Individual Differences in Game Motivation as Moderators of Preprogrammed Strategy Effects in Prisoner’s Dilemma

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The impact of three programmed strategies (tit-for-tat, 100% cooperation, and 100% defection) on cooperation level in the Prisoner’s Dilemma game is examined as a function of the subject’s motivational orientation (cooperative, competitive, or individualistic). Motivational orientation was assessed on the basis of each subject’s choices across four classes of decomposed games. Following this assessment, subjects played 30 trials of Prisoner’s Dilemma in matrix form against one of the above-mentioned strategies. Results were wholly consistent with predictions, showing that (a) cooperatively oriented subjects cooperate with a tit-for-tat and a 100% cooperative strategy, but defect against a 100% defecting strategy, (b) competitive subjects defect against all three strategies; and (c) individualistic subjects defect against both 100% cooperative and 100% defective strategies, but they cooperate with a tit-for-tat strategy. It appears reasonable to conclude that the outcomes of a Prisoner’s Dilemma have affectively different meanings (i.e., values) for subjects of differing orientations, and that subjects of all three orientations adopt strategies that effectively maximize their particular type of reward in the game.

Motivational Orientation

Recently, Messick and McClintock (1968), and McClintock, Messick, Kuhlman, and Campos (1973) have demonstrated that a good deal of choice behavior in two-person, mixed-motive games is based on a set of three motivational orientations: (a) individualism, which is the orientation to maximize one’s own gain with no concern for the gains or losses of the other person, (b) competition, or the orientation to maximize one’s gains relative to the gains of the other person, and (c) cooperation, which is the orientation to maximize both one’s own gains and the gains of the other person. The game paradigm employed for the study of these motives is a departure from the traditional 2 x 2 matrix PD format; this departure is labeled the decomposed game.

The decomposed format presents the subject with a set of n alternatives (n = 3 in the present paper), each possessing two numbers: (a) SF is the number of units that go to one’s self and (b) OT is the number of units that go to the other subject. On a given trial, each subject’s total outcome is the sum of SF (resulting from his own choice) plus OT (resulting from the other subject’s
Effects of Motives and Strategy on Cooperation

Table 1
General Form of Prisoner's Dilemma

<table>
<thead>
<tr>
<th>Person 1</th>
<th>Cooperation</th>
<th>Defection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperation</td>
<td>$K, R$</td>
<td>$T, S$</td>
</tr>
<tr>
<td>Defection</td>
<td>$R, P$</td>
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</tr>
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Note. The payoff to the left of the comma in each cell is Person 1’s outcome; Person 2’s outcome, is to the right of the comma. Following Rapoport and Chammah (1965), $K$ indicates reward for mutual cooperation, $S$ indicates sucker’s payoff, $T$ is temptation to defection, and $P$ is punishment for mutual defection. A Prisoner’s Dilemma Game obtains when the following inequalities are satisfied: (a) $T > R > P > S$ and (b) $2R > T + S > 2P$. In the present study, $T = 200$, $R = 110$, $P = 90$, and $S = 0$.

Associated with each of the three motivational orientations is a well-specified and unique criterion for choosing between the $n$ alternatives in any given decomposed game. Specifically, individualism leads to the alternative having the largest SF value; competition leads to the alternative that maximizes SF minus OT; and cooperation leads to the alternative maximizing SF plus OT. As may be seen in Table 2, the four different game classes used in this study differ with respect to the distribution of these motivational criteria over the $n$ alternatives. For example, in the Single Dominance Game, all criteria lead to the same choice, whereas in the Triple Dominance Game each criterion leads to a unique choice.

McClintock et al. (1973) state that this format of game is desirable for the assessment of motivational (as opposed to strategic) processes. They argue that a matrix format makes the subject’s dependence on the other highly salient, leading the subject to make choices not only as a function of his/her ultimately desired outcomes (motivations) but also in consideration of how his/her actions will influence those of the other (strategy). McClintock et al. assert that the decomposed format, by its very form, de-emphasizes the total interdependence structure and hence de-emphasizes strategic considerations, causing one’s choices to be more clearly indicative of motives. Such an assertion is intuitively plausible, though the present authors know of no empirical work directly evaluating it. Whatever the relative merits of decomposed games as measures of motives, their usefulness in providing additional insight to behavior in standard PD settings is directly evaluated in the present paper. Specifically, decomposed games are used to assess a subject’s most salient motivational orientation; that subject’s response to a preprogrammed strategy in a standard PD context then indicates the extent to which the orientation is important.

