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► **To cite this version:**

Timothy Hopthrow, Dominic Abrams. Group Transformation: How Demonstrability Promotes Intra-Group Cooperation in Social Dilemmas. *Journal of Experimental Social Psychology*, 2010, 46 (5), pp.799. 10.1016/j.jesp.2010.04.002 . hal-00851027

HAL Id: hal-00851027

<https://hal.science/hal-00851027>

Submitted on 12 Aug 2013

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Accepted Manuscript

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PII: S0022-1031(10)00087-9
DOI: [10.1016/j.jesp.2010.04.002](https://doi.org/10.1016/j.jesp.2010.04.002)
Reference: YJESP 2444

To appear in: *Journal of Experimental Social Psychology*

Received Date: 4 March 2010



Please cite this article as: T. Hopthrow, D. Abrams, Group Transformation: How Demonstrability Promotes Intra-Group Cooperation in Social Dilemmas, *Journal of Experimental Social Psychology* (2010), doi: [10.1016/j.jesp.2010.04.002](https://doi.org/10.1016/j.jesp.2010.04.002)

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Running Head: Demonstrability, Group Composition

Dr Timothy Hopthrow
Centre for the Study of Group Processes School of Psychology University of Kent
Canterbury Kent CT2 7NP

ACCEPTED MANUSCRIPT

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Timothy Hopthrow & Dominic Abrams

University of Kent

This work was supported by ESRC grant: PTA-026-27-1503

Word count: 3793

Abstract

Intra-group cooperation in a social dilemma is increased after a group has discussed and reached a decision, especially if the dilemma is easily understood ('demonstrable'). This paper examines how demonstrability affects the decision of a group that consists entirely of participants who are initially non-cooperative. Thirty-eight 6-person groups with unanimous prior preference for cooperation or non-cooperation discussed a prisoner's dilemma before making a group decision. When demonstrability was low groups reflected the prior (either cooperative or non-cooperative) preferences of their members. When demonstrability was high we found that groups showed no effect of prior preference. Specifically, groups of prior non-cooperators made more cooperative group decisions and subsequently their members remained cooperative when asked to express preferences individually. The combined advantages of group process and high demonstrability for facilitating optimal cooperation are discussed.

Is it possible to change the decision of a unanimous group? Most social psychological research and evidence suggests that in the absence of new information, new members, or external pressure there would be no reason for groups to change their decision. However, the evidence we present in this article suggests that, under certain conditions, groups will exhibit enlightened self-interest and that it is the process of group discussion and decision that can provide the basis for such a transformation. A social dilemma arises when individuals each stand to benefit at others' expense if they allocate resources to one-another non-cooperatively, but all will be better off on average if all cooperate (Dawes, 1980). Groups and society as a whole stand to gain if, when placed in such dilemmas, we can encourage individuals to be cooperative. For example, fishing stocks can only be sustained if overfishing in open seas is curtailed. Individual trawlers can increase their profits relative to others by overfishing, but ultimately the total yield, and average per trawler, is imperilled. Likewise, tackling global warming depends on mutual cooperation requiring countries to forego potential competitive advantages of using carbon-producing technology. As illustrated by the inconclusive 2010 Copenhagen summit on climate change, there is often significant opposition and difficulty reaching agreement on such issues. Arguably, our collective survival depends on finding ways to reach collectively optimal outcomes. Therefore, it is important to know whether, even when all individuals are strongly motivated to gain maximum advantage for themselves, there are conditions and decision processes under which a group can recognise and adopt the optimal strategy of cooperation. Moreover, even when cooperative decisions are made collectively there may be strong incentives for individuals to exploit others' cooperativeness and seize an advantage. Therefore, just as important as the decision itself is whether members remain committed to it.

A very reliable finding in social dilemma research is that when group members have an opportunity to discuss a social dilemma prior to making their choice this can increase cooperation rates (Caldwell, 1976). One explanation for this is that the discussion period provides group members with an opportunity to coordinate their actions and reduce their fear that they will be exploited (Kerr & Kaufman-Gilliland, 1994). It could also be that exposure to cooperative individuals highlights the social desirability of cooperativeness. Furthermore, Hothrow and Hulbert (2005) found that once a collective decision has been made to cooperate this promotes higher cooperation in *subsequent* decisions by group members.

