PROSOCIAL VALUES AND GROUP ASSORTATION

within an *N*-person Prisoner's Dilemma Game

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Ninety-five freshmen each recruited three peers to play a "group bidding game," an *N*-person prisoner's dilemma in which anyone could win movie tickets depending on their scores in the game. Prior to playing, all participants completed a measure of prosocial value orientation. Replicating and extending earlier findings (Sheldon and McGregor 2000), our results show that prosocial participants were at a disadvantage within groups. Despite this vulnerability, prosocial participants did no worse overall than asocial participants because a counteracting group-level advantage arose for prosocials, who tended to be concentrated in groups. Implications of this assortative process for the egoism/altruism debate, and for hierarchical selection theory, are discussed.

KEY WORDS: **Assortation; Group selection; Prosocial values; Prisoner's dilemma.**

An important challenge for evolutionary theories of human behavior is that of understanding how prosocial or altruistic behavior can evolve (Axelrod 1984). That is, how can those who seemingly ignore or even sacrifice individual self-interest compete with those who would exploit them? This important question has spurred many theoretical advances in evolutionary biology, including the concept of inclusive fitness or kin selection

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(Hamilton 1964), which addresses the advantages of altruistic behavior aimed towards genetically related individuals, and the concept of reciprocal altruism (Trivers 1971), which addresses the advantages of altruistic behavior aimed towards unrelated individuals. Notably, both of these theories have relied on the assumption of egoism or self-interest to explain altruism, that is, they postulate that apparent prosocial acts are always interpretable in selfish terms.

Sober and Wilson (1998) have recently mounted a challenge to conventional wisdom in this area by helping to revive the concept of "group selection" as an explanation for the evolution of altruism (Wilson 1997; Wilson and Sober 1994). As originally espoused by Wynne-Edwards (1962) and others, group selection was supposed to explain adaptations in which animals would sacrifice their self-interest "for the good of the group" or "for the good of the species." In this view, an animal might elect not to mate during a time of resource scarcity or overpopulation because this would help the group or species as a whole do better than would otherwise be the case. The logical flaw in this reasoning was the assumption that individuals might literally sacrifice themselves for no return on the investment (Williams 1966). Later scientists, focusing on the gene as the unit of selection (Dawkins 1977), clearly recognized that such a trait could not evolve. Thus the concept of group selection lost favor. However, Sober and Wilson and others are now seeking to restore and expand the concept, using a hierarchical perspective (Caporael and Brewer 1995) to argue that genuine altruism does exist and has played a substantial role in evolution.

Specifically, Sober and Wilson (1998) assert that past adaptationist models of altruism have tended to commit an "averaging fallacy" in which the fitness coefficient calculated for a particular individual misleadingly collapses the within- and between-group variance components that contribute to that fitness. This practice confounds processes occurring *within* groups of individuals with processes occurring *between* groups of individuals. The danger is that theorists may tend to think of selection primarily in terms of competition between individuals, overlooking the individual fitness benefits that may accrue from between-group competition in which individuals may still benefit even as they make personal sacrifices for their groups. Wilson and Sober (1994) suggested that by paying more careful attention to these two orthogonal variance components, researchers might gain a clearer view of how emergent group-level processes influence individual fitness, thus gaining new conceptual understanding of the meaning and adaptive advantages of altruism.

Sheldon and McGregor (2000) followed this advice, using multi-level or hierarchical linear modeling techniques to simultaneously analyze the within-group and between-group effects of participants' value orientations upon their ability to reap individual profit within an iterated com-

mons dilemma. Although social dilemmas are a natural context for application of hierarchical modeling techniques, few social dilemma researchers have taken advantage of these analytical tools (Kenny, Kashy, and Bolger 1998).

In Sheldon and McGregor's experimental study, participants were placed into groups of four, depending on their score on the Aspirations Index (Kasser and Ryan 1996), which is a measure of the relative strength of *intrinsic* values (i.e., values for emotional intimacy, community feeling, and personal growth) compared with *extrinsic* values (i.e., values for financial success, fame/popularity, and physical attractiveness). Three types of groups were created using a median split of the values measure: intrinsic groups (consisting of four relatively prosocial individuals), extrinsic groups (consisting of four relatively self-oriented individuals), and mixed groups (consisting of two persons of each type). Each participant was asked to imagine that he or she was an independent timber company, making repeated anonymous annual bids within a national forest, in which the forest had a limited replenishment rate. Participants were asked to imagine that the profit to be made in this situation had value to them, and to think in terms of both immediate and future profits.