Of course, evaluating the importance of orientation is possible only if variation in orientation exists. Messick et al. (1968) have shown these orientations to be experimentally manipulable. More directly related to the purposes of the present paper is a recent finding (Kuhlman & Marshello, in press) that the orientations also vary across experi-

Table 2
Decomposed Games Used in the Present Study

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<td>1 Self</td>
<td>50</td>
<td>40</td>
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TABLE 1
GENERAL FORM or PRISONER'S DILEMMA

Person 1 | Cooperation | Defection
---------|-------------|-----------
Cooperation | $R, R$ | $T, S$ |
Defection | $R, P$ | $P, P$ |

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Note. Values in the table are units. Letters in parentheses represent the goal maximized by each alternative: O = own gain, R = relative gain, J = joint gain, and N indicates that none of these three goals are maximized by this alternative.
mental subjects. The approach of Kuhlman and Marshello was to have same-sex pairs make choices across the four classes of decomposed games shown in Table 2. Each subject made his/her choices in the absence of feedback concerning the other subject's behavior. The responses made by each subject were examined to see if a single orientation determined the majority of choice within and across all four game classes. Of the 20S subjects observed, 66% showed a consistent preference across all four games; specifically, 23% responded individualistically, 29% competitively, and 14% cooperatively. That such consistency exists for two thirds of a large sample of introductory psychology students implies the potential importance of such individual differences for a more complete accounting of PD behavior.

The present experiment had subjects respond in the no-feedback decomposed game procedure just described, in order to determine each subject's most salient motivational orientation. After completing the decomposed task, subjects were exposed to a standard 2 × 2 matrix version of a PD game, in which they had complete information on each trial about the choices of the "other" subject (in fact, subjects played against a simulated other whose style of play was preprogrammed). In this PD task, the other's strategy (i.e., style of play) was manipulated as an independent variable; the other variables included were subject's motivational orientation and sex.

A great deal of prior PD research has used the programmed strategy technique to assess the impact of various strategies, which have been of two general types: (a) noncontingent, in which the confederate chooses the cooperative alternative with some fixed probability, the value of which is independent of the actual subject's choices, and (b) contingent, in which the probability of the confederate choosing cooperatively varies as some function of the actual subject's choices. In his exhaustive review of the strategy literature, Oskamp (1971) shows that a noncontingent strategy of 100% cooperation elicits more cooperative responding than one of 100% defection. The average level of cooperation elicited by the 100% cooperative confederate, however, is usually low, ranging from 40% to 50%. In discussing contingent strategies, Oskamp makes clear that the one most frequently studied is the so-called tit-for-tat; with a tit-for-tat strategy, confederate's response on trial n is a match of subject's response on trial n — 1. The tit-for-tat strategy is relatively effective in eliciting cooperation from subjects. In discussing a set of studies comparing tit-for-tat with noncontingent strategies and free-play conditions (i.e., in which there is no confederate), Rapaport (1973) states "the Tit-for-tat strategy is probably most effective in eliciting cooperative choices in Prisoner's Dilemma" (p. 27).

Although the preceding passage is an adequate summary of strategy findings viewed as main effects, several recent strategy studies suggest the necessity of considering individual differences as moderators of these effects. Specifically, Chammah (1970) found the distribution of subject's choices of a 100% cooperative strategy to be bimodal; that is, some of his subjects reciprocated the confederate's cooperation, whereas others exploited it. The present writers wish to show that Chammah's bimodal distribution can be accounted for in terms of the motivational orientations discussed in the preceding paragraphs. Two additional studies (McNeel, 1973; McNeel, Sweeney, & Bohlin, 1974) directly demonstrate the importance of motivational orientation for the effectiveness of the tit-for-tat strategy. For females (McNeel, 1973) and males (McNeel et al., 1974) McNeel found tit-for-tat to elicit cooperative choice among individualistic subjects, but he found it ineffective among competitive subjects.