Demonstrability

Cooperativeness can also be affected by the demonstrability of the optimality of this strategy. Laughlin (1980) proposed that group members who identify a correct answer to a problem facing the group can often demonstrate the correctness of that answer to a doubting, but otherwise capable, group member. Demonstrability is on a continuum from low to high, with many tasks falling at some point between the two endpoints. Tasks in which the correct answer is quite easily shown (e.g. a math problem) are known as intellectual or high in demonstrability. Tasks on which the answer is less easily shown to be correct (e.g. Nature or Nurture) are known as judgmental, or low in demonstrability. It follows that increasing the demonstrability of the solution to a social dilemma should make it easier for a *group* to determine the optimality of *every* group member choosing to cooperate. Consistent with this idea, Hothrow and Hulbert (2005) demonstrated that, in groups comprised of a mixture of co-operators and non-cooperators higher demonstrability led to more cooperative decisions and these in turn led to more subsequent cooperative decisions by individual group members.

The present article examines whether demonstrability can affect group decisions even when all group members hold identical prior preferences to cooperate or compete. This is an

important issue to consider as it does reflect real life situations, such as when food or fuel shortages arise (e.g., looting of shops following an earthquake). Continuity of supply for all depends on steady demand, but if people decide to stock up personally, supplies may become scarce and some people may be left with none, endangering their lives. In a social dilemma, demonstrability can be manipulated through changes to the absolute values of fear and greed (i.e. size of losses or benefits). The present study uses the dilemma matrices from Hothrow and Hulbert (2005). In these the ratio between fear and greed remains constant, and hence the so called K' value (Komorita, 1976) remains the same in each dilemma at 0.346. As the two dilemmas have the same K' any individuals would be expected to choose similarly in each dilemma. However, the absolute values of fear and greed in the low demonstrability dilemma are 10 times larger than in the high demonstrability dilemma. The absolute value of the temptation to defect (1 person choosing non-cooperatively and the remaining group members choosing cooperatively) is therefore relatively higher in the low demonstrability dilemma. Kahneman, Slovic, and Tversky (1982) describe a mechanism by which this may arise, namely anchoring. They found that when participants were asked to estimate a numerical answer to a problem their answers showed a systematic bias depending upon the size of the numbers that were initially presented. Moreover, Morrison (1999) has argued that when groups face social dilemmas they are likely to transform the objective matrix presented to them into a more subjective one. According to Doise (1978) groups may be especially prone to focus on biasing information because locating a salient common point of reference facilitates the functioning of the group as a whole. For example, Doise (1969) argued that, "Groups more than individuals, put stress on certain aspects of the material under discussion in order to make interaction between their members possible..." (p.71). This idea is in line with Tindale, Sheffey and Scott's (1993) proposal that groups generally have an immediate

goal of reaching consensus. Therefore we would expect changes in demonstrability to affect a group's subjective judgement of the dilemma.

We argue that in the lower demonstrability dilemma the high value of 1 person not cooperating makes it more difficult for group members to perceive the relative value of universal cooperation, as each is more motivated to be the only non-cooperator and therefore receive a substantial personal payout. On the other hand, under higher demonstrability, groups should be more likely to recognize and decide to be cooperative.

Moreover, if demonstrability effects are dependent on group process, these should only emerge during and after group interaction. In line with this contention, Hoptrow and Hulbert (2005) found that prior to group interaction the same proportion of individuals indicated a preference for a non-cooperative choice when considering a high or low demonstrability dilemma. Demonstrability only had an effect once they considered the dilemma in a group. This highlights that it is the perception of the dilemma that can be altered and has an effect, not its fundamental property in terms of fear and greed.

Preference Distribution

Seibold, Meyers, and Sunwolf (1996) argue that group communication research concentrates largely on group process without considering the 'input'. An important input is individuals' prior judgments regarding cooperation. This is likely to affect communication within the group and the subsequent group decisions.

Parks and Nelson (1999) examined how initial preference distribution and the content of group discussions affected group decisions. Even when members all held the same initial preference, groups still spent time discussing the possible alternatives and the prospective decision that they were going to make. This feature of group process, which seems to involve additional information processing, means that groups have the potential to reveal information

that results in decisions that depart from an, initially unanimous, preference. We argue that increasing the demonstrability of the dilemma should make it more likely that a group composed entirely of non-cooperators will identify the cooperative choice as the optimal response (Hopthrow & Hulbert, 2005).

