The Effects of Within-Group Communication on Group Decision and Individual Choice in the Assurance and Chicken Team Games

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Two team games are introduced: a game of assurance and a game of chicken. The games were operationalized as a competition between two teams, with three players on each team, and were compared either with or without the opportunity for a within-team discussion. The authors found that the vast majority of the teams in both game types chose to compete, and almost all individual players abided by the group's decision. However, the rationale for choosing the competitive team strategy (as coded from group discussions) and the beliefs of individual team members following discussion (as reflected in the postdecision questionnaire) differed systematically as a function of game type.

The tendency of intergroup behavior to be highly competitive is well substantiated (for a review, see Schopler and Insko 1992). Insko and Schopler (1987) and Schopler and Insko (1992) 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 decide to compete because they expect the outgroup to behave competitively and wish 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 even when they expect the outgroup to cooperate because group members provide each other with support for acting in an exploitative, ingroup-oriented way.

This research on intergroup relations has been conducted in the context of the two-person prisoner's dilemma (PD) and other PD-like games (Insko et al. 1994). In the PD game, fear and greed are not both necessary; either is sufficient to motivate a

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competitive strategy (Coombs 1973; Dawes 1980). Therefore, to construe a competitive group choice as motivated by either fear or greed, one must take into account the group's expectations concerning the opponent. As maintained by Schopler and Insko (1992, 135),

> Fear associated with the schema-based distrust hypothesis is rooted in the expectation that the other group will be competitive (and is therefore dangerous), while greed associated with the social-support-for-shared-self-interest hypothesis is anchored in the expectation that the other group will be cooperative (and is therefore vulnerable).

The present study takes a different approach to the study of intergroup competitiveness. Rather than assessing (or manipulating) expectations concerning the outgroup in a PD game, in which groups have both defensive and offensive reasons to compete, we studied intergroup behavior in a game of assurance, in which the incentive to compete is purely defensive (i.e., a rational group should compete only if it expects the outgroup to compete), and a game of chicken, in which the incentive to compete is purely offensive (i.e., a rational group should compete only if it expects the outgroup not to compete or to compete to a lesser extent). By eliminating greed in the first type of conflict and fear in the second one *as a rational basis for competition*, we can study the operation of each motive separately in determining group competitiveness.

The present study differs from previous research in yet another important aspect—it operationalizes the intergroup conflict as a team game (Palfrey & Rosenthal 1983; Bornstein 1992) rather than a two-person game. Whereas two-person games necessarily assume that all group members have identical interests (and therefore that each group can be treated as a unitary player), team games are based on the observation that intergroup conflicts often entail a conflict of interests within the competing groups as well. The intragroup conflict is conceptualized as a problem of public goods provision. It stems from the fact that the benefits associated with the outcome of the intergroup competition (e.g., national security, pride) are public goods that are nonexcludable for the members of a competing group and therefore enable them to free ride on the efforts of others. A second purpose of the present study, therefore, was to study the effect of pregame communication on free riding within the competing groups. In particular, we are interested in comparing the mechanisms used for solving the intragroup problem of collective action in the assurance and chicken team games.

The team games. The games were operationalized as a competition between two teams, with three players on each team. Each player received an endowment of 10 Israeli Shekels (IS) (approximately $4 when the experiment took place) and had to decide between keeping the money and contributing it toward the group's benefit. The group with more contributors won the competition, and each member of that group received a bonus of IS 20. The members of the group who lost the competition received no bonus.

The difference between the assurance and the chicken games involved the cases in which the game was tied (i.e., when there was an equal number of contributors in both teams). In case of a tie in the assurance game, each member of both teams was paid a bonus of IS 20. By making the reward for a tie equal to that for a win, we eliminated

TABLE 1
Individual Payoff Matrices

	Assurance Game $m_A - m_B$						
	3	*2*	*1*	*0*	*–1*	*–2*	*–3*
Contribute	20	20	20	20	0	0	—
Not contribute	—	30	30	30	10	10	10

	Chicken Game $m_A - m_B$						
	3	*2*	*1*	*0*	*–1*	*–2*	*–3*
Contribute	20	20	20	0	0	0	—
Not contribute	—	30	30	10	10	10	10

NOTE: The entries represent the net payoff (bonus for contributors and bonus + endowment for noncontributors).

