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Toward a Reconciliation of Diverging Perspectives on Interindividual-Intergroup Discontinuity: The Role of Procedural Interdependence

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This experiment investigated the effect of procedural interdependence on interindividual–intergroup discontinuity (i.e., the tendency within mixed-motive situations for intergroup interactions to be more competitive than interindividual interactions) in Dutch and U.S. college populations. Groups composed of members who were procedurally interdependent, groups composed of members who were procedurally independent, and individuals interacted with a programmed other on three trials of a Prisoner's Dilemma Game. Results across trials indicate that procedurally interdependent group members were more competitive than pooled procedurally independent group members and individuals. The latter two conditions did not differ significantly. No significant effects involving participant nationality were observed. We propose that these findings reconcile diverging perspectives on interindividual–intergroup discontinuity.

One of the enduring questions in social science is whether decent individuals are prone to behave indecently when they are part of a group. A concern with this comparison between individuals and groups can be traced back as far as Plato's *Republic*. As implied by G. Allport (1985), Plato distrusted democracy because of his belief that it involved rule by irrational crowds: "Had every Athenian citizen been a Socrates, every Athenian assembly would still have been a mob" (p. 40). Our approach to this classic issue involves the systematic comparison of interindividual and intergroup interactions within the context of matrix games, typically the Prisoner's Dilemma Game (Insko et al., 1987, 1988, 1990, 1993, 1994, 1998; Insko et al., 2001; Lodewijkx & Rabbie, 1992; Rabbie & Lodewijkx, 1991; Schopler et al., 1991, 1993, 1995, in press).

Most, but not all, of the experiments cited above revealed a tendency for intergroup interactions to be more competitive and less cooperative than interindividual interactions. This phenomenon is labeled the interindividual–intergroup *discontinuity effect.* The term *discontinuity* was derived from Brown's (1954) discussion of LeBon's (1895/1896) seminal work on crowd behavior, *Psychologie des Foules.* According to Brown, "The quality of mob behavior has always required explanation because of its apparent discontinuity with the private characters of the individuals involved" (p. 843).

The discontinuity effect has been investigated systematically in the United States at the University of North Carolina (UNC) and in The Netherlands at Utrecht University

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(UU). These programs of research have generated seemingly inconsistent findings (Rabbie, 1998). The experiment described here was designed to resolve these disparities.

Generality and Mediation of the Discontinuity Effect

The program of research conducted at UNC has demonstrated that within the context of mixed-motive matrix games the discontinuity effect is a reliable and descriptively large phenomenon when communication between players is allowed. Discontinuity effects have been observed under a wide variety of conditions: when participants were all male or all female, when intergroup communication involved all group members or just the groups' representatives; when a PDG or mutual fate control (MFC) payoff matrix was used; and when the low payoff values in the game matrices were negative or positive (see Insko & Schopler, 1998; and Schopler & Insko, 1992, 1999, for reviews).

Three explanations for the discontinuity effect have been advanced. The identifiability hypothesis proposes that in interindividual interactions, people assume that they are identifiable and can be held accountable if a competitive choice is made. In intergroup interactions, however, it is less clear who bears responsibility for a competitive choice and who should be held accountable for it. Group membership thus provides a shield of anonymity (Insko & Schopler, 1998; Schopler et al., 1995). The social support-for-shared-self-interest, or greed, hypothesis proposes that intergroup interactions are more competitive than interindividual interactions because group members provide each other with social support to pursue their immediate shared self-interest in a competitive way. This social support for self-interested behavior is unavailable to individuals, who are thus less competitive (Schopler et al., 1993). Finally, the schema-based distrust, or fear, hypothesis proposes that intergroup interactions are more competitive than interindividual interactions because the anticipation of interacting with another group activates an outgroup schema, consisting of learned beliefs or expectations that intergroup interactions are competitive, unfriendly, deceitful, and aggressive (Insko & Schopler, 1998; Pemberton, Insko, & Schopler, 1996). Because it is rational in a PDG to compete when one anticipates the opponent to be competitive and untrustworthy, groups will be more competitive than individuals.

Diverging Perspectives

Although most investigations of individual-group differences within the context of mixed-motive games indicate a significant discontinuity effect, there are some exceptions. After an insightful review of four experiments conducted at UU, Rabbie (1998) proposed that, instead of a discontinuity effect, there is a reciprocity effect in cooperation and competition between individuals and groups. He argued that groups are not invariably more competitive than individuals, but that they are more likely to reciprocate the cooperative or competitive behavior of their opponent in an attempt to maximize their long-term gains and minimize their losses (for a fuller discussion of the reciprocity hypothesis; see Rabbie, 1998).

Consistent with this perspective, the first two experiments reviewed by Rabbie (1998) indicated that group members who were instructed to reach a consensus on their PDG selection were more likely to reciprocate the competitive behavior of an opponent than were individuals (Rabbie, Visser, & Van Oostrum, 1982, Experiments 1 and 2). These findings are not inconsistent with the interindividual–intergroup discontinuity perspective. Rabbie acknowledged this when he wrote that "these early results are not that different from those obtained by Schopler and Insko (1992)" (p. 490).

However, the final two experiments reviewed by Rabbie (1998) pose a serious challenge to the interindividual–intergroup discontinuity perspective. In an experiment by Lodewijkx and Rabbie (1992), individuals and participants categorized into groups of two and three interacted with a programmed other on three PDG trials. The categorized participants were allowed to discuss their options during a 3-min within-group discussion period. Participants were told that the discussion period was not meant to produce a binding agreement within their group on a PDG selection. Rather, the discussion period offered a chance to "get ideas regarding the choices they could make" (Rabbie, 1998). After the discussion period, participants made their individual PDG selection. The results indicated a nonsignificant reversal of the discontinuity effect; categorized participants were descriptively more cooperative than individuals. This finding is inconsistent with the discontinuity perspective.

Following a similar procedure, Rabbie and Lodewijkx (1991) manipulated independently whether participants acted as an individual or as a categorized group member, and whether they interacted with an individual or a categorized opponent. The purpose of this experiment was to assess independently the effects of membership versus nonmembership of the actor and membership versus nonmembership of the opponent. Inconsistent with the anonymity and social support explanations for the discontinuity effect, there was no effect for membership versus nonmembership of the actor; categorized participants were not more competitive than individuals. Furthermore, inconsistent with the schema-based distrust explanation, there was no effect for membership versus nonmembership of the opponent; participants interacting with a categorized opponent were not more competitive than participants interacting with an individual opponent.