Bouas and Komorita (1996) showed evidence for a consensus building process during group discussion of a dilemma. Prior to group discussion participants may be naive to the notion that there could be consensus. Hence they may indicate their preference for non-cooperation as a protection against exploitation (Kerr, 1983). However, if during discussion participants become aware that no members intend to cooperate they may each realise that they will all lose substantially rather than benefit from their individual non-cooperative position. This may make them reassess their choices. We assume higher demonstrability should make it easier to determine the utility of the mutually cooperative position. Such reassessment is likely to promote an increase in cooperative choices.

The present study considers an extreme but important scenario, in which all group members start with the same preference – either to cooperate or not to cooperate. If demonstrability modifies the decision and subsequent individual choices of a group of non-cooperators this would be a clear demonstration that group process is responsible for the effect. In other words, cooperation could only be an emergent consequence of group process and could not be attributable to inputs. In particular if the combination of higher demonstrability and group decision making can lead non-cooperators to become cooperative it could greatly aid collective solutions to social dilemmas with real world consequences.

Within a group consisting entirely of advocates of cooperation a high demonstrability dilemma should not convey any structural reason to change preferences, so such groups should simply persist in opting for their initial mutually cooperative position. However, we note Parks and Nelson's (1999) suggestion that a feature of group processes is, that there is a

tendency to be different or novel. Ironically, this could undermine cooperativeness. Thus if innovativeness is an important consequence of group discussion we would expect both groups of co-operators and non-cooperators to become less homogeneous in their preferences. But if demonstrability were a key process we would only expect a change among non-cooperative groups.

In sum, groups have the potential to revisit information presented to them even if they consist entirely of members that prefer the same alternative. A group may therefore change its preference owing a re-evaluation of the parameters of their decision. We predict that this is more likely under high demonstrability. Specifically, within groups composed entirely of non-cooperators high demonstrability should promote cooperative group decisions.

The present study also addresses the likely sustainability of collective decisions by investigating individuals' preferences after their group's decision. Based on group decision and group polarization research, it seems reasonable to expect that group members will continue to endorse the group decision (Moscovici & Zavalloni, 1969). Therefore, we expect that once a group decides to be cooperative this will result in significantly more cooperative choices subsequently by its individual members.

In line with Hoptrow and Hulbert (2005), demonstrability should have effects via group process (Laughlin, 1980) so we do not expect to see any differences in individual pre-discussion choices as a function of demonstrability. Unlike Hoptrow and Hulbert (2005) the present experiment rules out the possibility that group preference shifts because of the influence of particular (e.g. minority preference) members. Instead we are testing whether group process alone can be sufficient to promote cooperation, and whether this orientation sustains beyond the immediate group decision. Therefore our hypothesis regarding inputs is that prior individual choice preference will only affect group decisions or post-discussion individual dilemma choices in the low demonstrability condition.

Method

Participants

Two hundred and seventy six introductory psychology undergraduate students (in 46 6-person groups) from the University of Kent, UK, participated as partial fulfilment of their course requirements.

Design

A 2 (Choice Preference: All cooperative vs. All non-cooperative) x 2 (Demonstrability: High vs. Low) between participants factorial design was used. Participants were randomly assigned to demonstrability conditions. Demonstrability was manipulated using payoff matrices taken from Hothrow and Hulbert (2005) see Table 1. Participant preference had two levels, all cooperative (i.e. groups that consisted entirely of members that advocated the cooperative choice) and all non-cooperative (i.e. groups that consisted entirely of members that advocated the *non*-cooperative choice). Participants were told that any points earned during the experiment would be turned into school supplies at the end. Participants were asked to make 3 choices: i) Individual pre-discussion preference which could be cooperate or not-cooperate; ii) Group Decision which could be All cooperate, All not-cooperate, or a Mixed decision; iii) Individual post-discussion choice which could be cooperate or not-cooperate, participants' rewards were based on this final choice. For the purposes of analysis post-discussion choices were aggregated to create a measure of proportion of cooperative choices i.e. proportion of cooperation. This gives a value between 0 and 1. The value of 0 corresponds to no one choosing cooperatively in the group, and 1 corresponds to everyone in the group choosing cooperatively.

