectiveness of sanctions or monitoring that the group may use. Secondly, the dissolution of the group would likely negate the grip of any group specific norms particularly the ad hoc norms created at the group's conception. Therefore, in this experiment one extra factor will be manipulated. In order to determine if the opinion change is a function of adherence to the group norms and preferences or not, participants will be told either that they are playing the dilemmas as part of the same group before or a different group with no members the same as before.

It is expected that the high demonstrability will promote more opinion change than low demonstrability and that the discussion only groups will also benefit from greater levels of opinion change. Allied to this we would expect higher levels of adherence to the group preferences in the same conditions than the different conditions.

Group Identity and Group Cohesion

Dawes McTavish, and Shaklee (1977) argued in favour of a group identity explanation for the increases in individual cooperative choice observed after a period of discussion. In Study 2 we outline an argument for why this explanation is would not explain the findings in the current context and indeed when followed up with post choice questionnaires we find no evidence in favour of this explanation. However, in Study 3 the groups used differ along the axis of discussion. If forming these types of task oriented groups is a 'sufficiently minimal device' we should expect to see differences in group identity and its effects between the different discussion

conditions i.e. the opportunity to have a discussion vs. not to have a discussion should elicit higher levels of group identity if this is the device driving the phenomena as participants are given greater exposure to one another. Therefore, we will measure group identity post-choice in Study 3. With the increase in intragroup contact that comes with discussion we would expect to see an increase in group cohesion. Therefore, group cohesion will be measured because as with group identity we would expect the change in discussion type to affect group cohesion if cohesion were an important explanatory factor.

Method

Participants

Two hundred and forty one participants took part in this experiment. They consisted of 1st year undergraduate psychology students that took part in the experiment as part of their course requirement, and 1st year A-level students recruited from Canterbury College, Simon Langton Girls Grammar school, and Kent College. All participants were over 16, there were 37 males, 174 females, and 30 participants did not report their gender. They were randomly assigned to six person groups.

Design

Participants were randomly assigned to conditions in a 2 (Demonstrability, High/Low) x 3 (Discussion Type, No discussion/Discussion only/ Discussion and Decision) x 2 (Group membership, Same group/Different group) between-participants factorial design and asked to make and individual choice between J (cooperative choice) and P (non-cooperative choice) in a non-iterated prisoner's dilemma game. Participants were informed that their individual choices were anonymous and that the

points they earned during the experiment would be converted into school supplies at the end. The main dependent variable was the proportion of J-choices made in the group both before and after discussion.

Demonstrability was an independent samples factor with two levels, high and low demonstrability. The points matrices are in Table 4.3 below.

Table 4.3: Payoff Tables for High and Low Demonstrability

High demonstrability							
	0	1	2	3	4	5	6
J	x	194	197	200	203	206	209
P	200	204	208	212	216	220	x
Low demonstrability							
	0	1	2	3	4	5	6
J	x	140	170	200	230	260	290
P	200	240	280	320	360	400	x

Participants were either asked to base their choices on a payoff matrix high in demonstrability or on one low in demonstrability. Discussion type was also an independent samples factor with three levels; no discussion, discussion only, and discussion and group decision. In the no discussion condition participants were asked to write down all the reasons the could think of for choosing one choice or the other for five minutes in silence before making their final individual choice. In the discussion only condition participants were given the opportunity to discuss their choices for five minutes before making their individual choice, but were specifically asked not to make a group decision or talk in specifics that would enable an implicit group decision. Discussion and decision group members were given five minutes to discuss their choices and reach a group decision. The decision could take one of three

forms; All –J, All – P or mixed. Group membership was a repeated measures factor. For this factor participants were asked to make an individual choice without being physically with their group. They were told however that they were either playing with the original members of their group or that they were playing with other participants none of whom had been in their group previously.

Pre-discussion participants were asked to indicate the choice that they intended to make post- discussion/decision. Between the first group discussion phase of the experiment and the later repeated measure part, participants were asked to fill in three short questionnaires measuring group identity, group cohesiveness and individual motivations. The questionnaires were measured using 7 point Likert scales (See Appendix B1).

Procedure

Participants arrived at a central holding room and were told briefly about the format of the experiment and informed about their need to give informed consent and their right to withdraw. They were asked to create an individual code number for themselves based upon the day of their birth and their initials. They were then assigned randomly to groups of six people and taken to individual group rooms. Several groups were run simultaneously over a number of different sessions. Once seated, participants were assigned a group number and a seat number so that each participant could be anonymous but separately identified. Participants were then given the initial instruction sheet a copy of the matrix of points and asked to read along with the tape recorded instructions (Appendix B2 and B3). The instructions explained the

nature of the dilemma and the procedure for the experiment. They were instructed that they would be able to exchange the points they earned for pens and pencils at the end of the experiment. Once this process was completed the experimenter re-entered the room and gave the participants the opportunity to ask any questions regarding the clarification of the task and procedure. Experimenters were encouraged where possible to couch their answers in terms of the already read instructions.

Participants were then asked to privately indicate the choice that they intended to make after the no-discussion/discussion/decision period. This choice was placed into an envelope and collected by the experimenter before continuing on to the next phase of the experiment. The experimenter then gave out the instructions for the group procedure part of the experiment. In the case of the discussion and decision level of this factor the instructions had space for the participants to fill in the group decision. Once the five minutes were up the experimenter re-entered the room and asked the participants to make their individual choice without communicating with any of the other group members.

On completion of their individual choice the experimenter re-entered the room and collected the forms. The participants were then informed of the number of points that they received. The experimenter entered the room and said, 'those of you that chose J received X points and those of you that chose P received Y points' in order to preserve anonymity. The participants were then asked to complete the post decision questionnaires (group cohesiveness, group identity, and motivation) individually.

After this phase of the experiment all the participants returned to the main holding area and given one further questionnaire to complete. This questionnaire asked the participants to make a decision based upon the matrix they had already seen. On completion of the questionnaire the participants were given a verbal debriefing of 30 minutes and told that the amount of school supplies that they would get was not dependent on the number of points that they earned but in fact they could take as many as they liked.

Results

Only data from participants in 6 person groups was analysed. Before further analyses were conducted, the effects of gender were explored. There was no significant effect of Gender on intended cooperation choices, $t(196) = -0.05$, $p = .96$ ($M_{males} = .41$ ($SD = .50$), $M_{females} = .41$ ($SD = .49$), therefore, this variable was not considered further (see Endnote).

Data from 241 participants were collected and aggregated into 41 experimental groups, to give a proportion of cooperative (J) choices for each group called P (c). Three groups were discounted from the analysis because they consisted of fewer than the required 6 members leaving 38 groups for data analysis. To assess the validity of the equal K' assumption individual pre-discussion choice was analysed by High and Low demonstrability. Consistent with expectations demonstrability had no effect on choice making before the discussion manipulation, $t(36) = .410$, $p = .685$ (Means respectively = .421, .447). Table 4.4 shows the percentage of cooperative choice for participants before the discussion manipulation.

Table 4.4: Percentage J and P choices by Condition pre Discussion

Discussion/ Demonstrability	No discussion/High	No discussion/Low	Discussion only/High	Discussion only/Low	Discussion and Decision/High	Discussion and Decision/Low
% J Choice	50	43.3	42.9	50	37.5	40.5

Next mean P(c) was calculated for all conditions Table 4.5 shows mean P(c) and standard error by condition.

Table 4.5:Mean P(c) and Standard Error by Condition

	High Demonstrability		Low Demonstrability	
	Mean	Standard Error	Mean	Standard Error
No discussion	.292	.113	.267	.101
Discussion only	.571	.085	.557	.085
Discussion and Decision	.792	.08	.810	.085

A 2 (Demonstrability, High/Low) x 3 (Discussion Type, No discussion/Discussion only/Discussion and Decision) ANOVA showed a significant main effect of Discussion Type $F(2,32) = 15.05$, $p < .001$, $\eta^2 = .49$. Pairwise comparisons with the bonferroni adjustment significantly higher rates of cooperative choice in the discussion only condition than in the no discussion condition $p = .018$. There were significantly higher rates of cooperative choice in the discussion and decision conditions than in the discussion only conditions $p = .025$. There was also significantly more cooperative choice in the discussion and decision conditions than

in the no discussion conditions $p < .001$. There was no main effect of Demonstrability and no interaction effect F's < 1.

Theoretically we would not expect an effect of demonstrability in any condition other than the discussion and decision conditions. An independent samples t-test showed no effect of demonstrability on post-discussion choice in the discussion and decision conditions.

Change between Time 1 and Time 2

We performed an analysis of the group discussion effect by comparing proportion of cooperative choice at time 1 (pre-discussion choice) and time 2 (choice immediately post discussion) collapsed across demonstrability for all three discussion conditions. A 2 (Time, pre-discussion(1)/post-discussion(2)) x 3 (Discussion type, no discussion/discussion only/discussion and decision) mixed model ANOVA, with Time as a repeated measures factor, was conducted. Respective means are reported with standard deviation in brackets. Time showed a significant effect with a significantly greater proportion of cooperative choice post-discussion than pre-discussion, $F(1,35) = 9.57$, $p = .004$, $\eta^2 = .215$ (respective means, .59 (.293) & .43 (.196)). A significant main effect of Discussion type was also found, $F(1,35) = 4.46$, $p = .019$, $\eta^2 = .203$ (Means (standard errors); No discussion, .37 (.059), Discussion only, .514 (.048), Discussion and Decision, .594 (.046)). There was also a significant interaction effect, $F(1,35) = 23.204$, $p < .001$, $\eta^2 = .570$.

However, in line with expectations simple effects analysis showed that there were no differences between Discussion conditions pre-discussion. $F(2,35) = .651$, $p = .528$, $\eta^2 = .036$. Simple effects analysis showed a significant effect of discussion

type post – discussion, F (2,35) = 16.621, p <.001, η^2 = .487. Examining this effect more closely with pair wise comparisons we found that discussion and decision showed significantly greater cooperative choice than the discussion only condition, p = .006 (respective means, .80 (.201), .56 (.263)) and the no discussion condition, p < .001. (Respective means, .80 (.201), .278 (.144)). The discussion only condition showed a significantly greater level of cooperative choice than the no-discussion condition p = .004.

Examining the simple main effects that explore the differences between time 1 and time 2 individual choice we see that consistent with our hypotheses the proportion of cooperative choice dropped between time 1 and time 2 in the no discussion condition (respective means .46 (.217), .28 (.144)), F (1,35) = 6.927, p= .013, η^2 = .165. No difference was found in cooperative choice between time 1 and time 2 in the Discussion only condition (respective means.46 (.219), .56 (.263)), F (1,35) = 3.142, p = .085, η^2 = .082. In the Discussion and Decision condition proportion of cooperative choice significantly increased between time 1 and time 2 (respective means .39 (.163), .80 (.201)), F (1,35) = 56.897, p < .001, η^2 = .619.

Group Decisions

The decisions made by the groups in the discussion and decision conditions were classified as either 'All J' (the group decides that the best choice to make would be all to choose J) or 'Not all J' (the group decides something other than 'All J'). No effect of demonstrability on the nature of the group decisions was found, contrary to expectations. As hypothesised a significant effect of group decision on post discussion choice was found with groups deciding all J showing significantly more post

discussion cooperative choices than those that chose 'not all J', $F(1,13) = 19.372$, $p = .001$ (means respectively = .859, .417).

Social Decision Scheme Analysis

Finally SDS model fitting analysis was used to test the hypothesis that group decisions will be based upon a 'truth supported wins' rule. Analysis was limited to the discussion and decision conditions as these were the only conditions that included a group decision for comparison. In addition because demonstrability had no significant effects the analysis examines group decision across the two demonstrability conditions.

Participants' time 1 choice asking for their intended choice was used to predict group decisions. Three decision schemes were tested: 'J-Wins', 'J-supported Wins', '2/3 Majority equiprobable otherwise' Table 4.6 shows the results of this analysis.

Table 4.6: Observed and Predicted proportion of cooperative group decision with Kolmogorov-Smirnov model fit results

	P (coop)	
Individual proportion of cooperative choice in group decision conditions	.39	
Observed (Group decision)	.866	
Social decision scheme	Predicted (non-cooperative group decision)	Dmax (N = 15)
P -wins	.996	.867
	Predicted (cooperative group decision)	
2/3 majority-equiprobable otherwise	.394	.473
J – supported wins	.751	.116*
J - wins	.948	.082*

* This model was not rejected at $p > .20$[5]

Table 4.6 shows the observed proportion of groups that make a cooperative group decision. In addition it shows a series of predicted proportion of cooperative group decisions based upon different theoretically derived decision rules. Using null hypothesis testing we tested each of these predictions against the observed group

[5] In this case we are looking to fail to reject the null hypothesis i.e. the model does not differ from the observed group outcomes. Therefore, we need to be careful to avoid a Type II error. In order to address this we use $\alpha = .20$ for significance tested as suggested by Davis, Hulbert, Au, Chen and Zarnoth (1997).

decisions. Any rule that is not rejected indicates the decision rule used by the groups. In this case consistent with the hypothesis of the group decision effect, the model fitting shows that the decision schemes 'J-wins' and 'J-supported wins' failed to be rejected indicating minority based decision making.

Post-choice Questionnaires

The ten question measure of group identity with question 8; 'I regret being a member of this group' reversed, showed good internal consistency with a Chronbach's $\alpha = .894$. A group identity score was created that was the mean of the 10 questions in the scale and using this measure a 2 (Demonstrability) x 3 (Discussion type) between participants ANOVA showed, consistent with predictions, no effects on group identity.

2 (Demonstrability) x 3 (Discussion Type) ANOVAs were performed on each question of the 'post decision questionnaire'.

Question 1: 'I only take my group's interest into account' showed a significant effect of discussion $F(2,219) = 4.033$, $p = .019$. Means: No discussion = 4.25, Discussion only = 4.133, Discussion and decision = 3.635. Tukey post hoc tests show that those in discussion and decision feel that they only take their group interest into account significantly more than those in no discussion, $p = .04$. The difference between discussion only and discussion and decision is marginal $p = .064$.

Question 2: 'I only take my own interest into account' showed no effects of Discussion or Demonstrability. Question 3: 'I do not trust the other members of my group' showed no effects of Discussion or Demonstrability.

Analysis of the group cohesion questionnaire with Item 8 'Without me my group would not have been able to complete the tasks that they were asked to do' reversed showed good reliability with a Chronbach's $\alpha = .803$. A 2 (Demonstrability) x 3 (Discussion type) ANOVA showed a significant main effect of Demonstrability, groups exposed to the high demonstrability dilemma showed a higher level of cohesion than groups exposed to the low demonstrability dilemma, $F(1,219) = 6.85$, $p = .009$, $\eta^2 = .03$ (respective means, 3.02 & 3.32). There was also a significant effect of Discussion Type, $F(2,219) = 5.49$, $p = .005$, $\eta^2 = .048$ (means, No discussion = 3.46, Discussion only = 3.21, Discussion and Decision = 2.96). Tukey post-hoc analysis indicate that the discussion and decision condition showed significantly higher levels of group cohesion than the no discussion condition ($p = .003$). No difference was found between the discussion only and the no discussion conditions. No difference was found between the discussion and decision condition and the discussion only condition.

To ensure that group identity and group cohesion could not predict Time 2 choice a multiple regression analysis was conducted. Time 1 choice, group identity and group cohesion were entered as simultaneous predictors of Time 2 choice, Table 4.7 shows the correlation between variables and regression statistics. Table 4.7 shows that there is a significant positive correlation between Time 1 and Time 2 choice. There is also a significant correlation between the cohesion and Time 2 choice and a strong significant correlation as expected between group cohesion and group identity. The model predicted 15.4% of the variance in Time 2 choice, this was significant $F(3,221) = 13.46$, $p < .001$. Table 4.7 shows that only Time1 choice was a significant

individual predictor and consistent with our hypotheses group identity and group cohesion were not.

Table 4.7: Assessment of Group Cohesion and Group Identity

	Time 2 choice	Time 1 choice	Group Identity	Group Cohesion	*B*	β	*sr*2
Time 1 Choice	.381**	-	-	-	.375	.378**	.141
Group Identity	.072	.098	-	-	-.001	-.002	.00008
Group Cohesion	-.111*	-.041	-.382**	-	-.054	-.096	.011
M	.597	.427	3.52	3.20	$R^2 = .154$		
SD	.492	.496	1.03	.880	Adj.$R^2 = .143$		

Note: Group identity low score corresponds to low identity
Group cohesiveness low score corresponds to high cohesiveness
* $p<.05$, ** $p<.01$

Time 3 Questionnaire

An analysis of demonstrability on the time 2 questionnaire showed no effects. Nor was there an effect of Same/Different on time 3 choice. Those exposed to discussion conditions were significantly more likely to choose J at time 3 than those not $\chi^2(2) = 16.009$, $p < .001$. See table 4.8 for proportions of cooperative J choices at time 3.

Table 4.8: Proportion of cooperative J choices by Discussion condition at Time 3

	Proportion of J choices
No Discussion	.230
Discussion only	.325
Discussion and decision	.544

In order to determine the effect of discussion on opinion change between time 1 and time 3 a series of t tests were carried out to track the change in cooperative choice over time. Participants that had been in the no discussion condition showed significantly lower cooperative choice at time 3 than at time 1, $t(51) = 2.396$, $p = .02$ (respective means, .23, .44). This pattern is repeated in the discussion only condition, time 3 cooperative choice significantly lower than time 1 cooperative choice, $t(82) = 2.253$, $p = .027$ (respective means, .32, .46). However a different pattern emerges for discussion and decision. Time 3 choices are significantly more cooperative than time 1 choices $t(89) = -2.549$, $p = .013$ (respective means, .54, .39).

To further examine the level of opinion change brought about by the main conditions of this study, a new variable was created (Switching) quantifying whether participants switched their choice between the time 1 measure (intended choice) and the time 3 measure of cooperative choice. A backwards stepwise (likelihood ratio) logistic regression was performed with Switching as the dependent variable and Discussion Type and Same/Different as the predictor variables showed no variables left in the equation. The same analysis was performed again but with switching quantifying change between time 2 and time 3. As before no variables were left in the equation. However, the same analysis looking at switching between time 1 and time 2 supports our discussion type hypothesis. When terms were removed from the model the only term remaining which significantly predicted switching was discussion Wald (1) = 3.642, $p = .047$.

Analysis of the post choice questions at time 3 using 2 (same/different) x 2 (switch t2-t3/no switch) ANOVA indicated no effects of same/different and no interaction effects. However, as expected for question 1 (' To what extent were you just going along with the choice that you made before?') people not switching their choice said that they were just going along with their choice significantly more than those that switched, $F(1,223) = 127.15$, $p < .001$ (means respectively 4.87, 1.76). Those people switching their choice also felt that the were reappraising the matrix at time 3 significantly more than those not switching, $F(1,223) = 55.239$, $p < .001$ (means respectively = 5.10, 3.11). As expected those not switching felt that they were sticking with their choice they made before because it was the right decision significantly more than those switching, $F(1,223) = 139.445$, $p < .001$ (means respectively = 5.27, 2.19).

Discussion

Aims

In response to the findings of Hopthrow and Hulbert (2005) and the questions raised in that piece of work this study had a number of main aims. The first aim of this experiment was to extend and replicate the findings of Hopthrow and Hulbert (2005). We explicitly tested the effect of periods of no-discussion, discussion only, and discussion followed by a group decision upon levels of cooperation in a social dilemma. The purpose of this comparison was to more clearly indicate that it is necessary to explain the group discussion effect in social dilemma research (Caldwell, 1976; Rapoport, 1974; Van de Kragt et al., 1986) in terms of a cooperative group decision. Bouas and Komorita (1996) and Orbell, van de Kragt, and Dawes (1988)

suggest that the explanation for the group discussion effect was based on a consensus building process. This experiment is designed to elaborate on this idea and test explicitly the differences between discussion types. Bouas and Komorita (1996) and Orbell et al. (1988) also suggest that the consensus process is a majority based one.

The second aim of this experiment through the use of the demonstrability manipulation and social decision scheme analysis (Davis, 1973) was to test this idea i.e. that the consensus process is based upon a majority rule. We also wanted to test the idea that groups making a decision about the dilemma will be affected by the demonstrability of the dilemma in a similar way to the response of groups to the demonstrability of a problem to be solved as found by Laughlin (1980). Therefore, the third aim of this experiment was to further replicate the data behind the group problem solving view of social dilemmas.

The fourth aim of the experiment was to assess the level of opinion change that group membership would bring about on individual group members. We have used conversion theory (Moscovici, 1980) and the work of Davis et al. (1981) as a basis. We expected to see that a group decision, if it were minority based, would promote lasting opinion change.

The final aim of this experiment was to further explore the possible effects of group identity and group cohesion. Dawes et al. (1977) found evidence in support of the idea that group discussion increases the level of group identity in a dilemma group and this elicits greater levels of cooperation. We argued, however, that in this study there is no referent group we are more likely to see an increase in group cohesion.

Demonstrability

Consistent with our theoretical standpoint no difference was found between the demonstrability conditions prior to discussion. We argued that demonstrability is only a factor of influence when individuals are part of a group decision whether that be implicit or explicit Laughlin (1980). Therefore, the dilemmas were, at least to individuals, rationally equivalent, our analysis of K' (Komorita, 1976) supports this view. Further analysis showed no effects post-discussion of our demonstrability conditions. This finding is contrary to the previous work of Hopthrow and Hulbert (2005). We would not expect any effect on the no-discussion conditions but limiting to discussion and decision only no effects were found. Our effect size suggests that this is not simply a matter of insufficient power. This issue will be examined in more detail later in this section. For the purposes of the remainder of the analyses of proportion of cooperative choice P(c) we have, in light of the lack of effect of the demonstrability variable, collapsed across the demonstrability conditions. We have shown the differing dilemma matrices to be rationally equivalent on the main dimension of K' and therefore we are justified in using this analysis strategy.

Discussion Type

In line with predictions the discussion only condition showed significantly higher levels of cooperation than the no discussion condition. Additionally the discussion and decision condition showed significantly higher levels of cooperative choice than the discussion only condition and the no discussion conditions. Therefore, we can see that a group decision is important in increasing cooperative choice.

Looking at this phenomenon in more detail by comparing the changes in cooperative choice between the pre-discussion phase (time 1) and the post-discussion phase (time 2) we see that the proportion of cooperative choice for the no discussion conditions drops from time 1 to time 2 i.e. being exposed to group membership without communication reduces the level of cooperative choice between the individuals playing the dilemma. In the case of the discussion only conditions, despite a small rise in levels of cooperative choice there was no significant difference between the proportion of cooperative choice at time 1 and time 2. Therefore, a period of discussion appears to hold levels of cooperation steady at or slightly above their pre-discussion levels. For the discussion and decision conditions the pattern is different gain, these conditions show a substantial and significant increase in cooperative choice between time 1 and time 2. Tazelaar, Van Lange, and Ouwerkerk (2004) note that communication is not always found to increase cooperative choice. Our findings support this by indicating that communication is not sufficient per se without the presence of an implicit or explicit group decision.

Group Decisions

To support this finding, as was found in Hopthrow and Hulbert (2005), a cooperative group decision significantly increased levels of individual cooperative choice. However, unlike Hopthrow & Hulbert (2005) no effect of demonstrability on group decision making was found. Social decision scheme analysis (Davis, 1973) allows us to shed more light on the process that is behind the effect of group decision. Contrary to the arguments in favour of a majority based consensus process of Bouas and Komorita (1996), and Orbell et al. (1988) we found that the pattern of group decisions predicted by the two majority based rules tested (D-wins, derived from

Orbell et al., (1988) and 2/3 majority equiprobable otherwise, derived from Bouas and Komorita (1996), differed significantly from our observed data. Moreover, model testing of the two minority based rules (J-wins and J-supported wins) showed that we were unable to reject either model. To expand, groups were making a cooperative group decision if one or two of their members advocated the cooperative choice. This finding supports the view that a minority based decision is a necessary condition of the group discussion effect (Hopthrow & Hulbert, 2005).

Looking at the pattern of results we see that a cooperative group decision is a necessary condition for the group discussion effect. However whilst group discussion alone does not improve the level of cooperative choice within a group it does seem to protect the group against the reduction in cooperative choice that is evident in the non-discussion conditions. This could be because of the greater level of information about others' choices available to participants in the discussion conditions. It would appear that the participants in the group decision conditions are changing their opinion about which choice to make in a positive (i.e. becoming more cooperative) direction whereas those in the non-discussion conditions are changing their opinion in a negative direction (i.e. becoming more non-cooperative). Those people that are in the discussion only conditions appear to be adhering to their original pre-discussion opinion.