Toward a Reconciliation: Three Explanations

The results of the latter two experiments led Rabbie (1998; Rabbie & Lodewijkx, 1994) to challenge the generality and robustness of the discontinuity effect. We designed

an experiment to test three explanations for the discrepant findings from the UNC and UU research programs.

Cultural differences. An international study on negotiation behavior conducted at three European and five United States (U.S.) laboratories suggests that there are cultural differences in the way competitive behavior is defined and evaluated (Kelley et al., 1970). Factor analyses indicated that at four of five U.S. sites, competition loaded on a *Dynamism* factor (Osgood, Suci, & Tannenbaum, 1957), which was further defined by the semantic differentials passive–active, weak–strong, cowardly–brave, and foolish–wise. In other words, competition was associated with activity, strength, bravery, and wisdom for participants at these U.S. sites. In contrast, competition did not load on the *Dynamism* factor at any of the three European sites. Instead, at two of these three sites, competition loaded on an *Evaluation* factor (Osgood et al., 1957), which was further defined by the semantic differentials honest–dishonest, peaceful–hostile, and moral–immoral. For participants at these European schools, competition was thus associated with dishonesty, hostility, and immorality.

Although Kelley et al.'s (1970) study indicates that there are cultural differences between Europe and the United States in the connotative meaning of competition, recent research has failed to find evidence for cultural differences in social value orientations. Liebrand and Van Run (1985), for example, did not find differences between The Netherlands and the United States with regard to the distribution of social motives or choice behavior in a social dilemma. Similarly, Van Lange and Kuhlman (1994) found no differences between The Netherlands and the United States in either the distribution of social value orientations or the relation of social value orientations to choice behavior in a social dilemma.

Because the evidence regarding cultural differences in the evaluation of cooperation and competition is mixed, the possibility that cultural differences moderate the discontinuity effect cannot be dismissed *a priori* and deserves to be investigated empirically. We are aware that an explanation in terms of cultural differences in the connotative meaning of cooperation and competition must explain why these differences are a more powerful factor in intergroup relations than in interindividual relations. One possibility is that after within-group discussions the individual opinions of group members shift toward the opinion to which they are already attracted as individuals. For example, Moscovici and Zavalonni (1969) proposed that group discussions create a greater involvement with and commitment to the issues being discussed. Consequently, the group members' opinions become more extreme in the direction of their initial positions. Other approaches to group-polarization emphasize the role of normative (Myers, 1978) and informational (Burnstein & Vinokur, 1977) comparisons, which may lead group members to adopt more extreme positions after group discussions than before (Eagly & Chaiken, 1993; Isenberg, 1986).

To test whether the discrepancy between findings from UU and UNC is due to cultural differences, the present experiment included a contrast between interactions involving all U.S. nationals and interactions involving all Dutch nationals. The cultural differences hypothesis predicts a stronger discontinuity effect among U.S. nationals than among Dutch nationals.

Cooperative programmed other. Our second explanation focuses on the role of the programmed other in the UU experiments of Rabbie and Lodewijkx. In a review of the literature on interindividual–intergroup discontinuity, Schopler and Insko (1992) noted that experiments in which participants interacted with a programmed other "have shown mixed results with respect to support of a discontinuity effect" (p. 125). In an attempt to account for these mixed results, they propose that: "[. . .] it is possible that the existence of a programmed-other changes the interpersonal character of the interaction. Specifically, it is likely that it creates a problem-solving set (rather than a concern with interdependence) where two or more heads are superior to one" (p. 125). In other words, participants facing a programmed other may approach the situation as an abstract intellectual exercise, instead of one involving true social interaction. Because they can share information within their group, group members may realize more readily that mutual cooperation is an efficient "solution" of the Prisoner's Dilemma.

To see whether unique features of the procedure used in the UU experiments eliminated the discontinuity effect, that procedure was replicated in our experiment. The absence of a discontinuity effect in both the U.S. and Dutch sample would be consistent with an explanation centering on procedural differences. However, detection of a discontinuity effect in one or both samples would be inconsistent with that explanation. We acknowledge that a more stringent test of the procedural differences explanation requires a systematic comparison between the procedures used in the UU and UNC experiments. The latter experiments have shown, however, that among U.S. college students the discontinuity effect is a descriptively large effect. Thus, a failure to detect the effect in this population with an alternative experimental procedure would suggest that the procedure is responsible for the absence of interindividual–intergroup discontinuity rather than a lack of statistical power.

Procedural interdependence. Procedural interdependence refers to the interrelationship between own-group member choices and outcomes. For example, the imposition of a consensus requirement or majority rule creates procedural interdependence among group members. Under these circumstances, group members' individual decisions are combined into a collective group decision that cannot be traced back to individual group members. Whereas groups

in the UNC experiments are typically characterized by procedural interdependence among their members (through a consensus requirement), group members in the Lodewijkx and Rabbie (1992) and Rabbie and Lodewijkx (1991) experiments were not procedurally interdependent. Group members in those experiments were allowed to discuss their decisions during a 3-min discussion period, but they were instructed not to reach binding agreements regarding their decisions. After the discussion period, group members made their personal choices and exchanged them on an interindividual basis with a particular member of the other group. This difference between the UNC and UU experiments constitutes a third explanation for the discrepancy between the results obtained at these two laboratories.

Three experiments point to the importance of procedural interdependence as an antecedent to interindividual–intergroup discontinuity. The first, conducted by Insko et al. (1987), was designed to test the altruistic-rationalization explanation of the discontinuity effect. According to this explanation, which has since been abandoned, the discontinuity effect is due to the tendency of group members to rationalize their self-interested, competitive behavior as an altruistic act carried out for the sake of other group members. For our present purposes, we describe only the three most relevant conditions from this experiment. The first was an individuals condition, in which three individuals, located in separate rooms on one side of an experimental laboratory, interacted on an interindividual basis with single individuals located in separate rooms on the other side of the laboratory. Second, an outcome interdependence condition was similar to the individuals condition, except that participants were told that they would be sharing earnings with the three persons on the same side of the laboratory. This created the opportunity to engage in altruistic rationalization. Finally, in the group-all condition, all of the group members on each side of the laboratory collectively interacted with all of the group members on the other side of the laboratory. The results of this experiment indicated that the group-all condition was more competitive than the individuals and outcome interdependence conditions. Inconsistent with the altruistic rationalization hypothesis, the latter two conditions did not differ significantly.

