Between-Group Communication and Conflict Resolution in Assurance and Chicken Games

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Two types of intergroup conflicts modeled as team games, a game of assurance where the groups' incentive to compete is purely fear and a game of chicken where the groups' incentive to compete is purely greed, are examined. The games involved competition between two 3-person groups. The players discussed the game with other in-group members, then met with the members of the out-group for a between-group discussion, and finally had a within-group discussion before deciding individually whether to contribute to their group's collective effort vis-à-vis the out-group. Results show that all groups playing the assurance game achieved the collectively efficient outcome of zero contribution, whereas groups playing the chicken game maintained a highly inefficient contribution rate of 78%. Communication between groups is highly effective in bringing about a peaceful resolution if the conflict is motivated by fear and useless if the conflict is motivated by greed.

Keywords: *intergroup conflict; team games; chicken; assurance; communication*

Groups often communicate a great deal in time of conflict. "They talk, negotiate, signal, and make threats, commitments, and promises" (Majeski and Fricks 1995, 624). Much of this communication is costless and nonbinding "cheap talk" that has no direct bearing on the participants' payoffs. The focus of this investigation is the effect of such informal communication on the resolution of intergroup conflicts.

Previous research on this issue has produced inconsistent results. Insko and Schopler (1987; Schopler and Insko 1992) found that communication between groups is relatively ineffective as a means for resolving the conflict. Their research typically employed the two-person prisoner's dilemma (PD) game and allowed group members

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(or group representatives) to discuss the game with their opponents before each group (as a whole) made its choice of a strategy. Insko and Schopler found that group decisions were highly competitive—much more so than individual decisions under the same conditions (see Schopler and Insko 1992 for a review).

Insko and Schopler (1987) offer two explanations for the observed competitiveness of groups. The "schema-based distrust" hypothesis explains intergroup competitiveness in terms of fear. It postulates that group members compete because they expect the out-group to behave competitively and want to defend themselves against the possibility of being exploited. The "social support for shared self-interest" hypothesis explains group competitiveness in terms of greed. It argues that groups are competitive because group members provide each other with support for acting in an exploitive, in-group–oriented way.

In the PD game, either fear or greed is sufficient to motivate a competitive choice (Coombs 1973; Dawes 1980). Therefore, to help distinguish between these two motives for competition, Insko et al. (1990, 1993) devised a version of the PD game, called the PD-alt game, which includes a third option of withdrawal for both players. Withdrawal is a safe option that guarantees each side a certain payoff regardless of what the other side does. This payoff is set to be higher than the payoff for mutual defection, so that a player who fears that the other player will defect should withdraw rather than defect. Defection, in other words, is rational only if a player believes that the opponent will cooperate and is therefore indicative of greed.

Insko et al. (1993) studied the effect of communication between players in the one-shot PD-alt game. They found that although communication enhanced cooperation between two individuals, it did not improve cooperation between two groups (as compared with a no-communication control condition). Different results were reported by Majeski and Fricks (1995), who studied the effect of communication on intergroup cooperation in the repeated PD and PD-alt games. These researchers found that communication in general enhanced intergroup cooperation; groups that were allowed to communicate cooperated more, defected less, and consequently earned more money than groups that were not. The option of withdrawing also had a positive effect. Groups that had that option (in the PD-alt game) defected less (whether they could communicate or not) but did not cooperate more or earn more money than groups that did not have the withdrawal option. Moreover, even groups that could communicate and had a withdrawal option chose to defect about 10% of the time, which led Majeski and Fricks to conclude that "some groups are apparently still motivated by greed."

This experiment uses a different approach to separate fear and greed. Rather than constructing the conflict as a PD-alt game where the groups have a withdrawal option (which is seldom available in real-life conflicts), we structured the conflict as either a game of assurance, where the groups' incentive to compete is purely defensive (a rational group should compete only if it expects the out-group to compete as well), or a game of chicken, where the groups' incentive to compete is purely offensive (a rational group should compete only if it expects the out-group not to compete or to compete to a lesser extent). In other words, the games were structured so that there is no monetary incentive to win (rather than tie) the assurance game and no incentive to tie (rather than lose) the chicken game. Hence, greed is eliminated from the first game and fear from the second.