In addition to tit-for-tat, the present study examines the effects of 100% cooperative and 100% defective strategies as a function of the three motivational orientations of individualism, cooperation, and competition. In the following paragraphs, the predicted response of each orientation to each of the three strategies will be developed. The approach will be to consider each orientation separately, define its goals, indicate the type of choice behavior it would manifest in the decomposed task, and then to predict its response to each of the strategies in the matrix form of PD.
Individualism. The subjects manifesting this orientation seek to maximize the absolute level of their own personal gain; for such subjects, the gains or losses of the other person possess no motivational significance. As is indicated in Table 2, such subjects would prefer the A alternative across all four classes of decomposed game. In the standard PD task (see Table 1), the outcome most preferred by individualists is $T$ (temptation to defect), then $R$ (reward for mutual cooperation), then $P$ (punishment for mutual defection), and finally $S$ (sucker's payoff). Given such a preference ordering, the effect of each programmed strategy is easily derived: (a) 100% cooperation. Such a strategy limits subject's outcomes to $T$ or $R$. The individualistic subject would choose so as to obtain the larger of these outcomes, which is $T$; therefore, against a 100% cooperative strategy in a PD game, individualistic subjects will show high levels of defection. (b) 100% defection. This strategy limits subject's outcomes to $S$ or $P$; the same reasoning as above results in the prediction that individualistic subjects will show high levels of defection against a 100% defecting strategy in PD. (c) Tit-for-tat. Against a tit-for-tat strategy, the individualist's best choice is no longer defection, as it is against 100% defecting strategies. Each time the subject defects, the tit-for-tat other defects on the next trial, and continues to defect until subject makes a cooperative response; during the trials when the other defects, subject's maximum outcome is $P$, which is less than the $R$ outcome he/she could be receiving if he/she cooperated. In order to achieve $R$ following a defection response, subject must first make a unilaterally cooperative move, thus allowing him/herself to be exploited. The subject's cooperation will be reciprocated by the other on the following trial, and continued so long as the subject cooperates. Hence one "learns" that individualistic goals are most effectively maximized by cooperation against a tit-for-tat strategy. This leads to the prediction that tit-for-tat will produce cooperation as a dominant response among individualists. Indeed, the McNeel (1973) and the McNeel et al. (1974) studies show just this result against a tit-for-tat strategy.

Cooperation. The goal being maximized here is relative gain, or the amount by which one is ahead of the other subject. The preference over the four decomposed game classes for competitive subjects would be: alternative B in the Triple Dominance and the Maximizing Difference Games, and alternative A in the Prisoner's Dilemma and Single Dominance Games (see Table 2). In the standard PD task, the preference for outcomes is determined by how much any given cell puts subject ahead of the other person; hence, the most preferred outcome is the one in which subject receives $T$ and the other receives $S$; the least preferred outcome is the one in which subject receives $S$ and the other receives $T$. The two cells along the main diagonal of the PD matrix (i.e., those containing $R$, $R$ and $P$, $P$) may be viewed as essentially neutral for this group, in that neither offers competitive advantage or poses the threat of falling behind the other. Thus, for competitive subjects, the cooperative choice in PD gains nothing; of the two outcomes that might follow a cooperative choice, one achieves no relative advantage ($R$, $R$) and the other places subject at a disadvantage (subject receives $S$ and other receives $T$). The only choice that offers the competitive subject any chance of obtaining his/her preferred outcome is defection, and this is the case independent of the other person's style of play. Hence, it is predicted that competitive subjects will show defection as their dominant response across all three strategies.

Competition. The goal being maximized here is the absolute gain of each party to the interaction; unlike individualists, cooperators view the outcomes of the other person as motivationally relevant. For this orientation, choices over the decomposed game classes would be as follows: A in the Maximizing Difference and Single Dominance Games; B in Prisoner's Dilemma, and C in the Triple Dominance Game. Although cooperative subjects do show a positive concern for the gains of the other player, it does not appear that they will tolerate exploitation. This intolerance for exploitation among cooperators is suggested by the work of Kelley and Stahelski (1970), who showed that subjects who
initially described their intentions as cooperative in a PD task made defecting choices when they were paired with another subject who defected. When paired with another who cooperated however, such subjects respond cooperatively. Similarly, Sermat and Gregovich (1966) found that subjects who initially cooperate in Chicken against a tit-for-tat strategy became competitive when that confederate switched to a defecting strategy.