greed (i.e., the temptation payoff—the incentive for each group to compete when the other group was cooperating). In case of a tie in the chicken game, each player on both teams was paid nothing. By equating the reward for a tie with that for a loss, we eliminated fear (i.e., the sucker payoff—the disincentive for each group to cooperate when the other was competing). The individual payoff matrices for the two team games appear in Table 1. The entries in the various cells represent the payoff to Player i ($i \varepsilon A$) as a function of his or her own decision whether to contribute and the number of contributors in team A and team B.[1]

Effect of group discussion. The games were compared under two conditions: (1) an experimental condition in which the participants were allowed to discuss the game with other ingroup members before deciding whether to contribute their endowment and (2) a control condition in which no such communication was allowed. Communication was operationalized as "cheap talk"—that is, individual group members (who made their contribution decisions privately and anonymously) were not constrained to keep any agreement that may have been reached during group discussion.

Group decision. We assume that during group discussion, all group members had a common interest in identifying and pursuing the collectively optimal strategy vis-à-vis the outgroup. In making this collective decision, it was rational for them to assume that the members of the outgroup (who also were communicating among themselves) would behave in a similar fashion. Thus, for the purpose of making a group decision, each team was considered a unitary player, and the game was framed as a two-person game between teams A and B. In this two-person game, a pure strategy corresponded to the number of players the group designated as contributors. Each

1. The parallel between these team games and the well-known two-person chicken and assurance games will become clearer in the next section, when we discuss the payoff matrices from the teams' point of view.

TABLE 2
Group Payoff Matrices

	Assurance m_A 0	1	2	3
m_B				
0	90,90	30,80	30,70	30,60
1	80,30	80,80	20,70	20,60
2	70,30	70,20	70,70	10,60
3	60,30	60,20	60,10	60,60

	Chicken m_A 0	1	2	3
m_B				
0	30,30	30,80	30,70	30,60
1	80,30	20,20	20,70	20,60
2	70,30	70,20	10,10	10,60
3	60,30	60,20	60,10	0,0

group had four such strategies, namely to designate 0, 1, 2, or 3 contributors. The group payoff matrices for the two team games appear in Table 2. The entries in the various cells represent the total group payoff (rewards and endowments summed across all group members) as a function of the number of contributors in team A and team B.

Because communication between the teams was prevented in our experiment, each team had to make its decision without knowing what the other team would do. What can we expect the teams to choose in the assurance game? If, as assumed by the schema-based distrust hypothesis, one team fears that the other team will compete (designate three contributors), its best response is to do the same. Designating three contributors is the maximin team strategy; it protects the team against the possibility of losing the competition and guarantees a reward of IS 20 for each team member. If both teams choose their maximin strategies (and because the game is symmetric, there is no reason not to expect the same choice by both teams), the game is predicted to result in the outcome represented by the lower right-hand cell (i.e., the 3:3 cell). And because the intersection of the maximin strategies is a Nash equilibrium, no group has an interest to unilaterally deviate from this solution.

But assume that a team expects the opposing team to behave cooperatively (i.e., to designate no contributors). Is there still a reason for it to compete? In other words, is there an incentive to be greedy? As can be seen in Table 2, the answer is no. If a group expects the outgroup to cooperate, its best response is to do the same. The mutually cooperative outcome (the 0:0 outcome resulting from the choice of the noncompetition strategy by both teams) is Pareto-optimal, that is, it yields the highest joint payoff in the game. It is also (in contrast to the PD game) a Nash equilibrium, and therefore no team has an incentive to deviate from it unilaterally. Choosing a different, more competitive strategy will not increase the team's payoffs (because the payoffs for winning and tying the game are identical) but will reduce its endowments. It is therefore rational for a team to compete only if it fears that the other team will act competitively. The intergroup competition in this team game is thus a generalization of the two-person assurance or stag-hunt (Jervis 1978) game.[2]

Let us now analyze the group's decision in the chicken game. If a team fears that the other team will behave competitively, its best response is to designate no contributors (fear of the opponent, in other words, is not a rational reason for competition). Designating no contributors is the maximin team strategy that guarantees each team member a minimum of IS 10. Again, because the game is symmetric, both teams are expected to choose their maximin strategies, and the game is predicted to result in the outcome represented by the upper left-hand (0:0) cell.