THE ASSURANCE AND CHICKEN TEAM GAMES

The games were operationalized as team games (Palfrey and Rosenthal 1983; Rapoport and Bornstein 1987; Bornstein and Horwitz 1993; Bornstein forthcoming) involving two groups with 3 members in each group. Each group member received an endowment of e and had to decide between keeping the money and contributing it toward his or her group's benefit. Contributions were not refunded. The group with more contributors won the competition and each of its members received a bonus of r ($r > e$). The members of the group that lost the competition received no bonus.

The difference between the assurance and chicken team games involved the case where the game was tied (i.e., when there was an equal number of contributors in both groups). In case of a tie in the assurance game, each member of both groups was paid a bonus of r. In case of a tie in the chicken game, the members of both groups were paid nothing. Intergroup conflicts often end up in a stalemate, with neither side clearly winning or losing the competition. The utility of such an outcome may, however, differ from one conflict to another. The intergroup chicken game models a particularly fierce conflict where a tie is valued as a loss (Snidal 1991). The intergroup assurance game models a milder type of conflict where groups only aspire not to lose and therefore value a tie as a win.

Similar to the "discontinuity" experiments described above, the players in our experiment were allowed to discuss the game with other in-group members, after which they met with the members of the out-group for a between-group discussion and finally had a within-group discussion. However, the individual decisions of whether to contribute their endowments were made privately and anonymously, and group members were not constrained to keep any agreement that may have been reached either between the two groups or within each group. This procedure leaves open the possibility of free-riding. Because individual contribution is costly, a player who believes that her or his contribution will not affect the outcome of the game (in the sense that her or his group will win or lose the competition regardless of what she or he does) is better off not contributing.

It is typically the case that the payoffs associated with the outcome of intergroup conflict (e.g., national security, pride) are public goods that are nonexcludable to the members of a group, regardless of their contribution to their group's effort (Rapoport and Bornstein 1987). Because contribution entails personal cost (e.g., of time, money, physical effort, and risk of injury or death), rational group members have an incentive to free-ride on the contributions of others. The problem, of course, is that if everyone else in the group tries to free-ride as well, the group is bound to lose the competition, and the public good will not be provided or, worse yet, a public "bad" will be provided for contributors and noncontributors alike. Note, however, that although withholding contribution is collectively deficient from the perspective of one's own group, it is collectively optimal from the wider perspective that includes all players of both groups. In

TABLE 1
Individual Payoff Matrices

	$m_A - m_B$						
	3	*2*	*1*	*0*	*–1*	*–2*	*–3*
Intergroup assurance game							
C	30	30	30	30	0	0	—
NC	—	45	45	45	15	15	15
Intergroup chicken game							
C	30	30	30	0	0	0	—
NC	—	45	45	15	15	15	15

NOTE: The entries in the various cells are the payoffs to player i (a member of group A) as a function of her or his own decision to contribute (C) or not contribute (NC) and the number of in-group (m_A) and out-group (m_B) contributors.

battle, for example, all the soldiers are better off if they all act selfishly and defect (Dawes 1980).

The individual payoff matrices for the intergroup assurance and chicken games with the parameters used in this study (*e* = New Israeli Shekels [NIS] 15 and *r* = NIS 30) appear in Table 1. The entries in the various cells are the payoffs to player i (a member of group A) as a function of her or his own decision to contribute or not and the number of in-group (m_A) and out-group (m_B) contributors. The only difference in individual payoff between the intergroup chicken and intergroup assurance game as shown in Table 1 is that a contributor in the chicken game receives NIS 0 in case of a tie, whereas in the assurance game, she or he receives NIS 30. Noncontributors keep in addition their NIS 15 endowment. As can be seen in these matrices, a rational player should contribute if her or his contribution is critical for tying the assurance game or if it is critical for winning the chicken game. In all other cases, a player is better off withholding contribution.