These studies suggest that cooperative subjects most prefer the R, R outcome, but will not allow the other to take advantage of their cooperative behavior. This leads to the following predictions for each preprogrammed strategy: (a) 100% cooperation. Cooperative subjects will (unlike individualistic or competitive subjects) respond with high levels of cooperative choice. (b) 100% defection. Rather than allow exploitation, cooperative subjects will (like the two other motivational categories) respond to this strategy with high levels of defection. (c) Tit-for-tat. Cooperative subjects (unlike competitive subjects, but like individualistic ones) will cooperate given this strategy.

To summarize, the current study hypothesizes a specific interaction between subject’s motivational orientation (as assessed by his/her choices in the decomposed task) and confederate’s strategy as determinants of cooperative choice in the PD game. The nature of this interaction, developed in the last three paragraphs, is presented in Table 3.

### Method

**General Overview**

The experiment consisted of three orthogonal factors: (a) motivational orientation, with three levels, (b) strategy of other, with three levels and, (c) sex of subject. The motivational orientation variable was established by classifying subjects as individualists, cooperators, or competitors, based on their choice behavior in the decomposed game task at the beginning of the study. In order to be included in a given motive category, a subject had to show a clear preference for a single type of goal (either own, relative, or joint gain) across all four classes of decomposed game; the criterion for demonstrating a clear preference is given below. Once the decomposed task was completed, subjects played 30 trials of a matrix version of PD with feedback after each trial. During this period, subjects played against a same-sex simulated other whose strategy was either tit-for-tat, 100% cooperative, or 100% defective. The experiment was run until a minimum of five subjects had been included in each of the 18 cells of this design.

**Subjects**

The subjects were male and female introductory psychology students fulfilling an experimental participation requirement. In all, 70 males and 97 females were run before the requisite minimum of five subjects per cell was obtained.

**Period 1 Procedure**

Two subjects of the same sex were seated at separate tables, each subject facing a common slide projection screen. They were separated visually from one another and from the experimenter, who sat between them.

The instructions (for both Period 1 and Period 2) were designed to achieve two purposes: (a) to thoroughly instruct each subject as to how outcomes in each game task were determined and (b) to present each task in as motivationally neutral a manner as possible. This latter purpose was an effort to require the subject to use his/her own orientation in defining the nature of the experimental task. Tape-recorded instructions gave a full explanation of the decomposed task and informed subjects that their total outcome on each trial would be the result of both subjects’ choices. They were told they could make a small amount of money, based on the total number of units each accumulated over the entire experiment; the announced payoff rate was 10¢ for every 1,000 units accumulated. During the instructions a slide of a decomposed Maximizing Difference Game was projected, and subjects had explained to them how the combined choices of each person determined the total numerical outcome to each subject on a given trial. Following this, a written test was administered to determine the subjects’ comprehension of the decomposed task; the test required them to compute the outcome to each subject that would result from each of the nine possible choice combinations in a given decomposed game. Once each subject demonstrated a full comprehension of the task, the first trial began. During the 24 decomposed trials, subjects were given no feedback as to the choices of the other or the num-
number of units being accumulated, in an attempt to minimize the impact of such information on choice. Before the first trial, subjects were told that their task was to make what they considered to be the best choice on each trial.

Each trial began with the presentation of one of the four types of game (see Table 1). A few seconds after the experimenter projected the slide for a new trial, a signal light on each subject's response panel was lit, indicating to subjects that they could now make their choices. They signaled their choices to the experimenter by pressing one of three silent switches (labeled A, B and C) on their panel. This lit an appropriate light on the experimenter's panel; he then recorded each subject's response. A repetition of this procedure occurred until all 24 slides had been shown. Two copies of each game in Table 1 were presented, one appearing in the first and the other in the second 12 trials. As a control for position preference, each motive was associated with each choice alternative equally often; also, within trial blocks of four, each game class appeared once. The sequence of game class within trial blocks was random.

After the last trial, subjects were given a questionnaire asking how they were making their choices and how they thought the other subject was making his/her choices. The experimenter used this time to categorize subjects in terms of motivational orientation; for a subject to be categorized as an individualist, competitor, or cooperator, he/she had to make at least 50% of his/her choices consistent with a single motive in each of the decomposed game classes. If a subject failed to satisfy this criterion, or if he/she produced a protocol that satisfied the criterion for more than one motive, that subject was labeled as inconsistent. Within each motivational category and within sex, subjects were assigned to the three strategy conditions such that for every three subjects of a given orientation (individualist, competitor, or cooperator), each strategy was presented once; this procedure was repeated until at least five observations were made in each cell of the present 2 X 3 X 3 (Sex X Motive X Strategy) design. After subjects completed the questionnaire, instructions for Period 2 began.