In a follow-up to this experiment, Insko et al. (1988) explored what made the group-all condition so much more competitive than the individuals and outcome interdependence conditions. This experiment employed a one-way design, starting with the outcome interdependence condition, which was followed by four other conditions that progressively took on more and more of the properties of the group-all condition. In the second, or contact, condition the three participants on each side of the laboratory were placed in the same room, but not allowed to talk to each other. In the third, or discussion, condition the three participants in each room were required to discuss their individual PDG decisions with each other. The fourth, or consensus condition, required participants to reach a consensus regarding their separate PDG choices within their group. The fifth condition, labeled group-all, involved collective interaction between the members of both groups, similar to the Insko et al. (1987) experiment. The only aspect in which the latter two conditions differed was that in the consensus condition participants on one side of the laboratory still interacted individually with another participant from the other side. In the group-all condition, all three participants from one side of the laboratory interacted collectively with all three participants from the other side. The results showed that participants in the consensus condition were more competitive than those in the outcome interdependence, contact, and discussion conditions and did not differ significantly from participants in the group-all condition. These results were interpreted as indicating that a consensus rule is necessary for the discontinuity effect to occur.

This conclusion proved to be somewhat premature, however, and was revised on the basis of an experiment by Insko et al. (1994; Experiment 2). In this experiment, individuals, groups without required consensus, and groups with required consensus interacted within the context of one of two generalizations of the PDG: the intergroup public goods game (IPG) and the intergroup prisoner's dilemma game (IPD). The IPG (Rapoport & Bornstein, 1987) is based on the minimal contributing set paradigm and designed to model intergroup conflict over step-level public goods. The IPD game (Bornstein, 1992) was developed to model intergroup conflict over continuous public goods. The results of this study indicated that groups were more competitive than individuals in both the IPG and IPD. More importantly, in neither IPG nor IPD was a significant effect for required consensus observed. Interpreting this unexpected finding, Insko et al. wrote: "Possibly the somewhat complex *n*-person game matrix implies sufficient interrelationship of own-group member choices and outcomes so as to create at least some perceived entitativity even in the absence of an experimentally imposed consensus rule. This suggests the interesting possibility that perceived entitativity may be a function of procedural interdependence" (p. 114). The important implication here is that the discontinuity effect may not be limited to those relatively few situations in which a consensus requirement is imposed on groups. Rather, it is more general and extends to the many situations in which group members are procedurally interdependent.

To examine the procedural interdependence explanation, our experimental design involved a manipulation of interaction type. This included the two original conditions used in the Lodewijkx and Rabbie (1992) experiment and the addition of a new condition. The two original conditions involved interactions among individuals (*individuals* condi-

tion) and interactions among procedurally independent group members (*procedural independence* condition). The new condition involved interactions among procedurally interdependent group members (*procedural interdependence* condition), who were required to reach a consensus on their group choice. The procedural interdependence explanation predicts that more competition will be observed in the procedural interdependence condition than in the pooled individuals and procedural independence conditions regardless of participant nationality. The latter two conditions are not expected to differ significantly.

OVERVIEW

We have described three explanations for inconsistent findings regarding the discontinuity effect. First, the cultural differences explanation proposes that the lack of support for the discontinuity effect in the UU experiments of Lodewijkx & Rabbie (1992) and Rabbie & Lodewijkx (1991) is due to cultural differences between The Netherlands and the United States in the connotative meaning of cooperation and competition. This explanation predicts an interaction effect, namely that the discontinuity effect will be stronger among U.S. nationals than Dutch nationals. A second explanation focuses on the role of the cooperative programmed other in the UU experiments. Perhaps the use of a programmed other eliminates the interpersonal character of the interaction, presenting participants instead with an abstract intellectual exercise where "two or more heads are superior to one" (Schopler & Insko, 1992, p. 125). This explanation predicts that the discontinuity effect will not occur when participants interact with a cooperative programmed other regardless of participant nationality. Detection of the discontinuity effect in either The Netherlands or the United States would be inconsistent with this explanation. Third, the procedural interdependence explanation proposes that the inconsistent findings are due to the absence of procedural interdependence among group members in the UU experiments. This explanation predicts that procedurally interdependent group members will be more competitive than individuals and procedurally independent group members regardless of participant nationality and that the latter two will not differ signifcantly.

These three explanations are not mutually exclusive; it is possible that more than one is correct. For example, it is possible that procedurally interdependent group members are more competitive than procedurally independent group members and individuals, but that this contrast is more pronounced in the United States than in The Netherlands. This pattern of results would be consistent with the procedural interdependence explanation as well as the cultural differences explanation.

METHOD

Design and Participants

Our hypotheses were tested in a 3 (interaction type: individuals versus procedural independence versus procedural interdependence) $\times 2$ (participant nationality: Dutch nationals versus U.S. nationals) $\times 3$ (trials) factorial design, treating trials as repeated measures. One hundred fifty-eight male participants took part in the experiment. Data from Dutch nationals were collected at UU, and data from U.S. nationals were collected at the University of Colorado at Boulder (CU). Participants at both research sites were randomly assigned to levels of the interaction type variable. Participants at UU volunteered for the experiment and were paid for their participation. They were recruited by means of sign-up sheets placed in different buildings of UU. In addition to their reward of 7.50 Dutch guilders (about $4 U.S.), participants could keep the money they earned during the experiment. At CU, participants took part in the experiment to fulfill the laboratory requirements of an introductory psychology course. In addition to receiving credit toward their requirement, they were allowed to keep any money they earned during the experiment. All groups consisted of either two or three members. Because no significant main or interaction effects involving group size were found, the data were collapsed across group size. The behavior of members of the same group was obviously not independent, so the group rather than the individual was treated as the unit of analysis in the procedural independence and procedural interdependence conditions. Respective cell *N*s for the individuals, procedural independence, and procedural interdependence conditions were 15, 14, and 14 in the U.S. sample and 17, 15, and 15 in the Dutch sample.