Let us now examine the assurance and chicken team games from the perspective of the competing groups. In the game between groups A and B, each group has four pure strategies, namely, to designate 0, 1, 2, or 3 contributors. The group payoff matrices for the two games appear in Table 2. The entries in the various cells represent the total payoff for each group (rewards and endowments summed across all group members) as a function of the number of contributors in group A and group B.

In the assurance game, if a group fears that the other group might compete (i.e., designate all of its members as contributors), its best response is also to compete. Designating all 3 group members as contributors is the maximin strategy, which protects the group against the possibility of losing the competition and guarantees a reward of *r* for each member. If both groups choose their maximin strategies, the outcome (represented by the lower right-hand cell in Table 2) is a Nash equilibrium, and no group has an interest to unilaterally deviate from it. But if a group expects the out-group to behave cooperatively (i.e., designate no contributors), its best response is also to coop-

TABLE 2
Group Payoff Matrices

		m_A			
		0	*1*	*2*	*3*
Intergroup assurance game					
m_B	0	135, 135	45, 120	45, 105	45, 90
	1	120, 45	120, 120	30, 105	30, 90
	2	105, 45	105, 30	105, 105	15, 90
	3	90, 45	90, 30	90, 15	90, 90
Intergroup chicken game					
m_B	0	45, 45	45, 120	45, 105	45, 90
	1	120, 45	30, 30	30, 105	30, 90
	2	105, 45	105, 30	15, 15	15, 90
	3	90, 45	90, 30	90, 15	0, 0

NOTE: The entries represent the total payoff for each group (rewards and endowments summed across all group members) as a function of the number of contributors in group A and group B.

erate. Choosing to compete in this case will not increase the group's payoffs (because the payoffs for winning and tying the game are identical) but will reduce its endowments. The mutually cooperative outcome of designating no contributors is collectively efficient—it yields the highest joint payoff in the game. It is also a Nash equilibrium, and therefore no group has an incentive to deviate from it unilaterally.[1] The intergroup conflict is thus a generalization of the two-person assurance game (Jervis 1978), where it is rational for each side to compete if it fears that the other side will compete and to cooperate if it expects that the other side will cooperate.

The strategic considerations in the intergroup chicken game are practically reversed. If a team fears that the other team will behave competitively, its best response is to cooperate or yield by designating no contributors (fear of the opponent, in other words, is not a rational reason for competition). Designating no contributors is the maximin team strategy, which guarantees each team member a minimum of e. However, the intersection of the maximin strategies is not an equilibrium, and therefore each group can benefit from deviating from its maximin strategy if it assumes that the other team will stick to its own maximin. Of course, if both teams are greedy and try to win the game, the game might result in the outcome represented by the lower left-hand cell in Table 2, which is the worst outcome in the game. As can be seen in Table 2, when all 6 players contribute their endowments, no one gets paid. The intergroup conflict has the characteristics of a two-person chicken game, as understood by Schelling (1960) and others. If one player "chickens out," the other can exploit his or her caution to win the game. But by trying to get the maximum payoff (i.e., by being greedy), both players are exposed to the risk of a mutually disastrous outcome (i.e., a "collision").

Would communication between the groups enable them to achieve the cooperative outcome? In the assurance game, the answer is definitely yes. The cooperative solution

1. In fact, all the cases in which the game is tied are Nash equilibria, meaning that the best response for each group is to match the number of contributors in the out-group.

in this game, namely, for all members of both groups to withhold contribution, is symmetric and stable. The solution is symmetric because it allows both groups to "not lose" the competition, and not losing in the assurance game, as defined above, is as good as winning. It is stable, because no group (and no individual player) can benefit from unilaterally reneging on a no-contribution agreement.[2] Recall that the only rational reason to compete in the assurance game is fear of an irrational or competitive opponent (or fear of the opponent's fear, etc.). Communication between the groups can diffuse such fears by reassuring each group of the other group's rationality (its intention to maximize absolute, rather than relative, payoffs). Communication can also be used to verify a common understanding of the game's payoff structure and enhance trust through an explicit agreement of mutual cooperation (Majeski and Fricks 1995).