However, the intersection of the maximin strategies is not an equilibrium and is therefore problematic. The problem arises from the fact that each team 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 (i.e., the 3:3 outcome), which is the worst outcome in the game. As can be seen in Table 2, when all six players contribute their endowments, no one gets paid. The intergroup conflict in this team game has the characteristics of a chicken game, as understood by Schelling (1960) and other social psychologists and political scientists. If one team "chickens out," the other can exploit its caution to win the game. But by trying to get the maximum payoff (i.e., by being greedy), the exploiting team not only harms the other side but also exposes itself (and the other team) to the risk of a mutually disastrous outcome (i.e., a "collision").[3]

Individual decision. Under what conditions are individual group members expected to abide by a competitive group decision to designate three contributors? In the absence of some form of coercion (i.e., side payments), rational players should contribute if and only if they believe that their contribution is critical in affecting the outcome of the competition (and provided that their personal gain from changing the

2. The two-person "stag-hunt" (assurance) game is associated with the following story: two hunters have surrounded a stag. If both cooperate to trap the stag, both will eat well. If one hunter defects to chase a passing rabbit, the stag will escape. The defector will eat lightly and the other will not eat at all. If both of them chase rabbits, each one will have some chance of catching a rabbit and eating lightly (Oye 1986). Thus each hunter prefers to cooperate if the other hunter cooperates but defects if the other defects. A similar preference ordering exists in the assurance team game. Consider the corner cells in the group payoff matrix in Table 2. Each team prefers to cooperate (designate no contributors) if the other team cooperates, but each team prefers to defect (designate three contributors) if the other team defects.

3. The two-person chicken game is associated with the following story: two drivers race down the center of the road from opposite directions. If one swerves and the other does not, then the first will be known as a chicken and the second will be known as a hero. If neither swerves, both will suffer a collision. If both swerve, damage to the reputation of each will be limited (Oye 1986). Each driver then prefers to defect (by continuing down the center of the road) if the other cooperates (swerves) but cooperates if the other defects. A similar preference ordering exists in the chicken team game. To illustrate this, consider the corner cells in the group payoff matrix in Table 2. Each team prefers to defect (designate three contributors) if the other team cooperates (designate none), but each prefers to cooperate if the other team defects.

game's outcome exceeds the cost of contribution). If individuals cannot change the outcome of the competition (i.e., their team will win or lose the competition regardless of their decision), or if their net benefit from doing so is negative, they should not contribute (Rapoport and Bornstein 1987). From the point of view of rational choice theory, therefore, a group agreement is self-enforcing only if it renders the contribution of each designated contributor necessary or critical for provision (and thus removes the option to take a free ride). In the terminology of van de Kragt, Orbell, and Dawes (1983), a group agreement holds if and only if the set of contributors designated by the group is a minimal contributing set.

As argued earlier, a group decision to designate three contributors in the assurance game is fear based; that is, it involves the assumption that the outgroup also will compete. Given this assumption, the designated set is a minimal contributing set; that is, if each player believes that all other (ingroup and outgroup) players will contribute, each one also knows that he or she cannot benefit from a unilateral defection. More technically, the outcome of all six players contributing is a Nash equilibrium in the noncooperative game among the six individual players in addition to being an equilibrium in the two-person game between the two teams.

This is not the case in the chicken game. Team A should designate three contributors only if it expects Team B to designate two. However, the two designated contributors in Team B have no reason to abide by their group's decision and, as rational players, the members of A should know that. In turn, the expectation that all members of Team B will defect creates a three-person game of chicken among the members of A because, given that expectation, a single contributor is sufficient to win the game, and each player prefers to take a free ride rather than bear the cost of contribution. Of course, if members of Team B expect that members of Team A will become involved in this intragroup game of chicken, they might then decide to contribute in the hope of winning. Yet the possibility of their implementing this decision depends on their ability to solve the intragroup chicken game, and so on. In other words, the absence of a pure-strategy equilibrium in the two-person competition between teams A and B renders the designation of a minimal contributing set impossible.