Procedure

We followed essentially the same procedure used by Lodewijkx & Rabbie (1992; Rabbie & Lodewijkx, 1991). Participants interacted with a videotaped, programmed other on three trials of a PDG, without communication between opponents. After reporting to the experiment, participants were seated behind a table in the laboratory. They faced a video monitor and a video camera mounted on a tripod. Each participant received a booklet containing instructions for the PDG, copies of the PDG payoff matrices, a quiz concerning their understanding of the matrices, and a sheet of paper to keep track of their outcomes per trial. The instructions read that the "Interaction Experiment" involved a "Blue" side and a "Green" side, to which participants were assigned randomly. Actually, all participants were assigned to the "Blue" side. Participants were told they would interact with the "Green" side on the basis of the payoff matrices presented to them in the booklet. The experiment would involve three trials, each with a different matrix. Next,

participants completed an individual quiz of their understanding of the PDG payoff matrix. When participants seemed to understand the matrix, they were instructed to read the remaining procedural details. Participants were informed that choices would be exchanged by way of an audiovisual circuit. Participants could see the "Green" side on their video monitor, while (allegedly) the "Green" side could see the participants on their video monitor.

As in the Lodewijkx and Rabbie (1992) experiment, response sequence varied between trials. On the first trial, the programmed other began with a unilateral cooperative choice, to which the participants could then respond. On the second trial, choices were made simultaneously, with the programmed other again making a cooperative choice. On the final trial, choices were exchanged successively again, with participants going first this time. Once more, the opponent responded with a cooperative choice. The participants were told about the sequence in which both sides would respond at the beginning of each trial. During each trial, they were thus unaware of what the sequence of responses would be on the next trial. Participants were also instructed not to look at the matrices that were to be used on future trials.

In the *individuals* condition, each participant was given two signs, one with an "A" (cooperative choice) and the other with a "B" (competitive choice) printed on it. Individual participants exchanged their choices by holding up one of these signs to the camera in front of them, under the impression that it could be seen on their opponent's video monitor. This procedure was repeated for each trial. Participants in the *individuals* condition could see the programmed other on their screen showing his "A" sign on each of the three trials.

In the *procedural independence* condition, a similar procedure was followed. The members of two-person groups were identified by a code-letter (X and Y) and told that they would interact with the members of another group identified by code-letters P and Q. Person X interacted with person P, and person Y with person Q. In three-person groups, the code-letters were X, Y, and Z for participants' own group, and P, Q, and R for the other group. On each trial, participants were permitted to discuss their choices with the other members of their group during a 3-min period. However, the participants were instructed not to arrive at any binding agreements within the group. After the within-group discussions, participants made their choices individually and communicated those choices to their individual opponents in the other group. Similar to the individuals condition, each group member indicated his individual choice by holding up the selected sign (either "A" or "B") to the camera.

A similar procedure was followed in the *procedural interdependence* condition, except that this time the group members were required to reach a consensus about their collective choice during the 3-min within-group discussion

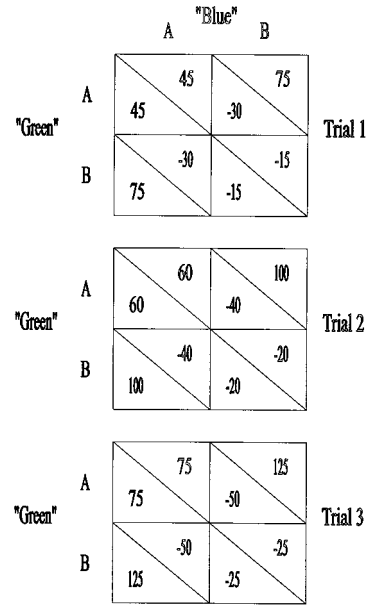

FIG. 1. The PDG payoff matrices used in the U.S. conditions of the experiment.

periods. This consensus choice was then communicated to the other group. Participants were told that the other group also had to reach a consensus on their choice. After the experiment ended, participants were debriefed and paid whatever money they had earned.

For the purpose of replication, the payoff matrices were identical to those used by Lodewijkx & Rabbie (1992). The matrices for the U.S. conditions are presented in Fig. 1. All participants were shown the same matrices. Participants in the individuals condition were told that the numbers in the matrices represented the payoffs in cents that they could earn, and participants in the procedural independence and procedural interdependence conditions were told that the numbers represented the payoffs in cents that each group member could earn. For Dutch participants, the matrix values were multiplied by 2, following the international exchange rate between U.S. dollars and Dutch guilders at the time the experiment was conducted. Note that these matrices contain negative values in all but the top left (cooperative–cooperative) cell. Although the discontinuity effect has been found almost exclusively with matrices containing positive values, an experiment by Schopler et al. (1991; Experiment 1) showed that the effect is not qualified by the positivity versus negativity of outcomes. In addition to containing negative values, the matrices were also characterized by an interaction effect or, as Kelley and Thibaut (1978) labeled it, a behavior control (BC) component. On Trial 1, the column player's outcomes varied by 30¢ (from 45¢ to 75¢) in the top row, but only by 15¢ (from −30¢ to −15¢) in the bottom row. Kelley and Thibaut approach the PDG exclusively in terms of row and column main effects (Reflexive Control and Fate Control) and emphasize that the

TABLE 1
Mean Proportions and Standard Deviations of Competitive Choices as a Function of Participant Nationality and Interaction Type

		Dutch nationals			U.S. nationals		
		Individuals	Procedural independence	Procedural interdependence	Individuals	Procedural independence	Procedural interdependence
Trial 1	*M*	.18	.17	.33	.00	.24	.14
	SD	(.39)	(.31)	(.49)	(.00)	(.37)	(.36)
Trial 2	*M*	.18	.37	.67	.07	.38	.57
	SD	(.39)	(.44)	(.49)	(.26)	(.35)	(.51)
Trial 3	*M*	.35	.37	.60	.13	.35	.57
	SD	(.49)	(.44)	(.51)	(.35)	(.42)	(.51)
All trials	*M*	.24	.30	.53	.07	.32	.43
	SD	(.35)	(.34)	(.41)	(.19)	(.31)	(.36)

presence of a BC component changes the situation from one of pure exchange to one containing elements of coordination. Does this influence the discontinuity effect? There is no evidence available to answer this question. The question can be simplified, however, by asking whether there is a sufficiently large incentive to act on distrust of the opponent. In the matrix used on Trial 1, the row player's outcome is −30¢ if the row player cooperates and the column player competes. But if the row player also competes, the row player's outcome is −15¢. This means that there is a 15¢ incentive to act on distrust of the opponent on Trial 1. On Trial 2, the incentive to act on distrust is 20¢, and on Trial 3 the incentive is 25¢. The discontinuity effect has been found, however, with a matrix that affords only a 10¢ incentive to act on distrust (Schopler et al., in press). Thus, our concern with replication did not limit the probability of detecting the discontinuity effect. Finally, note that because the programmed other cooperated on each trial, participants never experienced negative outcomes and always earned money.