In the game of chicken, however, because winning is all that matters, between-group communication is expected to be practically useless. The collectively optimal solution in this game is for one group to have a single contributor whereas the other group has none.[3] This solution, however, is asymmetric and inherently unstable. Assume that groups A and B have reached a 0:1 agreement and that the members of group A believe that group B will keep the agreement and designate only 1 contributor; then they are tempted to win the game by designating 2. Knowing that, group A should designate all 3 members as contributors, and anticipating this, group B should designate none. However, given the expectation that all members of B will defect, a single contributor is again sufficient to win the game for A, and so on. In other words, there is no Nash equilibrium in pure strategies in the chicken game between groups A and B, and therefore, any nonenforceable agreement between them is expected to be rather futile.[4]

Our hypothesis, then, is that the effect of between-group communication will interact with game type. Communication is predicted to be highly effective in bringing about the collectively optimal outcome in the assurance game, where the competition is motivated by fear, but to have little or no effect in the chicken game, where the competition is motivated by greed.

METHOD

PARTICIPANTS AND DESIGN

The participants were 120 undergraduate students at the Hebrew University of Jerusalem. They were recruited by campus advertisements promising a monetary reward for participation in a group decision-making task. Participants were scheduled in sets

2. That is, in addition to being a Nash equilibrium in the 2-person assurance game between groups A and B, this outcome is an equilibrium in the noncooperative game among the 6 individual players, because no player can benefit from contributing when all other players do not.

3. When a single player contributes, the 6 players earn a total of 3 (New Israeli Shekels [NIS] 30) + 5 (NIS 15) = NIS 165, which is the highest joint payoff in the game.

4. There is, however, a unique mixed-strategy equlibrium, which will be discussed later.

of 6. Ten such sets played the assurance game and 10 the chicken game. In addition to a flat show-up fee of NIS 10, the participants were paid between NIS 0 and NIS 45, contingent on their decisions and the decisions of the other players in their set (4 NIS equaled approximately $1 when the experiment took place).

PROCEDURE

As they arrived at the laboratory, the 6 participants were given instructions about the rules and payoffs of the game. The game instructions were phrased in terms of the individual player's payoff as a function of her or his own decision of whether to "invest" her or his endowment and the decisions made by the other players in the set, with no reference to cooperation or defection. The participants were given a short quiz to test their understanding, and the explanations were repeated until the experimenter was convinced that everyone understood the payoff matrix.

After the game instructions, the participants were randomly divided into two 3-person groups and were told that they would be allowed to discuss the situation with the other participants before making their individual decisions. Specifically, they were informed that the members of each group would first meet separately for a within-group discussion, then the two groups would meet together for a between-group discussion, and finally each group would conduct a second within-group discussion. The within-group discussions were held in two separate rooms, and the between-group discussion took place in the central experiment room. Each discussion lasted up to 5 minutes. An experimenter was present in each room and audio-recorded the discussion with the explicit knowledge and consent of the participants.

Following the sequence of discussions, each participant was handed a promissory note for NIS 15, a copy of the game's payoff matrix, and a decision form. The participants were told that to ensure the confidentiality of their decision, they would make their decision in writing by checking the appropriate box on the decision form, receive their payment in sealed envelopes, and leave the laboratory one at a time with no opportunity to meet the other participants. Once all the decision forms had been collected, the participants were handed a questionnaire in which they were asked to estimate the probability that (a) exactly 0, 1, or 2 of the remaining in-group members had contributed their endowments; (b) exactly 0, 1, 2, or 3 out-group members had contributed their endowments; and (c) their team had won, tied, or lost the competition. The participants were instructed that the probability estimates in each question should sum to 1. Following the completion of the questionnaire, the participants were debriefed on the rationale and purpose of the study. They were then paid and dismissed individually.