**Period 2 Procedure**

Each subject was given a new response box that contained two silent switches and four lights; the lights were located at the corners of a 2-inch (5-cm) square. The PD matrix itself was not presented at this time. It was explained to subjects how each unique combination of their choice switches (each subject had two switches) would turn on a unique one of the four lights. Next a short test was given to determine subjects' comprehension of the relationship between their combined choices and the lights. After this, subjects were told that in this second part of the experiment they would also be receiving units, determined by the combined choices of the two subjects. At this point, a PD matrix was placed over each subject's response box so that the four lights already on the box were centered in the four cells of the PD matrix. In addition, a large version of this matrix was mounted on the wall in front of both subjects; this large matrix was used by the experimenter to explain the PD game to them.

The subjects were told that the numerical entries in each cell were the units that Person 1 (the row player) and Person 2 (the column player) would receive if the light in that particular cell came on. The subjects were informed that the units they accumulated in this task would also be exchangeable for money at the end of the session; again, the announced rate was 10c for every 1,000 units. The instructions concluded with a short test that specified a given outcome (such as "Person 1 receives 200 units, Person 2 receives 0 units") and then asked each subject to press the switch necessary to produce that outcome. After subjects had indicated their ability to produce all four outcomes in this manner, the PD session began. Again, subjects were instructed to make what they considered to be the best choice on each trial.

During the 30 PD trials, the experimenter provided each subject with the appropriate preprogrammed strategy in the tit-for-tat strategy the simulated other's first response was cooperative. It should be pointed out that subjects began the PD task with no information concerning the other subject's choices in Period 1, nor any information as to the number of units accumulated by either subject during Period 1. Upon completion of the 30 trials, they were told the number of units each had accumulated over the entire experiment, paid, and asked not to talk about the experiment until the end of the term.

**RESULTS**

**Choice Behavior in the Decomposed Task**

Of the 70 male subjects run, 81% satisfied the choice criterion for inclusion in one of the three motivational categories. Of the 97 females run, 70% satisfied this criterion. Thus, 57 males and 68 females are included in the analysis of cooperation level in the PD task. One might wonder if a relationship between sex of subject and motivational category exists; a chi-square computed on the 2 X 4 contingency table (Sex X Category, the four levels of category being individualistic, competitive, cooperative, and inconsistent) was nonsignificant, suggesting that

1 The procedures of the present study cause the marginal sums for sex in this contingency table to be not strictly independent of the four frequencies composing them. However, an earlier study by Kuhlman and Marshello (in press) found a similar nonsignificant chi-square when strict dependence did obtain.
males are just as likely as females to be included in a given motivational category. In addition, one might ask if sex differences occur in terms of choice consistency, regardless of specific motivation; a chi-square computed on the 2 x 2 contingency table (Male-Female x Consistent-Inconsistent) was non-significant, suggesting no sex differences in this regard. The proportion of subjects (collapsed over sex) in each category was .26 individualists, .21 competitors, .28 cooperators, and .25 inconsistent. It appears, then, that the subjects included in the following PD analysis do not comprise an atypical, or “extreme” group; 75% of the 167 subjects presented with the decomposed task show a clear preference for one of the three social goals under consideration, and are included in the results to be presented next.

Choice Behavior in the PD Game

The dependent variable here was the proportion of cooperative choices made by subjects across the 30 PD trials. These proportions were transformed via arc sine and then analyzed in a 2 x 3 x 3 (Sex x Motive x Strategy) univariate analysis of variance for unequal cell frequencies. The number of observations per cell ranged from five to nine.

The analysis indicated no main effect for sex, nor were there any significant interactions of sex with the other variables. Each of the two remaining variables yielded significant main effects. For motivational orientation, the mean levels of cooperation were as follows: .35 individualists, .12 competitors, and .67 cooperators, \( F(2, 107) = 49.51, p < .0001 \). For strategy of other, the mean proportion of cooperative choice for tit-for-tat, 100% cooperative, and 100% defective strategies was .57, .48, and .17, respectively, \( F(2, 107) = 21.76, p < .0001 \). It is interesting to note that these strategy effects, showing tit-for-tat most effective in eliciting cooperation, replicate those of prior strategy studies mentioned in the introduction.