Sheldon and McGregor (2000) found that "nice groups finished first," in that members of intrinsic groups had the highest mean harvest levels during the dilemma (followed by mixed, followed by extrinsic groups). This was due to intrinsic groups' ability to forestall depletion of the resource (i.e., the "tragedy of the commons"; Hardin 1968). However a counteracting within-group effect emerged, such that more extrinsic individuals within all three types of groups out-harvested the more intrinsic members within their groups. In other words, prosocial values provided mixed blessings, in terms of resource acquisition, by simultaneously conferring both an advantage (at a between-groups level of analysis) and a disadvantage (at a within-groups level of analysis). Interestingly, in a simple correlational analysis, intrinsic values were uncorrelated with cumulative harvest. Had the analysis stopped there (i.e., had Sheldon and McGregor committed the averaging fallacy), the intriguing multi-level pattern described above would not have been revealed.

The current research attempted to develop this line of thinking further by addressing several important new questions. First and foremost is the problem of *assortation*. Given the pattern described above, it is clear that prosocial or self-restrained values can be adaptive only to the extent that individuals possessing such values can successfully associate with each other, and also exclude the "cheaters" from their midst (Tooby and Cosmides 1992). In other words, in order to be able to derive group-level benefits, prosocial individuals must be able to assort with other similarly self-restrained and cooperative individuals (Wilson and Dugatkin 1997).

Such an ability would create at least two different types of groups in the population: those containing prosocials, and those composed of the remaining "asocials." Sober and Wilson's (1998) hierarchical model acknowledges this need for group diversity, asserting that there must be substantial between-group variation for group-level processes to influence the fitness of individuals. If all groups are the same, then prosocial individuals become merely "suckers," easy targets for their more acquisitive group mates.

To examine the assortation issue we asked participants to create their *own* groups, rather than assigning them to groups as in the Sheldon and McGregor (2000) study. Participants (freshmen at the University of Missouri) filled out questionnaires and also were asked to recruit three peers to fill out the questionnaires. The questionnaires contained a "group bidding game" in which any participant could win free movie tickets, depending on his/her score in the game. Both primary participants and their chosen peers made anonymous bids in the game, enabling us to examine each person's score as a function of both within- and between-group variations.

In addition to making bids in the game along with the original study participants, the peers themselves completed the Aspirations Index, allowing us to assess the extent to which intrinsic individuals successfully assort with other such individuals (i.e., Do primary participants' value scores correlate with the scores of their chosen peers?). We believed that demonstrating a pattern of assortation, which gives prosocial participants an advantage or at least remedies their disadvantage, might represent an important new contribution to the literature on altruism, social dilemmas, and hierarchical selection theory (Caporael and Brewer 1995).

A second way that the current study extended prior work was that an actual resource (movie tickets) was at stake; thus, participants had a genuine incentive in the game. Given this fact it becomes more meaningful to speculate on the influence of an individual's choices or values upon the "fitness" of that person, in other words, his or her ability to obtain resources via their values or particular approach to life. As a third extension beyond prior studies, we employed an *N*-person Prisoner's Dilemma Game (NPDG; Komorita and Parks 1994), rather than a resource dilemma. That is, rather than making bids of how much to harvest from a common pool, participants were shown a NPDG matrix in which their own outcomes were determined by their own choices to cooperate (vs. defect), in addition to choices made by the others within their group (explained in more detail below). This allowed us to examine the generalizability of earlier results to a different type of social dilemma. As a fourth extension, movie-ticket prizes were offered for both *group*-level and *individual*-level scores. In other words, participants could win tickets either by being members of high-scoring groups (typically requiring high levels of cooperation by group members) or by being high-scoring individuals (typically

requiring high levels of defection relative to one's group members). Notably, this methodology allowed us to examine the impact of both within- and between-group variation upon both individual- and group-level outcomes. It also allowed us to examine whether some individuals might be able to win tickets via *both* individual-level and group-level routes.