Opinion Change

Examining the question of opinion change more closely we hypothesised that if groups were using a minority based decision process, they will be engaging in more information based, systematic than normative based, heuristic processing (De Vries,

De Dreu, Gordijn, & Schuarman, 1996). If this is the case in line with the well replicated findings of Lewin (1947) we would expect to see lasting opinion change in discussion and decision conditions because group members are engaging fully with dilemma and ascertaining based upon information from the dilemma matrix (rather than information regarding what others have chosen), that the correct solution to the dilemma is for everybody in the group to make the cooperative choice. In order to test this idea once participants had left their groups, they were asked what their preferred choice would be on the matrix they had just played. In order to establish whether opinion change is a function of group adherence participants were told that they would be playing the dilemma either against the same group members as before (although not face to face) or different group members.

When analysing the time 3 questionnaire we found no effects of this Same/Different variable nor were there any effects of demonstrability. However, examining opinion change between time 1 and time 3 we found that in both the no discussion and discussion only conditions participants showed lower levels of cooperative choice at time 3 than at time 1, however for the discussion and decision conditions participants showed significantly higher levels of cooperative choice at time 3 than at time 1. We know that the only conditions to rise between time 1 and time 2 was the discussion and decision conditions, indicating that the correctness of the cooperative choice had enduring appeal for the participants in these conditions.

The creation of a switching variable was designed to help us understand the opinion change process in more detail, although no results were found for the switch

between time 1 and time 3 and between time 2 and time 3, the findings do provide support for our analysis of opinion change thus far.

Participants switched between time 1 and time 2 in line with the condition that they were in i.e. more likely to switch to the cooperative choice in the discussion and decision conditions than in the other conditions. We know that the levels of cooperative choice dropped for participants in the discussion only and no discussion conditions but went up in the discussion and decision conditions between time 1 and time 3. Therefore, combining this with our switching variable we can see that participants in the discussion and decision conditions were changing their opinion from the non-cooperative choice to the cooperative choice between time 1 and time 2 and that that change was relatively stable over time as evidenced by the high rates of cooperative choice for discussion and decision at time 3.

Post-choice Measures

Post choice data were collected examining participants personal motivation, levels of group identity and group cohesion. Consistent with our predictions there was no effect of condition upon group identity. However, in line with our predictions we did find an effect of discussion type on group cohesion. Participants that discussed the dilemma and made a group decision as to the best way to act reported significantly higher levels of group cohesion than participants belonging to groups that had not had a discussion at all. We also found an effect of demonstrability upon group cohesion. Groups that played the dilemma that was high in demonstrability showed a greater level of cohesion than groups that played the low demonstrability dilemma. It is possible that Demonstrability had an effect here because group cohesion was

measured after participants had made their time 2 choice and received feedback on it. This increased level of information may have meant that participants could perceive the effects of demonstrability. It would appear that the process behind the effect of demonstrability in social dilemmas is still somewhat under specified.

Consistent with Study 2 group identity and group cohesion were significantly correlated with one another indicating that they measure a process that is somewhat similar. Therefore, it is conceivable that Dawes et al. (1977) were in fact looking at a process incurred through changes to group cohesion. A group that has a high level of group cohesion would tend to me more close knit and have a greater feeling of responsibility for the outcomes of that group (Widmeyer et al., 1992). Evidence from this study indicates that a change in the type of communication (discussion) between group members changes the level to which the group members feel a responsibility to the outcome of the group.

Further analysis indicates stronger support for the consensus/decision perspective on post-discussion cooperative choice. We found that neither group identity nor group cohesion could significantly predict the proportion of cooperative choice post discussion. Time 1 choice was as expected a significant predictor of Time 2 choice. These results are consistent with our findings in Study 2. However, in Study 3 there is some trend based evidence that group cohesion has some predictive power. Future research could examine this in more detail. It is conceivable that the discussion conditions do not promote a sufficiently strong level of group cohesion for it to have a significant effect. Therefore, future research should cross discussion type with a device designed to elicit higher levels of group cohesion, for example a common

group goal. We would expect to see that there would some amount of shared variance explained by group decision and some by group cohesion.

When questioned about their motivation participants indicated that they were significantly more interested in their group outcome under the discussion conditions than in the no discussion condition. No effect of demonstrability was found. This allied with the group identity finding and the Dawes (1980) criteria suggests that these groups realise the benefits to all of working for the collective good. Unexpectedly no effects were reported for levels of trust for other group members across the discussion conditions.

Implications, Limitations, and Future Research Opportunities

One implication of these findings would be regarding the role of decision making in the process of solving a dilemma. It would appear that groups asked to make a decision were likely to show increased levels of cooperative choice making behaviour, with enhanced levels of switching from a non-cooperative preference to a cooperative choice between time 1 and time 2. This increased level of cooperative choice making subsequently remained stable. Consequently we can see that there is evidence to indicate that the presence of a group decision acts as a tool that persuades individuals via the medium of group process to choose cooperatively. The findings also indicate that the persuasion is long lasting. Participants are likely to undergo lasting opinion change rather than merely acquiescence to the group decision. Therefore, we can argue that the presence of a group decision enhances the ability of a group to *solve* a prisoner's dilemma. This provides more evidence for the idea that

groups appear to view a dilemma as a group problem solving task, or at least can be encouraged to view it in that way.

One of the limitations of this study was that changing the demonstrability of the J (cooperative) choice did not have any noticeable effect on the way the participants chose. Indeed we saw evidence that all groups in the discussion and decision conditions were making their decisions based upon the influence of a minority of group members advocating the J choice. Hopthrow and Hulbert (2005) argue that minority attempt to persuade others to choose cooperatively that we showed in that experiment and which we have showed in Study 3, is likely to introduce new, persuasive arguments to the group. Considering our findings regarding opinion change in this chapter, it would appear that this argument has good validity. Of interest in the context of Study 3 (no effect of demonstrability on time 2 choice), we argue that the effect of minority group decision making can occur independently of alterations to the demonstrability of the dilemma. It would appear that while Hopthrow and Hulbert (2005) and Study 2 indicated effects of demonstrability, it may be somewhat underspecified. The consequence of this viewpoint and the findings of Study 3 would indicate that the impact of demonstrability maybe attenuated by other factors that are affecting the group process. It should also be remembered that demonstrability lies on a continuum (Laughlin, 1980) meaning that a problem is still solvable even if it is in the lower end of the continuum. Therefore, we may find that dilemmas further apart on the continuum show greater effects.

Another limitation concerns the lack of an effect of social identity. We have argued in favour of viewing group concern in this context in terms of group cohesion

the effects of group identity cannot be ruled out all together. However, Van Vugt and Hart (2004) found that group members naturally varied in their levels of identification and those that identified highly made more investment into the common pool. The use of a prisoner's dilemma game with dichotomous choices may not be giving us enough variation in cooperation to determine an effect.

In sum, we have found evidence to support the hypothesised role of group decision making in the group discussion effect. A cooperative group decision increases the level of individual cooperative choice over and above that found in discussion only groups. Discussion only groups showed no change in cooperative choice pre and post discussion and no discussion groups showed a decrease in cooperative choice.

This experiment has shown that the type of discussion a group participates in makes a significant difference to subsequent levels of cooperative choice behaviour. Groups that make a group decision are significantly more cooperative than groups that do not. In addition, this increase in cooperative behaviour following a group decision is relatively stable over time, indicating that participants' opinions as to which is the correct choice are changed by a group decision.

Future research might examine factors affecting the effects of group decision. Komorita and Parks's (1996) stated aim that researchers should be striving for greater levels of cooperative choice, would indicate that future research may look at whether the effect of group decision could be magnified. Indeed the social dilemmas that people encounter daily in everyday living do not always lend themselves to a

discussion and a decision as to the best way to choose. It is possible that a group decision is working as an informational tool if this is the case another form of information may mimic its effects. In the next chapter, Study 4 will examine the effects of a public or private vote on the amount of cooperative choice displayed by group members exposed to different discussion styles.

Chapter 5: Group Discussion, Group Decision, Voting Style, and Cooperation

Summary

This chapter presents Study 4, designed to examine in more detail the finding in Study 3. That is when groups make an explicit decision regarding the best choice in a social dilemma members' cooperative preferences increase more than those members of a non decision group. A factor that manipulated voting style was used so that during a period of group interaction participants had to vote for their preferred choice. This vote was made either in private or in public. The group interaction followed the format of Study 3. Participants were exposed to either a period of no discussion, a period of group discussion only, or a period in which they had the opportunity to discuss and decide about the dilemma. Participants were asked to make an anonymous actual choice.

Findings suggest that under conditions of private voting the amount of cooperative choice displayed by group members follows a similar pattern to Study 3 with the highest level of cooperative choice evident in the discussion and decision condition and the lowest in the no discussion condition. In the public voting conditions a different pattern emerges. In the discussion only condition results suggest that public voting mimics the effect of a group decision, increasing cooperative choice above what would normally be expected. However, in the discussion and decision condition public voting reduces the level of cooperative choice. The combination of public voting and a period of discussion and decision appear to prompt group members to exploit the potential cooperative choices of other group members. This

suggests that future research could examine the level to which the more exploitative group members have a higher meta-cognition of group process.

Study 4: Investigating the effects of voting style and group discussion on cooperation

Introduction

Background

When group members interact with one another as part of a group they are often in the situation where they have to have a vote (Wood, 1984). The purpose of the vote is often to indicate their preference on an issue that the group is concerned with. For example a jury may employ a vote to determine the guilt of a defendant, a company board may vote on whether to adopt new environmentally friendly technologies, or indeed a local council may vote on whether a wind farm should be placed in the local area http://news.bbc.co.uk/1/hi/england/kent/5304774.stm. It is possible that a voting procedure could act as a mechanism for improving informational exchange and cooperative choice in a social dilemma. This process may have similar outcomes to the effects of group discussion and decision making seen in Study 3. VanLear and Mabry (1999) advocate the need for further research into the link between group process and group performance with specific mention of communication. The experiment presented in the chapter will examine the interaction between voting and discussion processes.

This study will examine the limitations of the effect of group decisions. We have seen in Chapter 4 that among participants who have been asked to make a cooperative or non-cooperative choice before and after a period of group interaction, those given the opportunity to make a group decision about how to choose in a social

dilemma are more cooperative than those who have not. We also found that participants who were only allowed to discuss and not to make any form of decision showed no change between their choice pre- and post-discussion, whilst those having no discussion became less cooperative. These findings raised questions regarding the function of the group decision making process. That is, what role is the group decision having in promoting cooperative choice in a social dilemma? Another question raised was whether the opportunity to have a group decision would always be beneficial.

It is possible that the group decision merely provides participants with more information about what their fellow group members are going to do. In this case other methods of improving information about the other group members' intentions could mimic the effects of a group decision. The increase of information with the group decision could, if increased further, encourage people to try to exploit the situation. That is, if participants know all group members are going to be cooperative then they may well be very tempted to be non-cooperative as they perceive their chance of receiving the largest payoff as high. When participants are involved in a group decision they are not entirely sure everyone is going to be cooperative because of the nature of being a non-unanimous, decision but if they are sure, through another mechanism, everyone is going to cooperate then they would be foolish not to defect. However, as we will see later this may lead to mutual defection, or other structural aspects of the dilemma becoming more salient (Hopthrow & Hulbert, 2005).

Alternatively, group decision may introduce a sense of obligation or commitment to stick with one's indicated preference. Therefore, it is conceivable that the group decision is a form of invaluable consensus building process that encourages

increased levels of trust and, as a consequence, increased levels of cooperative choice. This consensus process may be robust enough to withstand the influences of other factors. This experiment will examine these two viewpoints in more detail, more specifically we will examine the influence of another information based factor on the group decision process.

Evidence from Folger, Poole, and Stutman (1993) suggested that group decision making may have limitations with regard to promoting greater levels of cooperative choice. They argued that free discussion is not always a beneficial phenomenon. They found that it can cause groups to become caught in a system of increasing conflict or conflict avoidance. In the setting of a social dilemma, this would likely manifest itself in an iterated dilemma. As the iterations progress so the level of non-cooperation would be expected to increase. We can see parallels to this in the work of Marwell and Schmitt (1972). They found that while defection did not increase per-se over the course of large numbers of trials, they did show that over the course of the first 10 trials the level of cooperative choice dropped. Over the course of the experiment they found that anybody who made a non-cooperative choice served as an 'inhibition to cooperation'. In social dilemmas the presence of a defecting member of the group can have a bad influence on the other group members in that if one group member becomes non-cooperative it is likely to encourage other group members to become non-cooperative (Kelley & Stahelski, 1970; Ouwerkerk, Kerr, Gallucci, & Van Lange, 2005; Rutte & Wilke 1992,) as they are trying to avoid being exploited.

Iterated Dilemmas

Axelrod (1984) outlined the importance of reciprocity and multiple trials in the solution to a social dilemma that being, the promotion of increased cooperative choice. He outlined the importance of reciprocity both in cooperative choices and non-cooperative choices. A person faced with a social dilemma should immediately retaliate if other participants are non-cooperative to prevent an exploitative cycle in which other participants are benefiting from the person's cooperative choices to the detriment of him/her. They should also immediately reward others' cooperative choices with cooperative choices of their own, allowing the possibility for a scenario that is anchored in mutual cooperative choice. Axelrod (1984) states

'....an important way to promote cooperation is to arrange that the same two individuals will meet each other again, be able to recognise each other from the past, and to recall how the other has behaved until now. This continuing interaction is what makes it possible for cooperation based on reciprocity to be stable' (p.125 cf. Komorita and Parks, 1996)

This statement indicates the importance of accountability in the promotion of cooperative choices. Axelrod argues that the fact that participants may meet again will promote increased cooperative choice. This could mean, as he implies, that at some point in the future on a separate occasion, or would also apply to a multiple trial game. In a multiple trial game, the individual knows (or can learn) that over the longer term their behaviour has a significant impact on future choices made by other people in the dilemma. In dilemmas of more than two people played over multiple trials it is more difficult for the participants to keep track of the two important variables that Axelrod mentions - what choice people in the group have made on previous trials and what those choices were. Helping participants coordinate these pieces of information may therefore, help increase cooperative behaviour. Indeed a study by Fox and Guyer (1978) supports this view point. They asked participants to

make their choice (actual choice) and told them either that their choice would remain anonymous or be made public. They found more cooperative choices when participants' choices were public. We are proposing an anonymous vs. public voting or intended choice process as an information gathering tool.

Increased Information

Evidence for the impact of messages of intent or increased information about intended choices comes from the work of Parks, Henager, and Scamahorn (1996). They conducted two experiments looking at the impact of messages of intention to participants that were either high or low in trust of their other group members. They argued that statements of intent should be viewed as a form of communication, and advocate the combination of communication and trust research. In their experiments participants were classified as either high or low in trust and asked to play a 2 person prisoner's dilemma game. They were given the opportunity after 5 trials to pass a pre-determined message to their opponent. This message could take the form of a cooperative or non-cooperative statement of intent. Whilst they thought they were playing the dilemma against a real person the participants were in fact playing against a 'tit-for-tat' strategy. In Study 1 this strategy made a choice consistent with the participant's message for 1 trial after the message. It then reverted back to a 'tit-for-tat' strategy, in study 2 this consistency was manipulated. Parks et al. (1996) found that if a participant indicated that they were going to make a cooperative choice then other participants were more likely to cooperate. However, unless this intention was supported by repeated cooperative behaviour the increase in opponents' cooperative choice only occurred if the opponent was high in trust.

Kerr and Kaufman-Gilliland (1997) argued that group discussion elicits some form of commitment norm whereby if group members undertake to cooperate they are likely to stick with that undertaking. We have shown in Hopthrow and Hulbert (2005), and more explicitly in the previous chapter of this thesis, that this process appears to be driven by a period in which the group makes a group decision to cooperate. Kerr and Kaufman-Gilliland (1997) conducted experiments in which the anonymity of participants' final choices was manipulated and found no effect of anonymity, which suggests some form of internalised commitment norm. Bennett (1955) found no effect of making a public or private decision to turn up for an experiment; simply making the decision was enough to improve the level to which people 'showed up' to an experiment. Furthermore, Langer (1989) suggests that participants who make a cognitive commitment will then just 'mindlessly' act on that commitment. However, Kerr and Kaufman-Gilliland (1997) found no evidence that this applied in the context of the group discussion effect. Indeed, Kerr and Kaufman-Gilliland found no evidence to suggest that group discussion does not illicit an internalised personal commitment to cooperate. They agree, however, that their work does not rule out the possibility that there is an effect of anonymity just that it needs to be in a context where the perceived punishment for defection is greater.

In Study 4 presented in this chapter we will be looking at the anonymity of participants' preferences during rather than after the discussion period, more of an immediate informational tool. We believe that the combination of increased information from a public vote and an explicit group decision may be enough to overcome this personal commitment norm and encourage participants to renege on

their commitments to cooperate. If participants are sure that others will cooperate, they may think that they are almost assured of the highest possible payoff by defecting. They may be unconcerned about the implications of this behaviour on future interactions and this might be because although their vote is public their actual choice is anonymous.

Aims and Hypotheses

Kerr and Kaufman-Gilliland (1997) examined ways of attenuating the group discussion effect. We are adopting a somewhat similar approach in that we are looking at the limits of the group decision effect. The findings summarized here surrounding anonymity have been somewhat mixed. It would appear that the timing of the application of anonymity, or the context such as whether there will be future meetings, or whether there is a discussion, all affect the way anonymity, or lack of it, should affect choice making. Fundamentally, we would expect public choices to be more binding because of the social norms that surround commitments (Kerr, Garst, Lewandowski, & Harris, 1997). However, this process may be moderated by the format of the group interaction, more specifically the format of the group discussion. We have seen that it is likely that public voting should, through the increased information it gives and the increased level of normative pressure it elicits, improve cooperative choice in discussion only and no discussion scenarios. A scenario involving a group decision may be different, the confidence provided by such a high level of information may prompt people to be non-cooperative because they may believe they are more likely to get the 5J (cooperate) 1P (not-cooperate) payoff which is the highest possible for the group member that does not cooperate. This is an element of the way Parks perceives demonstrability, i.e. knowing which outcome you

are likely to end up with (Parks, personal communication, 2003). This exploitative phenomenon can be seen when participants are exposed to multiple trials with fore-knowledge of which trial will be the last. They know that there will be no comeback after this trial so they exploit their opponent without fear of reprisal (Axelrod, 1984). We expect a similar phenomenon here, as in previous studies in this thesis, real choices will be anonymous to closely match the circumstances of our findings on discussion and decision. Therefore, we expect that public voting should increase cooperative choice except when there is also an explicit group decision.

In this study participants will, over multiple trials, be given the opportunity to make public or private votes as to their intentions before making their actual choice, which is the choice that they will earn their payoffs from. The aim of Study 4 is to determine possible limitations of the group decision effect that we have shown in the previous chapter of this thesis.

Method

Participants

Two hundred and fifty 1st year psychology undergraduate students and 1st year A-level students took part in this experiment as part of their course requirement. All participants were over 16 years old. There were 41 males, 180 females, and 29 did not report their gender. Participants were randomly assigned to experimental groups of six.

Design

Participants were randomly assigned to conditions in a 2 (voting type, public/private) x 3 (Discussion type, no discussion/discussion only/discussion and group decision) between participants factorial design using an iterated prisoner's dilemma game with three trials. Participants were asked to make a choice between J (the cooperative choice) and P (the non-cooperative choice). This choice was made before and after the discussion manipulation. Participants were also asked to vote as to the choice that they would prefer. Participants we informed that their non-voting individual choices would remain anonymous and that only the last choice on each trial would count towards their final points tally. They were also told that their final points tally would be converted into school supplies at the end of the experiment.

Voting type was a between subjects factor with two levels, public voting or private voting. When making their votes participants were told either that the vote would remain anonymous or would become public. In the private voting condition participants were asked to vote in a hidden ballot. In the public voting condition each participant's vote was made clear to every other member of the group.

Discussion type was also a between subjects factor with 3 levels. Participants in the no discussion condition were asked to write about their reasons for choosing J or P and on trials 2 and 3 this was extended to include their reactions to the choice made on the previous trial/s. Participants in the discussion condition were asked to discuss the dilemma and the best choice to make. However, they were asked specifically not to come to any agreement or group decision but merely talk in general

terms about possibilities. Participants in the discussion and group decision condition were asked to discuss the dilemma but to also reach a group decision as to the best course of action to take. This decision could take three forms, All J (all group members choosing J), All P (all group members choosing P), or a mixed decision (something in between the first two).

After the dilemma phase of the experiment was over participants were asked to questionnaires measuring: Group identity, group cohesiveness and their motivation whilst playing the game (see Appendix C1).

Group identity: The group identity questionnaire consisted of 9 statements e.g. 'I am glad to be a member of this group', 'I feel close links with other members of this group', 'It is important to me to be a member of this group'. Participants were asked to indicate their level of agreement with each statement on a 7 point scale ranging from 1, 'not at all true' to 7, 'very true'.

Group cohesiveness: The group cohesiveness consisted of 9 items measured using 7 point scales. Four of the items required participants to indicate their agreement with statements such as 'I felt that I was a typical member of this group' and 'Without me my group would not have been able to complete the tasks they were asked to do' 1 signified agreement and 7 disagreements. Five questions asked participants to quantify their feelings on selected statements e.g. 'How much do you think members of the group actively contributed to working together' and 'How much did you like the group you were in as a whole' 1 indicated 'Very much' and 7 'Not at all'. Question 9 asked 'How well do you think the members of the group got on

together' and was measured again on a 7 point scale with 1 signifying 'Very well' and 7 'Not at all well'.

Motivation: The motivation questionnaire was designed as a manipulation check and a measure of the participants' motivations within the experiment. It consisted of 5 statements that participants were asked to indicate their level of agreement to on 7 point scales ranging from 1 'Totally agree' to 7 'Totally Disagree'. E.g. 'It was easy for others to know what I had voted for', 'I had the opportunity to gain reliable information about the prospective choices of others'. Participants were also asked to respond the statement: 'My actual choices differed from my votes ....' by ticking as many of five different statements as applied to their situation. The choices were: 'Not at all', 'Because each time was different from the last', 'Because I was unable to trust my fellow group members', 'Because I wanted to maximise my personal outcomes' and 'Because I wanted to maximise my group's outcomes'. Appendix C1 contains full versions of each post-choice measure.

Procedure

Prior to the day of the data collection participants were spit into 4 different hour long experimental sessions of approximately 60 people, via a self-selection method. On arrival to a central holding room at their allocated time the format of the experiment was explained to them briefly. They were provided with a written and verbal explanation of their need to give informed consent, their right to withdraw and how to create their experimental code number. They were then randomly assigned to groups of 6 and to condition before being taken to the individual group rooms. Six experimenters were used each running a maximum of two groups per session each to

give the ability to run 12 groups simultaneously. Any remaining participants were run in a group of less than 6 with the same procedure but will not be included in the analysis.

Once seated participants were given their group number, seat number and reminded of their personal code and the importance of labelling each sheet of paper with these numbers. There were then given detailed instruction explaining the matrix of points and the correct method of interpreting the payoff structure. These instructions were also tape recorded and participants were asked to read along while listening to the tape recorded instructions (see Appendix C2). After the tape had finished the experimenter re-entered the room and answered any questions regarding the matrix of points and the coming experiment, while being careful to couch them in terms of the written instructions. They were instructed that there would be several trials, and that the experimenter would be keeping a tally of their points across trials, so that their score could be converted into school supplies at the end of the experiment.

Participants were then asked to indicate their intended choice after the manipulations. This choice remained anonymous and the participants did not receive any feedback from it. Participants were then asked to vote as to their preferred choice. They were told that the function of this was to provide other members of the group with information about the opinions within the group. In the private voting condition participants were asked to complete a voting slip in private and place it in an envelope provided. The experimenter then re-entered the room to collect the votes and gave the participants feedback in the form of: 'X of you voted for J and Y of you voted for P'.

The participants were then asked to record this information on a form that was left in plain view in the centre of the table for the duration of the experiment. In the public voting condition participants were asked to write their vote on the provided form and hold it up so that all the other participants could see it. Then the person at seat 1 was instructed to write down, on a sheet that was kept in plan view in the centre of the table throughout the experiment, each participant's first name, code number and seat number along with that person's vote. The person at seat one then had to read this out to ensure that every group member was fully aware of who had voted for what. Participants were reassured that the experimenter could not identify them with their first names alone.

After this voting procedure the participants were then asked to; write about, discuss or discuss and decide about the dilemma depending on the discussion manipulation. They were told on the first and second trials that they had 3 minutes to complete this task. However, if they needed more time the experimenter was able to give them two extra 1 minute time periods, giving up to five minutes. On the third trial they were informed that the initial 3 minute period was shortened to 1 minute.