RESULTS

OVERALL CONTRIBUTION RATES

The mean number of contributors (per set of 6 participants) was 4.7 (78%) in the chicken game and 0 in the assurance game. Clearly, this difference is statistically

TABLE 3
Intergroup Agreements, Group Decisions, and Actual Number of Contributors by Game

	Session																			
	1		*2*		*3*		*4*		*5*		*6*		*7*		*8*		*9*		*10*	
Intergroup assurance game																				
B	0:0		0:0		0:0		—		0:0		0:0		0:0		0:0		0:0		0:0	
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
#	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Intergroup chicken game																				
B	0:1		0:0		—		0:1		—		1:0		—		1:0		—		—	
W	3	3	3	—	1	3	3	1	—	—	—	3	3	2	3	0	3	3	3	1
#	3	3	3	2	1	2	3	1	3	2	2	3	3	3	3	0	3	3	3	1

NOTE: B represents the intergroup agreement; W represents the subsequent within-group decisions; and # is the actual number of contributors in each group. Cases in which the discussion did not result in an explicit decision or in which the two judges did not agree on what the decision actually was appear as a dash.

significant ($p < .001$ by Fisher exact test, using the set of 6 participants as the unit of analysis).

INTERGROUP AGREEMENTS, GROUP DECISIONS, AND INDIVIDUAL CHOICE

Table 3 reports the number of contributors agreed upon in the between-group discussion, the number of contributors designated in the following within-group discussion, and the actual number of contributors in each group, by game condition and session within condition. The (between- and within-group) agreements were assessed independently by two judges, one of whom was present during the discussion, whereas the other listened to audio recordings of the discussions. The judges agreed on the outcome of 19 of the 20 B discussions and 37 of the 40 W discussions (an agreement rate of 95% and 92.5%, respectively).[5] Table 3 reports the outcome of the between- and within-group decisions as indicated by both judges. Cases in which the discussion did not result in an explicit decision or in which the two judges did not agree on what the decision actually was appear as a dash.

Except for one session in which no agreement was reached, all between-group discussions in the assurance game resulted in an explicit agreement of collective noncontribution.[6] Based on the strategic properties of this game, we hypothesized that

5. All the disagreements between the judges occurred in the chicken game condition. In all of these cases, one judge claimed that there had been a decision whereas the other did not. There were no cases in which the two judges claimed that different decisions had been made.

6. In session 4, one group suggested the collectively optimal solution, but the members of the other group decided to postpone their final decision until they met separately. Judging by the outcome of the subsequent within-group decisions and that none of the 6 players contributed their endowment, it seems that a tacit agreement had nevertheless been reached.

these cooperative intergroup agreements would be highly stable. Indeed, Table 3 shows that all nine agreements were fully kept at both the group and individual levels. That is, following an intergroup agreement to designate no contributors, both groups decided to keep the agreement in their subsequent within-group discussions, and all individual players withheld their contribution in accordance with both the between- and within-group agreements.

In the chicken game, the situation is dramatically different. Only four between-group discussions resulted in the collectively optimal agreement of 1:0, one discussion resulted in a 0:0 agreement, and the remaining five discussions did not result in an agreement. Of the five agreements reached, *none* were kept. In fact, most of the intergroup agreements were already violated in the subsequent within-group discussions. For example, following a 0:1 between-group agreement in session 1, both groups violated the agreement by designating 3 contributors in the subsequent discussions, and all 6 individuals contributed their endowment (which resulted in a payoff of 0 for each player). In session 4, following a 0:1 agreement between groups A and B, group A reneged by designating 3 contributors, and because group B kept its side of the agreement and designated only 1, group A ended up winning the game.

Interestingly, the mean number of contributors per session following an agreement (in sessions 1, 2, 4, 6, and 8) was 4.6 (out of 6), which is hardly different from the mean of 4.8 contributors per session (in sessions 3, 5, 7, 9, and 10) where no agreement was reached. In other words, groups that reached a cooperative agreement were as competitive (and as inefficient) as groups that did not reach an agreement. Comparing the actual choices of the individual group members with the decision reached by their group shows that only 1 designated contributor (in session 3 of the chicken game) did not contribute his or her endowment, in violation of the intragroup agreement.