In sum, the current study was designed to examine natural interpersonal sorting processes, and the effect of these processes upon participants' ability to score points within a four-person prisoner's dilemma. We hoped to show that although participants with relatively stronger prosocial values are at a significant disadvantage *within* their groups, this disadvantage is mitigated by their ability to associate with others like themselves. Hierarchical modeling techniques were used to disentangle these two sources of effects.

METHODS

Participants and Procedure

Our primary participants were 95 freshmen at the University of Missouri who were participating in a year-long study of adjustment to college. They completed a questionnaire containing the values measure in September, and a questionnaire containing the PD game the following March. Also in March these participants were asked to give sealed envelopes to three peers. Inside the envelope was a questionnaire including both the values measure and the PD game, and a cover letter asking the peer to complete the questionnaire in return for being included in a cash lottery. As a result an additional 179 "secondary" participants were recruited (N = 274 participants).[1] All participants returned their materials directly to the researchers.

Values Measure

To measure participants' prosocial (vs. antisocial or asocial) values we employed the Aspirations Index (Kasser and Ryan 1993, 1996), which was also used in the Sheldon and McGregor (2000) study. This measure consists of 30 statements regarding the future. Participants are asked to rate how important it is to them that each statement come to pass (using a 1 "not at all important" to 5 "very important" scale). Fifteen items concern the "intrinsic" values of emotional intimacy, self-acceptance, and community contribution (i.e., "I will have committed, intimate relationships;" "I will know and accept who I really am;" "I will help make the world a better place."). The other fifteen items concern the "extrinsic" values of financial success, popularity/fame, and physical attractiveness (i.e., "I will have enough money to buy everything I want;" "My name will be known

to many people;" "I will have people comment often about how attractive I look.").

The Aspirations Index was designed in large part to understand the roots of emotional well-being (Ryan 1995). Behaviors guided by intrinsic values are conceptualized as inherently meaningful and consistent with important needs and growth trends, whereas strongly extrinsic individuals are conceptualized as being overly concerned with acquiring symbols of status and worth, perhaps paying a price in terms of well-being. Past research has supported the a priori conceptual distinction between intrinsic and extrinsic values (via factor analysis; Kasser and Ryan 1996) and has also supported the claim that those who are more oriented towards intrinsic values evidence higher levels of emotional well-being and adjustment (Kasser and Ryan 1993; Kasser, Ryan, Sameroff, and Zax 1995) whereas those who are strongly extrinsically oriented are lower in many indices of adjustment.[2]

Of course, emotional well-being is not necessarily relevant to questions of adaptation, fitness, and resource acquisition. However, because the intrinsic/extrinsic value distinction maps fairly well onto the altruism/egoism distinction which is so important within evolutionary game theory, we deemed it appropriate for this study. Supporting the scale's suitability as a measure of prosociality (vs. asociality or antisociality), past research has found that intrinsic individuals contribute more time and energy to helping others (Sheldon and Kasser 1995) whereas extrinsic individuals are more likely to evidence conduct disorders and antisocial behavior (Kasser and Ryan 1993; Kasser et al. 1995).

In the current study a single "prosocial value orientation" score was computed for each participant by summing the intrinsic item ratings and subtracting the extrinsic item ratings. This measure indexes the relative importance the individual places on intrinsic versus extrinsic pursuits. Although some past work has used a regression residualization procedure to assess the relative strength of extrinsic compared with intrinsic values (Kasser and Ryan 1993, 1996), in the current study we used a differencing procedure which also has the effect of removing participants' mean level of valuing, allowing the relative within-subject valuing of different types of incentives to become clearly manifest (Schwartz 1996; Sheldon and McGregor 2000).[3]

Prisoner's Dilemma Game

Midway through the questionnaire participants encountered a "group bidding game." It was explained that the primary participant and the three secondary participants to whom the primary participant had given questionnaires constituted a four-person group, and that group members

had the opportunity to win free movie tickets, depending on their choices in the game. There were two ways to win tickets: by attaining a high individual score (the top 40 scorers would receive two tickets each) and/or by attaining a high group score (each member of the top ten groups would receive two tickets each; all ties to be broken by lottery).[4] It was emphasized that the choices *must* be made alone without any communication, and we recommended that participants refrain from talking about the game amongst themselves for at least two weeks afterward.