After the discussion manipulation, the participants were asked to vote again following the same procedure as before. The participants were then asked to make what was referred to as their actual choice. They were informed that this is the choice that would determine the number of points that they received for that trial and that the points would be combined across trials and converted to school supplies. They were also informed that no other members of the group would ever know the choices they made and the point that they earned for the actual choices. The experimenter then

gave feedback from that choice in the terms of: 'X of you chose J and Y of you chose P, those of you that chose J receive A points and those of you that chose P receive B points'. The process was then repeated for trials two and three but without the first no-feedback preference question. Following the completion of the three trials participants were asked to complete the post-trial questionnaires before being given a written debriefing. They were then told that the points that they earned will not be converted into school supplies instead they could take as many as they wanted

Results

Only data from participants in 6 person groups was analysed. Before further analyses were conducted, the effects of gender were explored. There was no significant effect of Gender on intended cooperation choices, $t(195) = 1.33$, $p = .19$ ($M_{males} = .52$ ($SD = .51$), $M_{females} = .39$ ($SD = .49$), therefore, this variable was not considered further (see Endnote).

Two hundred and fifty participants were aggregated into 42 groups for the purposes of the data analysis. Two groups were then excluded for having a group size of less than 6, leaving a total of 240 participants in 40 groups of six. The aggregation of the groups gives a value of the proportion of cooperative choice P(c) for each group on each choice or vote. Data analysis of post choice questionnaires was performed using non-aggregated data.

Proportion of Cooperation in Actual Choice

A 2 (Voting Style, Public/Private) x 3 (Discussion Style, No Discussion/Discussion Only/Discussion and Decision) between-participants ANOVA

was conducted on intended choice, that is the choice participants made before any experimental manipulation. Four groups were excluded from this analysis due to missing data. As expected there was no effect of Voting style. Contrary to expectations there was a significant effect of Discussion style, $F(2,30) = 3.34$, $p = .049$, $\eta^2 = .182$. Pairwise comparisons indicate that the Discussion and Decision were significantly more cooperative than the Discussion only conditions $p = .045$. As a consequence we will account for baseline differences in intended choice when analysing proportion of cooperation in actual choice. Thus, intended choice was treated as a covariate and actual choice as the dependent variable.

We would not have expected any effects of our experimental variables for participants' actual choice for Trial 1, as we would expect that participants would need one round of feedback to see the effects of the voting variable and understand the other participants' reactions to it. Indeed we found this to be the case a 2 (Voting Style, Public/Private) x 3 (Discussion Style, No Discussion/Discussion Only/Discussion and Decision) between-participants ANOVA with Trial 1 Actual choice as the dependent variable and Intended choice as a Covariate showed no effects of Discussion type or Voting Style Fs < 1.

2 (Voting Style, Public/Private) x 3 (Discussion Style, No Discussion/ Discussion Only/Discussion and Decision) between-participants ANOVA was conducted with Actual choice 2 as the dependent variable and Intended choice as a covariate. Seven groups were excluded from this analysis due to missing data.

There were no significant main effects of Discussion Style, F (2, 26) = 2.77, p = .08, η^2= .18 or Voting Style, F (1, 26) <1, η^2< .01. As hypothesised, this was qualified by a marginally significant Voting Style by Discussion Style interaction, F (2, 26) = 3.18, p = .058, η^2= .20. This two-way interaction was followed up with simple main effects analysis in order to test the hypothesis that there would be a difference in cooperative choice for discussion and decision between the two different voting conditions (Howell, 1992).

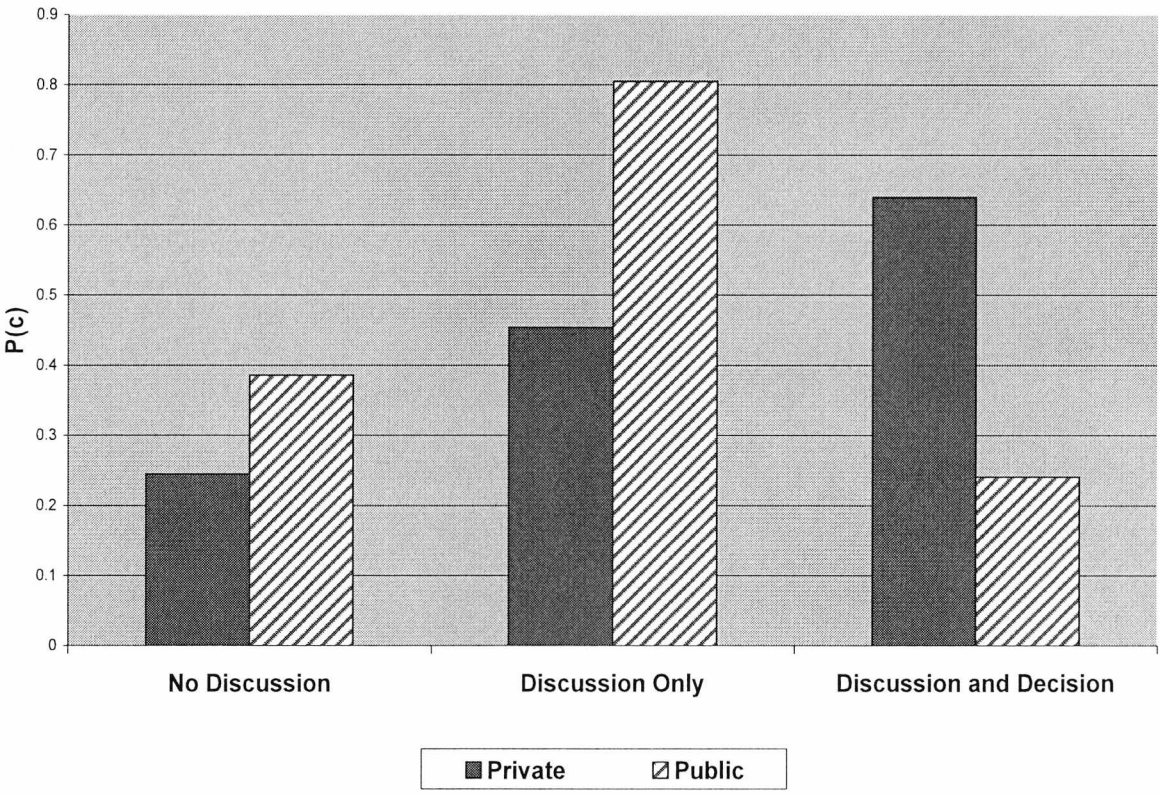
The simple main effect of Discussion Style was analysed within each level of Voting Style (using intended choice as a covariate) and pair-wise comparisons utilised for follow-ups. Figure 5.1 below shows the pattern of mean levels of cooperation in actual choice. The proportion of cooperation in the private voting condition shows a similar trend to those in Study 2, with a small (but non-significant) simple main effect of Discussion Style, F (2, 15) = 2.64, p = .100, η^2= .260.

Groups in the discussion and decision condition had the highest proportion of cooperation (M = .64, SE = .12), and significantly more than those in the no discussion condition (M = .25, SE = .12, p = .04). In the public voting condition there was a strong and significant main effect of Discussion Style, F (2, 14) = 4.28, p = .045, η^2 = .461. The pattern of findings was somewhat different, with the groups in the discussion and decision condition demonstrating a flip in standard findings and actually having the least proportion of cooperation. In fact, when voting publicly, the groups in the discussion and decision condition showed cooperation levels (M = .24, SE = .13) similar to those in the no discussion condition (M = .39, SE = .10, p = .41), and significantly less than those in the discussion only condition (M = .81, SE = .14, p

= .02). Participants in the discussion only condition benefited with public voting as the cooperation was significantly higher than the no discussion condition (p = .03) and the discussion and decision condition (p = .02).

A 2 (Voting Style, Public/Private) x 3 (Discussion Style, No Discussion/ Discussion Only/Discussion and Decision) between-participants ANOVA with Actual choice on Trial 3 as the dependent variable and Intended choice and Actual choice trial 2 as covariates found no effects of Discussion Type or Voting Style. There were significant effects of both covariates, intended choice: $F(1,23) = 6.35$, $p = .019$, $\eta^2 = .22$, Actual choice trail 2: $F(1,23) = 9.21$, $p < .01$, $\eta^2 = .29$.

Figure 5.1: Proportion of Cooperation in Trial 2 Actual Choice as a Function of Voting Type and Discussion Type.



Group Decisions

The decisions made by the groups in the discussion and decision conditions were classified as either 'All J' (the group decides that the best choice to make would be all to choose J) or 'Not all J' (the group decides something other than 'All J'). We examined the effect of group decision at Trial 2 on Trial 2 actual choice intended choice was included as a covariate. We found individuals that had been part of a cooperative group decision showed significantly greater levels of cooperation post-decision than individuals that had been part of a non-cooperative group decision $F(1,11) = 9.51$, $p = .015$, $\eta^2 = .543$ (respective means, .86 & .07).

Post choice questionnaires

Group Identity: This scale consisting of 9 items showed good inter-item reliability with a Chronbach's $\alpha = .92$. We computed a mean of the 9 items to create a measure of group identity lower scores on this item indicated lower levels of group identity. A 2 (Voting Style, Public/Private) x 3 (Discussion Style, No Discussion/ Discussion Only/Discussion and Decision) between-participants ANOVA on our measure of group identity showed no main or interaction effects.

Group Cohesiveness: A 9 item measure of group cohesiveness showed good inter-item reliability with a Chronbach's $\alpha = .86$. A group cohesiveness variable was created by computing the mean of these nine items lower scores indicated greater agreement. A 2 (Voting Style, Public/Private) x 3 (Discussion Style, No Discussion/ Discussion Only/Discussion and Decision) between-participants ANOVA on our measure of Group cohesion indicated a significant main effect of Voting style. Participants in the Public voting conditions indicated more group cohesion than those in the Private voting conditions, $F(1,194) = 7.787$, $p = .006$, $\eta^2 = .039$ (Respective means, 3.15 & 3.57).

To test our hypotheses regarding group identity and cohesion we conducted a multiple regression analysis. Time 1 choice (intended choice) was entered in block 1, group identity and group cohesion were entered as simultaneous predictors in block 2 of Trial 2 choice (actual choice). The group cohesion and group identity scores were constructed by taking the mean of all items on each scale. Table 5.1 shows the correlation between variables and regression statistics. There was a significant positive correlation between intended and actual choice, higher levels of cooperative

intended choice indicate higher levels of cooperative actual choice. There were significant negative correlations between Group identity and intended choice and between Group identity and Group cohesion. The block 1 model predicted 2.3% of the variance in actual choice, this was significant $F(1,179) = 4.28$, $p = .04$. Block 2 accounted for 2.7% of the variance in actual choice. This model was not significant $F(2,177) = 1.64$, $p = .183$. Therefore, the only significant predictor of actual choice in this case was intended choice.

Table 5.1: Assessment of Group Cohesion and Group Identity

	Trial 2 Actual choice	Time 1 choice	Group Identity	Group Cohesion	*B*	β	*sr*2
Time 1 Choice	.153*	-	-	-	.153	.153*	.023
Group Identity	-.30	-.129*	-	-	-.019	-.050	.002
Group Cohesion	-.30	.085	-.559**	-	-.035	-.071	.002
M	.46	.45	3.37	3.36	$R^2 = .027$		
SD	.50	.50	1.30	1.03	Adj.$R^2 = .011$		

Note: Group identity low score corresponds to low identity
Group cohesiveness low score corresponds to high cohesiveness
* $p<.05$, ** $p<.01$

Motivation: A 5 item questionnaire designed to measure the participant's motivation analysed as separate items with a 2 Voting Style (Public vs. Private) by 2 Discussion Style (No Discussion vs. Discussion Only vs. Discussion and Decision) between-participants ANOVA. Lower scores indicate more agreement with the statement for each item.

Item 1 'It was easy for others to know what I had voted for', showed a significant effect of Voting style. As expected participants in the Public voting conditions agreed with this statement significantly more than those in the Private voting conditions, $F(1,213) = 24.62$, $p < .001$, $\eta^2 = .104$ (respective means, 3.29 & 4.52). There was also a significant main effect of Discussion style, $F(2,213) = 5.28$, $p = .006$, $\eta^2 = .047$. Tukey post-hoc tests indicated that participants in the Discussion only conditions agreed with this statement significantly more than those in the No discussion conditions ($p = .002$ respective means, 3.46 & 4.4). Mean for the Discussion and Decision conditions was 3.9.

Item 2 'I felt that I could trust the other members of my group' As expected there was a significant main effect of Voting style. Participants in the Public voting conditions felt that they could trust their fellow group members more than those in the private voting conditions, $F(1,213) = 3.85$, $p = .05$, $\eta^2 = .018$. Table 5.2 shows the means and standard deviations. A lower number indicates more agreement with the statement. The descriptive statistics indicate that the main effect of Voting style stems from the No discussion and Discussion only conditions.

Table 5.2: Means and Standard Deviations for Trust

	Private voting		Public voting	
	Mean	Standard Deviation	Mean	Standard Deviation
No discussion	3.67	1.66	2.9	1.65
Discussion only	3.33	1.76	2.9	1.87
Discussion & decision	3.9	1.87	3.66	1.84

Item 3 'I had the opportunity to gain reliable information about the prospective choices of others' indicated a significant effect of Discussion style $F(2,212) = 13.91$, $p < .001$, $\eta^2 = .116$. Table 5.3 displays the means, standard deviations and the results of Tukey post-hoc tests, lower scores indicate greater agreement with the item

.

Table 5.3: Means and Standard Deviations for Reliable Information

	Mean	Standard Deviation
No discussion	4.48_{ab}	1.62
Discussion only	3.05_{ac}	1.61
Discussion & decision	3.81_{bc}	1.71

*Items that share subscripts significantly different

Item 4 'I felt that my vote was being evaluated by the other members of my group' indicated as expected that participants agreed with this statement more in the Public voting conditions than in the Private voting conditions $F(1,212) = 6.96$, $p = .009$, $\eta^2 = .032$ (respective means = 3.79 & 4.39).

Item 5 'I felt pressure from the other group members to keep my actual choices the same as my votes' indicated that as expected there was a significant effects if Discussion style $F(2,212) = 8.163$, $p < .001$, $\eta^2 = .072$. Table 5.4 shows the means and standard deviations, participants in the Discussion and decision conditions indicated significantly more agreement with this statement than those in the No discussion conditions ($p < .001$).

Table 5.4: Means and Standard Deviations for Pressure

	Mean	Standard Deviation
No discussion	6.03	1.31
Discussion only	5.48	1.65
Discussion & decision	4.85	2.02

To test for possible mediation we looked for motivation questionnaire items that significantly correlated with Actual choice on trial 2 (our dependent variable measuring cooperation). Table 5.5 shows the correlation matrix. From this we can see that only item 5 fulfils the criteria for mediation.

Table 5.5: Correlation matrix between post-choice motivation questionnaire items and Actual choice trial 2

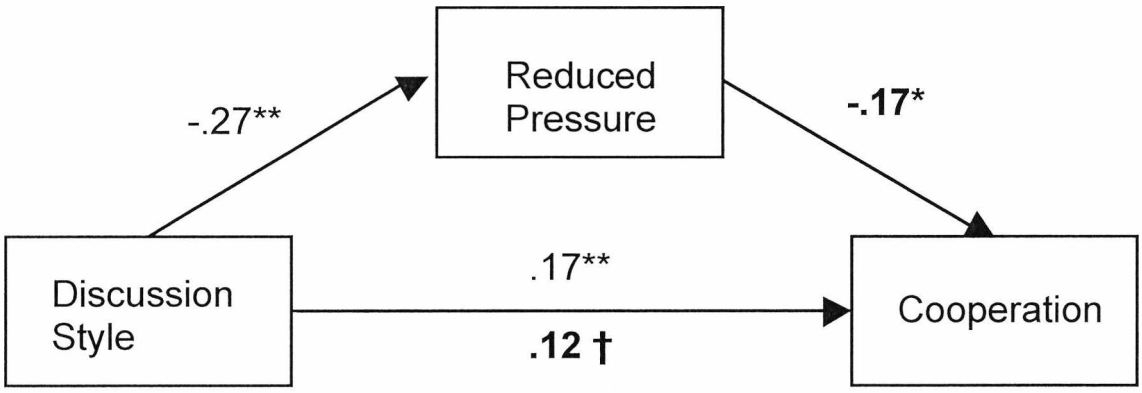
	Item 1 (Knowledge)	Item 2 (Trust)	Item 3 (reliable information)	Item 4 (evaluation)	Item 5 (pressure)
Correlation with Actual choice trial 2	-.045	-.002	-.112	-.001	-.201**

** $p < .01$

Following Baron and Kenny (1986) we computed a series of regression analyses between these variables. These revealed, as expected that discussion style did predict cooperation, as did perceived pressure from other group members. Furthermore, there was a significant reduction on the effect of discussion style when

pressure was entered as a simultaneous predictor, *Sobel Z* = 2.06, p = .04. Indeed, when the predictors were entered together discussion style no longer significantly predicted cooperative choice. This mediation analysis is presented in Figure 5.2 below and demonstrates that only when pressure is perceived does discussion style impact on increasing cooperative choice.

Figure 5.2: The mediating role of pressure on the effect of discussion style on cooperation



Beta co-efficients, **bold** refer to multiple regression * p <.05, ** p <.01, † p ≤.10.
Sobel Z = 2.06, p = .04.

Discussion

The aim of Study 4 was to examine a moderator of the group decision effect that we found in Study 3. To examine this aim we used the Discussion type factor described in the previous chapter and added periods of voting into the phase of group interaction. These voting periods consisted of public or private votes, and were designed to act as a tool to provide more information to participants about other group members' choices. Participants were asked to make choices on a low demonstrability dilemma, so as to avoid possible ceiling effects.

As expected, in the private voting condition the results are similar to the results of Study 3. Participants in the no discussion condition showed the lowest levels of cooperative choice, those in the discussion only condition showed a higher level of cooperative choice. Participants in the discussion and decision condition showed the highest levels of cooperative choice. Participants in the discussion and decision condition were significantly more cooperative than those in the no discussion condition.

Public voting was expected under certain circumstances to increase cooperative choice further still because a lack of anonymity would make participants feel more obligated to stick their vote. However, in the group discussion and decision condition we think the concreteness of knowledge regarding every group members' intentions would encourage an exploitative choice, namely non-cooperation. The results indicated that, like, for private voting there was a main effect of discussion type in public voting. However the pattern was somewhat different. Participants in the discussion only condition showed the highest level of cooperative choice, this was significantly higher than no discussion/public and discussion and decision/public. Indeed, in the public voting conditions the amounts of cooperative choice in no discussion and discussion and decision were very similar.

Comparisons between the public and private conditions indicate no significant follow ups but the means indicate higher levels of cooperative choice in the public conditions for no discussion and for discussion only, but lower levels of cooperative choice for discussion and decision.

The results indicate that voting moderates group discussion and decision. The results show that public voting promotes increased cooperative choice in a discussion only condition indicating that the effect of group discussion can be improved. However, in the discussion and decision condition public voting reduces the amount of cooperative choice displayed in the group. It is likely that this is because participants in this condition have 'too much' information about the choices of others. They know everyone is going to cooperate and, therefore, try to exploit others. This phenomenon is often seen in the last trial of a dilemma. Participants do not think there will be any comeback because they have publicly committed to choosing J and no one will know that it was them that chose P. Therefore, it would appear that group decision is not always a panacea for cooperative choice in a social dilemma. We would not have expected private voting to have the same level of effect because no one knows who made which vote.

Comparing these results with the findings in the previous study we can see that for private voting the findings are similar to those of Study 3, although somewhat attenuated. However, the effect of public voting in the discussion only condition is to mimic the effect of a group decision in Study 3. This suggests that group decision and public voting have similar mechanisms which could be the promotion of a feeling of commitment or obligation to be cooperative. We also have similar findings with Study 3 with respect to the influence of group decision. Individuals were more cooperative after a cooperative group decision than a non-cooperative group decision. Unfortunately due to the random nature of the effects on intended choice we were unable to perform SDS analysis.

Post choice questionnaires

We found that voting style had a significant effect on the level to which participants viewed their group as cohesive. However, in line with our findings in Studies 2 and 3 we found no effects of group cohesion or group identity on participants' actual choice. This is interesting because there was a change in cohesion between public and private voting. It suggests that cohesion is not one of the processes affecting actual choice in this context. Future research might examine the reason behind the finding that voting style affects group cohesion whilst discussion style does not. It is possible that the important factor in group cohesion is a feeling of accountability that is increased by a public vote. However, this would be outside the bounds of this thesis. There was a small but significant correlation between group identity and intended choice but this is likely to be because of the unexpected random effects displayed on intended choice. It is for this reason that in this experiment intended choice was treated as a covariate.

The items from the motivation questionnaire confirm the success of the manipulation of the two factors in this experiment and support our conclusions regarding the effect of public voting in the discussion and decision condition. Inevitably these post-choice measures don't complete the story as they were measured after participants' actual choice and therefore, are likely to be affected by the feedback on choice making.

Consistent with our expectations, participants in the public voting conditions felt that it was easier for others to know what they had voted for than those in the private voting conditions. In addition, participants in the discussion conditions felt

that it was easier to know what others had voted for than those in the no discussion conditions. This was highest in the discussion only conditions. Public voting was associated with greater levels of trust of other group members than private voting, however, this was not present in the public voting/discussion and decision condition which showed very similar levels of trust to the private voting/no discussion condition (the condition we would expect to show a very low level of trust, as there is very little information being shared). This finding is as we would expect based upon the lack of cooperative choice that we have found in the public voting/discussion and decision condition.

Of interest in the light of the finding about trust is participants' belief that they were able to gain reliable information about the choices of others. Participants thought they were able to gain the most reliable information in the discussion only condition followed in turn by the discussion and decision conditions with no discussion being the lowest. This finding fits in part with the previous one, in that participants appear to be less sure of the reliability of their counterparts in the discussion and decision condition. As expected participants felt that their vote was being evaluated more in the public conditions than in the private conditions. One finding that was inconsistent with our findings of actual choice was that people in the discussion and decision conditions reported feeling more pressure to keep their actual choices the same as their votes, more so than those in the no discussion conditions. Mediation analysis indicates that only when participants perceive pressure from other group members to stick with their choice does discussion style impact choice making. This is consistent with what we have seen so far in that it could account for the discrepancy in the public/discussion and decision condition. However, this does not necessarily impact

upon our theoretical standpoint. The questions merely asks about the amount of pressure participants feel that they are under, they may feel pressurised to make a cooperative choice but that does not mean they are obligated to. Therefore, further research into this area would benefit from the inclusion of a measure of the obligation participants feel to abide by their votes and the group decisions made by the group.

Implications, limitations, and future research directions

The findings of Study 4 indicate that public voting alters levels of cooperative choice. Public voting has a positive effect on cooperative choice in comparison to private voting in the no discussion and discussion only conditions. However, in the discussion and decision conditions public voting has a detrimental effect on the levels of cooperative choice compared with private voting. It would appear that because participants are not directly accountable for their actual choice that they are using the increased information in this condition as a tool to enable them to exploit other group members. This is supported by the finding that participants in the public/discussion and decision condition voting cooperatively but chose non-cooperatively[6]. The implication of this is that the positive effect of a group decision does have limits. In that, under conditions of high information a group decision may lose its positive effects. This findings are in line with Folger et al. (1993) who suggested that group discussion may at times encourage a cycle of mutual non-cooperation.

[6] A 2 (Choice, Vote 2, trial 2/actual choice 2) x 2 (Voting type, public/private) x 3 (Discussion type, no discussion/discussion only/discussion and decision) mixed model ANOVA with intended choice as a covariate and Choice as the repeated measures factor indicated a significant interaction between Choice and Discussion style $F(2,24) = 3.67$, $p = .041$, $\eta^2 = .23$. There was also a marginally significant Choice x Voting type x Discussion type interaction $F(2,24) = 2.66$, $p = .09$, $\eta^2 = .18$. Follow up tests indicate that participants in the public/discussion and decision condition were becoming significantly less cooperative from the time of their post discussion vote to their actual choice $F(1,24) = 10.42$, $p = .004$, $\eta^2 = .30$. This analysis is used to support our discussion point. It is not reported in the main results due to the factor that we have already analysed actual choice 2, therefore this analysis should be viewed as merely indicative.

Looking at our findings in terms of Kerr and Kaufman-Gilliland's (1996) we see support for their idea of a commitment norm in the no discussion and discussion only conditions in that participants were more likely to cooperate in the public voting conditions. However, this norm is not binding, in that in the public discussion and decision conditions it is broken and people are more likely to be non-cooperative. If we put the findings from Study 4 into the context of Study 3 we can see that a non-binding vote can replicate the effects of a group decision. This could account for the positive effects of group discussion found in previous research. A further study in which discussion style is included without any form of voting would be useful as it would provide a baseline control to which the effects of voting can be compared explicitly.

We are somewhat limited by the unexpected findings on our intended choice measure. It could also be the case that the procedure, particularly for the first trial, is somewhat over complicated with 3 messages on intent before a participant's actual choice. One message is likely to be sufficient to enable participants to concentrate more on the dilemma and group process around them rather than the intricacies of the procedure. We do not believe this to be a substantial problem, however, we would address this issue in a future replication.