To summarize, if we assume that individual players are rational and selfish, they should abide by a competitive group decision to designate three contributors in the assurance game and ignore such a decision in the chicken game. Within-group communication, in other words, is expected to interact with game type; communication should increase contribution rates in the assurance game as compared to the no-communication control condition, but communication will have little or no effect on individual contributions in the chicken game. There is, however, another possibility. Several studies have demonstrated that group discussion affects individual cooperation in ways that cannot be explained in terms of a strictly rational model (Orbell, van de Kragt, and Dawes 1988; Dawes, McTavish, and Shaklee 1977; Messick & Brewer 1983). In particular, group discussion elicits promises to cooperate, and individuals seem to keep their promise without any help from side payments, designated contributed sets, or other devices that provide self-interested reasons for cooperation (e.g., iteration of the game). If the act of promising is indeed the decisive mechanism, we may expect subjects to be equally likely to follow a competitive strategy in both games.

The result, as can be seen in Table 2, will be collectively (i.e., Pareto) deficient and will be particularly devastating in the chicken game.

METHOD

Subjects and design. The participants were 180 male undergraduate students at the Hebrew University of Jerusalem. The subjects were recruited by campus advertisements promising monetary reward for participation in a group decision-making task. Subjects were scheduled in sets of six. Half the sets played the assurance game and half the chicken game. Five sets in each game condition were conducted without preplay communication, but in 10 sets subjects were allowed within-group communication. In summary, the experiment used a two-factorial design, with game type defining one dimension and presence or absence of within-group communication defining the other. Subjects were paid between IS 0 and IS 30, contingent on their decisions and the decisions of the other players in their set.

Procedure. As they arrived at the laboratory, the participants were seated in a single room with arrangements to ensure their privacy. Each participant was handed a promissory note for IS 10 and a copy of the payoff matrix summarizing the different ways to earn money in the experiment. The participants were randomly assigned to 2 three-person groups and were given instructions concerning the rules and payoffs of the game. The game instructions were neutral and were phrased in terms of the individual player's payoff as a function of his own decision whether to invest and the decisions made by the other players in his set. The participants were not instructed to maximize their earnings, and no reference to cooperation or defection was made. Subjects were given a short quiz to test their understanding, and explanations were repeated until the experimenter was convinced that all subjects understood the payoff matrix.

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 a sealed envelope, and leave the laboratory one at a time with no opportunity to meet the other participants. Subjects also were assured that the experiment involved no deception. At this stage, subjects in the no-communication condition made their decisions. Once all the decision forms were collected, subjects were handed a questionnaire in which they were asked to estimate (1) the probability that exactly 0, 1, or 2 of the remaining ingroup members had contributed their endowment; (2) the probability that exactly 0, 1, 2, or 3 outgroup members had contributed their endowments; and (3) the probability that their team had won, tied, or lost the competition. (The subjects 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.

The procedure in the communication condition was identical, except that members of each group were allowed a 5-minute discussion with the other members of their team before making their individual decisions. Group discussions were held in two separate rooms; an experimenter was present in each room and audiorecorded the discussion with the explicit knowledge and consent of the subjects.

RESULTS

RATES OF CONTRIBUTION

In the no-communication control condition, the mean number of contributors per set of the six subjects was 2.58 (43%) in the assurance game and 2.22 (37%) in the chicken game. In the within-group communication condition, the mean number of contributors was 4.50 (75%) in both games. An analysis of variance (ANOVA; using the set of six subjects as the unit of analysis) revealed a significant main effect for communication (F [1, 26] = 9.21, $p < .005$). The Game-type main effect and the Game-type × Communication interaction effect were not significant.

GROUP DECISIONS

The group decision was assessed independently by two judges. The judges were graduate students who had taken an extensive course on social dilemma and team games and were specifically trained for this task. The judges used audiorecordings and transcriptions of the discussions. Table 3 presents the decisions reached during intragroup discussions (i.e., the number of contributors designated by the group), as indicated by both judges. Cases in which the discussion did not result in a clear decision or in which the two judges did not agree on what the final group decision actually was appear as a minus sign. As can be seen in the table, there were only two such cases in each game condition, indicating a 90% agreement rate between the two raters.

Table 3 shows that of the 18 groups in the assurance game that reached a decision, 15 groups decided to designate three contributors, and 3 groups decided to designate no contributors. Of the 18 groups that reached a decision in the chicken game, 13 groups designated three contributors, 3 groups designated two contributors, and 2 groups designated no contributors.