The only interaction that reached statistical significance is the one directly related to the major hypotheses of this paper. Specifically, the interaction between motivational orientation and strategy yielded: \( F(4, 107) = 6.201, p < .0002 \). As Table 4 clearly shows, the structure of this interaction is completely consistent with that hypothesized earlier.

The analysis of this interaction was performed by computing the simple main effects of strategy at each level of motivational orientation. If the obtained \( F \) was significant, paired comparisons of the three means involved were made via the Newman-Keuls technique. As can be seen in Table 4 (the right-most entry in each row), simple main effects for strategy were obtained for individualistic and for cooperative subjects, but not for Competitive subjects. Thus, as predicted for competitors, cooperation level was unaffected by the other’s choices, staying quite low across all three strategies. Also wholly consistent with the hypothesis, cooperative subjects responded with high levels of cooperation to tit-for-tat and 100% cooperative strategies (these levels not being significantly different), but against a 100% defective strategy they show a dramatic (and significant) reduction. Finally, among individualists a tit-for-tat strategy produces significantly more cooperation than either of the two noncontingent strategies under study; the cooperation levels produced by these latter two strategies do not differ significantly.

One can also view this interaction in terms of the simple main effects for strategy at each level of motivational orientation. The \( Fs \) obtained (see the bottom entry in each row of the table) show that a 100% defective...
strategy produces high levels of defection across all three categories of subject. A tit-for-tat strategy produces cooperation among individualists and cooperators but not among competitors. Finally, a 100% cooperative strategy produces cooperation only among competitive subjects; individualists and competitors exploit such a person. This response to total cooperation is certainly consistent with the bimodal distribution obtained by Chammah (1970) mentioned in the introduction.

Analysis of Inconsistent Subjects

In a decomposed task virtually identical to the present experiment, Kuhlman and Marshello (in press) found that approximately 11% of subjects were altruistic in their orientation; that is, they appeared concerned with maximizing the other subject’s gains. The choice pattern of such subjects across the four classes of games was C in the Triple Dominance Game, B in the Prisoner’s Dilemma, and A in the Maximizing Difference Game. In Single Dominance Games 2 and 3, C was chosen; in Single Dominance Game 1, B was chosen. Of the 42 subjects labeled inconsistent in the present study, it was found that 19 (5 males and 14 females) made choices (a majority in each of the four games) consistent with this altruistic pattern.

These 19 altruists were distributed across the three strategy conditions as follows: 7 in tit-for-tat, 7 in 100% cooperation, and 5 in 100% defection. Of the remaining 23 subjects who failed to manifest an altruistic orientation, no simple description of choice behavior in the decomposed task was possible. These remaining inconsistent subjects were distributed fairly evenly across the three strategy conditions: 8, 7, and 8 in tit-for-tat, 100% cooperation, and 100% defection, respectively. The PD behavior of these 42 subjects was examined (after arc sine transformation) via a 2 X 3 (Altruistic-Inconsistent X Strategy) unweighted means analysis of variance. The analysis yielded significant Fs for both main effects, but no interaction. For motivational orientation the mean levels of cooperation were as follows: .64 altruists and .36 inconsistents, \( F(1,34) = 6.6046, p < .01 \). For strategy, the mean levels of cooperation were .57 tit-for-tat, .63 100% cooperation, and .24 100% defection, \( F(2,34) = 4.599, p < .05 \). These results suggest the desirability of a more systematic examination of altruistic motivation in future research. For the present, it should be noted that inclusion of the altruists increases the proportion of motivationally consistent subjects to 86%.