It is conceivable that the participants who were non-cooperative in the public voting group decision condition of this experiment understood the implications of other actions in the context of group process more completely. This increased level of meta-cognition of the group process maybe one plausible explanation as to why some group members would appear to exploit the cooperative choices of other group

members. Future research could examine the meta-cognitions of participants in a social dilemma in more detail, as if they have some influence over choice behaviour then it may be possible to exploit these to fulfil Komorita and Parks' (1996) stated aim of increasing cooperative behaviour. Study 4 will conduct preliminary work specifying the possible effects of participants' meta-cognition of a social dilemma on cooperation.

Chapter 6: Meta-cognition of Group Process and Social Dilemmas

Summary

The aim of the experiment in this chapter is to more fully understand individuals' approaches to the concept of demonstrability in a social dilemma. An interesting but not unexpected finding thus far has been that demonstrability has no effect prior to a discussion period. This would suggest that participants do not have an understanding of group process prior to being part of the group. This experiment examines the concept of meta-cognition in the context of a social dilemma. In this experiment individuals were asked to imagine a scenario in which they were making a decision about a social dilemma (either high or low demonstrability depending on condition) in a group of six people. They were then asked whether they would choose cooperatively or non-cooperatively before being asked about their motivations. Findings match previous findings in this thesis, in that there was no effect of demonstrability on individual choice without a discussion period. However, the results suggest that a discussion prime can activate the effects of manipulating the demonstrability of the dilemma. The results also suggest that participants have some level of meta-cognition about the group processes involved. Future research would benefit from an examination of the interaction between meta-cognition and face-to-face group performance, and whether discussion priming and demonstrability would be useful factors for improving cooperative behaviour in social dilemmas in the applied arena.

Study 5: Investigating meta-cognition of the effects of discussion and demonstrability in social dilemmas

Introduction

Group Problem Solving View

A common theme throughout the thesis so far has been that groups approach a social dilemma as a problem to be solved. This viewpoint is not incompatible with the traditional mixed-motive viewpoint of social dilemmas (Komorita & Parks, 1996) in which people must make a decision between two competing motivations, individual gain and group gain. Two factors are of particular interest in the group problem solving view. Firstly, the positive effect of a cooperative group decision upon individual levels of cooperative choice. Secondly, the role of demonstrability upon the outcome of the group decision i.e. can we increase the likelihood that the group decision will be cooperative thereby fulfilling the criteria of Komorita and Parks (1996) of improving individual levels of cooperative choice. Demonstrability is the level to which the correct answer to a problem can be shown to a doubting group member who is capable of understanding that the answer is correct (Laughlin, 1980). We have discussed in detail in this thesis why the correct answer should be looked upon as the cooperative choice, including issues such as the morality of the J choice (Messick & Brewer, 1983) and the Dawes' (1980) criteria (see Chapter 1). In the context of a social dilemma the demonstrability of the dilemma can be altered by changing the payoff matrix in the manner developed by Hopthrow and Hulbert (2005).

There is a conceivable alternative to the above approach which should be explored. Specifically, by altering the dilemma in this manner the experimenter is

merely changing the magnitude of the payoffs to make the J (cooperative) choice more appealing to a participant. This would mean that there would be little added value to the body of social dilemma research as there has been extensive work examining changes to the payoff structure both in terms of absolute payoffs e.g. K (Rapoport, 1967), K' (Komorita, 1976), and in terms of the individual parameters of fear and greed (Coombs, 1973). However, the change to the dilemma matrix in terms of the demonstrability variable accounts for the knowledge regarding changes to the fear, greed, and K' parameters. The changes are made so that the ratio between the fear and greed and, therefore, the K' parameter remain the same and so, according to the well accepted work of Komorita (1976) the dilemmas are *rationally* equivalent i.e. they should appear the same to an individual. Therefore, we argue that changes to the demonstrability of a social dilemma should only impact at a group level in that individuals' choices are only affected after a period of group interaction.

The experiments within this thesis have always measured the reaction of individual participants to the payoff matrices before they were asked to discuss the matrix as a group. This measure of intended choice is taken from the group problem solving literature and is unusual and innovative in this context. We have consistently found that there is no difference in the levels of intended cooperative choice individuals display between the two matrices. Therefore, it seems likely that the effect is solely at the group level and that the effects of demonstrability and of group decision are only available when in a group. If we look more closely at the work of Laughlin (1980) we can see the reasons for this, for example, a correct answer needs to be demonstrated to a doubting member by another group member (see Chapter 1 for a more detailed explanation).

Whilst the evidence for the group level effect of demonstrability appears to be relatively strong, it important to try to understand the process in more detail. Our aim is not to change the incentive per se but to facilitate the recognition of the correctness of the J (cooperative) choice. This aim to facilitate recognition of the J choice, and the subsequent increase in levels of cooperation, come from Komorita and Parks' (1996) argument that the purpose of social dilemma research should be to improve rates of cooperative behaviour. With this purpose in mind it is conceivable that we can encourage individuals to recognise the correctness of the J (cooperative) choice without the presence of a group. For example, through the use of instructions telling individual players that there is a definitely correct answer to the dilemma. However, Hopthrow and Hulbert (2005) were unsuccessful in their attempt to improve cooperative choice by informing groups that there was a definitely correct answer. We found that only a manipulation of group process had an effect. This suggests that merely telling participants that there is a correct answer is not a sufficient prime for improving cooperative choice. The study reported in this chapter will further investigate the concept of demonstrability and how individuals conceptualise it, if at all. This will be done with an individual level experiment.

Individual Level Experiments

Individual level experiments have been used by social dilemma researchers to further understand group processes and to support face-to-face group findings. For example, in an experiment designed to examine the interaction of social value orientation and public goods success on leadership selection De Cremer (2000) successfully instructed participants to imagine a social dilemma involving a group of

six people. He asked them to imagine a scenario in which the participants were in a group of six people contributing real money to a public goods dilemma. De Cremer found that pro-socials (people more likely to work for collective good) had a stronger preference for a group leader than pro-selfs (people more likely to work for their own good) when the group failed to provide a resource. In addition, De Cremer (2000) found that participants generally preferred the adoption of a leader when the group was not making the required payments to the public good to prevent failure. This result was a replication of the same finding by Van Vugt and De Cremer (1999) in which participants were asked to play a public goods dilemma in real groups of six people. These experiments show that, at least in this context, the findings between an experiment using real groups and one using imaginary groups have some level of equivalency. They provide evidence for the reliability of findings in an experiment looking at group process conducted at the individual level.

Therefore, it would appear that it is possible to garner understanding of group level effects through the use of an individual based study. There are advantages and disadvantages to this approach. From an applied perspective it is advantageous because researchers can then design interventions that will work upon individuals and extrapolate to groups. From an experimental point of view there are significant logistical advantages with the need for substantially fewer participant hours. Conversely generalisability may be threatened as could the validity of the conclusions. Moreover, these experiments can be used in their own right to gather information about what participants think of group process or they can be used to explore avenues of interest and create hypotheses in a parsimonious way, much like the use of thought experiments (Davis, 1973). In the context of this experiment we

will be using this type of design to support previous findings from the group experiments and to gain an insight into the border between group and individual process.

Demonstrability

The evidence so far indicates that individuals pre-discussion are not affected by the demonstrability manipulation and we aim to replicate this finding in Study 5. Indeed we would not expect that they would be as demonstrability by its nature should only affect groups attempting to reach a consensus (Laughlin, Bonner, & Miner, 2002). Our findings from Study 3, Chapter 4 indicate that a group decision will increase levels of cooperative choice. The mechanism behind this is a minority decision for the cooperative choice. This minority decision appears to invoke systematic processing within the group and as such promotes stable opinion change from the non-cooperative to the cooperative choice. Hopthrow and Hulbert (2005) argue that this process is intimately linked with the demonstrability of the dilemma. They say that a dilemma low in demonstrability will provoke a majority process and a high demonstrability dilemma a minority based process.

However, it may be possible that we can improve cooperative choice using the group problem solving principles without having the presence of a group. For this occurrence individuals would need to have some level of meta-cognition of group process. That is, they would have to understand, without actually having a group present, the issues that govern the ways group make decisions and to, therefore, predict those decisions. Obviously there are difficulties with this approach, for example the effect of consensus processes. Our finding that demonstrability does not

have an effect on individual pre-discussion choices is an important one because it indicates that group process has an important role to play in the promotion of cooperative choice amongst individuals. Therefore, we will be examining demonstrability in this experiment and because the mechanism by which demonstrability is likely to have an effect is through changing the decision rule, we will also manipulate decision rule.

To further address the criticism that we are just changing the incentive for J (cooperative choice,) it would be important to examine participants' meta-cognition of the potential group process. Gaining an insight into the meta-cognition of individuals involved in the dilemma may help us to move the findings of the effect of demonstrability and group decision into a more applied arena. People spend a substantial amount of time in group settings (Pennington, 2002) for example, in task orientated work teams, sports teams and even family/community units. Therefore, we would expect that most people would be sensitive to ideas of group process and mechanisms that may have an effect on group processes, garnered as a result of the knowledge learned from previous experiences and extrapolating to the current situational context.

Meta-cognition of Group Process

Meta-cognition refers to an individual's knowledge of a cognitive process. Lories, Dardenne, and Yzerbyt (1998) refer to it as the 'cognition of cognition' (p. 1). They state that meta-cognition is viewed as a 'self reflective mechanism' (p.2). As a term it encompasses what people know about their own and other peoples' cognitive processes. The concept would appear to indicate some level of tiered cognitive

process, for example asking oneself the question 'what do I think about X' implies two different thought processes the first validating the attitude to the object/idea in question and the second, understanding that idea.

According to Jones (1990), a meta-cognitive theory of a particular process may give the individual an expectation of a particular behaviour or outcome, this expectation may in turn impact upon the outcome through the possibility that it becomes a self-fulfilling prophecy. Therefore, it is clear that meta-cognitive theories about a process or cognition can be impactful on behaviour as we will see in more detail below. The initiation of a meta-cognitive evaluation of group process could occur through the use of priming. For example, asking a series of questions regarding group discussion processes may activate difficult to access schema of group process. As a consequence participants may become more cooperative in the context of a dilemma because they would be able to see and understand the potential advantages of a period of group discussion and decision.

An important aspect of meta-cognition that is worth noting is that it is predominantly a self-reflective process. As such meta-cognitions are often revisited in the light of new information and then used by the individual to modify their specific attitude or behaviour (Lories et al., 1998). Therefore, the meta-cognitive process has the potential to be encouraged or used as a way of regulating individuals' thought processes regarding a particular object or process. However, individuals' need to have the ability and motivation to make adjustments to their cognitions in this way, therefore invoking some intrinsic level of 'cost' (Wegener, Petty, & Dunn, 1998).

An example of the possible utility of a meta-cognitive process is the finding of Banaji and Dasgupta (1998). They found that people are often not aware of their biases due to stereotypes. If they were aware of these biases they would be less likely to be biased. This sounds like somewhat of a circular argument but we can see it has truth and parallels with Komorita and Parks' (1996) aim of improving levels of cooperation (i.e. if people are more *aware* of the correctness of the cooperative choice they are more likely to make that choice). Evidence suggests that meta-cognitive processes or awareness can be used to modify attitudes or behaviour in a beneficial way (e.g. Lories et al., 1998). One field in which this is commonly used is education. Meta-cognition is often used to facilitate learning by making pupils aware that learning is a process that can be controlled. Therefore, it may be that it also has a role to play in the promotion of cooperative choice. That is, if researchers can use the knowledge of gaps in knowledge or problematic strategies to inform participants of more functional strategies/knowledge this may improve cooperative behaviour in that individuals may understand better the benefits of choosing cooperatively.

The concept of meta-cognition will be used in the context of this experiment as a tool with the aim of providing us and other researchers with data that would inform the creation of a possible mechanism for promoting cooperative choice. Nelson, Kruglanski, and Jost (1998) state 'Meta-cognitive theories engender expectations about cognitive performance, and these expectations are capable of impacting actual judgements, memories and intellectual performances...' (p.77). This statement provides support for the idea that meta-cognitions about group process may act as a mechanism for influencing the choice an individual might make when faced with a dilemma that they must solve as part of a group.

It is conceivable that people with a high level of understanding of the group process involved in a dilemma will elicit more signs of cooperative behaviour. This can be explained with reference to the basic principles outlined by Dawes (1980). Recall that everyone is better off if everyone chooses the cooperative choice over the non-cooperative choice (Dawes, 1980). However, a participant is always better off if he/she chooses the non-cooperative choice than if he/she chooses the cooperative choice. A person that is by orientation likely to be cooperative may choose to be non-cooperative if they are presented with a dilemma of low demonstrability, and have a good understanding of group process. This is due to the nature of the dilemma. They may understand that the level of cooperative choice in the group is likely to be low and so try to minimise their loss by choosing non-cooperatively. In a high demonstrability dilemma they may understand that the group is more likely to be cooperative and, therefore, stick with their cooperative choice. It is in fact likely that this process also holds true for someone that is by orientation non-cooperative, as the basic principle is the same, maximisation of outcomes.

We do not presume to be able to improve the understanding of the theoretical concept behind meta-cognition within the bounds of this thesis. We simply suggest that meta-cognitive processes may help us to understand more fully the complete timeline from first exposure to a dilemma matrix to final choice.

Design Overview, Aims, and Hypotheses

The aim of Study 5 is to further explore the finding that demonstrability does not have any effect upon choice making prior to group discussion. It will also attempt

to answer the criticism that by changing the demonstrability of the dilemma the experimenter is merely changing the attractiveness of the cooperative payoff. This will be done by replicating the finding that there is no effect of demonstrability prior to a discussion period or prime. Therefore, we will be asking participants to make their choice twice.

Participants will be asked to make their choice twice Time 1 choice will be after participants have been asked to imagine a scenario in which they are expected to have a group discussion. It is likely that participants will not have a sufficient meta-cognition of the group discussion for there to be any effects of demonstrability at this stage. Time 2 choice will be after a series of questions asking participants in detail about various aspects of discussion and its related processes. We expect these questions to act in part as a form of discussion prime. We would expect this to elicit some form of meta-cognitive process and, therefore, we would expect to see an effect of demonstrability.

Based on the findings of Study 1 in which group process was shown to have a significant effect on an individuals' preferred ideas, and the findings of the thesis so far, we will ask a series of questions designed to measure meta-cognitive processes and prime the impact of group discussion. Research into the meta-cognitions of group process is in their infancy and as far as we are aware no work has been performed examining people's meta-cognition of a social dilemma. There are a number of different concepts that make up the construct of meta-cognition, for example, whether people can predict the impact of discussion on their choice or whether they will make

a plan as to their conduct. These different constructs will be measured and analysed as subsets of items.

In a similar method, as used by De Cremer (2000), participants will be asked to imagine playing the dilemma as a group of six. However, the current study will not provide false feedback as we were interested in participants' predictions of what would happen in the group phase rather than their reactions to what did happen. Participants will also not be asked to think in terms of money but rather in terms of 'a reward that is of intrinsic value to the group' to maintain consistency with the other studies in this thesis. Demonstrability will be manipulated through the use of the matrices used in Study 1 and decision size will be manipulated by asking participants to imagine the group consisting of either a minority in favour of J (cooperative choice) or a majority in favour of J (cooperative choice). The impact upon cooperative choice of these two factors will be assessed by asking what choice the participant would make if they were taking part in the six person dilemma J (cooperative) or P (non-cooperative). Further scale items will be used to assess the level to which participants have a meta-cognitive representation of the likely group processes that would influence choice making.

Method

Participants

Eighty-one participants recruited via opportunity sample from the University of Kent took part in the experiment. The sample consisted of 34 males and 46 females (one did not report gender), with an age range of 18 – 42 years and an average age of 20 years. Participants were offered £1 and chocolate for taking part in the study.

Design and Materials

Participants were randomly assigned to condition in a 2 (Demonstrability: High/Low) x 2 (Decision size: Minority/Majority) between-participants factorial design. Data were collected via a questionnaire. Participants were asked to indicate their choice between J (cooperate) or P (not-cooperate) on a prisoner's dilemma type game.

Participants were instructed using a 6 person version of the prisoner's dilemma game. They were told that the experimenters were developing a new training task for small groups. They were asked as part of it to imagine that they would be entering a group discussion and choice making phase with a group of 5 other people that would be representative of the general population. They were informed that the training task involves earning points, which would be converted into rewards that were of value to members of the group, at the end of the task. Participants were told that they would be asked a series of questions aimed at understanding the potential usefulness of the task as a training exercise. They were then given detailed instructions explaining the way the dilemma worked (see Appendix D1 and D2). At this point they were given the opportunity to ask questions if they did not fully understand the matrix of points.

Demonstrability was a between-participants variable, manipulated via changes to the payoff schedule presented to participants. These matrices were identical to those used in Study 2. These matrices did not differ in the relative proportion of the

fear and greed parameters (i.e. Komorita, 1976, K'), but rather in their absolute magnitude.

Decision size was a between-participants variable manipulated by a short paragraph part way through the questionnaire. Participants in the minority decision size condition were asked to imagine that a minority of group members had indicated that they would choose J (the cooperative choice). Participants in the majority condition were asked to imagine that a majority of group members had indicated that they would choose the J (cooperative choice). Participants were then asked a series of questions regarding their attitudes and choice making given that particular set of circumstances (see Appendix D3).

Participants were asked to indicate which choice they would make (Time 1 choice), J (cooperative choice) or P (non-cooperative choice) immediately after reading the experimental instructions. They were given the minority/majority manipulation after question 18 and then asked again which choice they would make (Time 2 choice), J (cooperative choice) or P (non-cooperative choice). Participants were then asked to complete another series of Likert style questions before being asked to imagine that they had to make their choice for J (cooperative choice) or P (non-cooperative choice) several times with the same people. This was followed by item 24.

The first section of the questionnaire questions 2-8 were designed to determine the factors that were influencing the choice of the participant and whether the

participants thought that there was a best option and as such was split into three sub-sections.

Perceptions of influence on choice making

Three items measured participants' perceptions of influence on choice making. These items, 2 (fear of others), 5 (speed) and 6 (thought), included the level to which they were making their choice as quickly as possible, the extent to which they thought carefully about the arguments before making their choice and the extent to which they were motivated by fear of other group members' potential choices. These items were measured from 1 '*not at all*' to 7 '*totally*'.

Perceptions of best choice

Items 7 (clear best option) and 8 (difficult to understand best) measured the level to which participants could determine the best option, these items were measured from 1 '*totally disagree*' to 7 '*totally agree*'.

Perceptions of payoffs

Items 3 (maximise individual gain) and 4 (maximise group gain) measured the level to which participants were working for their own good (also thought of as greed) or the collective good, these items were measured from 1 '*not at all*' to 7 '*totally*'.

Participants were then asked to imagine the group discussion including what people might say and the choices they might make. Questions 9-19 were designed to determine to what extent participants had a meta-cognition about a group discussion of a social dilemma. The concept of meta-cognition is complex and as such has a

number of different parts. For example, to what extent participants made a plan and to what extent they understand that discussion will impact their choice making, therefore for the purposes of analysis the questionnaire was split into a number of sub-sections of related items.

Perception of the correctness of one choice over the other

Item 11 (correctness) asked whether participants felt that they could perceive one choice as more correct than the other. It was measured from 1 '*not at all*' to 7 '*totally*'.

Impact of discussion on personal choice

Items 9 (discussion impact own), 12 (like other members), and 15 (influence of others) were designed to measure the extent to which participants could perceive the potential influence that group discussion would have on their choice making, and is one of the core components of meta-cognition. These items asked if participants thought that discussion would impact the way they themselves would choose, whether the amount they liked the other group members would impact their choice, as well as asking if they thought other group members would be able to influence their decision. These items were measured from 1 '*not at all*' to 7 '*totally*'.

Impact of discussion on others' choices

Items 10 (discussion impact of others), 13 (show correctness) and 14 (show best choice) asked about the impact discussion would have on others' choices, whether group members would be able to show one another the correct answer, and whether the group members could show each other the best way to choose. Item

'discussion impact of others' was measured from 1 '*not at all*' to 7 '*totally*'. Item 'show best choice' was measured from 1 '*totally disagree*' to 7 '*totally agree*'.

Planning

Items 16 (plan for action during discussion) and 17 (plan for actions after discussion) measured another component of meta-cognition, planning. Item 'plan for action during discussion' asked if participants would make a plan for their actions during discussion and Item 'plan for actions after discussion' asked if they would after discussion. Both items were measured from 1 '*not at all*' to 7 '*totally*'.

Prediction

Items 18 (predict discussion) and 19 (important predict discussion) asked participants whether they felt they could predict the group discussion and whether this was important. They were both measured from 1 '*not at all*' to 7 '*totally*'.

At this point participants were given the minority/majority manipulation and asked to make another choice for the J (cooperative) or P (non-cooperative) choice. We have called this choice Time 2 choice. The remaining items (items 20-24) were designed to form a scale measuring the participants' perception of the level to which the group would influence or persuade them in their choice making. Item 20 (choice made before) asked whether they made their Time 2 choice because it was the same as the one before. It was measured from 1 '*not at all*' to 7 '*totally*'.

Perceptions of influence and persuasion

Items 21 (follow minority), 22 (persuade others), 23 (follow others), and 24 (sources of information) were measured from 1 '*not at all*' to 7 '*totally*' and measure the level to which participants thought that they would try to persuade other group members or just go along with the preferences or arguments of other group members. Item 'follow minority' asked if they thought it was important to follow the J sayers, and was measured from 1 '*not at all important*' to 7 '*very important*'. Item 25 (fear of retaliation) measured the extent to which choice making would be influenced by fear of retaliation measured from 1 '*not at all*' to 7 '*totally*'.

These questions were followed by demographic questions including gender, age, and subject of study.

Procedure

Participants were approached on campus by the researcher and offered £1 and some chocolate to take part in the study. After giving informed consent they were give an opportunity to read carefully the dilemma instructions and ask any clarification questions. These questions were answered only with reference to the printed instructions. No mention was made of value laden terms such as 'game', 'cooperate', or 'defect'. On completion participants were thanked, rewarded, and debriefed via a written debriefing sheet. This sheet provided information for future data withdrawal if the participants needed it.

Results

Data were collected and analysed for 81 participants. A one-way Analysis of Variance indicated that consistent with our hypothesis that there was no effect of

demonstrability upon the participants' Time 1 (intended) choice, $F(1,75) = .62$, $p = .43$, $\eta^2 = .01$ (means: High demonstrability = .44, Low demonstrability = .53). These means provide a proportion of cooperative choice (i.e. 44% of participants in the High Demonstrability condition chose the cooperative choice). To check for consistency across the sample we also analysed the effects of gender and whether they were psychology undergraduates or not. There was no effect of gender $F(1,71) < 1$ (see Endnote), and there was no effect of whether the participants were psychology undergraduates or not $F(1,68) < 1$.

Following participants' Time 1 choice they were asked a series of questions about their motivations for that choice and their viewpoint of the potential processes and outcomes of a discussion period. This could be looked upon as a prime of discussion: participants are prompted to process the potential implications of a group discussion more thoroughly. Therefore, we examined the effect of demonstrability and participants' Time 1 choice at Time 2. The frequency distributions can be seen in Figure 6.1 and 6.2. Figure 6.1 shows, consistent with our hypothesis, a significant effect of demonstrability for the people that initially chose P (non-cooperatively) significantly more people changed their choice to J (cooperative) in the high demonstrability condition than the low demonstrability condition, $\chi^2(1) = 4.022$, $p = .045$.

Figure 6.1. The Frequency of J and P choices at Time 2 by Demonstrability after a P choice at Time 1.