Fear and Greed Assessments

Given the demonstrated role of fear and greed in producing the discontinuity effect (e.g., Insko et al., 1990), we included an assessment of these variables. Fear reflects distrust of the other side as well as a concern for defending one's own side against the anticipated competition of the other side. In terms of interdependence theory (Kelley & Thibaut, 1978), self-interest, or greed, reflects a concern for maximizing one's own interests (or max own), a concern for maximizing relative outcomes (or max rel), or both. Because the competitive option in the PDG confounds max rel and max own, we wanted to assess these two components of greed separately. After making their choice on the third trial, but before receiving the decision from the programmed other, participants were thus asked to respond to six closed-ended questions regarding their behavior during the interaction. These questions were designed to assess max own ("I want to earn as much money as possible" and "I only take my own/my group's interest into account"), max rel ("I want to beat the other person/group" and "I do not want to lose more money than the other person/group"), and fear ("I do not trust the other person/group" and "I want to defend myself/my group against the actions of the other person/group"). For participants in the individuals and procedural independence conditions, these items were phrased in terms of an interaction between two persons. For participants in the procedural interdependence condition, the items were phrased in terms of an interaction between groups. Items were rated on 7-point scales ranging from 1 (*not important at all*) to 7 (*very important*). The Spearman–Brown corrected reliabilities for the three item-pairs were .63 for max own, .77 for max rel, and .80 for fear. Given the high level of agreement among these items, they were aggregated into composite measures of max own, max rel, and fear respectively. These composite measures were significantly correlated: $r = .30$ for max own with max rel; $r = .42$ for max own with fear; and $r = .68$ for max rel with fear, all ps $< .01$.[1] The correlation between max own and max rel is consistent with the idea that these are related components of self-interest, or greed. The associations of max own and max rel with fear are consistent with the possibility that own self-interest leads to a concern that the other side may also act in a self-interested way. Or fear of the other side may provide a justification for behaving in a self-interested way.

[1] The considerable overlap among these measures may raise doubts about whether they represent distinct constructs, as we propose. Confirmatory factor analysis indicated that a model specifying three correlated factors provided an accurate description of the covariances among the six individual items, $\chi^2(6, N = 90) = 3.60$, $p > .73$, Root Mean Square Residual = .03, Normed Fit Index = .99. The fit for this model was significantly better than that for a one-factor model [$\chi^2(9, N = 90) = 54.24$, $p < .01$] that treated all items as indicators of a single latent variable, $\chi^2(3)$ difference = 50.64, $p < .01$. These analyses suggest that our measures of max rel, max own, and fear indeed represent three distinct, yet related constructs.

RESULTS

We conducted a 3 (interaction type: individuals versus procedural independence versus procedural interdependence) ×2 (participant nationality: Dutch versus U.S.) ×3 (trials) mixed analysis of variance (ANOVA) on competitive choice behavior, treating trials as repeated measures. Relevant means and standard deviations are presented in Table 1. The analysis yielded a significant main effect for interaction type, $F(2, 84) = 7.44$, $p < .01$, a significant main effect for trials, $F(2, 168) = 14.62$, $p < .01$, and a significant interaction type by trials interaction, $F(4, 168) = 2.86$, $p < .05$.[2] There were no significant effects involving participant nationality.

Competitive Choice Behavior across Trials

Two planned orthogonal contrasts were used to examine the main effect for interaction type. The first contrast compared the combined individuals and procedural independence conditions with the procedural interdependence condition. This involved a comparison of the two original conditions from Lodewijkx and Rabbie (1992) with the new procedural interdependence condition. The second contrast compared the individuals with the procedural independence condition. This is a comparison between the two original conditions from the Lodewijkx and Rabbie experiment. The first planned comparison revealed that participants in the individuals and the procedural independence conditions (pooled together) were less competitive than participants in the procedural interdependence condition, $F(1, 84) = 11.05$, $p < .01$. The second planned comparison revealed that the difference in competition between participants in the individuals and procedural independence conditions was not significant, $F(1, 84) = 3.49$, $p < .10$. (There was a tendency for participants in the procedural independence condition to be more competitive than individuals). Neither of the planned comparisons varied significantly with participant nationality, indicating the generality of the results, Fs$(1, 84) < 1.42$, *ns*.

On the basis of these findings we drew several conclusions regarding the three explanations described earlier for the discrepant results from the UNC and UU research programs. First, the absence of a significant interaction between interaction type and nationality is inconsistent with the cultural differences explanation. Second, the significant main effect for interaction type is inconsistent with the explanation centering on the effect of using a programmed other. Third, the significant difference between the procedural interdependence condition and the pooled procedural independence and individuals conditions is consistent with the procedural interdependence explanation.

Trial-by-Trial Analyses

To explore the significant Interaction Type × Trials interaction, we compared the effect of interaction type on the first trial to its effect on the later trials (Trials 2 and 3) combined. Next, we tested whether the effect of interaction type differed across Trials 2 and 3. Recall that Trial 1 involved successive responding with the programmed other choosing first, Trial 2 involved simultaneous responding, and Trial 3 involved successive responding with the participants choosing first. Tests were conducted within the context of the same ANOVA described earlier, with two planned contrasts on the interaction type between-subjects variable and two planned contrasts on the trials within-subjects variable (i.e., Trial 1 versus Trials 2 and 3 combined and Trial 2 versus Trial 3).