CONTENT OF GROUP DISCUSSIONS

In addition to the group decision, the judges derived the following dependent variables from coding the transcripts of group discussions: risk-avoidance (maximin) arguments, risk-seeking arguments, maximizing-relative-gain arguments, symmetric ingroup/outgroup expectations, and asymmetric ingroup/outgroup expectations. These categories were defined in a precise way (the definitions for each category appear in the following relevant section) and discussed extensively with the judges. The coding was done independently by the two judges, and each judge was instructed to mark all relevant statements in the text. When the two judges agreed on the occurrence of at least one statement of a given type, this category was marked by a

TABLE 3
Group Decisions, Individual Choice, and Content Analysis of Group Discussion

	Assurance Session No.									
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Group decisions	3:3	0:0	3:3	0:3	3:3	3:3	3:3	–:3	3:3	3:*
Individual decisions	3:3	0:0	3:3	0:3	3:3	3:3	2:3	0:2	3:3	2:3
Maximin	+ +	– +	+ +	+ +	+ +	+ +	+ +	+ +	+ +	+ *
Risk	– –	+ +	– –	– –	– –	– –	– –	+ –	– –	– *
Max-rel	– –	– –	– –	– –	– –	– –	– –	– –	– –	– *
Symmetry	+ –	+ +	– +	+ +	+ +	– +	+ –	+ –	– +	+ *
Asymmetry	– –	– –	– –	– –	– –	– –	– –	– –	– –	– *
	Chicken Session #No.									
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Group decisions	3:2	3:3	3:3	3:3	0:0	3:3	3:3	2:3	–:–	2:3
Individual decisions	3:2	3:3	3:3	1:2	0:0	3:3	3:3	2:3	2:1	2:3
Maximin	– +	+ +	+ –	–	+ +	+ –	+ +	+ –	+ +	– +
Risk	– +	– –	– –	– +	– –	+ +	– –	+ +	– –	– –
Max-rel	– –	+ +	+ –	– +	– –	+ –	+ –	+ –	– –	– +
Symmetry	+ –	– +	– –	– –	+ –	+ +	– +	+ +	+ –	– –
Asymmetry	+ +	– +	+ +	– +	– –	+ –	– –	– –	–	+ –

NOTE: + indicates the occurrence of at least one statement of a given type; – indicates that no such statement had occurred; * indicates a missing value. Due to equipment failure, the discussion of one of the teams in session 10 in the assurance game was not recorded. Max-rel = maximizing-relative-gains.

plus sign in Table 3. If no such statement had occurred or if the two judges did not agree on its occurrence, the category was marked by a minus sign in the table.

Risk-avoidance (maximin) arguments. This category includes arguments in support of the maximin team strategy, that is, the strategy that maximizes the team's minimal payoff or security level. In 18 of the teams playing the assurance game, an argument was made for choosing the maximin team strategy of full contribution. A typical argument was, "If we all contribute we are assured at least IS 20 each." (In three of these teams, subjects also mentioned the fact that the maximin strategy for the individual player was to keep the IS 10 endowment.) In the chicken game, the maximin argument was raised in 13 of the 20 teams. The typical argument was, "If we don't contribute, we are assured at least IS 10 each." (Note that in this game, withholding contribution was the maximin strategy at both the group and the individual level.)

Risk-seeking arguments. This category was defined as willingness to risk a sure payoff (the group's security level, or maximin payoff) for a chance of winning a higher payoff. In the assurance game, the risky team strategy was to cooperate (designate no contributors). This strategy was risky because it involved the possibility of losing the game; however, if chosen by both teams, it would have resulted in the highest possible payoff of IS 30 per player. The maximax argument was raised in three teams in the assurance game condition. All of these teams decided to designate no contributors.

The risky strategy in the chicken game was to compete. (Strictly speaking, the maximax strategy was to designate a single contributor. If no one contributed in the outgroup, this strategy would have provided the highest total payoff for the ingroup.) As described earlier, choosing the competitive strategy could result in winning the game, but if chosen by both teams it could lead to the worst possible outcome. In six group discussions in the chicken game, an argument for risk taking was made. Typical arguments were, "We can get the most only if we all contribute" and "If we all contribute, it's either all or nothing." Five of these teams designated three contributors, and one designated two contributors.