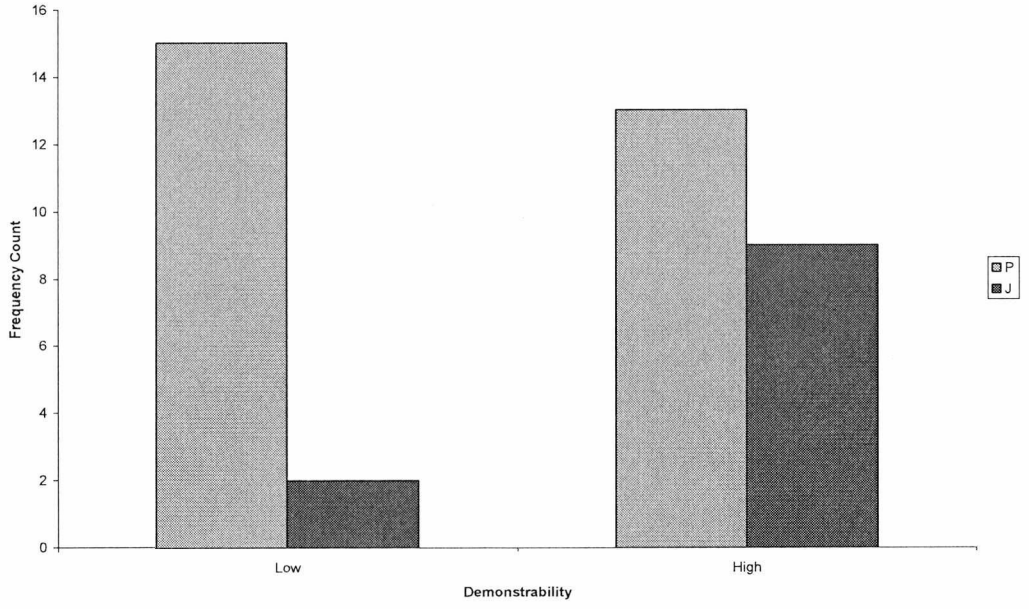
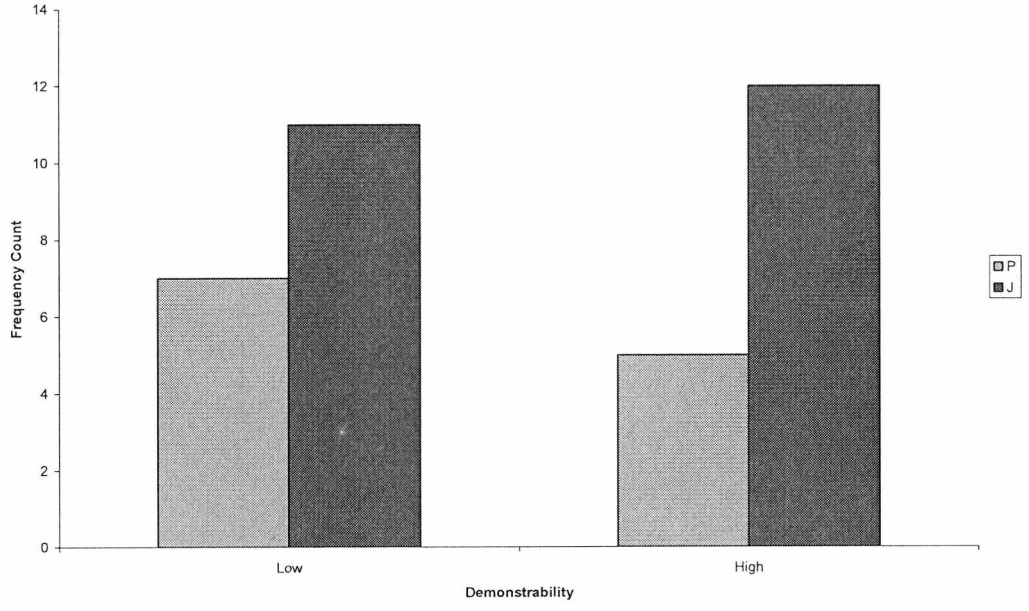


Figure 6.2: The Frequency of J and P choices at Time 2 by Demonstrability after a J choice at Time 1.



For the analysis of the remainder of the questionnaire we split the items into subsets of items that we expected to be related to one another and performed a series of MANOVAs on the subsets.

Perceptions of influence on choice making

We expected items 'fear of others', 'speed', and 'thought' to be related to each other as these items asked to what level of influence they perceived on their choice making. Table 6.1 shows the correlations between these items, the table shows that the items correlate. However, they are conceptually different so we analysed them using a 2 (Time 1 choice, J/P) x 2 (Demonstrability, Low/High) Multivariate ANOVA.

Table 6.1: Correlations between Items on Perceptions of Influence on Choice Making

	Fear of others	Speed	Thought
Fear of others	-	.20†	-.27*
Speed		-	-.38**
Thought			-

†$p < .10$, *$p < .05$, **$p < .01$

The MANOVA revealed a significant main effect of Demonstrability, $F(3,69) = 2.81$, $p = .046$, $\eta^2 = .109$, there was no effect of Time 1 choice $F < 1$ and no interaction effect $F < 2$.

The univariate analysis show more detail about this finding. There was a significant effect of Demonstrability on 'fear of others' people in the high

demonstrability condition indicated a greater fear of others choices than those in low demonstrability (respective means, 3.80 & 2.94), $F(1,71) = 4.48$, $p = .038$, $\eta^2 = .06$. Participants in the high demonstrability condition also felt that they made their choice as quickly as possible (speed) to a greater extent than those in the low demonstrability condition (respective means, 4.44 & 3.52), $F(1,71) = 5.67$, $p = .02$, $\eta^2 = .07$. No univariate effects were found for 'thought'.

Perceptions of best choice

'Clear best option' and 'difficult to understand best' were assessing how correct a certain choice was perceived to be. There was a significant negative correlation between these two items, $r(79) = -.48$, $p < .001$. A 2 (Time 1 choice, J/P) x 2 (Demonstrability, Low/High) MANOVA indicated a marginal effect of Time 1 choice $F(2,72) = 2.704$, $p = .074$, $\eta^2 = .70$. No other effects on these items. No univariate effects were found on these items.

Perceptions of payoffs

We expected items 'maximise individual gain' and 'maximise group gain' to be related and they were, $r(79) = -.526$, $p < .001$. However, they are conceptually different because a participant could agree with both so we conducted a 2 (Time 1 choice, J/P) x 2 (Demonstrability, Low/High) MANOVA. There was a significant multivariate effect of Time 1 choice $F(2,72) = 4.23$, $p = .018$, $\eta^2 = .11$.

Follow up univariate tests showed that on item 'maximise individual gain' participants who chose P (non-cooperative choice) wanted to maximise the points they would get as an individual more than participants that had chosen J (cooperative

choice) (respective means, 5.55, & 4.51) $F(1,73) = 7.42$, $p = .01$, $\eta^2 = .09$. Complimenting item 'maximise individual gain', item 'maximise group gain' showed that participants who chose the J (cooperative) choice at Time 1 wanted to maximise the number of points that they received as a group significantly more than those that chose P (non-cooperative) at Time 1 (respective means, 4.92, 4.00), $F(1,73) = 5.236$, $p = .025$, $\eta^2 = .067$.

At this point in the questionnaire participants were asked to imagine a possible group discussion.

Perception of the correctness of one choice over the other

A 2 (Time 1 choice, J/P) x 2 (Demonstrability, Low/High) ANOVA on Item 'correctness' indicated no effects of Demonstrability or Time 1 choice, and no interaction.

Impact of discussion on personal choice

Items 'discussion impact own', 'like other members', and 'influence of others' examined the impact of discussion on personal choice. Table 6.2 shows the table of correlations between the items.

Table 6.2: Correlations between Items on Impact of Discussion on Personal Choice

	Discussion impact own	Like other members	Influence of others
Discussion impact own	-	.436**	.379**
Like other members		-	.132
Influence of others			-

**$p < .01$

We conducted a 2 (Time 1 choice, J/P) x 2 (Demonstrability, Low/High) MANOVA. This showed a significant effect of Demonstrability $F(3,71) = 2.66$, $p = .05$, $\eta^2 = .10$.

Univariate follow ups showed a significant effect of Demonstrability on items 'discussion impact own' and 'influence of others'. People in the High demonstrability condition thought that the discussion would have an impact on their choice significantly more than those in the Low demonstrability condition (respective means, 5.46 & 4.76), $F(1,73) = 5.95$, $p = .02$, $\eta^2 = .08$. In addition people in the High demonstrability condition felt that others would influence their choices more than participants in the Low demonstrability condition (respective means, 4.64 & 3.84) $F(1,73) = 5.16$, $p = .03$, $\eta^2 = .07$. There was no interaction with Time 1 choice and there was no main effect of Time 1 choice.

Impact of discussion on others' choices

Table 6.3 shows the correlations between items 'discussion impact of others', 'show correctness', and 'show best choice' that examine the perception that a period of discussion will impact other group members' choices. As those were related, we conducted a 2 (Time 1 choice, J/P) x 2 (Demonstrability, Low/High) MANOVA. This showed a marginal multivariate effect of Time 1 choice $F(3,71) = 2.43$, $p = .07$, $\eta^2 = .09$. Follow up tests show that for item 'discussion impact of others', J (cooperative) choosers think group discussion will have significantly more impact on others than P (non-cooperative) sayers (respective means, 5.70, & 5.18), $F(1,73) = 4.99$, $p = .03$, $\eta^2 = .06$.

Table 6.3: Correlations between Items of Impact of Discussion on Others' Choices

	Discussion impact of others	Show correctness	Show best choice
Discussion impact of others	-	.286**	.373**
Show correctness		-	.590**
Show best choice			-

**$p < .01$

Planning

Items 'plan for actions during discussion' and 'plan for actions after discussion' were significantly positively correlated with one another, $r(79) = .49$, $p < .001$. A 2 (Time 1 choice, J/P) x 2 (Demonstrability, Low/High) MANOVA showed no effects, Fs < 1.

Prediction

Items 'predict discussion' and 'important predict discussion' showed a small but significant correlation with one another $r(79) = .214$, $p = .05$, no effects were found from a 2 (Time 1 choice, J/P) x 2 (Demonstrability, Low/High) MANOVA.

At this point the participants were told to imagine they were in a group with a majority or minority of people that advocated the J (cooperative) choice. They were then asked again what choice they would make (Time 2 choice, J (cooperative)/ P (non-cooperative)) before being asked more questions about their perceptions.

We performed a 2 Time 1 choice (J (cooperative), P (non-cooperative)) x 2 Demonstrability (High/Low) x 2 Decision size (Minority/Majority) ANOVA with Time 2 choice as the dependent variable. As expected this revealed a significant effect of Time 1 choice, those participants that chose J (cooperative) at Time 1 chose J significantly more at Time 2 than those that chose P (non-cooperative) at Time 1 (respective means, .66 & .28), $F(1,66) = 14.36$, $p < .001$, $\eta^2 = .18$. There was also a significant effect of decision size with a greater proportion of cooperative choice in the majority condition than the minority condition (respective means, .54 & .38), $F(1,66) = 3.80$, $p = .056$, $\eta^2 = .05$.

We then analysed participants' perceptions of the way they made their choice at Time 2. Generally, participants felt that they had not just made their Time 2 choice the same as their Time 1 Choice (Item 'choice made before') (*Mean* = 3.78) which is below the midpoint (although this difference was not significant $t(80) = -0.93$, $p = .36$). We analysed this item (Item 'choice made before') with a 2 Time 1 choice (J (cooperative), P (non-cooperative)) x 2 Demonstrability (High/Low) x 2 Decision size (minority/majority) x 2 Time 2 choice (J (cooperative), P (non-cooperative)) ANOVA. This showed a main effect of Demonstrability. Participants in the High demonstrability condition felt that they had stuck with the same decision significantly more than participants in the low demonstrability condition (respective means, 3.97 & 3.49), $F(1,58) = 4.11$, $p = .05$, $\eta^2 = .07$. As expected there was a Time 1 choice by Time 2 choice interaction. Intuitively, if these two choices were congruent then participants scored more highly on this item $F(1,58) = 9.65$, $p = .003$, $\eta^2 = .14$. Table 6.4 shows the means and standard errors for Time 1 and Time 2 choice for this item. There were no other significant effects.

Table 6.4: Means and Standard Errors For Time 1 choice x Time 2 choice

	Time 2 Choice			
	J (Cooperative)		P (Non-cooperative)	
Time 1 Choice	Mean	Standard Error	Mean	Standard Error
J (Cooperative)	4.99	.45	2.69	.81
P (Non-cooperative)	2.06	.81	3.78	.40

Perceptions of influence and persuasion

Items 'follow minority', 'persuade others', 'follow others', 'sources of information', and 'fear of retaliation' all showed significant correlations with one another (see Table 6.5). Therefore, we checked to see if they formed a unidimensional construct.

Table 6.5: Correlations between Items on Perceptions of Influence and Persuasion

	Follow minority	Persuade others	Follow others	Sources of information	Fear of retaliation
Follow minority	-	.257*	.486**	.398**	.397**
Persuade others		-	.294**	.223*	.258*
Follow others			-	.348**	.221*
Sources of information				-	.339**
Fear of retaliation					-

*$p < .05$, **$p < .01$

Table 6.6 below shows the results of a factor analysis conducted using principle component analysis and no rotation, on the perceptions of influence and persuasion items. This Table shows that these 5 items do make a unidimensional construct examining the perceptions of group influence.

Table 6.6: Factor Analysis of Items on Perceptions of Influence and Persuasion

Eigenvalue	2.32
% Variance explained	46.42
Follow minority	.79
Persuade others	.56
Follow others	.71
Sources of information	.69
Fear of retaliation	.64

Reliability analysis of the items as a scale indicate good internal reliability Chronbach's $\alpha = .70$. A mean score of the items was taken to create a measure of the extent to which participants perceive that the group can impact upon their choice making. We conducted a 2 Time 1 choice (J (cooperative), P (non-cooperative)) x 2 Demonstrability (High/Low) x 2 Decision size (minority/majority) x 2 Time 2 choice (J (cooperative), P (non-cooperative)) between participants ANOVA with this scale as the dependent measure. We found that people choosing J (cooperative) at Time 2 perceived the group as having significantly more potential influence than those that chose P (non-cooperative) (respective means, 4.24 & 3.50) $F(1,58) = 5.28$, $p = .03$, $\eta^2 = .08$. There was also a significant Demonstrability x Decision size x Time 1 choice

interaction $F(1,58) = 11.47$, $p = .001$, $\eta^2 = .17$. Table 6.7 shows the means and standard errors for this interaction.

Table 6.7: Means and Standard Errors for Time 1 choice x Context x Demonstrability

		J (cooperative)		P (Non-cooperative)	
Demonstrability	Context	Mean	Standard error	Mean	Standard error
Low	Minority	3.25	0.30	4.98	0.56
	Majority	3.82	0.57	3.52	0.55
High	Minority	4.95	0.37	3.40	0.32
	Majority	3.11	0.55	3.93	0.33

Table 6.7 shows that participants who chose P (non-cooperative) in the Low demonstrability, Minority of J choosers condition and participants that chose J (cooperative) in the High demonstrability Minority J choosers condition perceived that there was a greater level of group influence over choice making than in the other conditions. This is supported by the results from simple effects analysis and can be seen more clearly in Figures 6.3 & 6.4. Simple effects analyses indicated that there was a significant effect of Time 1 choice in the Low demonstrability, Minority condition (higher scores for P (non-cooperative choosers)), $F(1,58) = 7.39$, $p = .01$, $\eta^2 = .11$. There was also a significant of effect of Time 1 choice in the High Demonstrability, Minority condition (higher scores for J (non-cooperative choosers)), $F(1,58) = 10.13$, $p = .002$, $\eta^2 = .15$.

Figure 6.3: Means for perceived group influence as a function of Time 1 choice x Decision Size x Low demonstrability

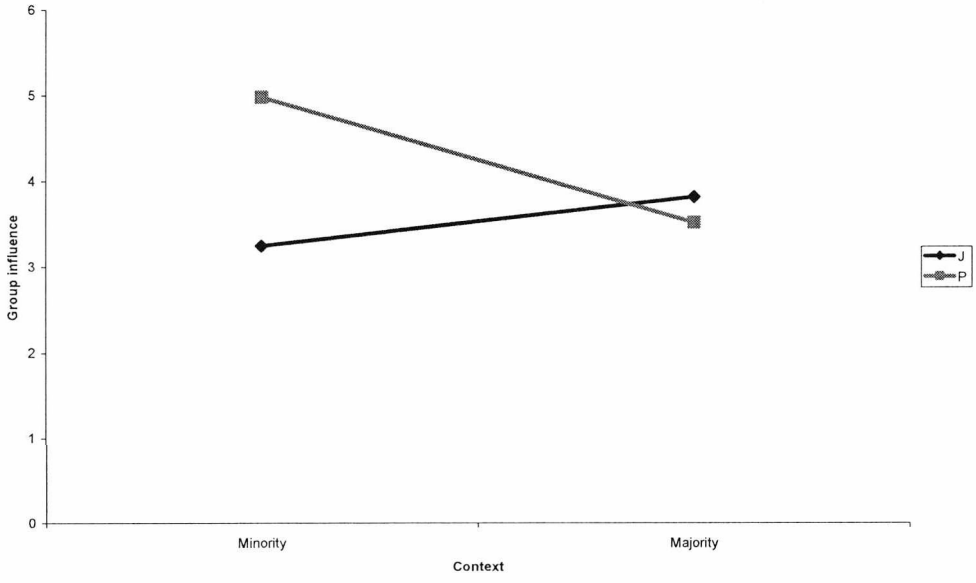
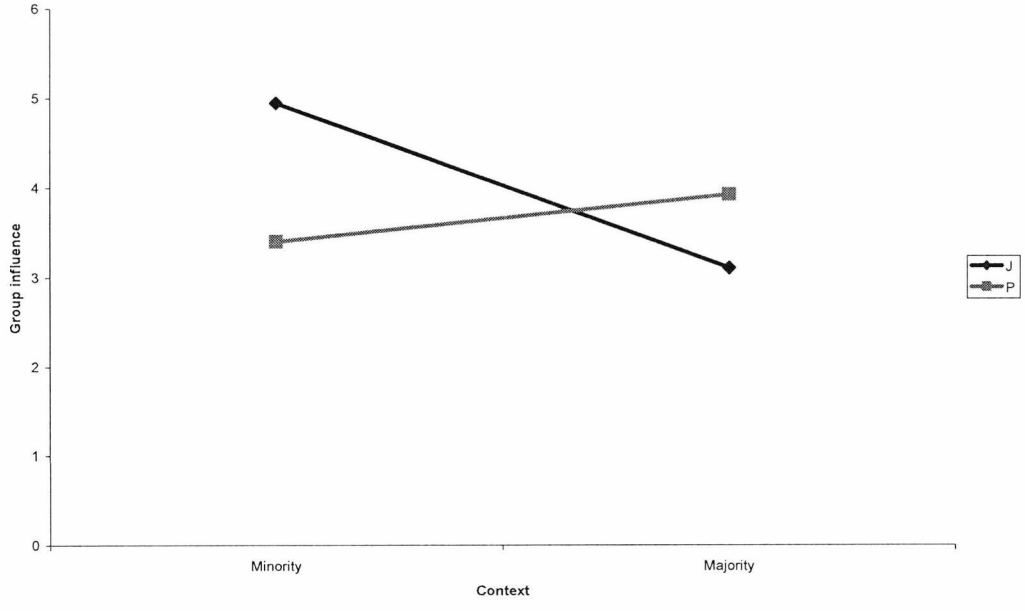


Figure 6.4: Means for perceived group influence as a function of Time 1 choice x Decision Size x High demonstrability



Discussion

The aim of this study was to look more carefully at the link between the manipulation of demonstrability and group process. That is, one conceivable alternative explanation to Hopthrow and Hulbert, (2005) discussion of the demonstrability manipulation is that we are merely altering the payoff for choosing J (cooperative), and therefore merely making J more attractive. This was done by looking at individuals' choices before and after a discussion prime. This was primed by asking participants to imagine a group discussion and then asking a series of questions about its possible utility. Demonstrability was manipulated in this case by changing the payoff structure of the matrices used so that they remained rationally equivalent, (i.e. K' remained the same). Furthermore, this study was designed to look more closely at a person's perception of the possible group process by exploring participants' meta-cognitions of group discussion and group processes.

Analysis of choice preference indicates as expected, that there was no effect of demonstrability on whether participants opted for the cooperative or non-cooperative choice at Time 1. This finding supports and replicates the findings from the analyses of intended choice in the earlier experiments of this thesis and Hopthrow and Hulbert (2005). It provides further evidence that demonstrability only affects choice making in the context of a group discussion. Checks of the sample indicated no effect of gender and no effect of whether participants were psychology undergraduates or not.

The second round of choice making (Time 2 choice) occurred after a prime of discussion and a manipulation of whether participants would be making their choice in a group consisting of a minority or a majority of J (cooperative) choosers. Analysis

of Time 2 choice indicated a significant effect of demonstrability for participants that had chosen P (non-cooperative) at Time 1. That is significantly more participants changed from choosing P at Time 1 to choosing J (cooperative) at Time 2 in the High demonstrability condition than did in the Low demonstrability condition. This effect was not present for those people that chose the J choice initially. We would not expect demonstrability to have an effect on J choosers because its effect is to persuade people of the correctness of the J choice so these people do not need to change.

This finding conceptually replicates our finding in Study 2. In Study 2 we found that groups given a high demonstrability dilemma and consisting of All J choosers at Time 1 showed no difference in the level of cooperative choice at Time 2 (after a period of discussion and decision) than groups that consisted entirely of P choosers. However, in low demonstrability all P groups were significantly less cooperative than all J groups at Time 2. In order for this to occur a number of Time 1 P choosers would have to be changing to the J (cooperative) choice. We see this phenomenon in study 5 as well, that is, a significant number of participants that were given a high demonstrability dilemma changed from P at Time 1 to J at Time 2 (after a discussion prime). This finding adds further weight to the view that discussion and a group decision is an important factor in the level to which the J choice is more or less demonstrable. It provides evidence that by changing a payoff matrix to make the J choice more or less demonstrable we are tapping a process that works at a different level than merely changing the attractiveness, to an individual, of the J choice. The finding that demonstrability does have some effect in this study indicates that participants may have some meta-cognition of the group discussion process but that this may need to be primed before it has an effect on choice making.

The evidence that a discussion prime may have an effect on the manipulation of demonstrability and subsequent levels of cooperative choice indicates that future research looking at applied dilemmas in this context would be useful. Applied dilemmas such as public transport usage are often very large scale involving many thousands of actors, this makes discussion almost impossible. However, if we were able to replicate at least some degree the effects of discussion without the need for direct communication we would be one step further to solving these large scale problems.

The questionnaire items in this study indicate that individuals have some pre-discussion awareness of the demonstrability manipulation. We found that participants in the High demonstrability indicated more fear of others choices than participants in the Low demonstrability condition. We also found that participants in the High demonstrability condition indicated that they made their choice as quickly as possible to a greater extent than participants in the Low demonstrability condition. A conceivable explanation for these two findings is that participants in the high demonstrability condition understand the dilemma more fully and despite the motivations for their choice, understand the arguments for choosing the J choice.

We found no effects of demonstrability on whether participants perceived there to be a best choice. Allied to this we also found no effects of demonstrability or Time 1 choice on whether participants thought one choice was more correct than another. This is somewhat unexpected but indicates that the meta-cognitive process is complex. It is conceivable that at this point there had not been sufficient priming of

discussion. In line with the findings of Hopthrow and Hulbert (2005) and the writing of Komorita and Parks (1996) we found that participants who had made the P choice at Time 1 wanted to maximise their individual payoffs more than those who had chosen J at Time 1. Complimenting this finding we found that participants that chose J at Time 1 wanted to maximise the outcomes for the group significantly more than those who chose P. This finding indicates that as expected those choosing J are working for collective gain and those choosing P are working for individual gain.

We found that participants in the High demonstrability condition thought that discussion, and other group members, would have an impact on their choice more than participants in the Low demonstrability condition. Laughlin (1980) writes that if something is high in demonstrability a group member can show the correctness of one choice over another to a doubting group member. Our findings here dovetail with this, it is plausible that participants in high demonstrability understand that choices may change based upon the process outlined by Laughlin (1980). We also found that participants thought group discussion would have more impact on others' choices if they had chosen J at Time 1 than if they had chosen P at Time 1.

No effects of demonstrability or Time 1 choice were found on whether participants would plan their actions. Neither were there any effects on whether group members thought that they could predict the discussion. Both of these items are components of meta-cognition.

After the manipulation of decision size participants made their Time 2 choice. As expected we found that Time 2 choice was significantly affected by Time 1

choice, we also found that people told they would be in a group with a majority of J choosers were more likely to choose J than those told they would be in a group with a minority of J choosers. This does not fit exactly with the idea that high demonstrability would elicit more systematic processing (i.e. based upon a minority see Chapter 1 for more details). In this case the power of heuristic processing may in this case outweigh some participants' meta-cognition of how demonstrability interacts with group process. However, as will be discussed later, this manipulation may not have been entirely accurate, so further experimental work is needed.

We asked participants to what extent they made their Time 2 choice because it was what they chose before. We found that participants in the High demonstrability dilemma felt they had stuck with their decision more than those in the low demonstrability dilemma. Therefore, it seems likely that participants in the High demonstrability condition understood the dilemma more clearly and were more confident in the choice that they made initially. As their first choice was made before a significant level of priming it is possible that this was initially an implicit process. Untangling this issue is beyond the scope of this chapter and would need more empirical examination. We found as we would expect, that participants who showed congruity between their choices scored more highly on this item.

At this point participants were asked to complete a scale measuring the extent to which they perceived that the group could impact on their choice making. We found that participants who chose J (cooperative) at Time 2 thought the group had more potential influence than those who chose P (non-cooperative). We also found a 3-way interaction between Demonstrability, Decision size and Time 1 choice.