We used this set of planned contrasts on the trials within-subjects variable because recent research by Insko et al. (1998) indicates that procedurally interdependent group members are not more competitive than individuals when they are confronted with a unilateral cooperative initiative of their opponent and anticipate future interactions with the opponent. Recall that on Trial 1 in our experiment participants faced exactly these circumstances. Clearly, an opponent's unilateral cooperative initiative eliminates the risk of being exploited and therefore reduces distrust, or fear. One basis for the discontinuity effect is thus removed. But what about self-interest, or greed? There are at least two possible ways in which a unilateral cooperative initiative can reduce greed-based intergroup competition. First, it is possible that a unilateral cooperative initiative causes a shift from a concern with short-term outcome maximization to a concern with long-term outcome maximization (Pruitt & Kimmel, 1977; Axelrod, 1984). In the short run, each side maximizes its outcomes by competing regardless of whether the other side cooperates or competes. In the long run, however, things are not that simple. If both sides attempt to maximize their short-term outcomes by competing, the result is a competitive "dead lock" preventing both sides from maximizing long-term outcomes. This means that groups may not exploit the unilateral cooperative choice of the programmed opponent on the first trial because this would entail the risk of a competitive "dead lock" on the second and third trial. The second possibility is that a unilateral cooperative initiative reduces greed because greed-based actions are frequently justified through defensive assertions. Citing anecdotal evidence, Insko et al. (1993) note that diplomats of the former Soviet Union sometimes justified Soviet imperialism toward Eastern Europe on the basis of Russia's traditional fear of being invaded from the West. In the present experiment this means that groups may not exploit the unilateral cooperative choice of the programmed

[2] Tests involving the trials within-subjects effect used the overall within-subjects error term and associated degrees of freedom ($df = 168$). Tests of between-subjects effects used the overall between-subjects error term and its associated degrees of freedom ($df = 84$).

TABLE 2
Mean Importance Ratings and Standard Deviations for Concern with Maximizing Own Outcomes (Max Own), Concern with Maximizing Relative Outcomes (Max Rel), and Fear as a Function of Participant Nationality and Interaction Type

		Dutch nationals			U.S. nationals		
		Individuals	Procedural independence	Procedural interdependence	Individuals	Procedural independence	Procedural interdependence
Max own	*M*	4.70	5.00	6.47	4.27	4.94	6.00
	SD	(2.02)	(1.90)	(0.74)	(1.75)	(1.25)	(1.71)
Max rel	*M*	2.88	3.10	3.73	2.07	3.56	4.57
	SD	(1.73)	(1.65)	(2.09)	(1.33)	(1.53)	(2.10)
Fear	*M*	3.08	3.02	4.57	2.47	3.76	5.00
	SD	(1.73)	(1.49)	(2.23)	(1.42)	(1.24)	(2.19)

opponent because in the absence of outgroup threat this self-interested behavior cannot be justified through defensive assertions.

Based on these considerations, we predicted that the main effect of interaction type would be stronger on the combined second and third trials (where there is a basis to fear the other side) than on the first trial (where there is no basis to fear the other side). Our second prediction was that the main effect of interaction type would not differ significantly between the second and third trial.

Consistent with our first prediction, the main effect for interaction type was significantly stronger on the later trials than on Trial 1, $F(2, 168) = 3.36$, $p < .05$. We explored this interaction by examining the planned contrasts on the interaction type variable. The contrast of the combined individuals and procedural independence conditions versus the procedural interdependence condition was significantly stronger on the pooled second and third trial than on Trial 1, $F(1, 168) = 6.20$, $p < .05$. The contrast of the individuals versus the procedural independence condition was not significantly stronger on the pooled second and third trial than on Trial 1, $F < 1$.

Separate analysis of Trial 1 data revealed no significant main effects for interaction type, $F(1, 84) = 1.48$, *ns*, or nationality, $F(1, 84) = 1.71$, *ns*, nor a significant two-way interaction effect, $F(1, 84) = 1.25$, *ns*.[3] For the combined later trials, however, there was a significant main effect for interaction type, $F(2, 84) = 8.31$, $p < .01$. Neither the main effect for nationality, nor the two-way interaction effect was significant, Fs < 1. The planned comparisons on the interaction type variable showed that on the pooled second and third trials there was significantly less competition in the combined individuals and procedural independence conditions than in the procedural interdependence condition, $F(1, 84) = 13.10$, $p < .01$. The individuals and procedural independence conditions did not differ significantly, $F(1, 84) = 3.13$, *ns*.

As a final step in our analyses, we tested whether the effects of interaction type differed across Trials 2 and 3. Consistent with our second prediction, they did not, $F(2, 168) = 1.87$, *ns*.

Fear and Greed

Next, we treated assessments of max own, max rel, and fear as dependent variables in a series of 3 (interaction type: individuals versus procedural independence versus procedural interdependence) $\times 2$ (participant nationality: Dutch versus U.S.) ANOVAs. The relevant means and standard deviations are presented in Table 2. Because the use of conventional alpha levels in a series of univariate tests may result in a high experimentwise Type I error probability, we used a Bonferroni adjusted α level of .017 in these analyses (Huberty & Morris, 1989).

The results for max own, max rel, and fear tracked the choice data. The ANOVAs indicated significant (ps $<$ .002) main effects of interaction type for all three measures: $F(2, 84) = 9.13$ for max own, $F(2, 84) = 6.93$ for max rel, and $F(2, 84) = 10.27$ for fear. The planned comparison of the combined individuals and procedural independence conditions versus the procedural interdependence condition was also significant (ps $< .002$) for all three measures: $F(1, 84) = 16.65$ for max own, $F(1, 84) = 9.92$ for max rel, and $F(1, 84) = 18.36$ for fear. The individuals condition did not differ significantly (ps $> .05$) from the procedural independence condition on any of the measures: $F(1, 84) = 1.33$ for max own, $F(1, 84) = 3.59$ for max rel, and $F(1, 84) = 1.84$ for fear.