Each participant made a series of five bids, corresponding to five rounds of the game. Five rounds were chosen in order to permit aggregation, reduce measurement error, and thus enhance statistical power. In a given round, participants could either choose to "cooperate" or to "get ahead," and we pointed out that in making their decisions participants might want to consider both *what* the other members of their group were likely to do (cooperate or get ahead?) and also *when* they were likely to do it (early or late? Of course since there was no feedback regarding others' choices on "earlier" rounds, these five bids actually represent five "one-shot" prisoner's dilemmas, rather than an iterated dilemma).

Table 1 contains the outcome matrix that was presented to participants, which was later applied to determine points in each round of the game. This matrix meets the formal criteria for an *N*-person prisoner's dilemma in that participants could always obtain more individual points by defecting than by cooperating, but the greater the number of people within the group who defect, the less everyone receives (Komorita and Parks 1994). There were two dependent measures of interest in the study, which were derived by applying this outcome matrix: each participant's total score (summed over the five rounds) and each group's total score (also summed over the five rounds).

For some primary participants we received questionnaires back from only one or two peers, rather than the desired three peers. As a result we found ourselves with 24 groups of four, 36 groups of three, and 35 groups

Table 1. Outcome Matrix Applied to Each Round of the *N*-person Prisoner's Dilemma Game

	Individual Score	*Group Score*
If all four choose C:	Each gets 8	Group gets 32
If three choose C and one chooses G:	Cs get 6, G gets 11	Group gets 29
If two choose C and two choose G:	Cs get 4, Gs get 9	Group gets 26
If one chooses C and three choose G:	C gets 2, Gs get 7	Group gets 23
If all four choose G:	Each gets 5	Group gets 20

C = Cooperate, G = Get ahead (defect)

of two (24 + 36 + 35 = 95 primary participants). In order to retain all participants for analysis, we did the following: for two-person groups, if both cooperated on a given round, both received eight points for that round and their group received 32 points. If one cooperated and the other defected, the first received four points and the second 9 points, and the group received 26 points. If both defected both received five points, and the group received 20 points (in other words, the second and fourth lines of the outcome matrix shown in Table 1 were not applied for two-person groups). For three-person groups only the third line of the outcome matrix was not applied, since no balanced mixed outcome was possible in these groups.

Importantly, a preliminary analysis of both individual scores and group scores by type of group (2-, 3-, or 4-person) revealed no effects of group type, indicating that these outcome measures were not biased depending on what size group participants were in (and thus were also not biased by our ad hoc solution for computing comparable scores for those in 2-, 3-, and 4-person groups). These findings help rule out the possibility that some primary participants deliberately chose to give questionnaires to fewer peers, or colluded with their peers within the smaller groups, in an attempt to maximize their scores. It is also worth noting that Hierarchical Linear Modeling (HLM; Bryk and Raudenbush 1992), the statistical software used for our primary data analysis, is well-equipped to deal with differing values of n at the within-group level of analysis.

RESULTS

Preliminary Results

Table 2 contains descriptive statistics for all major study variables, separately for primary and secondary participants as well as combined across

Table 2. Descriptive Statistics for Major Study Variables

	Mean	*s.d.*
Total Group Score (95 groups)	147.31	11.28
Primary participants (n = 95)		
Prosocial Value Orientation	23.67	12.35
Total Individual Score	36.53	5.10
Secondary participants (n = 179)		
Prosocial Value Orientation	24.26	14.38
Total Individual Score	36.96	7.25
All participants (N = 274)		
Prosocial Value Orientation	24.06	13.68
Total Individual Score	36.81	6.50

the whole sample. As can be seen in this table, primary and secondary participants did not differ from each other in either their mean prosocial value scores or their mean total individual scores in the NPDG. In other words, there were no systematic differences between the original 95 participants and the 179 additional participants they recruited for the study. Thus it is appropriate to create a single combined sample of 274, as will be done in the HLM analyses below. It is also worth noting that participants cooperated an average of 3.91 times over the five choices (a 78% cooperation rate), and that primary and secondary participants did not differ on their levels of cooperation in the five choices. Notably, this cooperation rate is relatively high for research of this type (Caporael et al. 1989). One can speculate that informing participants that they were part of a particular group chosen by the primary participant may have tended to create a cooperation-enhancing group identity (Brewer and Kramer 1986), or that the use of the term "get ahead" in the instructions may have depressed defection rates somewhat.