Participants that chose P at Time 1 and were in the Low demonstrability, Minority of J choosers scored highly on this scale as did participants who chose J at Time 1 that were in the High demonstrability, Minority of J choosers condition. This interaction is consistent with the experimental findings of Hopthrow and Hulbert (2005). They found that a minority of J choosers in low demonstrability was not sufficient to overcome a majority of P choosers, however in a High Demonstrability condition a minority of J choosers was enough to persuade the other group members to be cooperative. Therefore, in this study it is conceivable that participants who understand the dilemma would understand that the group has substantial influence over choice making and choose according to the influence.

Limitations, implications and avenues for future research

The results of Study 5 clearly show that with priming participants are capable of having a level of meta-cognition regarding the outcome of a group discussion period. However, there are some inconsistencies which might indicate that participants have a level of meta-cognition about a potential group discussion process that is not entirely explicit. One possible problem with this study is the manipulation of minority influence; we aimed to see if participants had an understanding of the impact of minority vs. majority processes within the group. The manipulation could have been more powerful if the participant believed that they were in the minority or the majority. However, there is a problem with this sort of approach, which is that we are interested in a majority or minority for the J (cooperative choice) and its effects and therefore approximately half the participants, namely the P-choosers (non-cooperative) would be eliminated from the study. As such we believe that the manipulation used in this study was the correct one to use in that it outlined the

process and then subsequent questioning probed for the participants' reactions to the possible differences. Future research may be desirable in adopting the alternative approach outlined above. We believe the effect of this would be to strengthen the manipulation because in effect the instructions would be made clearer by removing the ambiguity shown above.

A useful avenue for future research would be examining in more detail mechanisms that could tap into the meta-cognitive process. In the context of this study it would be useful to try to prime participants to be aware of the possible consequences of their actions. More specifically this would involve instructing participants with the use of an example in which participants are informed of each possible stage of group process (i.e. 'in a previous experiment participants found it useful to make a group decision etc.'). It is conceivable that this will exert some form of informational influence upon the participant encouraging increased cooperative choice. We should be careful not to overstate the possible benefits of meta-cognitive processes, Lories et al. (1998) argue that there is a limit to the influence they can exert. The fact that we found no evidence of an explicit meta-cognitive schema but evidence in favour of priming in this context suggests that we may have some success with this approach in the future.

Of course it maybe that high demonstrability merely increases the motivation of a cooperative chooser to convince the other group members of the correctness of the cooperative choice. Future research could examine this by measuring, preferred choice, the level of meta-cognition of the dilemma, and participants' motivations

within the group. We would expect that cooperative people would be less likely to free ride if their motivation is increased by demonstrability.

The results of this experiment provide evidence that by changing the demonstrability of a dilemma through changes to the payoff matrices we are not merely changing the payoff and attractiveness of the J (cooperative choice), but, rather accessing some deeper level of processing Overall we can see that if people think carefully about the process they are likely to be involved in they can be affected by demonstrability. This chapter also provides us with a strong foundation on which to further the research into understanding meta-cognition, demonstrability and social dilemmas.

Chapter 7: General Discussion, Conclusions and Future Research Directions

Summary

This final chapter will summarise the work presented throughout the course of this thesis. Following a brief summary of the theoretical background and questions that underlie the thesis, we revisit our empirical questions in the light of the main findings. Central findings are presented and those of particular significance or importance will be discussed in more detail. We discuss the methodological challenges encountered and methods employed to solve them. This chapter concludes with methodological and theoretical implications for further research. Included in this is an analysis of the limitations of the research and suggest directions this research program should follow in the future.

Komorita and Parks (1996) explain that the ultimate aim for researchers in social dilemmas should be the improvement of cooperative choice. VanLear and Mabry (1999) argue that social psychologists have a clear 'mandate' to explore the important link between group process and individual behaviour in task orientated groups. These two viewpoints have underpinned and informed the overall theoretical and empirical questions examined over the course of this thesis.

The aim of this thesis has been to explore the group discussion effect in social dilemma research (van de Kragt, Orbell, Dawes, Braver, & Wilson, 1986). The group discussion effect shows that participants who are given the opportunity to discuss a social dilemma are more cooperative post-discussion (van de Kragt, et al., 1986). More specifically the research has investigated, as proposed by Hopthrow and Hulbert (2005), that groups view a social dilemma as a problem to be solved and behave

accordingly. This thesis investigated the process of group decision making, proposed by the group problem solving view. Specifically, the thesis investigates whether a cooperative group decision is the process driving the group discussion effect.

One of the major factors affecting groups solving a problem is the demonstrability of the solution (Laughlin, 1980). Demonstrability lies on a continuum and refers to the ease to which a motivated group member who knows the correct answer to a problem can show that this is correct to a doubting but capable group member. Hopthrow and Hulbert (2005) found evidence to suggest that a social dilemma can vary along the continuum of demonstrability. This thesis started from the premise that the increase in cooperative choice post-discussion could be due to a group decision. It therefore examined in more detail factors that have an impact on group decision making and demonstrability.

Theoretical Background

Chapter 1 begins by explaining the nature of a social dilemma through the use of real world examples and outlines the empirical nature of a social dilemma. This is followed by a detailed review of current research into social dilemmas designed not only to cover different methodological and theoretical considerations in social dilemma research, but also to put the research of the thesis into a broader context.

Following this broad based literature review the remainder of Chapter 1 explains in detail the various theoretical elements that form the basis for the empirical questions studied over the course of the thesis. It explains that participants playing an intragroup dilemma often display an increase in cooperative choice after having the

opportunity for a period of group discussion about the dilemma (Caldwell, 1976). Two competing explanations for this effect were described. The first is the group identity explanation (Dawes, McTavish, & Shaklee, 1977) which argues that discussion provokes greater identity within the group and thereby more concern for the collective outcome. We argue later in the thesis that as there is no referent group it is unlikely that group identity plays a role (Turner, Hogg, Oakes, Reicher & Wetherell, 1987). The second was the perceived consensus explanation (Bouas & Komorita, 1996). This argues that a period of group discussion gives group members the opportunity to reach some form of consensus. However, this explanation does not fully explain how this consensus might be reached. Orbell, van de Kragt, and Dawes (1988) and Bouas and Komorita (1996) argue that the consensus must be based upon a majority consensus. Chapter 1 explains in detail how this cannot explain the group discussion effect. These explanations do not account fully for why the consensus might be for the cooperative choice. Therefore, it is evident that one of the main theoretical questions to be answered is 'how does the consensus process work?'

Chapter 1 describes in detail the structural theory behind a social dilemma. It explains the relationship between the fear and greed parameters (Coombs, 1973) and discusses the reasons why the cooperative choice may be looked upon as the 'correct answer' to the dilemma. It goes on to explain the concept of demonstrability (Laughlin, 1980). This is complimented with an explanation of the theoretical and practical mechanisms behind the manipulation of demonstrability in the context of a social dilemma. Following this theoretical explanation of our factors of interest we conducted a pilot study to support our assertions that our variables of interest would have an impact on participants. This is described in Chapter 2.

Summary of the Key Questions of the Thesis

Hopthrow and Hulbert (2005) found evidence to support the idea that the process behind the group discussion effect was a cooperative group decision. They argued that groups, when given the opportunity to discuss the dilemma, made an implicit or explicit group decision to cooperate. It is this decision that promotes the increase in individual cooperative choice post discussion. This suggests that groups view a dilemma as a problem to be solved. As such we found evidence that the demonstrability of the dilemma influences the type of decision that is made. This thesis explored this in more detail, specifically testing the difference between a group discussion with no group decision, no discussion at all, and a period in which the group has the opportunity to discuss and decide about the dilemma (Study 3, Chapter 4).

The thesis also examined in more detail the mechanism of the group decision. Chapter 1 argued that the group discussion effect cannot be based upon a majority decision for the cooperative choice, rather a minority one. Through changes to the demonstrability of the dilemma, Hopthrow and Hulbert (2005) showed evidence that we can change the decision rule used by the group. The first aim of the thesis was to examine the demonstrability of a dilemma in more detail. An intellective dilemma, that is one with high demonstrability for J, would mean that it is easier for group members who prefer the cooperative choice to demonstrate its correctness to group members who prefer the non-cooperative choice. Altering the demonstrability of the dilemma improves the ability of group members to perceive the 'correct answer'. Study 2, in Chapter 3 examined whether demonstrability is robust to the composition

of the group members by preference. That is, we asked whether presenting unanimously doubting group members with a dilemma high in demonstrability could promote a level of cooperative choice greater than would be expected from previous social dilemma work (e.g. Marwell & Schmitt, 1972).

Study 2 examined change in non-cooperative group members' preferences, Study 3 took this a stage further. We aimed to replicate the finding that the group discussion effect was based on a minority decision to cooperate. If this is indeed the case then we expect to see group members changing their preference from the non-cooperative choice to the cooperative one. We would, if the process is based upon minority influence and the fundamental correctness of the cooperative choice, expect to see a level of systematic processing within the groups. The consequence of this systematic processing would be opinion change towards the cooperative choice that is stable over time. Study 3 was designed to examine this by measuring participants' choices at three time points tracking their level of opinion change over time according to the demonstrability of the dilemma they were exposed to.

We have argued in the thesis that it is possible that the process of making a group decision is an informational one. That is making a cooperative group decision gives participants the opportunity to show one another the correct answer (via the concept of demonstrability), gain information about other group members' intentions, and to garner confidence in their expectations of the behaviour of other group members. We looked in more detail at this idea of informational influence in Study 4. We examined whether another form of information exchange could have a similar impact to a cooperative group decision.

Study 5 was designed to test some questions brought up in the course of the empirical work of this thesis. It examined two main issues in order to create a foundation for further work in this area. Komorita and Parks (1996) explain that the main aim of a social dilemma researcher should be the improvement of cooperative choice. This thesis has, to some extent, addressed this point for small groups, finding that a cooperative group decision amongst other factors can promote higher levels of cooperation. However, many dilemmas are on a much larger scale, for example public transport or power conservation decisions. The size of these dilemmas precludes face to face group interaction. Therefore, it is pertinent to examine methods of improving cooperative choice for individuals. Moreover, whether it is possible that some of the group based methods of improving cooperative choice found in this thesis could be applied to individuals playing a dilemma. Indeed Study 5 aimed to combine these two issues and create a foundation for further work in this area. Study 5 examined the level to which an individual has a meta-cognition about group process for a social dilemma. It also examined whether this could be primed, that is could participants be primed to understand the positive effects of discussion thereby improving their level of cooperative choice and negating the need for the actors in a given dilemma to meet as a group.

Main findings, Limitations, and Future Research Directions

Over the course of the thesis we tested four main factors. These will be summarised and discussed in this section of the chapter. Alongside the summary of the main findings we will discuss any theoretical or practical limitations and make conceptual recommendations for future research.

Demonstrability

We have over the course of this thesis explained in detail the potential effects of demonstrability. We have also explained the operationalisation of demonstrability as an independent variable in social dilemma research. Social dilemmas were presented to participants that were either high or low in the perceived demonstrability of the cooperative choice. These dilemmas were rationally equivalent. Demonstrability was manipulated in Studies 2, 3, and 5. Study 2 was designed to examine the extent to which altering the demonstrability of a social dilemma could improve the level of cooperative choice in groups that consisted of members that entirely preferred the non-cooperative choice. Participants were asked to discuss the dilemma and make a group decision as to the best way to choose. We found that there was only difference in the level of post-discussion and decision (Time 2) cooperative choice between groups that consisted of all cooperative choosers at Time 1 and groups that consisted of all non-cooperative choosers for the low demonstrability dilemma. For the high demonstrability dilemma the levels of cooperative choice were the same for the two conditions. This indicates that altering the perceived demonstrability of the dilemma can have a positive impact on mutually non-cooperative groups. It implies that the process behind demonstrability is to indicate the correctness of the cooperative choice and persuade doubting group members of that fact. This phenomenon could be driven by the process of first shift (Pennington, 2002) in which the group decision is consistent with the first change of opinion displayed by a group member.

One limitation of this study was that we can draw theoretical inferences about the decision rule but we are unable to use social decision scheme analysis because of

the non random distribution of preferences prior to the discussion and decision process. It was still practically relevant, however, as many groups do contain members who all hold the same position about a certain object (e.g. clustering, Latané & L'Herrou, 1996). The implication of this finding is that demonstrating the correct answer to a doubting member may instigate a change of opinion to being more cooperative. This was investigated in Study 3. Another limitation is that we do not have evidence to explain the finding that some participants from non-cooperative groups become cooperative when perceived demonstrability is low. We have discussed in chapter 3 the potential impact of personality and social value orientation on this issue. Future work could examine this in a more systematic way through differing classification techniques and post choice measure focussed in this direction.

Both from a theoretical standpoint and empirically we have argued and shown that demonstrability does not have an effect on pre-discussion choice. This would suggest that individuals do not have a complete understanding of group process prior to actually being in the group. Chapter 6 examines this concept of meta-cognition in more detail. The results from Study 5 suggest that a prime of discussion through the use of explanations and detailed questions about a likely discussion can elicit an effect of demonstrability amongst individuals before they interact with a group. We found that significantly more participants that had chosen non-cooperatively at Time 1 changed to the cooperative choice after a prime of discussion (Time 2) in high demonstrability than in low demonstrability. The results of this study suggest that participants do have some level of meta-cognition about the group process and that this can be improved. This innovative approach has the potential to form the basis of a substantial new research programme. Often everyday dilemmas are large scale and

whilst people are part of a group they may not interact with the rest of the group because of the scale (e.g. emissions control. The ideas of meta-cognition in social dilemmas have the potential to enable us to apply cooperation enhancing techniques found in small groups to large societal scale dilemmas.

In sum, we have shown that demonstrability has the potential to have a positive effect on cooperative choice. In Study 2 and Study 5 we show an increase in cooperative choice due at least in part to the concept of demonstrability. However, Study 3 failed to show a difference between the two different dilemmas. This would indicate that demonstrability in social dilemmas is still somewhat underspecified. Indeed both demonstrability conditions behaved in the way we would expect of a high demonstrability dilemma. We propose two possible explanations for this finding. Firstly, the two dilemmas used in this thesis might be too close together on the continuum of demonstrability. Future research should examine this in more detail by presenting groups with dilemmas with greater and lesser magnitudes of the relative differences between the cooperative and non-cooperative choices (a concept we have called demonstrability in this thesis). Indeed the work of Tversky and Kahnman (1974) suggests that as this magnitude of differences gets larger people will use more heuristic and less systematic processing. An alternative explanation is that, just because a task is low in perceived demonstrability does not necessarily mean that it cannot be solved, so this would seem to indicate that a dilemma does have a "correct" answer and that it is the cooperative choice. However, further research to examine the concept of 'correctness' in social dilemmas is needed as the nature of a dilemma would appear to preclude the possibility of a correct answer.

Discussion Style

Discussion style was used as a variable in both Study 3 and Study 4. It consisted of three levels, no discussion (participants instructed to not communicate), discussion only (participants instructed to discuss the dilemma but not to reach a decision) and discussion and decision (participants instructed to discuss the dilemma and make a decision as to the best way to choose). In Study 3 the aim was, via direct comparison, to test our assertion that the group discussion effect stems from a cooperative group decision. The results of this study extended and supported Hopthrow and Hulbert (2005) in that, when measured against participants' pre-discussion (Time 1) choice, group decision caused a significant increase in cooperation. Merely having a discussion did not promote this increase, rather the level of cooperative choice stayed constant between Time 1 and Time 2. Participants who did not have the opportunity to discuss the dilemma showed a drop in cooperative choice between Time 1 and Time 2. However, a limitation of this approach is that it does not explain the process that promotes higher cooperative choice in the discussion only condition than in the no discussion condition. It is conceivable that despite instructions to the contrary some form of consensus building is still occurring.

In Study 4 discussion style was used to examine the limits of the group decision effect through the use of different voting styles, described below. We found in both Studies 3 and 4 that, consistent with expectations, groups who made a cooperative group decision showed significantly higher levels of Time 2 cooperative choice. We also found in Study 3 using social decision scheme analysis that this group decision was based upon a minority of group members advocating the cooperative choice. We argued that if the increase in cooperation following a group

discussion is due to a minority based group decision, then we would expect to see lasting opinion change. This is what we found in Study 3, group members in the discussion and decision conditions showed an increase in cooperative choice between Time 1 and Time 2, and this increase stayed relatively stable and was still observable at Time 3 (at which point participants were no longer in their groups). The no discussion and discussion only conditions showed a drop in cooperative choice between Time 1 and Time 3. This implies that during the group decision making process group members who advocate the cooperative choice are able to demonstrate the situational correctness of their position to the other doubting group members.

In sum, the direct manipulation of discussion style in Study 3 showed specific evidence that the increase in cooperative choice shown in the group discussion effect (Caldwell, 1976) could be predicted by a cooperative group decision. This cooperative group decision in turn appear to have a lasting effect on participants' perceptions of a social dilemma in that many change from preferring the non-cooperative choice to the cooperative one. Both in terms of Komorita and Parks' (1996) aim of improving cooperative choice and in terms of solving everyday real world dilemmas this finding is important. It shows a method for helping groups solve a dilemma and behave cooperatively, namely making an explicit group decision.

Voting Style

Folger, Poole, and Stutman (1993) found evidence to suggest that group decision making may be limited in its positive effects. Parks, Henager, and Scamahorn (1996) found that messages of intent can promote increased levels of cooperative choice. These two ideas suggest that group decision may not be a panacea

for cooperative choice. Indeed it is possible that under certain circumstances a group decision may hinder cooperative choice. We also argue in Chapter 5 that other informational influences besides group decision may promote increased cooperative choice. Study 4 manipulated Voting style alongside discussion style with the aim of manipulating the amount of information available to participants. This design was created to test two ideas that about the effects of group decision. Firstly, that making a group decision may not always have a positive effect on cooperative choice, and secondly, that the positive effects of group decision may be replicated through the use of another factor. Study 4 was based around a low demonstrability dilemma to try to avoid any possible ceiling effects. It was an iterated dilemma so that participants felt that their choices were important because of the stake that they held in future interactions. Voting style had two levels. Private voting in which participants were asked to make a vote as to how they intended to choose. This vote was available for all group members to see but was anonymised so no group member knew who made which vote. The second level was public voting in which each participant voted to indicate their preferred choice. This vote was made public so each group member knew who had made which vote.

We found that participants who were in the private voting conditions showed a similar pattern of results with respect to cooperative choice as those in Study 3. There was a marginally significant effect of discussion type in the private voting condition, such that based upon descriptive statistics no discussion showed the lowest level of cooperative choice, and participants in the discussion and decision condition showed the highest level of cooperative choice. This would indicate that the processes within

a group when a private vote is imposed upon them are very similar to the processes within the group that are only subject to discussion style as in Study 3.

Participants in the public voting conditions showed a different pattern of results. In the discussion only condition there was a greater level of cooperative choice than in the private condition. Of interest is that the amount of cooperative choice displayed was very similar to that of the discussion and decision condition in Study 3 and the highest in Study 4. This indicates that the increased information and feelings of commitment potentially elicited by a public vote produce similar positive benefits to a group decision with no voting. The discussion and decision condition, however, showed less cooperative choice for public voting than private voting and less cooperative choice than public/discussion only. The implication of this finding, as discussed in Chapter 5, is that explicit group decision making is not a panacea for improving cooperative choice. Indeed under circumstances such as in the case of a public vote it may hinder cooperative choice. It is plausible to argue that the participants in this condition were so convinced that the other group members would choose cooperatively that they defect (choose non-cooperatively). This non-cooperative choice could be seen as an attempt to exploit the other group members and receive the maximum possible payoff in the dilemma.

In sum we found, consistent with our expectations, that a period in which group members made a public non-binding vote increased cooperative choice when group members discussed the dilemma without making a group decision. Group members who made a public vote and were asked to make a group decision showed less cooperative choice than if they had made a private vote or had a discussion with

no decision. These results indicate that there is an optimal level of informational exchange and commitment making once this level is reached cooperative choice starts to reduce. A limitation of this study is that participants were in effect asked intended choice up to three times on each trial. This could have had a detrimental effect on their choice making by devaluing the actual choice, that is the on that earns points and rewards.

Group Identity and Cohesion

Dawes, McTavish, and Shaklee (1977) found evidence to suggest that the group discussion effect stemmed from an increase in group identity. They argued that the consequent increase in concern for the collective outcome, caused by the group discussion was the process that increased cooperative choice. We find this not entirely convincing. Self categorisation theory (Turner, et al. 1987) argues that there should be a real or imagined referent group for a significant increase in group identity. In the context of this thesis, this appeared not to be the case. However, it seems implausible to assume that being part of a group does not alter an individual's attitudes towards that group. One concept that is related to group identity is group cohesion. Group members may feel more like a close nit team after a period of discussion or decision. This is the concept of group cohesion (Carron, 1982). Group cohesion is likely to bind group members together, make them more interdependent on one another and more likely to have increased responsibility for their group's outcomes. Komorita and Parks (1996) explain that concern for collective outcome translates to cooperative choice.

Throughout this thesis we have measured levels of group identity and group cohesion to ensure they are not the explanatory factors behind the group

discussion/decision effect. Study 2 supported the idea that although constructs based on different concepts the two are related. High levels of group identity corresponded to higher levels of group cohesiveness. In this study group cohesion and group identity were not affected by demonstrability or whether all the group members preferred the non-cooperative choice. Results also indicated that group identity and group cohesion did not play a significant role in predicting the level of cooperative choice post-discussion and decision.

Study 3 also measured group members' self reports of cohesion and group identity measured on reliable scales. The findings from Study 2 indicated that in this experiment we found, consistent with our expectations, that there were no effects of our experimental variables on group identity. This is entirely consistent with the idea that a referent group is needed to spark changes to identity. However, both demonstrability and discussion style variables affected levels of group cohesion. Groups exposed to a high demonstrability dilemma showed higher levels of group cohesiveness than group exposed to a low demonstrability dilemma. These changes were small but a group may feel more tight nit if they found the process of reaching the correct answer more satisfying. They also feel more close nit if they could more easily explain the correct answer to doubting group members. Future research might look at this in more detail.

Consistent with Study 2 we found a relationship between group cohesion and group identity. Also consistent with Study 2 we found that group identity and group cohesion did not significantly predict individuals' post-discussion choices. However, unlike Study 2 we found a small but significant correlation between group cohesion

and post-discussion choice. Higher levels of cohesion corresponded to higher levels of cooperative choice. It is possible that this stems from the fact that group cohesion was measured after participants were given the feedback from their choices. It is also possible that cohesion does play a role but that our experimental variables were not strong enough manipulators of cohesion for us to see its predictive effects. Indeed, it is likely that cohesion has an additive effect in increasing cooperative choice on top of a cooperative group decision. However, to have sufficient sensitivity to be able to measure this effect reliably future research might use a public goods dilemma which has more variability in the outcome measure than a straight prisoner's dilemma. This approach may also address more accurately the role of group identity as our results are inconsistent with those of Van Vugt and Hart (2004), in which they found increased identity corresponded with increased levels of cooperative choice.

Study 4 also utilised measures of group cohesion and group identity. No effects of the experimental variables were found on the group identity measure. We found a significant effect of Voting style on group cohesion, those participants in the public conditions reported higher cohesion than those in the private conditions. Unlike Study 3 no effect of discussion style was found. Consistent with Studies 2 and 3 there was a significant positive relationship between group identity and group cohesion. Also consistent with Studies 2 and 3 group cohesion and group identity did not significantly predict post-discussion cooperative choice. These findings would suggest that the effect of Discussion style on cohesion and the subsequent effect of cohesion upon cooperative choice are complicated and subtle. Further research is needed to determine the extent of the influence of group cohesion. It is possible that in

the context of Study 4 the effects of voting style on cohesion drown out the effects of discussion style.

In sum, our findings support our argument that group identity does not play a significant role in the group discussion/decision effect. However, the role of group cohesion is less clear. Certainly in the context of the experiments of this thesis it cannot account for the empirical findings that we have. However, the significant correlation between group cohesion and post-discussion choice in Study 3 and the effects of our experimental variables on group cohesion suggest that further research is warranted.

Methodological Challenges

One of the problems with a social dilemma is its complexity. It is important if researchers are to get meaningful results when using a social dilemma as a research tool that participants understand the dilemma and how it works. In the experiments conducted in this thesis all the participants were, on entering the labs, naïve to a social dilemma. To overcome this problem we drafted detailed written instructions that explained the dilemmas used through the use of basic principles and worked examples. To ensure that participants read these instructions carefully, the instructions were also tape recorded. Participants were asked to read the instructions carefully whilst listening to them being read out on tape. This ensured that all participants spent the same amount of time being instructed. After this they were given the opportunity to ask questions, the answers were carefully couched in terms of the instructions. This method was successful in aiding participants understanding of the dilemma. In future

more sophisticated methods of visual presentation could be used that may ease this issue further or may prompt a comparison of methods.