Table 1a and 1b shows the points payoff matrix used in the high and low demonstrability conditions, respectively. In both tables J is the label participants see for the cooperative choice and P for the non-cooperative choice. The matrices indicate the payoff a

participant receives as a function of their choice (the rows) and the distribution of preferences in the group (the columns). For example in Table 1a (high demonstrability) if a participant chooses *not* to cooperate (P) and all the other group members choose to cooperate (J) the participant will receive 220 points and the other group members will each receive 206 points. In Table 1b (low demonstrability) if a participant chooses *not* to cooperate (P) and all the other group members choose to cooperate (J) the participant will receive 400 points in comparison to the other group members receiving 260 points. This apparently higher magnitude of 400 points for the sole *non*-cooperator cell is one of the key reasons why cooperation in Table 1b is lower in demonstrability.

Procedure

After random assignment to Demonstrability condition participants listened to pre-recorded instructions while they looked at the decision matrices. Participants were asked to make a pre-discussion choice which involved indicating their preference for J (cooperative choice) or P (non-cooperative choice) in a forthcoming single shot prisoner's dilemma game. Participants knew from the outset that there would only be a single iteration of the game. On the basis of their answers, but without their knowledge, participants were then randomly assigned to 6 person groups of members who shared their own preference. Thus, groups consisted entirely of people who had individually preferred the cooperative choice, or entirely of people that preferred the non-cooperative choice (the few remaining non-unanimous groups were not included in the analysis). Participants in each group were given 5 minutes in which to discuss the game and reach a group decision as to the best course of action to take. This decision could be for All-J (everyone advocating cooperation), All- P (everyone advocating non-cooperation) or a Mixed decision which is some combination of J and P choices.

Finally, participants were asked to make a private individual decision to cooperate or to not-cooperate. They were told that this choice would determine their personal points score and consequent amount of school supplies that they would receive. At the conclusion of the experiment participants were informed of their point score anonymously, debriefed and given school supplies.

Results

Pre-discussion Choices

Fifty eight participants were excluded from the analysis for procedural reasons they could not be placed in groups with homogeneous prior preferences. The remaining 228 participants were assigned into 38 homogeneous experimental groups. Levels of pre-discussion cooperative choices were evaluated to check our assumption that the points matrices were of equal K' (Komorita, 1976) and the prediction that demonstrability does not affect individual choice making. Consistent with these expectations, aggregated data for individuals within each group showed that there was no difference in prior cooperation levels between high and low demonstrability conditions, $t(36) = 0.27, p = .79$ (Respective means: .40, .44).

Group Decisions

Group decisions were classified as cooperative or not-cooperative as in Hothrow and Hulbert (2005). Our prediction was that individual inputs would have a larger effect on group decisions in the low demonstrability condition than the high demonstrability condition. We tested whether the decisions of the two types of groups differed significantly within each condition. We conducted a $Z_{\text{contrasts for proportions}}$ test on group decision x choice preference. This analysis enables the testing of an a-priori hypothesis that is based on proportions of (in this case) groups choosing cooperatively or non-cooperatively (Rosenthal & Rosnow, 1985). As predicted, in the low demonstrability condition the proportion of groups making an all

cooperative group decision was significantly higher among groups comprised of cooperative choosers than groups comprised of non-cooperative choosers $Z_{\text{contrasts for proportions}} = 2.14, p = .016$. This difference was eliminated in the high demonstrability condition. There was no difference in the proportion of group decisions to all cooperate as a function of members pre-discussion choice pattern $Z_{\text{contrasts for proportions}} = 0$.

Post-Decision Individual Choices

A paired t-test showed a significant group discussion effect such that overall, individuals' post-discussion choices were significantly more cooperative than pre-discussion choices $t(37) = 4.07, p < .001$ (respective means: .72, .42). We then examined the effect of group decision upon post-discussion choice. Members of groups that chose cooperatively were significantly more likely to cooperate individually than were members of groups that made a non-cooperative group decision, $F(1,36) = 12.78, p = .001, \eta^2 = .26$ (respective means, .88, .56).

A 2 (Demonstrability: High vs. Low) x 2 (Choice preference: All cooperative vs. All not cooperative) ANOVA showed a significant main effect of choice preference. Participants from groups of all cooperative choosers were significantly more likely to choose cooperatively post discussion $F(1,34) = 9.82, p = .004, \eta^2 = .22$ (respective means: .89, .59). However, there was no overall significant main effect of demonstrability (means: High = .74, Low = .74) and no significant interaction effect. Cell means were in the direction expected and therefore we performed simple main effects analysis (Howell, 1992). This analysis shows, consistent with expectations, that the difference in post-decision cooperative choices made by members from cooperative groups and non-cooperative groups was significant only in the low demonstrability condition. In line with our hypothesis, groups of cooperators showed significantly more post discussion cooperative choice than groups of non-cooperators in low demonstrability $F(1,34) = 9.03, p = .005, \eta^2 = .21$ (respective means: .94, .53). No

such significant difference was found in the high demonstrability condition (respective means: .83, .65).