Mediation by Fear and Greed

To examine whether the main effect for interaction type was mediated by fear, greed, or both, we conducted a 3 (interaction type: individuals versus procedural independence versus procedural interdependence) $\times 2$ (participant

[3] These analyses should be interpreted with some caution because the absence of variability in the choice behavior of U.S. participants in the individuals condition created heterogeneity of variance across the six conditions.

nationality: Dutch versus U.S.) analysis of covariance (ANCOVA). Max own, max rel, and fear ratings served as covariates and competitive choice behavior across trials was the dependent variable. Because the potential mediators were assessed after the interaction, any association between the mediators and choice behavior may reflect the effects of choice behavior on those mediators, instead of the reverse. Our results are therefore suggestive rather than conclusive. The ANCOVA showed that after controlling for max own, max rel, and fear, the main effect for interaction type was no longer significant, $F < 1$. And there were significant relationships with competition for fear, $\beta = .46$, $F(1, 81) = 16.36$, $p < .01$; and max rel, $\beta = .24$, $F(1, 81) = 4.88$, $p < .05$; but not for max own, $\beta = .07$, $F < 1$. These findings suggest that in the present setting, fear and the max rel component of greed mediated the effect of interaction type on competition.

As noted earlier, the max own, max rel, and fear ratings were correlated. To examine the *independent* relationships of max own, max rel, and fear with choice behavior, the ratings were thus entered simultaneously in the above ANCOVA. But what happens when max own, max rel, and fear are treated as mediators one at a time? When max own was the sole covariate, the main effect for interaction type was reduced, but remained significant, $F(2, 83) = 3.57$, $p < .05$. This analysis further revealed a significant relation between max own and competition, $\beta = .25$, $F(1, 83) = 5.33$, $p < .05$. When max rel was the sole covariate, the main effect for interaction type was no longer significant, $F(2, 83) = 2.13$, *ns*. This analysis further revealed a significant relation between max rel and competition, $\beta = .52$, $F(1, 83) = 31.36$, $p < .01$. Finally, when fear was the sole covariate, the main effect for interaction type was no longer significant, $F(2, 83) = 1.11$, *ns*. This analysis further revealed a significant association between fear and competition, $\beta = .63$, $F(1, 83) = 50.03$, $p < .01$. It is important to keep in mind that in these analyses max own, max rel, and fear are confounded. For example, the mediating role of max own is attributable mostly to the collinearity of max own with fear and max rel. An accurate assessment of the *independent* mediating effects of max own, max rel, and fear can only be obtained when those variables are entered simultaneously in the ANCOVA.[4]

DISCUSSION

An extensive series of experiments by Insko, Schopler, and their colleagues at UNC has demonstrated the generality of the discontinuity effect, yet other experiments conducted by Rabbie and Lodewijkx at UU failed to produce that effect. Three explanations were formulated to account for the discrepant findings from these two laboratories. According to the cultural differences explanation, the discrepancy is due to differential conceptualization of competition by Dutch and U.S. participants. A second explanation involved the role of the cooperative programmed other in the UU experiments. Unique features of the procedure employed in those experiments may have eliminated the discontinuity effect. Finally, the procedural interdependence explanation proposes that the discrepancy in results is due to the absence of procedural interdependence among group members in the UU experiments.

Our experiment tested the effects of nationality and procedural interdependence, controlling for the effect of employing a programmed opponent. Results across trials were consistent with the procedural interdependence explanation. Across nationalities, participants in the procedural interdependence condition were significantly more competitive than participants in the combined individuals and procedural independence conditions. In other words, there was a discontinuity effect in this experiment. Consistent with previous research from both laboratories, individuals and procedurally independent group members did not differ significantly (Insko et al., 1988; Lodewijkx & Rabbie, 1992; Rabbie & Lodewijkx, 1991). At the same time, the results across trials were inconsistent with the explanations centering on cultural differences and the role of the cooperative programmed other. First, inconsistent with the cultural difference explanation, but in line with the demonstrated absence of United States–European differences in the domain of social value orientations (Liebrand & Van Run, 1985; Van Lange & Kuhlman, 1994), no main or interaction effects involving participant nationality were found. Second, despite our concern that participants facing a cooperative programmed opponent may approach the situation as an abstract intellectual exercise, instead of one involving true social interaction, a significant discontinuity effect was found using a procedure identical to the one used by Lodewijkx and Rabbie (1992).

Knowing what we know now, the procedural interdependence explanation seems to be the only viable explanation for the discrepancies between the two programs of research. Hindsight is always 20/20. When we planned our research,

[4] It is informative to test the indirect effects of interaction type on choice behavior via the mediators. However, because interaction type is a three-level categorical variable, it cannot be represented by a single variable in a regression analysis, as is required for the test of an indirect effect. We therefore focused our analyses on the contrast of the combined individuals and procedural independence conditions versus the procedural interdependence condition. For the model in which max own, max rel, and fear were entered simultaneously in the ANCOVA, there was a significant indirect effect of this contrast on choice behavior via fear, $z = 2.99$, $p < .01$, and a marginal indirect effect via max rel, $z = 1.87$, $p = .062$. The indirect effect via max own was not significant, $z = .79$, *ns*. When max own, max rel, and fear were entered separately in the ANCOVA, the indirect effect was significant when max own was the sole covariate, $z = 2.06$, $p < .05$, when max rel was the sole covariate, $z = 2.78$, $p < .01$, and when fear was the sole covariate, $z = 3.69$, $p < .01$. The standard errors of the indirect effects were calculated following Goodman's (1960) method.

we had ample reason to believe that cultural differences (i.e., the United States versus The Netherlands) and certain aspects of the experimental procedures used in the two programs of research (i.e., absence versus presence of a programmed other) would moderate the discontinuity effect. But we can now exclude explanations centering on cultural and procedural differences on the basis of actual evidence.