Competitiveness (maximizing-relative-gain) considerations. The competitive motivation was operationalized as an explicit preference for winning rather than tying the assurance game and for tying rather than losing the chicken game. Recall that such preferences are not embedded in the payoff structure of the games. In none of the discussions in the assurance game was such a preference expressed. In the chicken game, however, an argument for maximizing relative gain was raised in eight teams, seven of which designated three contributors. Typical arguments were, "If we all contribute they cannot win" and "If we don't all contribute they might win the game."

Symmetrical expectations. This category was defined as an explicit assumption that the outgroup is similar to the ingroup in the way it thinks and behaves—a direct extrapolation from the ingroup to the outgroup. Typical statements were, "They must be thinking in exactly the same way" and "They'll do the same thing that we do." Symmetric expectations were coded in 13 discussions in the assurance condition and in 9 discussions in the chicken condition.

Asymmetrical expectations. This category is defined as an explicit expectation that the outgroup or individual outgroup members will behave or think differently from the ingroup. In none of the discussions in the assurance game were such assumptions made. In the chicken game, however, asymmetric expectations were voiced in eight group discussions. The arguments were, "If we all contribute, we must be contributing more than they are"; "Let's all contribute, there's a good chance that they'll think we're not going to do it"; "At least one of them is bound to defect"; "The probability that they'll also decide to contribute is low." In six of these groups the decision was to designate three contributors, and in the remaining two groups the decision was to designate two contributors.

GROUP DECISIONS AND INDIVIDUAL CHOICE

Table 3 also reports the actual number of contributors in each group in the assurance and chicken games, respectively. Comparing the actual choices of the individual subjects with the decision reached by their group shows a very low defection rate in both games. Only two designated contributors did not contribute their endowments in the assurance game, and only three designated contributors did not contribute in the chicken game.

QUESTIONNAIRE DATA

The probability estimates made by the subjects were used to compute the expected contribution rate among the remaining ingroup members (denoted by p) and the expected contribution rate among the outgroup members (denoted by q).[4] Table 4 reports the means and standard error of these estimated rates.

An ANOVA performed on p revealed a significant main effect for communication (F [1, 165] = 36.53, $p < .0001$). The Game-type main effect and the Game-type × Communication interaction effect were not significant. The means in Table 4 show that subjects expected more ingroup contributors when within-group communication was allowed than when it was not, and their expectations corresponded quite well with the actual pattern of contribution reported earlier.

The ANOVA performed on q revealed significant main effects for communication (F [1, 176] = 11.49, $p < .001$) and for Game type (F [1, 176] = 7.18, $p < .01$) but no interaction effect. The most noticeable result is that although subjects in the no-communication condition were accurate in estimating the rate of contribution by the outgroup members, subjects in the communication condition considerably underestimated the outgroup's contribution rates.

Indeed, an ANOVA on the difference score p-q indicated that this difference was significantly higher in the within-group communication condition than in the no-communication control condition (F [1, 165] = 13.42, $p < .001$). A contrast between the two game types performed for the communication condition indicated that the p-q difference is significantly larger in the chicken game than in the assurance game (F [1, 165] = 5.21, $p < .05$).

Table 4 also reports the subjects' subjective probability of winning the game (denoted by w) and their subjective probability of tying the game (denoted by t) in the four conditions. The ANOVA performed on w revealed a significant main effect for game type (F [1, 170] = 6.29, $p < .02$) and no main effect for communication. But, more important, it also revealed a significant Game-type × Communication interaction effect (F [170] = 13.06, $p < .001$). Subjects in the no-communication condition estimated their group's chances of winning the game as relatively low (a little over .30), regardless of game type. However, following group discussion, subjects in the chicken condition became more optimistic about their chances of winning the competition (w = .45), whereas subjects in the assurance condition became less optimistic about their chances (w = .24).

The ANOVA performed on t revealed a main effect for communication (F [1, 170] = 7.48, $p < .01$) and for game type (F [1, 170] = 6.60, $p < .02$) and a significant Communication × Game-type interaction effect (F [170] = 18.08, $p < .0001$). The

4. Denote by $p(1)$ and $p(2)$ the probability of exactly one and two ingroup contributors and by $q(1)$, $q(2)$, and $q(3)$ the probability of exactly one, two, and three outgroup contributors. Then $p = [p(1) + p(2)]/2$, and $q = [q(1) + q(2) + q(3)]/3$.