A major challenge in this thesis was recruiting sufficient numbers non-acquainted 6 person groups. Links were forged with local schools and participants were recruited from the undergraduate population. From looking at the effect sizes we have seen that Study 4 showed some strong effects however the impact of these effects was attenuated by the lack of power. This is partly due to the very real practical problems of obtaining enough 6 person face-to-face groups of people that are not well acquainted with one another (to avoid that as a potential confound). In the case of assessing the impact of group decision making the lack of power is also in part due to the design of the experiment. We were looking at direct comparisons between the different types of discussion (no discussion, discussion only, discussion and decision). Therefore, by nature of the design any examination of group decision in more detail is limited because only one third of the design is used in the analysis.

For example, one design that would more fully test the ideas in this thesis would be a between participants 3 (Demonstrability, low/medium/high) x 3 (Voting, public/private/control) x 4 (Discussion, no discussion, discussion only, discussion and decision, decision with no discussion). Assuming eight 6 person groups per cell we would need 1728 participants, this would clearly create significant logistical problems. We could attenuate this problem now data has been collected regarding the role of no discussion, future research might compare just the group decision and discussion only conditions for public and private voting. This would maximise the efficiency of the design in terms of available participant hours as we could increase

the number of participants we have in the decision conditions to level that we can use for social decision scheme analysis.

Summary of Theoretical Implications

In Chapter 1 we explained that we were interested in explaining the process behind the group discussion effect (Caldwell, 1976). We outlined two possible explanations for this effect. The group identity explanation (Dawes, McTavish, & Shaklee, 1977) explained the group discussion effect through participants increased concern for the collective good as a consequence of the group discussion induced increased group identity. We argued that because of the lack of a suitable referent group, at least in the context of the thesis, the group was not a sufficiently minimal device to elicit strong feelings of group identity. Instead we argued that the group discussion may improve group cohesion (Carron, 1982). We measured these two factors in Studies 2, 3 and 4. We found some evidence that our experimental variables had an influence on levels of group cohesion. However, as expected we did not find compelling evidence to support these two factors as the explanation of the group discussion effect.

An alternative explanation for the group discussion effect was that of perceived consensus (Bouas & Komorita, 1996). This explanation argues that the group discussion elicits a form of consensus that informs individual decision making, without explicitly describing the mechanism by which that consensus is reached. Bouas and Komorita (1996) argued that the consensus was based upon a majority process. Over the course of this thesis we have indicated that a consensus based process can explain the effects of group discussion. However, we extend this and have

provided evidence that this consensus based process consists of a minority based decision in favour of the cooperative choice. Therefore, the findings of this thesis indicate that the group discussion effect could potentially be explained in terms of a cooperative group decision. Furthermore, we found evidence from Studies 2 and 3 that this minority based decision was promoting lasting opinion change among those participants that changed from being non-cooperative to cooperative. This would seem to dovetail with De Vries, De Dreu, Gordijn, and Schuurman's (1996) ideas of systematic processing.

The finding that the group discussion effect stems from an explicit group decision supports the work of Hopthrow and Hulbert (2005). Hopthrow and Hulbert (2005) found that the mechanism of demonstrability (Laughlin, 1980) governed the group decision making process and therefore the group decision itself. Demonstrability refers to the ease with which a group member that knows the correct answer can show that it is correct to a doubting but capable group member (Laughlin1980). The findings of Study 2 indicated that high demonstrability could improve cooperation in groups that consisted entirely of non-cooperators. This is further evidence that demonstrability may play an important role in improving cooperation. However, Study 3 indicates that demonstrability is a concept that still requires further specification and research.

The effect of group decision is not a panacea for solving the problem of cooperative choice. Study 4 indicated that there are limits to the positive effects of group decision. Results indicated that under circumstances of public voting (high informational influence) group members that made a decision showed lower levels of

cooperation than would normally be expected. This would indicate that whilst a cooperative group decision is a good mechanism for improving cooperative choice it is not effective under all circumstances. Future research could explore the limitations of decision in more detail. In sum, this thesis has added to the body of research on the group discussion effect by demonstrating the role of group decision. It has also found a link between the group problem solving literature (e.g. Laughlin, 1980) and social dilemmas.

Summary and Conclusions

Group problem solving is a consensus based process in that for a group to solve a problem the group must come to a group decision as to which alternative from a set of possible solutions they think is the correct answer (Laughlin, Bonner, & Miner, 2002). This process is by its very nature a group decision. Without this the group is unable to solve the problem. The findings from this thesis suggest that the group discussion effect (e.g. Caldwell, 1976) is driven by the fact that groups when having a free discussion of a dilemma view it as a problem to be solved. Therefore, they decide as a group the alternative they prefer as the correct answer before making their individual choices. This group decision is very influential in the choices that individual participants make. If it is a cooperative group decision individuals are more likely to choose cooperatively individually and this cooperative preference becomes stable over time at least within the context of a specific dilemma. An important aspect of group problem solving is the demonstrability of the task (Laughlin, 1980). We have shown over the course of this thesis that being able to demonstrate the correct answer to a social dilemma has an important role in improving cooperative choice.

Towards the end of the thesis we began to address the issue of individuals having some metacognition of the variables we investigated. Although preliminary, Study 5 demonstrated that this is an important consideration. Indeed, it would appear participants' levels of cooperation can be increased through changes to their metacognitions of the dilemma. Of particular consequence for real world dilemmas it would appear from the results of Study 5 that we can achieve this goal through the use of priming. This could be of particular interest for governmental campaigns, for example energy or water conservation. The number of people involved in a dilemma of this scale is plainly too large for every one to meet, discuss and decide upon the dilemma. Instead Study 5 indicates that, by priming the participants in the effects of group discussion (or potentially other variables that might improve cooperative choice in social dilemmas) in the context of the dilemma of interest, the effects of being in a face-to-face group can be replicated. Therefore, a campaign to promote energy conservation could benefit if participants were asked a series of questions about group discussion and decision, perhaps in the form of a survey or leaflet. Future research could further investigate the effects of meta-cognition experimentally and with the use of real world dilemmas.

In general we have indicated that giving group the opportunity to make a group decision as to the best way to choose regarding a social dilemma is a very good method of improving cooperation. However, there are certain caveats to the group decision effect. Too much information can prompt group members to become exploitative suggesting that it increases greed. Future research could examine this idea in more detail by manipulating both the numerical greed in the dilemma and the level of information available. We can also imitate the effects of group decision through the

use of a public vote. Participants that merely discuss a dilemma become more cooperative if they have a public but non binding vote. However, in sum the evidence from this thesis shows that a cooperative group decision is a device that is remarkably good at enabling people to solve a social dilemma.

Endnote

To fully test for the effects of Gender we examined its effect on intended and actual choice. This was not part of the theoretical scope of the thesis but was included for interest. This was not combined with other factors as it was not possible to complete this analysis with aggregated groups (as groups were allocated randomly and not necessarily with the same gender formation). There were no effects of Gender on actual choice. In Study 2 (choice preference and demonstrability) there was no significant effect of Gender on actual choice, t (268) = 1.22, p=.22 (M_{males} = .77 (SD = .43), $M_{females}$ = .67 (SD = .47)). In Study 3 (discussion type and demonstrability) there was no significant effect of Gender on actual choice, t (196)=-0.90, p=.37 (M_{males} = .57 (SD = .50), $M_{females}$ = .42 (SD = .50)). In Study 4 there was no significant effect of Gender of actual choice (using intended choice as a covariate as for other analyses in Study 4), F (1, 188) = 1.61, p=.21 (M_{males} = .57 (SD = .50), $M_{females}$ = .42 (SD = .50)). In Study 5 the data was individual level not group level, therefore the other factors were also included in the analysis. We conducted a Time 1 Choice (Cooperative vs. Non-cooperative) x Demonstrability (high vs. Low) x Decision Size (Minority vs. Majority) x Gender (Male vs. Female) ANOVA with Time 2 choice as the dependent measure. There was no significant main effect or interaction effects with Gender, $Fs \leq$ 1.86, $\underline{ps} > .18$ (M_{males} = .38 (SD = .49), $M_{females}$ = .52 (SD = .51)).

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Appendix A

Appendix A1:
Matrices for high and low demonstrability. Study 2, Study 3, and Study 5.

Appendix A2:
Study 2: Questionnaire for motivations, group identity, and group cohesion.

Appendix A3:
Study 2: Instructions for high demonstrability

Appendix A4:
Study 2: Instructions for low demonstrability

Appendix B

Appendix B1:
Study 3: Questionnaire for motivation, group identity, and group cohesion.

Appendix B2:
Study 3: Instructions for high demonstrability

Appendix B3:
Study 3: Instructions for low demonstrability

Appendix C

Appendix C1:
Study 4: Questionnaire for motivation, group identity, and group cohesion.

Appendix C2:

Study 4: Instructions (low demonstrability dilemma only)

Appendix D

Appendix D1:
Study 5: Instructions for high demonstrability

Appendix D2:
Study 5: Instructions for low demonstrability

Appendix D3:
Study 5: Questionnaire items

Appendix A1: Matrices for high and low demonstrability

High demonstrability matrix

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	194	197	200	203	**206**	209
P	200	204	208	212	216	**220**	no one chose P

Low demonstrability matrix

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	230	260	290
P	**200**	240	280	320	360	400	no one chose P

Appendix A2: Study 2 questionnaires for motivation group cohesion and group identity

Group cohesion

Group No. **Seat No.** **Code No.**

Please complete the following questionnaire individually.

How much did you like the group that you were in as a whole?

Very much	1	2	3	4	5	6	7 **Not at all**

How much do you feel you have in common with other members of the group?

Very much	1	2	3	4	5	6	7 **Not at all**

How much would you like to meet with this group of people again?

Very much	1	2	3	4	5	6	7 **Not at all**

How similar did you feel to the other members of the group

Very much	1	2	3	4	5	6	7 **Not at all**

I was an active member of my group

Agree	1	2	3	4	5	6	7 **Disagree**

I enjoyed being a part of this group.

Agree	1	2	3	4	5	6	7 **Disagree**

Without me my group would not have been able to complete the tasks that they were asked to do.

Agree	1	2	3	4	5	6	7 **Disagree**

How well do you think members of the group got on together?

Very Well	1	2	3	4	5	6	7 **Not at all well**

How much do you think members of the group actively contributed to working together.

Very much	1	2	3	4	5	6	7 **Not at all**

Group identity

Please circle the number that best indicates your opinion for the following statements.

1) It is important to me to be a member of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

2) I feel good about being a member of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

3) I am glad to be a member of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

4) I identify with the other members of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

5) I feel close links with the other members of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

Motivation

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University of Kent at Canterbury

Group Number_____ **Code Number**_____ **Seat Number**_____ **Student no.**_____

Post Decision Questionnaire

Please read each of the following statements carefully and indicate you agreement or disagreement by circling the number that corresponds to your personal feelings. This task should be completed without conferring with your other group members.

1. I want to earn as many points as possible.

Totally agree 1 2 3 4 5 6 7 **Totally Disagree**

2. I only take my group's interest into account.

Totally agree 1 2 3 4 5 6 7 **Totally Disagree**

3. I only take my own interest into account.

Totally agree 1 2 3 4 5 6 7 **Totally Disagree**

4. I do not want to lose more points than other members of my group.

Totally agree 1 2 3 4 5 6 7 **Totally Disagree**

5. I do not trust the other members of my group.

Totally agree 1 2 3 4 5 6 7 **Totally Disagree**

6. What is your Gender?

Appendix A3: Study 2 instructions for high demonstrability

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University of Kent at Canterbury

Personal code _____ Group Number _____ Seat Number_____

Welcome to the demonstration. Before we begin, please take note of a couple of numbers that you should write on all the materials you complete today. On a card on the table is a five digit group number. Also, taped on the table in front of you is your seat number. Please be sure to write your group number, seat number and personal code on all the questionnaires you complete today. Today, you and the other members of the group will make a series of simple choices. The choices you and the other members make will determine how many points each of you will receive. Each choice is very simple – you will choose between two options. Everyone will know the total of the choices that are made, since it is the combination of everyone's choices that determines how many points you personally receive. However, who makes which choice is private, and so the other members of the group will not know your choices and thus the amount of points that you personally have made. We keep track of how many points you earn, and at the end of the demonstration, you will receive pens and pencils in exchange for those points. Importantly, you will be given school supplies and dismissed individually at the end of the experiment. Therefore, no member of your group will ever know what choices you have made over the course of the demonstration.

Look at the table below. This table shows you how many points you and the other members of the group will receive according to the number of people in the group who choose 'J', or 'P'. The columns of the table are labelled by the numbers of J&P choices in the group. This goes from '0J/6P' (no one chooses J and everyone chooses P) to '6J/0P' (everyone chooses J and no one chooses P). The rows of the table are labelled according to the choice that you, personally, make. Each cell of the table shows how many points you receive from the different combinations of your and the other group members' choices.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	194	197	200	203	206	209
P	**200**	204	208	212	216	220	no one chose P

For instance, suppose that everyone were to choose P. In this case, you have also chosen P so you should find the place on the table where 'Number of J&P choices in the group' is '0J/6P', and where 'Your choice' is 'P'. Note here that you would receive ***200*** points (highlighted on the schedule above). Since no one chose J this time, there is nothing in the cell where 'You choose' is 'J'. Also, note that since all members have the same schedule of points, all members would receive ***200*** points in this case.

Suppose instead that everyone in the group chooses 'J'. In this case, you should look in the cell where 'Number of J&P choices in the group' is '6J/0P', and 'You choose' is 'J'. Here you would receive ***209*** points, as would everyone else in the group. As before, there is nothing in the cell where 'Number of J&P choices in the group' is '6J/0P' and 'You choose' is 'P'.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	194	197	200	203	206	**209**
P	200	204	208	212	216	220	no one chose P

Now suppose that you and four other people in the group choose J, meaning that a total of five people choose J. In this case, you should look in the cell where 'Number of J&P choices in the group is '5J/1P', and 'You choose' is 'J'. Here, you and the four other people in the group who choose J would receive ***206*** points. However, the one person in the group who chooses P would receive ***220*** points this time. Since all members have the same schedule of points, you can see how much the person choosing P would receive by looking in the row where 'Your choice' is 'P'.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	194	197	200	203	**206**	209
P	200	204	208	212	216	**220**	no one chose P

Finally, suppose that your choice changed to 'P'. In this case, the 'Number of J&P choices in the group' changes to '4J/2P'. The four people in the group who choose J receive ***203*** points. You and the other person who choose P in this case would instead receive ***216*** points.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	194	197	200	**203**	206	209
P	200	204	208	212	**216**	220	no one chose P

The general principle of the points schedule can be summarised with two ideas. First, no matter what anyone else in the group does, you will never be worse off than other members if you choose P (and very often, you would be better off than others). You can see this for instance, by considering how much a person would receive for choosing J when a total of four choose J (***203*** points). Suppose one of those four people had had instead chosen P, leaving only a total of three to have chosen J. That person would have received ***212*** points.

The second idea of the schedule is that, although for any possible situation, the P-choice always gives more points than the J-choice, if everyone in the group chooses P, everyone will be worse off than if they had all chosen J. You can see this by comparing the number of points you and everyone else receives if you all choose J (***209*** points) to the points you and everyone else receives for choosing P (***200*** points).

Appendix A4: Study 2 instructions for low demonstrability

Department of Psychology
University of Kent at Canterbury

Personal code _____ Group Number _____ Seat Number_____

Welcome to the demonstration. Before we begin, please take note of a couple of numbers that you should write on all the materials you complete today. On a card on the table is a five digit group number. Also, taped on the table in front of you is your seat number. Please be sure to write your group number, seat number and personal code on all the questionnaires you complete today. Today, you and the other members of the group will make a series of simple choices. The choices you and the other members make will determine how many points each of you will receive. Each choice is very simple – you will choose between two options. Everyone will know the total of the choices that are made, since it is the combination of everyone's choices that determines how many points you personally receive. However, who makes which choice is private, and so the other members of the group will not know your choices and thus the amount of points that you personally have made. We keep track of how many points you earn, and at the end of the demonstration, you will receive pens and pencils in exchange for those points. Importantly, you will be given school supplies and dismissed individually at the end of the experiment. Therefore, no member of your group will ever know what choices you have made over the course of the demonstration.

Look at the table below. This table shows you how many points you and the other members of the group will receive according to the number of people in the group who choose 'J', or 'P'. The columns of the table are labelled by the numbers of J&P choices in the group. This goes from '0J/6P' (no one chooses J and everyone chooses P) to '6J/0P' (everyone chooses J and no one chooses P). The rows of the table are labelled according to the choice that you, personally, make. Each cell of the table shows how many points you receive from the different combinations of your and the other group members' choices.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	230	260	290
P	**200**	240	280	320	360	400	no one chose P

For instance, suppose that everyone were to choose P. In this case, you have also chosen P so you should find the place on the table where 'Number of J&P choices in the group' is '0J/6P', and where 'Your choice' is 'P'. Note here that you would receive ***200*** points (highlighted on the schedule above). Since no one chose J this time, there is nothing in the cell where 'You choose' is 'J'. Also, note that since all members have the same schedule of points, all members would receive ***200*** points in this case.

Suppose instead that everyone in the group chooses 'J'. In this case, you should look in the cell where 'Number of J&P choices in the group' is '6J/0P', and 'You choose' is 'J'. Here you would receive ***290*** points, as would everyone else in the group. As before, there is nothing in the cell where 'Number of J&P choices in the group' is '6J/0P' and 'You choose' is 'P'.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	230	260	**290**
P	200	240	280	320	360	400	no one chose P

Now suppose that you and four other people in the group choose J, meaning that a total of five people choose J. In this case, you should look in the cell where 'Number of J&P choices in the group is '5J/1P', and 'You choose' is 'J'. Here, you and the four other people in the group who choose J would receive ***260*** points. However, the one person in the group who chooses P would receive ***400*** points this time. Since all members have the same schedule of points, you can see how much the person choosing P would receive by looking in the row where 'Your choice' is 'P'.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	230	**260**	290
P	200	240	280	320	360	**400**	no one chose P

Finally, suppose that your choice changed to 'P'. In this case, the 'Number of J&P choices in the group' changes to '4J/2P'. The four people in the group who choose J receive ***230*** points. You and the other person who choose P in this case would instead receive ***360*** points.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	**230**	260	290
P	200	240	280	320	**360**	400	no one chose P

The general principle of the points schedule can be summarised with two ideas. First, no matter what anyone else in the group does, you will never be worse off than other members if you choose P (and very often, you would be better off than others). You can see this for instance, by considering how much a person would receive for choosing J when a total of four choose J (***230*** points). Suppose one of those four people had had instead chosen P, leaving only a total of three to have chosen J. That person would have received ***320*** points.

The second idea of the schedule is that, although for any possible situation, the P-choice always gives more points than the J-choice, if everyone in the group chooses P, everyone will be worse off than if they had all chosen J. You can see this by comparing the number of points you and everyone else receives if you all choose J (***290*** points) to the points you and everyone else receives for choosing P (***200*** points).

Appendix B1: Study 3 questionnaires for motivation group cohesion and group identity

Group cohesion

Group No. **Seat No.** **Code No.**

Please complete the following questionnaire individually.

How much did you like the group that you were in as a whole?

Very much	1	2	3	4	5	6	7	**Not at all**

How much do you feel you have in common with other members of the group?

Very much	1	2	3	4	5	6	7	**Not at all**

How much would you like to meet with this group of people again?

Very much	1	2	3	4	5	6	7	**Not at all**

How similar did you feel to the other members of the group

Very much	1	2	3	4	5	6	7	**Not at all**

I was an active member of my group

Agree	1	2	3	4	5	6	7	**Disagree**

I enjoyed being a part of this group.

Agree	1	2	3	4	5	6	7	**Disagree**

Without me my group would not have been able to complete the tasks that they were asked to do.

Agree	1	2	3	4	5	6	7	**Disagree**

How well do you think members of the group got on together?

Very Well	1	2	3	4	5	6	7	**Not at all well**

How much do you think members of the group actively contributed to working together.

Very much	1	2	3	4	5	6	7	**Not at all**

Group identity

Department of Psychology
University of Kent at Canterbury

Personal code_____

Please read each of the following statements carefully and indicate your agreement or disagreement by circling the number that corresponds to your personal feelings. This task should be completed without conferring with your other group members.

1) It is important to me to be a member of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

2) When I think about who I am, I see my self as a member of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

3) I feel good about being a member of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

4) I feel I can be proud to be a member of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

5) I am glad to be a member of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

6) Being a member of this group is important to my sense of self

Not at all true 1 2 3 4 5 6 7 **Very true**

7) I identify with the other members of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

8) I regret being a member of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

9) I feel close links with the other members of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

10) This group forms an important group for me.

Not at all true 1 2 3 4 5 6 7 **Very true**

Motivation

Department of Psychology
University of Kent at Canterbury

Group Number_____ **Code Number**_____ **Seat Number**_____

Post Decision Questionnaire

Please read each of the following statements carefully and indicate you agreement or disagreement by circling the number that corresponds to your personal feelings. This task should be completed without conferring with your other group members.

1. I only take my group's interest into account.

Totally agree	1	2	3	4	5	6	7 **Totally Disagree**

2. I only take my own interest into account.

Totally agree	1	2	3	4	5	6	7 **Totally Disagree**

3. I do not trust the other members of my group.

Totally agree	1	2	3	4	5	6	7 **Totally Disagree**

4. What is your Gender?

Appendix B2: Study 3 instructions for high demonstrability

Department of Psychology
University of Kent at Canterbury

Personal code _____ Group Number _____ Seat Number_____

Welcome to the demonstration. Before we begin, please take note of a couple of numbers that you should write on all the materials you complete today. On a card on the table is a five digit group number. Also, taped on the table in front of you is your seat number. Please be sure to write your group number, seat number and personal code on all the questionnaires you complete today. Today, you and the other members of the group will make a series of simple choices. The choices you and the other members make will determine how many points each of you will receive. Each choice is very simple – you will choose between two options. Everyone will know the total of the choices that are made, since it is the combination of everyone's choices that determines how many points you personally receive. However, who makes which choice is private, and so the other members of the group will not know your choices and thus the amount of points that you personally have made. We keep track of how many points you earn, and at the end of the demonstration, you will receive pens and pencils in exchange for those points. Importantly, you will be given school supplies and dismissed individually at the end of the experiment. Therefore, no member of your group will ever know what choices you have made over the course of the demonstration.

Look at the table below. This table shows you how many points you and the other members of the group will receive according to the number of people in the group who choose 'J', or 'P'. The columns of the table are labelled by the numbers of J&P choices in the group. This goes from '0J/6P' (no one chooses J and everyone chooses P) to '6J/0P' (everyone chooses J and no one chooses P). The rows of the table are labelled according to the choice that you, personally, make. Each cell of the table shows how many points you receive from the different combinations of your and the other group members' choices.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	194	197	200	203	206	209
P	**200**	204	208	212	216	220	no one chose P

For instance, suppose that everyone were to choose P. In this case, you have also chosen P so you should find the place on the table where 'Number of J&P choices in the group' is '0J/6P', and where 'Your choice' is 'P'. Note here that you would receive ***200*** points (highlighted on the schedule above). Since no one chose J this time, there is nothing in the cell where 'You choose' is 'J'. Also, note that since all members have the same schedule of points, all members would receive ***200*** points in this case.

Suppose instead that everyone in the group chooses 'J'. In this case, you should look in the cell where 'Number of J&P choices in the group' is '6J/0P', and 'You choose' is 'J'. Here you would receive ***209*** points, as would everyone else in the group. As before, there is nothing in the cell where 'Number of J&P choices in the group' is '6J/0P' and 'You choose' is 'P'.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	194	197	200	203	206	**209**
P	200	204	208	212	216	220	no one chose P

Now suppose that you and four other people in the group choose J, meaning that a total of five people choose J. In this case, you should look in the cell where 'Number of J&P choices in the group is '5J/1P', and 'You choose' is 'J'. Here, you and the four other people in the group who choose J would receive ***206*** points. However, the one person in the group who chooses P would receive ***220*** points this time. Since all members have the same schedule of points, you can see how much the person choosing P would receive by looking in the row where 'Your choice' is 'P'.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	194	197	200	203	**206**	209
P	200	204	208	212	216	**220**	no one chose P

Finally, suppose that your choice changed to 'P'. In this case, the 'Number of J&P choices in the group' changes to '4J/2P'. The four people in the group who choose J receive ***203*** points. You and the other person who choose P in this case would instead receive ***216*** points.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	194	197	200	**203**	206	209
P	200	204	208	212	**216**	220	no one chose P

The general principle of the points schedule can be summarised with two ideas. First, no matter what anyone else in the group does, you will never be worse off than other members if you choose P (and very often, you would be better off than others). You can see this for instance, by considering how much a person would receive for choosing J when a total of four choose J (***203*** points). Suppose one of those four people had had instead chosen P, leaving only a total of three to have chosen J. That person would have received ***212*** points.

The second idea of the schedule is that, although for any possible situation, the P-choice always gives more points than the J-choice, if everyone in the group chooses P, everyone will be worse off than if they had all chosen J. You can see this by comparing the number of points you and everyone else receives if you all choose J (***209*** points) to the points you and everyone else receives for choosing P (***200*** points).