Can these results be explained by assuming that the groups used a mixed strategy? Because the intergroup chicken game has no equilibrium in pure strategies, it is possible that when the groups failed to reach an agreement (or reached an agreement they perceived as useless), they resorted to the use of a mixed strategy. The unique Nash equilibrium in mixed strategies of the intergroup chicken game in Table 2 predicts that a group will designate 0, 1, or 2 contributors with probability of 1/6 and 3 contributors with probability of 1/2. Thus, the frequency of 0, 1, or 2 contributors across all sessions and groups is predicted to be a little greater than 3, and the frequency of 3 contributors is predicted to be 10. As can be seen in Table 3, the observed frequencies are quite similar. Of the 20 groups in our experiment, 1 had 0 contributors, 3 had 1 contributor, 4 had 2 contributors, and 12 had 3 contributors. These observed frequencies are not significantly different from the predicted ones, $\chi^2(2) = 2.2$, n.s., and therefore one cannot discard the notion that groups used the mixed-strategy equilibrium. However, as described in the next section, the participants' belief structure makes this possibility quite unlikely. The mixed-strategy equilibrium in the chicken game is symmetric, and common knowledge of rationality would require players to hold symmetric beliefs about in-group and out-group members. Nonetheless, the participants in our experiment held clearly asymmetric beliefs. Specifically, they assumed that in-group members are much more likely to contribute than out-group members and, consequently,

TABLE 4
Means and Standard Deviations of Subjective Probabilities

	Chicken (n = *10)*		*Assurance* (n = *10)*	
	M	SD	M	SD
p	71.72	17.17	0.97	1.45
q	44.94	10.17	5.11	5.85
p* – *q	26.78	14.07	–4.14	4.95
w	47.66	9.96	2.38	3.34
t	29.36	7.45	92.6	7.81
l	23.43	11.46	4.86	5.0

NOTE: ***p*** = subjective probability of contribution by an in-group member; ***q*** = probability of contribution by an out-group member; ***w*** = probability of winning the game; ***t*** = probability of tying the game; ***l*** = probability of losing the game.

estimated the in-group's chances of winning the game as much higher. These biased beliefs are inconsistent with the notion of a mixed-strategy equilibrium.

QUESTIONNAIRE DATA

Table 4 reports the mean probability estimates made by the participants in response to the questionnaire. The probability estimates for question 1 were used to compute the expected contribution rate among the remaining in-group members (denoted by ***p***), and the probability estimates for question 2 were used to compute the expected contribution rate among the out-group members (denoted by ***q***).[7]

Participants expected both in-group (***p***) and out-group members (***q***) to be much more likely to contribute in the chicken game than in the assurance game, $t_{(9.1)} = 12.99$, $p < .001$ and $t_{(14.4)} = 10.74$, $p < .001$, respectively. A more interesting result, however, involves the difference score ***p* – *q***, the probability of contribution by an in-group member minus that by an out-group member. As can be seen in Table 4, ***p* – *q*** is 26.7% in the chicken game compared with –4.14% in the assurance game. Both of these mean difference scores are significantly different from zero, $t_{(9)} = 6.01$, $p < .001$ and $t_{(9)} = –2.65$, $p < .05$, respectively. And clearly, the ***p* – *q*** difference is significantly larger in the chicken game than in the assurance game, $t_{(11.2)} = 6.56$, $p < .001$.

Table 4 also reports the participants' subjective probability of winning (denoted by ***w***), tying (denoted by ***t***), or losing (denoted by ***l***) in chicken and assurance games. The *t* test performed on ***w*** revealed a significant main effect for game-type, $t_{(11)} = 13.63$, $p < .001$. Participants in the chicken game estimated their group's chances of winning the game as 48%, whereas those in the assurance game estimated their chances as only 2.4%. The participants estimated the probability that the game would be tied as about 30% in the chicken game and as 93% in the assurance game. This difference is also statistically significant, $t_{(18)} = –18.53$, $p < .001$.