TABLE 4
Means and *SD* of Subjective Probabilities

	Chicken	Assurance
No communication ($N = 30$)	$p = .375$ (.043)	$p = .474$ (.036)
	$q = .393$ (.050)	$q = .485$ (.030)
	$w = .311$ (.025)	$w = .347$ (.022)
	$t = .422$ (.048)	$t = .358$ (.033)
Communication ($N = 60$)	$p = .732$ (.043)	$p = .726$ (.048)
	$q = .513$ (.031)	$q = .639$ (.038)
	$w = .446$ (.031)	$w = .242$ (.030)
	$t = .364$ (.029)	$t = .627$ (.035)

NOTE: p indicates the probability of contribution by an ingroup member; q indicates the probability of contribution by an outgroup member; w indicates the probability of winning the game; t indicates the probability of tying the game.

interaction pattern was opposite to that described earlier for the probability of winning the game. When no communication was allowed, subjects estimated the probability that the game would be tied as .36 and .42 in the assurance and chicken games, respectively. Following group discussion, subjects in the assurance game offered a higher estimate of the probability that the game would be tied (t = .63), whereas subjects in the chicken game offered a lower estimate (t = .36).

DISCUSSION

Within-group communication increased the rate of individual contribution in both the assurance and chicken team games from approximately 40% to 75%. The level of contribution in the no-communication control conditions is similar to that found in other team game studies. It seems that in a one-shot game without communication, the majority of the individual players prefer to maximize their security level by withholding contribution (for a discussion of individual decision models in noncooperative team games, see Rapoport and Bornstein 1987; Bornstein and Rapoport 1988). The increase in contribution rates following discussion was due to the fact that the majority of the groups in both game conditions chose the most competitive strategy of designating all group members as contributors, and practically all players abided by the group decision.

Although the structural difference between the assurance and chicken games had little effect on (group or individual) choice behavior, it did have profound effects on the intragroup processes leading to these decisions. In particular, the rationale (or rhetoric) for choosing the competitive strategy (as coded from group discussions) and the beliefs of individual subjects 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 clearly was based on distrust or fear of the opponent. Ingroup members expected the outgroup to designate three contributors and decided to protect themselves against losing the competition by making the same choice. This mutual maximin scenario was reflected in the group discussions, which were characterized by risk-avoidance arguments and symmetric expectations concerning the ingroup and the outgroup. It also was manifested in the beliefs of the individual group members, as reflected in their responses to the questionnaire. Following group discussion, subjects in the assurance game reasonably scaled down their expectations of winning the game and raised their expectations that the game would be tied (as compared to subjects in the control condition). And even though subjects somewhat underestimated the probability of contribution by outgroup members, they did so to a significantly lesser extent than those in the chicken game.

In contrast, the decision to compete (designating three or two contributors) in the chicken game was based on the expectation that there would be fewer contributors in the outgroup. Such asymmetric ingroup or outgroup expectations were recorded in 40% of the groups, as compared with none in the assurance game. Specifically, subjects expected the outgroup to be less likely to choose the competitive strategy, and if such a choice was made they expected individual outgroup members to be less likely to keep it. This bias was apparent in the questionnaire data as well. Following within-group discussion, subjects estimated the contribution rate of the outgroup to be 20% lower than that of the ingroup; this bias is significantly greater than that in the assurance game. Subjects also estimated their team's chances of winning the game as higher following discussion.

How can these results be explained? One explanation is that groups are competitive rather than "narrowly" rational. Namely, groups are motivated to maximize their gains relative to the outgroup rather than their absolute (monetary) gains (Snidal 1991). When, as in the assurance game, the maximizing-relative-gain motivation is compatible with the choice of the maximin strategy, there is no need to make it explicit. It can be disguised effectively as fear and be based on the rational assumption that the outgroup also will decide to compete. When, as in the chicken game, the competitive motivation dictates the use of a nonmaximin choice, it can no longer be concealed. This interpretation receives some support from the finding that arguments for maximizing relative, rather than absolute, gains were voiced in 40% of the discussions in the chicken game, whereas in the assurance game, the discussions contained no evidence of such considerations.