Appendix B3: Study 3 instructions for low demonstrability

Department of Psychology
University of Kent at Canterbury

Personal code _____ Group Number _____ Seat Number_____

Welcome to the demonstration. Before we begin, please take note of a couple of numbers that you should write on all the materials you complete today. On a card on the table is a five digit group number. Also, taped on the table in front of you is your seat number. Please be sure to write your group number, seat number and personal code on all the questionnaires you complete today. Today, you and the other members of the group will make a series of simple choices. The choices you and the other members make will determine how many points each of you will receive. Each choice is very simple – you will choose between two options. Everyone will know the total of the choices that are made, since it is the combination of everyone's choices that determines how many points you personally receive. However, who makes which choice is private, and so the other members of the group will not know your choices and thus the amount of points that you personally have made. We keep track of how many points you earn, and at the end of the demonstration, you will receive pens and pencils in exchange for those points. Importantly, you will be given school supplies and dismissed individually at the end of the experiment. Therefore, no member of your group will ever know what choices you have made over the course of the demonstration.

Look at the table below. This table shows you how many points you and the other members of the group will receive according to the number of people in the group who choose 'J', or 'P'. The columns of the table are labelled by the numbers of J&P choices in the group. This goes from '0J/6P' (no one chooses J and everyone chooses P) to '6J/0P' (everyone chooses J and no one chooses P). The rows of the table are labelled according to the choice that you, personally, make. Each cell of the table shows how many points you receive from the different combinations of your and the other group members' choices.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	230	260	290
P	**200**	240	280	320	360	400	no one chose P

For instance, suppose that everyone were to choose P. In this case, you have also chosen P so you should find the place on the table where 'Number of J&P choices in the group' is '0J/6P', and where 'Your choice' is 'P'. Note here that you would receive ***200*** points (highlighted on the schedule above). Since no one chose J this time, there is nothing in the cell where 'You choose' is 'J'. Also, note that since all members have the same schedule of points, all members would receive ***200*** points in this case.

Suppose instead that everyone in the group chooses 'J'. In this case, you should look in the cell where 'Number of J&P choices in the group' is '6J/0P', and 'You choose' is 'J'. Here you would receive ***290*** points, as would everyone else in the group. As before, there is nothing in the cell where 'Number of J&P choices in the group' is '6J/0P' and 'You choose' is 'P'.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	230	260	**290**
P	200	240	280	320	360	400	no one chose P

Now suppose that you and four other people in the group choose J, meaning that a total of five people choose J. In this case, you should look in the cell where 'Number of J&P choices in the group is '5J/1P', and 'You choose' is 'J'. Here, you and the four other people in the group who choose J would receive ***260*** points. However, the one person in the group who chooses P would receive ***400*** points this time. Since all members have the same schedule of points, you can see how much the person choosing P would receive by looking in the row where 'Your choice' is 'P'.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	230	**260**	290
P	200	240	280	320	360	**400**	no one chose P

Finally, suppose that your choice changed to 'P'. In this case, the 'Number of J&P choices in the group' changes to '4J/2P'. The four people in the group who choose J receive ***230*** points. You and the other person who choose P in this case would instead receive ***360*** points.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	**230**	260	290
P	200	240	280	320	**360**	400	no one chose P

The general principle of the points schedule can be summarised with two ideas. First, no matter what anyone else in the group does, you will never be worse off than other members if you choose P (and very often, you would be better off than others). You can see this for instance, by considering how much a person would receive for choosing J when a total of four choose J (***230*** points). Suppose one of those four people had had instead chosen P, leaving only a total of three to have chosen J. That person would have received ***320*** points.

The second idea of the schedule is that, although for any possible situation, the P-choice always gives more points than the J-choice, if everyone in the group chooses P, everyone will be worse off than if they had all chosen J. You can see this by comparing the number of points you and everyone else receives if you all choose J (***290*** points) to the points you and everyone else receives for choosing P (***200*** points).

Appendix C1: Study 4 questionnaires for motivation group cohesion and group identity

Group cohesion

Group No. **Seat No.** **Code No.**

Please complete the following questionnaire individually.

How much did you like the group that you were in as a whole?

Very much	1	2	3	4	5	6	7	**Not at all**

How much do you feel you have in common with other members of the group?

Very much	1	2	3	4	5	6	7	**Not at all**

How much would you like to meet with this group of people again?

Very much	1	2	3	4	5	6	7	**Not at all**

How similar did you feel to the other members of the group

Very much	1	2	3	4	5	6	7	**Not at all**

I was an active member of my group

Agree	1	2	3	4	5	6	7	**Disagree**

I enjoyed being a part of this group.

Agree	1	2	3	4	5	6	7	**Disagree**

Without me my group would not have been able to complete the tasks that they were asked to do.

Agree	1	2	3	4	5	6	7	**Disagree**

How well do you think members of the group got on together?

Very Well	1	2	3	4	5	6	7	**Not at all well**

How much do you think members of the group actively contributed to working together.

Very much	1	2	3	4	5	6	7	**Not at all**

Group identity

Department of Psychology
University of Kent at Canterbury

Personal code_____ Group no._____ Seat no._____

Please read each of the following statements carefully and indicate your agreement or disagreement by circling the number that corresponds to your personal feelings. This task should be completed without conferring with your other group members.

1) It is important to me to be a member of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

2) When I think about who I am, I see my self as a member of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

3) I feel good about being a member of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

4) I feel I can be proud to be a member of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

5) I am glad to be a member of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

6) Being a member of this group is important to my sense of self

Not at all true 1 2 3 4 5 6 7 **Very true**

7) I identify with the other members of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

8) I feel close links with the other members of this group

Not at all true 1 2 3 4 5 6 7 **Very true**

9) This group forms an important group for me.

Not at all true 1 2 3 4 5 6 7 **Very true**

Motivation

Department of Psychology
University of Kent at Canterbury

Group Number_____ **Code Number**_____ **Seat Number**_____

Post Decision Questionnaire

Please read each of the following statements carefully and indicate your agreement or disagreement by circling the number that corresponds to your personal feelings. This task should be completed without conferring with your other group members.

1. It was easy for others to know what I voted for.

Totally agree 1 2 3 4 5 6 7 **Totally Disagree**

2. I felt that I could trust the other members of my group.

Totally agree 1 2 3 4 5 6 7 **Totally Disagree**

3. I had the opportunity to gain reliable information about the prospective choices of others.

Totally agree 1 2 3 4 5 6 7 **Totally Disagree**

4. I felt that my vote was being evaluated by the other members of my group.

Totally agree 1 2 3 4 5 6 7 **Totally Disagree**

5. I felt pressure from the other group members to keep my actual choices the same as my votes.

Totally agree 1 2 3 4 5 6 7 **Totally Disagree**

6. What is your Gender?

Appendix C2: Study 4 instructions for low demonstrability

Department of Psychology
University of Kent at Canterbury

Personal code _____ Group Number _____ Seat Number_____

Welcome to the demonstration. Before we begin, please take note of a couple of numbers that you should write on all the materials you complete today. On a card on the table is a five digit group number. Also, taped on the table in front of you is your seat number. Please be sure to write your group number, seat number and personal code on all the questionnaires you complete today. Today, you and the other members of the group will make a series of simple choices. The choices you and the other members make will determine how many points each of you will receive. Each choice is very simple – you will choose between two options. Everyone will know the total of the choices that are made, since it is the combination of everyone's choices that determines how many points you personally receive. However, who makes which choice is private, and so the other members of the group will not know your choices and thus the amount of points that you personally have made. We keep track of how many points you earn, and at the end of the demonstration, you will receive pens and pencils in exchange for those points. Importantly, you will be given school supplies and dismissed individually at the end of the experiment. Therefore, no member of your group will ever know what choices you have made over the course of the demonstration.

Look at the table below. This table shows you how many points you and the other members of the group will receive according to the number of people in the group who choose 'J', or 'P'. The columns of the table are labelled by the numbers of J&P choices in the group. This goes from '0J/6P' (no one chooses J and everyone chooses P) to '6J/0P' (everyone chooses J and no one chooses P). The rows of the table are labelled according to the choice that you, personally, make. Each cell of the table shows how many points you receive from the different combinations of your and the other group members' choices.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	230	260	290
P	**200**	240	280	320	360	400	no one chose P

For instance, suppose that everyone were to choose P. In this case, you have also chosen P so you should find the place on the table where 'Number of J&P choices in the group' is '0J/6P', and where 'Your choice' is 'P'. Note here that you would receive ***200*** points (highlighted on the schedule above). Since no one chose J this time, there is nothing in the cell where 'You choose' is 'J'. Also, note that since all members have the same schedule of points, all members would receive ***200*** points in this case.

Suppose instead that everyone in the group chooses 'J'. In this case, you should look in the cell where 'Number of J&P choices in the group' is '6J/0P', and 'You choose' is 'J'. Here you would receive ***290*** points, as would everyone else in the group. As before, there is nothing in the cell where 'Number of J&P choices in the group' is '6J/0P' and 'You choose' is 'P'.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	230	260	**290**
P	200	240	280	320	360	400	no one chose P

Now suppose that you and four other people in the group choose J, meaning that a total of five people choose J. In this case, you should look in the cell where 'Number of J&P choices in the group is '5J/1P', and 'You choose' is 'J'. Here, you and the four other people in the group who choose J would receive ***260*** points. However, the one person in the group who chooses P would receive ***400*** points this time. Since all members have the same schedule of points, you can see how much the person choosing P would receive by looking in the row where 'Your choice' is 'P'.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	230	**260**	290
P	200	240	280	320	360	**400**	no one chose P

Finally, suppose that your choice changed to 'P'. In this case, the 'Number of J&P choices in the group' changes to '4J/2P'. The four people in the group who choose J receive ***230*** points. You and the other person who choose P in this case would instead receive ***360*** points.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	**230**	260	290
P	200	240	280	320	**360**	400	no one chose P

The general principle of the points schedule can be summarised with two ideas. First, no matter what anyone else in the group does, you will never be worse off than other members if you choose P (and very often, you would be better off than others). You can see this for instance, by considering how much a person would receive for choosing J when a total of four choose J (***230*** points). Suppose one of those four people had had instead chosen P, leaving only a total of three to have chosen J. That person would have received ***320*** points.

The second idea of the schedule is that, although for any possible situation, the P-choice always gives more points than the J-choice, if everyone in the group chooses P, everyone will be worse off than if they had all chosen J. You can see this by comparing the number of points you and everyone else receives if you all choose J (***290*** points) to the points you and everyone else receives for choosing P (***200*** points).

Appendix D1: Study 5 instructions for high demonstrability

Department of Psychology
University of Kent at Canterbury

Participant code_____

We are designing a new training task for small groups and ask that you help us in this design process. You will be shown a points payoff table for a scenario based upon a group of 6 people. The payoff that you receive depends upon not only your choice but the choices of the other members of the group. **Imagine that you will be going into a group setting in which you can discuss your choice with the other members of the group. This group will consist of 6 people including you that have been randomly selected to represent the general population. The training task involves earning points that are converted into rewards of things of value to members of the group at the end of the task.** We will be asking you a series of questions that will help us to understand how useful this training task is likely to be.

Please read the following information carefully.

Look at the table below. This table shows you how many points you and the other members of the group will receive according to the number of people in the group who choose 'J', or 'P'. The columns of the table are labelled by the numbers of J&P choices in the group. This goes from '0J/6P' (no one chooses J and everyone chooses P) to '6J/0P' (everyone chooses J and no one chooses P). The rows of the table are labelled according to the choice that you, personally, make. Each cell of the table shows how many points you receive from the different combinations of your and the other group members' choices.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	194	197	200	203	206	209
P	***200***	204	208	212	216	220	no one chose P

For instance, suppose that everyone were to choose P. In this case, you have also chosen P so you should find the place on the table where 'Number of J&P choices in the group' is '0J/6P', and where 'Your choice' is 'P'. Note here that you would receive ***200*** points (highlighted on the schedule above). Since no one chose J this time, there is nothing in the cell where 'You choose' is 'J'. Also, note that since all members have the same schedule of points, all members would receive ***200*** points in this case.

Suppose instead that everyone in the group chooses 'J'. In this case, you should look in the cell where 'Number of J&P choices in the group' is '6J/0P', and 'You choose' is 'J'. Here you would receive ***209*** points, as would everyone else in the group. As before, there is nothing in the cell where 'Number of J&P choices in the group' is '6J/0P' and 'You choose' is 'P'.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	194	197	200	203	206	**209**
P	200	204	208	212	216	220	no one chose P

Now suppose that you and four other people in the group choose J, meaning that a total of five people choose J. In this case, you should look in the cell where 'Number of J&P choices in the group is '5J/1P', and 'You choose' is 'J'. Here, you and the four other people in the group who choose J would receive ***206*** points. However, the one person in the group who chooses P would receive ***220*** points this time. Since all members have the same schedule of points, you can see how much the person choosing P would receive by looking in the row where 'Your choice' is 'P'.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	194	197	200	203	**206**	209
P	200	204	208	212	216	**220**	no one chose P

Finally, suppose that your choice changed to 'P'. In this case, the 'Number of J&P choices in the group' changes to '4J/2P'. The four people in the group who choose J receive ***203*** points. You and the other person who choose P in this case would instead receive ***216*** points.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	194	197	200	**203**	206	209
P	200	204	208	212	**216**	220	no one chose P

The general principle of the points schedule can be summarised with two ideas. First, no matter what anyone else in the group does, you will never be worse off than other members if you choose P (and very often, you would be better off than others). You can see this for instance, by considering how much a person would receive for choosing J when a total of four choose J (***203*** points). Suppose one of those four people had instead chosen P, leaving only a total of three to have chosen J. That person would have received ***212*** points.

The second idea of the schedule is that, although for any possible situation, the P-choice always gives more points than the J-choice, if everyone in the group chooses P, everyone will

be worse off than if they had all chosen J. You can see this by comparing the number of points you and everyone else receives if you all choose J (***209*** points) to the points you and everyone else receives for choosing P (***200*** points).

1. What choice do you think you would make if asked to make your choice in a group setting? (Please Circle)

   J P

Please circle the number from 1 to 7 that best represents your opinion based on each question.

2. To what extent was the choice you made influenced by fear of the choices other group members might make?

Not at all 1 2 3 4 5 6 7 **Totally**

3. To what extent was the choice you made influenced by the desire to maximise the number of points you would receive as an individual?

Not at all 1 2 3 4 5 6 7 **Totally**

4. To what extent was the choice you made influenced by the desire to maximise the number of points you would receive as a group?

Not at all 1 2 3 4 5 6 7 **Totally**

5. To what extent when you made this choice did you just make you choice as quickly as possible?

Not at all 1 2 3 4 5 6 7 **Totally**

6. To what extent did you think carefully about the arguments for each option before making your choice?

Not at all 1 2 3 4 5 6 7 **Totally**

7. It was very clear to me which choice was the best option.

Totally disagree 1 2 3 4 5 6 7 **Totally agree**

8. It was very difficult to understand which the best option to choose was.

Totally disagree 1 2 3 4 5 6 7 **Totally agree**

Now imagine the group discussion think carefully about what people might say and the choices they might make.

9. Do you think the group discussion might have an impact upon the way you choose?

Not at all 1 2 3 4 5 6 7 **Totally**

10. Do you think the group discussion might have an impact upon the way others choose?

Not at all 1 2 3 4 5 6 7 **Totally**

11. Do you believe that one choice would be perceived as more correct than the other?

Not at all 1 2 3 4 5 6 7 **Totally**

12. Do you think the amount that you like your other group members will impact upon the way you choose?

Not at all 1 2 3 4 5 6 7 **Totally**

13. Group discussion would help to understand which the best option is because:

Group members would be able to show one another the correct answer

Totally disagree 1 2 3 4 5 6 7 **Totally agree**

14. Group discussion would help to understand which the best option is because:

The group members would show each other the best way to choose

Totally disagree 1 2 3 4 5 6 7 **Totally agree**

15. Do you think that the other group members will be able to influence your decision?

Not at all 1 2 3 4 5 6 7 **Totally**

16. Would you make a plan for your actions during the group discussion?

Not at all 1 2 3 4 5 6 7 **Totally**

17. Would you make a plan for your actions after the discussion?

Not at all 1 2 3 4 5 6 7 **Totally**

18. Do you feel that you can predict the group discussion?

Not at all 1 2 3 4 5 6 7 **Totally**

19. Is it important to predict the group discussion?

Not at all 1 2 3 4 5 6 7 **Totally**

Imagine you are in a group and a minority (2 or less) of the other group members have indicated that they would advocate choosing J.

Under these circumstances how would you choose? (please circle)

J P

20. To what extent did you make this choice because it was the one you made before.

Not at all 1 2 3 4 5 6 7 **Totally**

21. Do you think it is important to follow the minority decision?

Not at all important 1 2 3 4 5 6 7 **Very important**

22. I would try to persuade the other group members to follow my preference.

Not at all 1 2 3 4 5 6 7 **Totally**

23. I would just go along with the preferences of the other group members.

Not at all 1 2 3 4 5 6 7 **Totally**

24. What sources of information would you rely on to make your choice
The arguments of other group members?

Not at all 1 2 3 4 5 6 7 **Totally**

Now imagine you have to make the choice between J and P a number of times with the same people. Your Payoff would be the sum of the payoffs for each round.

25. To what extent do you think that the choices you make would be influenced by the fear of retaliation by the other group members?

Not at all 1 2 3 4 5 6 7 **Totally**

26. Please report your gender _____

27. Please report your age _____

28. What is your degree programme/occupation? _____

29. What is your nationality? _____

You have now completed the study, please inform the researcher.
MANY THANKS!

Appendix D2: Study 5 instructions for low demonstrability

Department of Psychology
University of Kent at Canterbury

Participant code_____

We are designing a new training task for small groups and ask that you help us in this design process. You will be shown a points payoff table for a scenario based upon a group of 6 people. The payoff that you receive depends upon not only your choice but the choices of the other members of the group. **Imagine that you will be going into a group setting in which you can discuss your choice with the other members of the group. This group will consist of 6 people including you that have been randomly selected to represent the general population. The training task involves earning points that are converted into rewards of things of value to members of the group at the end of the task.** We will be asking you a series of questions that will help us to understand how useful this training task is likely to be.

Please read the following information carefully.

Look at the table below. This table shows you how many points you and the other members of the group would receive according to the number of people in the group who choose 'J', or 'P'. The columns of the table are labelled by the numbers of J&P choices in the group. This goes from '0J/6P' (no one chooses J and everyone chooses P) to '6J/0P' (everyone chooses J and no one chooses P). The rows of the table are labelled according to the choice that you, personally, make. Each cell of the table shows how many points you receive from the different combinations of your and the other group members' choices.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	230	260	290
P	**200**	240	280	320	360	400	no one chose P

For instance, suppose that everyone were to choose P. In this case, you have also chosen P so you should find the place on the table where 'Number of J&P choices in the group' is '0J/6P', and where 'Your choice' is 'P'. Note here that you would receive ***200*** points (highlighted on the schedule above). Since no one chose J this time, there is nothing in the cell where 'You choose' is 'J'. Also, note that since all members have the same schedule of points, all members would receive ***200*** points in this case.

Suppose instead that everyone in the group chooses 'J'. In this case, you should look in the cell where 'Number of J&P choices in the group' is '6J/0P', and 'You choose' is 'J'. Here you would receive ***290*** points, as would everyone else in the group. As before, there is nothing in the cell where 'Number of J&P choices in the group' is '6J/0P' and 'You choose' is 'P'.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	230	260	**290**
P	200	240	280	320	360	400	no one chose P

Now suppose that you and four other people in the group choose J, meaning that a total of five people choose J. In this case, you should look in the cell where 'Number of J&P choices in the group is '5J/1P', and 'You choose' is 'J'. Here, you and the four other people in the group who choose J would receive ***260*** points. However, the one person in the group who chooses P would receive ***400*** points this time. Since all members have the same schedule of points, you can see how much the person choosing P would receive by looking in the row where 'Your choice' is 'P'.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	230	**260**	290
P	200	240	280	320	360	**400**	no one chose P

Finally, suppose that your choice changed to 'P'. In this case, the 'Number of J&P choices in the group' changes to '4J/2P'. The four people in the group who choose J receive ***230*** points. You and the other person who choose P in this case would instead receive ***360*** points.

Number of J&P choices in the group

You choose	**0J/6P**	**1J/5P**	**2J/4P**	**3J/3P**	**4J/2P**	**5J/1P**	**6J/0P**
J	no one chose J	140	170	200	**230**	260	290
P	200	240	280	320	**360**	400	no one chose P

The general principle of the points schedule can be summarised with two ideas. First, no matter what anyone else in the group does, you will never be worse off than other members if you choose P (and very often, you would be better off than others). You can see this for instance, by considering how much a person would receive for choosing J when a total of four choose J (***230*** points). Suppose one of those four people had instead chosen P, leaving only a total of three to have chosen J. That person would have received ***320*** points.

The second idea of the schedule is that, although for any possible situation, the P-choice always gives more points than the J-choice, if everyone in the group chooses P, everyone will be worse off than if they had all chosen J. You can see this by comparing the number of

points you and everyone else receives if you all choose J (***290*** points) to the points you and everyone else receives for choosing P (***200*** points).

1. What choice do you think you would make if asked to make your choice in a group setting? (Please Circle)

   J P

Please circle the number from 1 to 7 that best represents your opinion based on each question.

2. To what extent was the choice you made influenced by fear of the choices other group members might make?

Not at all 1 2 3 4 5 6 7 **Totally**

3. To what extent was the choice you made influenced by the desire to maximise the number of points you would receive as an individual?

Not at all 1 2 3 4 5 6 7 **Totally**

4. To what extent was the choice you made influenced by the desire to maximise the number of points you would receive as a group?

Not at all 1 2 3 4 5 6 7 **Totally**

5. To what extent when you made this choice did you just make you choice as quickly as possible?

Not at all 1 2 3 4 5 6 7 **Totally**

6. To what extent did you think carefully about the arguments for each option before making your choice?

Not at all 1 2 3 4 5 6 7 **Totally**

7. It was very clear to me which choice was the best option.

Totally disagree 1 2 3 4 5 6 7 **Totally agree**

8. It was very difficult to understand which the best option to choose was.

Totally disagree 1 2 3 4 5 6 7 **Totally agree**

Now imagine the group discussion think carefully about what people might say and the choices they might make.

9. Do you think the group discussion might have an impact upon the way you choose?

Not at all 1 2 3 4 5 6 7 **Totally**

10. Do you think the group discussion might have an impact upon the way others choose?

Not at all 1 2 3 4 5 6 7 **Totally**

11. Do you believe that one choice would be perceived as more correct than the other?

Not at all 1 2 3 4 5 6 7 **Totally**

12. Do you think the amount that you like your other group members will impact upon the way you choose?

Not at all 1 2 3 4 5 6 7 **Totally**

13. Group discussion would help to understand which the best option is because:

Group members would be able to show one another the correct answer

Totally disagree 1 2 3 4 5 6 7 **Totally agree**

14. Group discussion would help to understand which the best option is because:

The group members would show each other the best way to choose

Totally disagree 1 2 3 4 5 6 7 **Totally agree**

15. Do you think that the other group members will be able to influence your decision?

Not at all 1 2 3 4 5 6 7 **Totally**

16. Would you make a plan for your actions during the group discussion?

Not at all 1 2 3 4 5 6 7 **Totally**

17. Would you make a plan for your actions after the discussion?

Not at all 1 2 3 4 5 6 7 **Totally**

18. Do you feel that you can predict the group discussion?

Not at all 1 2 3 4 5 6 7 **Totally**

19. Is it important to predict the group discussion?

Not at all 1 2 3 4 5 6 7 **Totally**

Imagine you are in a group and a minority (2 or less) of the other group members have indicated that they would advocate choosing J.

Under these circumstances how would you choose? (please circle)

J P

20. To what extent did you make this choice because it was the one you made before.

Not at all 1 2 3 4 5 6 7 **Totally**

21. Do you think it is important to follow the minority decision?

Not at all important 1 2 3 4 5 6 7 **Very important**

22. I would try to persuade the other group members to follow my preference.
Not at all 1 2 3 4 5 6 7 **Totally**

23. I would just go along with the preferences of the other group members.
Not at all 1 2 3 4 5 6 7 **Totally**

24. What sources of information would you rely on to make your choice
The arguments of other group members?
Not at all 1 2 3 4 5 6 7 **Totally**

Now imagine you have to make the choice between J and P a number of times with the same people. Your Payoff would be the sum of the payoffs for each round.

25. To what extent do you think that the choices you make would be influenced by the fear of retaliation by the other group members?
Not at all 1 2 3 4 5 6 7 **Totally**

26. Please report your gender _____

27. Please report your age _____

28. What is your degree programme/occupation? _____

29. What is your nationality? _____

You have now completed the study, please inform the researcher.
MANY THANKS!

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