DISCUSSION

From the choice behavior in the decomposed task, we see each of the motivational orientations represented by an appreciable number of subjects. Two earlier studies also show sizable proportions of subjects in each category: Kuhlman and Marshello (in press) report values of .23, .29, and .14 for individu-

### Table 4

**Proportion of Cooperative Choice in the Motive X Strategy Interaction**

<table>
<thead>
<tr>
<th>Subject’s motive</th>
<th>Opponent’s strategy</th>
<th>Simple main effects for motive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cooperating</td>
<td>Tit for tat</td>
</tr>
<tr>
<td>Individualism</td>
<td>.31(^*)</td>
<td>.63(^*)</td>
</tr>
<tr>
<td>Cooperation</td>
<td>.92(^*)</td>
<td>.80(^*)</td>
</tr>
<tr>
<td>Competition</td>
<td>.14(^*)</td>
<td>.15(^*)</td>
</tr>
</tbody>
</table>

Note. In any given row of the table, two proportions with different subscripts are significantly different at \( p < .01 \) by Newman-Keuls test. In any given column, two proportions with different superscripts are significantly different at \( p < .01 \) by Newman-Keuls. Since no simple main effects were obtained among competitive subjects (row 3) or against a 100% defecting strategy (column 3), no paired comparisons were made over the means in row 3 or column 3.
alism, competition and cooperation, respectively; McNeel et al. (1974) reported values of .28, .49, and .13 for these same groups. In all these studies, subjects failing to show a consistent preference for a single motive have been the exception rather than the rule. It appears justified to suggest that the typical sample of college students participating in gaming research contains sizable subgroups of individualists, competitors, and cooperators. This suggests that these motives may have existed as unexplored sources of variation in prior PD research. For example, consider the finding that tit-for-tat appears most effective in eliciting cooperation in PD; its relative effectiveness can be viewed as a result of the fact that the number of subjects who would be induced to cooperate against such a strategy (cooperators, individualists, altruists) may frequently exceed the number of subjects for whom the tit-for-tat strategy has no cooperative impact (competitors). In both the Kuhlman and Marshello (in press) study and the present study this was the case. A generalization at this point would be that an important moderator of any strategy effect is the distribution of motivational orientation within that strategy treatment.

The most important point to be made in the present paper is that the effective structure of a Prisoner's Dilemma Game (and perhaps many other mixed-motive situations as well) varies from one person to the next, and a good deal of this variation may be understood in terms of the motivational orientations being considered here. (By the structure of a game we mean its distribution of rewards and costs over its specific outcomes.) Much prior theoretical analysis of mixed-motive situations has focused on the implications of structure for the decision behavior of its players. Such theoretical analysis takes as a given that the outcomes in a specified matrix are adequate representations of the preference structure of each decision maker; from this given, such analysis often yields prescriptions to the players for maximally effective choice, or strategy. (In this discussion, a decision maker who follows such a maximally effective course of action will be referred to as rational.)

Game research (as opposed to the above-mentioned theoretical analysis of games) often implicitly makes the questionable assumption of equivalence between the physical structure of the game it presents its subjects and the effective, or psychological, structure the game actually has for them. Such research frequently yields results that are at odds with the choice prescriptions of the above-mentioned theoretical analysis. A frequent reaction to this apparent theoretical-empirical gap is to question whether man can be viewed as a rational decision maker, which relegates game theory to the status of an acceptable normative system for choice, but inadequate as a descriptive account of human decision behavior. Unfortunately, this reaction suggests that we forget our experimental assumption of equivalence between the physical and psychological structure of the game we present our subjects; and as is only too obvious, game theory's ability to predict choice behavior can only be evaluated when such equivalence obtains.

As already mentioned, we feel the results of this study support the assertion that the psychological structure of Prisoner's Dilemma varies in an understandable fashion from one subject to the next. An understanding of this variance can be gained by considering the type of social goal a particular subject is motivated to maximize; we suggest that three very commonly occurring such goals are own, relative, and joint gain. Knowledge of a subject's goal allows a more accurate description of the psychological structure of Prisoner's Dilemma for that subject and places us in a much better position to determine the degree to which the subject rationally pursues his/her goals. The results of this study show that within each of the three motivational categories, the choice behavior of subjects appears quite rational indeed. That is, for each group, each strategy produced a level of cooperation effective in maximizing the rewards sought by that group. Perhaps we should be more cautious in assuming that we know the game our subjects are actually playing.

Finally, the motivational orientations studied here have been shown to possess general-
ity across the decomposed and matrix format of game presentation. The extent to which these orientations are modifiable by situational pressure and the degree to which they are stable over time seem to be highly appropriate steps for future research in this area.

REFERENCES

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Announcement
The Publications and Communications Board of the American Psychological Association announces the appointment of Anthony G. Greenwald as editor of the Journal of Personality and Social Psychology for the years 1977 to 1982.