7. Denote by ***p***(1) and ***p***(2) the probability of exactly 1 and 2 in-group contributors and by ***q***(1), ***q***(2), and ***q***(3) the probability of exactly 1, 2, and 3 out-group contributors. Then ***p*** = [***p***(1)/2 + ***p***(2)] and ***q*** = [***q***(1)/3 + 2***q***(2)/3 + ***q***(3)].

Another interesting comparison between the two games involves the difference score $\boldsymbol{w} - \boldsymbol{l}$ (the estimated probability of winning minus that of losing). As can be seen in Table 4, players in the assurance game estimated their chance of losing as small but significantly higher, $t_{(9)} = -2.25$, $p < .05$, than that of winning. Players in the chicken game estimated their group's chances of winning as high, and twice as high as that of losing, $t_{(9)} = 4.04$, $p < .005$. This pattern is consistent with the estimated contribution rates reported earlier. The participants in the assurance game expected about 5% of the out-group members to contribute (in violation of the cooperative agreement between the groups). Because the contribution (or violation) rate among in-group members was expected to be lower (less than 1%), they reasonably estimated their chance of losing the game as higher than that of winning. The participants in the chicken game expected a much higher contribution rate among in-group members than among out-group members (70% and 40%, respectively) and consequently estimated their chance of winning as much higher than that of losing. The $\boldsymbol{w} - \boldsymbol{l}$ difference is, of course, significantly larger in the chicken condition than in the assurance condition, $t_{(9.7)} = 4.39$, $p < .002$.

DISCUSSION

In a previous experiment, Bornstein, Mingelgrin, and Rutte (1996) studied the intergroup assurance and chicken games while allowing communication only within the groups. They found that the majority of the groups in both the assurance and chicken games (83% and 72%, respectively) chose the most competitive strategy of designating all group members as contributors, and practically all players abided by the group decision. As a result, 75% of the participants in both team games contributed their endowment (as compared with a contribution rate of about 40% in both games in a no-communication control condition), and almost half (45%) of the intergroup competitions resulted in full-scale "war"—the outcome least efficient for both groups.

Although the structural difference between the assurance and chicken games had little effect on (either group or individual) choice behavior, it did have profound effects on the intragroup processes leading to these decisions. In particular, the rationale for choosing the competitive strategy (as coded from group discussions) and the beliefs of individual group members following discussion (as reflected in the postdecision questionnaire) differed systematically as a function of game type.

The choice of the competitive group strategy in the assurance game was based on distrust or fear of the opponent. In-group members expected the out-group to compete by designating all of its members as contributors and decided to protect themselves against losing the game by making the same choice. This "playing-it-safe" strategy was reflected in the content of group discussions, which were characterized by risk-avoidance arguments (e.g., "If we all contribute we are assured at least a tie.") and based on symmetric expectations concerning the in-group and the out-group (e.g.,

8. Similar results were reported by Van Huyck, Battalio, and Beil (1990). They studied the minimal effort game—an *n*-person version of the assurance (stag-hunt) game with multiple equilibria, one of which is payoff-dominant and one of which is risk-dominant. They found that when the game was played

"They must be thinking in exactly the same way."). Following within-group discussion, group members assumed that in-group and out-group members would be about equally likely to contribute and consequently expected the game to be tied.[8]

In contrast, the decision to compete in the chicken game was motivated by risk-taking arguments (e.g., "If we all contribute, it's either all or nothing.") and was based on asymmetric in-group/out-group expectations. Specifically, participants expected the out-group to be less likely to compete (designate all group members as contributors), and if such a decision was made, they expected individual out-group members to be less likely to keep it (e.g., "Let's all contribute, at least one of them is bound to defect."). Following within-group discussion, participants estimated the contribution rate of the in-group to be almost 20% higher than that of the out-group and consequently estimated the in-group's chances of winning the game as much higher than the out-group's.