The distinction between absolute (i.e., monetary) and relative gains should be clarified. In the PD game, the two are confounded because choosing the competitive strategy is rational for both monetary and relative-gain maximizers. Fear and greed therefore can be defined in either absolute or relative terms—fear being the motivation to avoid losing the competition or receiving the "sucker" payoff, greed being the desire to win the competition or receive the "temptation" payoff. This was not the case in the assurance and chicken team games. These games were structured so that there was no monetary incentive to win (rather than tie) the assurance game and no monetary incentive to tie (rather than lose) the chicken game. Thus, if we assume that groups are own-gain maximizers, greed is eliminated from the first game and fear from the second. If, however, we assume that groups are motivated to maximize relative gain, both the assurance and chicken games are transformed into zero-sum games, which include both greed (the desire to win) and fear (the desire not to lose).

Even though the groups had no way of enforcing their decisions on the individual group members, we have found that almost all designated contributors acted according to the decision reached by their group. Let us first examine the implications of this finding in the context of the assurance game. The decision to designate three contributors in this game rendered the contribution of each designated contributor critical for provision only if each player firmly believed that all outgroup members also would contribute. Any sign of undue optimism about the outgroup's behavior could seriously undermine the effectiveness of the intragroup agreement by raising the temptation for individual group members to take a free ride. This structural property of the assurance game provides an important insight into the intragroup dynamics observed in this game. As described earlier, most of the groups in our experiment decided to designate three contributors and believed that the outgroup had reached the same decision. There were no traces of ingroup or outgroup bias in either the rhetoric of the group discussion or the individual responses to the questionnaire. This perceived symmetry between the two groups is highly functional for solidifying the competitive intragroup agreement because, given the strategic properties of the assurance game, it renders the contribution of each group member critical for provision.

The intragroup problem of free riding was solved differently in the chicken game. We already have demonstrated that the absence of an equilibrium point in the two-person competition between teams A and B renders the designation of a minimal contributing set (in the formal sense defined earlier) impossible. Criticalness, in other words, cannot explain the fact that individual group members abided by the competitive group decision. Our subjects, however, seemed to abandon the game-theoretic notion of mutual rationality. Instead, they adjusted their expectations concerning the outgroup such that the ingroup's decision constituted a minimal contributing set. Designating three contributors under the assumption that there would be two contributors in the outgroup made each designated contributor critical for provision. (A similar argument can be made, of course, for designating two contributors, assuming that only one outgroup member will contribute.)

In sum, the low defection rate among designated contributors observed in the assurance and chicken team game can be explained by criticalness if one assumes that individual subjects based their contribution decisions on the same perceptions contemplated during group discussion (the questionnaire data strongly support this explanation). The alternative explanation, namely, that subjects contributed because they would derive positive utility from keeping their promise to the group, also may be true. It is quite possible that people are willing "to enter and honor commitments, even when they are costly and there is little chance of detection and censure for violating them," as suggested by Kerr and Kaufman-Gilliland (1994, 527). The most interesting possibility arising from our results, however, is that both mechanisms operate concurrently. Namely, group members use the opportunity for discussion not only to commit themselves to the competitive course of action but also to tailor their beliefs so as to rationalize this decision in the particular game structure. In the assurance game, subjects compete because they perceive the outgroup to be competitive and dangerous.

In the chicken game, they compete because they perceive the outgroup to be vulnerable and likely to "chicken out."

Of course, we do not know if these representations of the opponent are formed intentionally and consciously. It could very well be that, when discussing a group strategy, subjects in both games first apply the mutual rationality principle. However, when, as in the chicken game, this line of reasoning results in a dead end, subjects simplify the situation by creating their own image of the opponent. A study by Carroll, Bazerman, and Maury (1988) documented a similar tendency of individuals to ignore the cognition of others in competitive situations. They argue that making unilateral assumptions about the opponent while ignoring the opponent's contingent cognitive processing is a common strategy for reducing the complexity of competitive decision problems. Regardless of whether the expectations concerning the outgroup are formed deliberately or inadvertently, the result is the same. Apparently, acting on these assumptions, most of the groups in our experiment decided to compete, and consequently many of the intergroup competitions resulted in an outcome disastrous to both groups.

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