Discussion

Demonstrability and Individual Choice Preference

Consistent with our predictions based on the calculation of the fear and greed ratio, K' (Komorita, 1976) we found no effect of demonstrability on pre-discussion individual choice. Also, in line with prior research there was a significant effect of prior choice preference (input) on group decisions. As one might expect, groups of prior cooperators were more likely to make cooperative decisions than groups of prior non-cooperators. This shows that inputs are important and that demonstrability does not operate at an individual level. The present findings are an important contribution to the relatively sparse experimental literature on small group interactions (Randsley de Moura, Leader, Pelletier, & Abrams, 2008), showing that group process can play a crucial role in generating social cooperation.

Group Decisions

Bouas and Komorita (1996) provided evidence for a consensus building process during group discussion. Consistent with previous work (see also Caldwell, 1976; Kerr & Kaufman-Gilliland, 1994) we found significantly higher levels of cooperative choice post-discussion than pre-discussion. 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 a group's decision or participants' later private choices. It seems likely that when competitive groups decided to cooperate it involved a consensus building process that then had an impact on subsequent individual preferences. Moreover, consistent with Hopthrow and Hulbert (2005) group decisions had a significant effect upon post-discussion/decision choice. Regardless of individuals' prior preferences, cooperative group decisions elicited more individual cooperative choice than did non-cooperative group decisions.

Most importantly, we argued that when demonstrability is low, groups will follow the prior consensus among members. However, as demonstrability is higher the group is more likely to realise the more optimal (cooperative) choice. Consistent with this idea, in the low demonstrability condition group decisions closely matched the members' prior choices. Cooperators continued to cooperate, non-cooperators continued not to cooperate. In contrast, when demonstrability was high groups used the information differently and cooperated. This finding is remarkable because it shows that there is something about considering such dilemmas *as a group* that elicits greater attraction to mutual cooperation if the demonstrability is sufficiently high. There might be several mechanisms involved, but one might be that members engage in mutual perspective taking, and if the absolute gains and losses of a dilemma are depicted as less extreme members may perceive greater intragroup similarity. But this is an avenue for investigation in future research. Nevertheless, the implication is that presenting social dilemmas in less rather than more extreme frames of reference (e.g. describing carbon emission differences in decades instead of months) could have considerable impact on cooperation rates.

A further important finding is that when groups of non-cooperators decide to be cooperative this is sustained in group members' subsequent individual preferences. An important issue that remains to be addressed is what elements of group process might be responsible for this effect. Does consensus building have its effects through *discussion* of the dilemma or is it necessary for groups to make an explicit consensual group *decision* prior to the final individual choice phase? Future research could compare non-discussion dilemma groups with those that merely have a dilemma-based discussion and those that have a discussion and make a group decision.

Under high demonstrability the post-discussion choices made by members from different types of groups were equally cooperative. However, under low demonstrability, there

remained a significant difference between members of these two types of groups echoing the pattern for group decisions. Non-cooperative groups showed significantly lower levels of post-discussion cooperative choice than members of cooperative groups. An interesting question is why there was little change in choices of members of initially non-cooperative groups when demonstrability was low. After all, even under conditions of low demonstrability groups could arrive at the conclusion that cooperation would be desirable (e.g. on moral or other grounds). Perhaps this does not happen because low demonstrability makes it difficult to expose a convincing rationale for cooperation. An important avenue for future research is to discover what other variables might help to overcome the obstacle of low demonstrability. But importantly, the present evidence suggests that if members can readily understand the structure of a social dilemma, group discussion and decision can promote a lasting cooperative solution. Advisors should heed this lesson when briefing representatives at inter-governmental meetings (e.g. the G20), and the same may be true when friends, families, and colleagues face shortages of resources that require them collectively to tighten their belts.

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Table 1a: High Demonstrability Points Table

		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

Table 1b: Low Demonstrability Points Table

		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