In sum, when allowed only within-group communication, group members chose the most competitive strategy in both the assurance and the chicken games. However, in the assurance game, they competed because they perceived the out-group to be competitive and dangerous and wanted to protect themselves against the possibility of losing the competition; whereas in the chicken game, they competed because they perceived the out-group to be vulnerable and likely to "chicken out" and wanted to take advantage of its weakness to win the competition.

This experiment allowed between-group communication (in addition to communication within the groups) and found that its effect on conflict resolution differed dramatically between the two games. In the assurance game, where competition is motivated by fear, communication was highly effective in bringing about a peaceful resolution.[9] In the chicken game, where competition is motivated by greed, communication was practically useless. This latter result is particularly striking. Following between-group discussion, the contribution rate in the chicken game remained as high (and as inefficient) as that found in the Bornstein, Mingelgrin, and Rutte (1996) experiment where communication between the groups was altogether prohibited. Eleven (of the 20) groups in this game condition chose the most competitive strategy of designating 3 contributors, and all (except one) of the designated contributors adhered to their group's decision. Recall that choosing (and sticking with) this strategy makes sense only if the in-group members believe that the out-group members will *not* make the same choice. In other words, differential beliefs concerning the behavior of in-group and out-group members are necessary to sustain such a decision.[10]

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repeatedly by a group of 14 to 16 players, with the outcome made public after each round, choices quickly converged on the Pareto-deficient, security equilibrium. Cooper et al. (1990), who studied 2-person games, also showed that although the equilibria in these games are Pareto-ranked, participants often coordinated on the less desirable equilibrium.

9. For an experiment on the effect of communication in coordination games, see Cooper et al. (1989). For experiments on communication in intergroup prisoner's dilemma games, see Bornstein (1992). For experiments on communication in social dilemma games, see Dawes, McTavish, and Shaklee (1977); Orbell, van de Kragt, and Dawes (1988); and Kerr and Kaufman-Gilliland (1994).

10. Strictly speaking, each of the 3 designated in-group contributors is critical for provision only if each assumes that there will be exactly 2 out-group contributors (van de Kragt, Orbell, and Dawes 1983).

The questionnaire data clearly affirm the existence of such biased beliefs. The participants in the chicken game estimated the probability of contribution by out-group members as lower than that by in-group members and consequently estimated their chances of winning the intergroup contest as higher. Because this optimism was shared by both groups, however, it proved unjustified, as 3 (out of 10) sessions resulted in full-scale "collision," and most other sessions resulted in a highly inefficient outcome for both groups. Apparently, intergroup contact did little to abate the tendency of group members to form and maintain (and eventually act on) biased out-group perceptions.[11]

CONCLUSIONS

The game of chicken models a variety of conflicts involving bilateral threat. Our experiment suggests that when, as in military confrontations or disputes between management and workers, the competing sides are groups, in-group/out-group bias can prevent either group from yielding, leading to an outcome, such as war or a strike, that is disastrous to both groups. The results concerning the intergroup assurance game are much more optimistic. The assurance game models a relatively benign version of the security dilemma where the temptation to defect for defensive reasons is balanced by the strong preference of both sides for mutual cooperation (Jervis 1978). The experiment suggests that intergroup communication (even when binding agreements are impossible) can dramatically facilitate the attainment of this desirable outcome.

Of course, in many real-life conflicts, the definition of the game is rather subjective, in the sense that changes in the utilities attached to the outcomes can transform the situation from one game into another (e.g., Jervis 1978; Oye 1986). The same objective situation can be perceived by both sides as a game of assurance, where the crucial thing is not to lose, or as a game of chicken, where winning is all that matters. Clearly, how the conflict is perceived or framed by the competing groups is bound to affect their chances of resolving it peacefully.

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11. A study by Carroll, Bazerman, and Maury (1988) documented a similar tendency of individuals to ignore the cognition of others in competitive situations. People often reduce the complexity of strategic decision problems by making unilateral assumptions about the opponent while ignoring the opponent's contingent cognitive processing.

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