We believe that the role of procedural interdependence as a critical antecedent to interindividual–intergroup discontinuity can be explained in terms of the identifiability, social support, and schema-based distrust hypotheses outlined earlier. Relevant to the identifiability hypothesis**,** procedural interdependence creates a situation in which there is no one-on-one relation between the collective group decision and the behavior of individual group members. This creates a "shield of anonymity" that facilitates self-interested, competitive behavior; each member can escape the appearance of selfishness by claiming that his competitive behavior was prompted by the other group members. Relevant to the social support hypothesis, it is plausible that group members act on social support for self-interest primarily under the conditions of anonymity created by procedural interdependence. This is consistent with the absence of a significant difference in competition between participants in the individuals and procedural independence conditions in both the present and past research (Insko et al., 1988; Lodewijkx & Rabbie, 1992; Rabbie & Lodewijkx, 1991). Although participants in the procedural independence condition had an opportunity to share social support for self-interest during the within-group communication periods, they lacked the anonymity to act upon that support because they exchanged their decisions on an interindividual basis with someone from the other group. Relevant to the schema-based distrust hypothesis, the anticipation of interacting with a group of procedurally interdependent persons following a collective course of action may lead more readily to the activation of learned beliefs that intergroup interactions are hostile, deceitful, and competitive than the anticipation of interacting with a group of procedurally independent persons following an individual course of action. Indirect evidence for the role of identifiability, social support, and schema-based distrust is provided by the ANCOVA results in our experiment. After controlling for max own, max rel, and fear, the main effect for interaction type was no longer significant. Consistent with the identifiability and social support for self-interest hypotheses, the mediation analyses suggest that the interaction type effect may have been partially mediated by max rel. Likewise, consistent with the schema-based distrust hypothesis, the interaction type effect may have been partially mediated by fear.[5]

Although our results did not indicate a link between competition and max own, there is evidence that a concern with maximizing one's own outcomes mediates the discontinuity effect in situations where outcome maximization more obviously involves competition. A recent experiment demonstrated, for example, that max own mediates the discontinuity effect when individuals and groups anticipate interacting on only one trial (Schopler et al., in press). In a one-trial situation, each side maximizes its outcomes by competing regardless of the other side's decision. When multiple interactions are anticipated, however, the situation is not that simple. If both sides attempt to maximize short-term outcomes by competing, the result is a competitive "deadlock" that prevents both sides from maximizing outcomes in the long run. As our findings for max own suggest, groups in a multiple-trial situation can learn that long-term outcomes are maximized by mutual cooperation, not by mutual competition. This holds the promise for reducing the discontinuity effect by making groups more aware of the detrimental future consequences of competition (Insko et al., 1998; Insko et al., 2001).

Limitations and Directions for Future Research

Before closing, we should address a few limitations of our work. First, although our findings provide compelling evidence for the role of procedural interdependence as an antecedent of interindividual–intergroup discontinuity, our knowledge about the processes that mediate the relationship between procedural interdependence and competition is limited. Consistent with the fear, greed, and identifiability explanations of the discontinuity effect, we found some indirect evidence that the effect of procedural interdependence in the present setting was mediated by fear and the max rel component of greed. These findings should be interpreted with caution, however, because the mediators

[5] Participants in the procedural independence condition were not required to reach a consensus about their choice, but they could still see one another's final responses on the cards they turned toward the video camera. Could normative and/or informational influence have led them to reach consensus decisions at the same rate as participants in the procedural interdependence condition? If so, would this weaken our explanations for the effect of procedural interdependence? We carefully inspected the data for answers to these questions. Relevant to the first question, we observed that of the 27 groups in the procedural independence condition, 12 (41%) did not reach a consensus on at least 1 of the 3 trials. Of the 81 trials run in this condition, 24 (30%) did not result in a consensus decision. But even if we had observed higher rates of consensus, we do not believe that this would have weakened our explanations for the effect of procedural interdependence. Suppose that the rates of consensus were identical in both conditions. Our explanations would still predict a higher rate of consensus *to compete* in the procedural interdependence condition than in the procedural independence condition. In fact, groups in the procedural independence condition that consistently reached a consensus were less competitive ($M = .22$) than groups that failed to reach consensus on at least one of the trials ($M = .44$). Thus, reaching consensus did not necessarily imply competition. However, procedural interdependence among group members, created by a consensus requirement, did increase competition.

were assessed after the choice behavior, allowing for the possibility that choice behavior affected the mediators, instead of the reverse. At a more fundamental level, Insko et al. (1994) suggested "the interesting possibility that perceived entitativity may be a function of procedural interdependence" (p. 114). This implies that perceived entitativity of one's own and the other side is the more proximal determinant of greed, identifiability, and fear and that procedural interdependence is a powerful entitativity cue. If this line of reasoning is valid, other known entitativity cues, such as proximity and similarity among group members (Campbell, 1958; Abelson, Dasgupta, Park, & Banaji, 1998), should produce effects similar to those observed for procedural interdependence.

Another, related, limitation of our experiment is that the effects of own and other side procedural interdependence are confounded. Own group procedural interdependence is more obviously related to social support for self-interest and identifiability, and other group procedural interdependence is more obviously related to activation of the outgroup schema, or fear. However, within the context of our experiment, the effects of own and other group procedural interdependence could not be assessed independently. Future research should attempt to independently assess the effects of own and other side procedural interdependence. In addition to procedural interdependence, this research should also investigate the role of other known determinants of entitativity (e.g., similarity and proximity). This would allow investigators to establish whether procedural interdependence is a unique antecedent of the discontinuity effect or whether procedural interdependence affects interindividual–intergroup discontinuity by virtue of its relationship to perceived entitativity.

Finally, we only studied the behavior of male participants. Can our results be generalized to females? This is an empirical question that we cannot answer at this point. However, we know from over two dozen published experiments that the discontinuity effect is not systematically qualified by participant sex. In the few experiments that did find an interaction between sex and the discontinuity effect, the simple discontinuity effect was still significant for each sex. These findings lead us to believe that the results reported here can be generalized across sex.

CONCLUSION: TOWARD A RECONCILIATION

In the spirit of critical rationalism (Popper, 1968), Phillips (1987) proposed that "any position can be supported by positive reasons [. . .], but what really counts is how well the position can stand up to vigorous assault" (pp. viii–ix). Inspired by Rabbie's (1998) thought-provoking criticism of the interindividual–intergroup discontinuity perspective, we sought here to delineate more precisely the domain of interindividual–intergroup discontinuity. Our basic finding, that procedural interdependence is a critical antecedent of the discontinuity effect, opens the door to a reconciliation between two programs of research that have been at odds with each other. Consistent with previous research from both the UU and UNC programs, our results showed that in the absence of procedural interdependence, mere categorization of persons into two groups is insufficient to produce the discontinuity effect (Insko et al., 1987; 1988; Lodewijkx & Rabbie, 1992; Rabbie & Lodewijkx, 1991). When categorized group members are also procedurally interdependent, however, the discontinuity effect is a reliable phenomenon, one that generalizes across experimental settings and is evident in both North America and Western Europe.

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