Primary Results

Assortation. For each primary participant we created a "peers' prosocial values" variable by computing the mean prosocial value score for that participant's associated group mates. In the case of two-person groups this variable was based on one peer score, for three-person groups it was based on two peer scores, and for four-person groups it was based on three peer scores. We then regressed the primary participant's prosocial value score upon the mean of his/her peers' scores. Based on the assumption that the true values of the participant's typical associates are better estimated in the larger groups, we used a weighted least squares approach in this regression, giving greatest weight to scores based on three peers and the least weight to scores based on only one peer. The resulting standardized coefficient was .18, $p = .08$ ($n = 95$), providing some support for the proposition that those with similar values associate with one another (further support is provided below). In other words, it appears that intrinsics tended to choose other intrinsics, and extrinsics tended to choose other extrinsics. Notably, the mean level of group prosociality did not vary depending on whether the groups consisted of two, three, or four people, further suggesting that our decision to retain all groups for analysis did not introduce biases into the data.

Group-level analyses. Next we attempted to predict the PDG scores achieved by the 95 groups, using the mean prosocial value score associated with each group. These analyses, focused solely at the group level, required no special statistical treatment. The group mean prosocial value scores used for this analysis included the primary participant's own prosocial value score as well as his/her peers' scores ($M = 24.2$, as in Table

2). The group mean PDG score was computed using the rules given in Table 1 ($M = 147.3$, s.d. = 11.3).

A simple correlational analysis revealed that the mean prosociality of the group predicted the group's total PDG score, $r = .33$, $p < .01$. In other words, "nice groups" tended to receive more points. Scrutiny of the data revealed that 19 of the 95 groups achieved the maximum possible score of 160, which resulted only when all members cooperated on every round. Again, these groups tended to be higher in their mean level of prosocial value orientation. The lowest group score obtained was 106, 6 points more than the minimum possible score. This lowest-scoring group also had a very low mean prosocial value score (12.2).

Individual-level analyses. We next conducted a regression predicting individual score from individual prosocial value score, controlling for group membership (via entry of a set of 94 dummy-coded variables). Such covariance analyses are commonly conducted when the upper-level unit is considered to be a nuisance variable (for example, in analyzing the effect of socioeconomic status upon children's standardized test scores within a school one might control for the particular classroom in which the children are nested; Bryk and Raudenbush 1992). These analyses revealed a significant negative effect of prosocial value orientation ($\beta = -.16$, $p < .01$, $n = 274$), suggesting that prosocial values gave a significant disadvantage in the individual-level game.

However, our conceptual model specifies that group-level effects are *not* nuisance variables, but a crucial part of how prosocial individuals do well in life, despite their vulnerability. Thus, rather than simply removing group-level effects, we next attempted to model them. We hoped that this analysis would reveal that prosocial participants are not so bad off after all.

Multi-level analyses. Specifically, we employed HLM statistical software (Bryk and Raudenbush 1992), which correctly partitions within- and between-group variance while computing separate error terms at each level of analysis. This allows for appropriate significance testing of effects at the two levels of analysis, and also examination of interactions between within- and between-group effects. For example, it is possible that the within-group slope relating individual prosocial values to individual score varies as a function of between-group variables (such as the mean level of prosocial values of the group). As discussed above, the models focus on the complete set of 274 participants nested in 95 groups and thus were able to address the question of interactions between levels of analysis.

A first step in HLM modeling is to compute intra-class correlation coefficients (ICCs) for the outcome variables, which indicate the extent to which group-level variation influences individual-level outcomes. ICCs are computed by running so-called unconditional models. When ICCs are

small, group memberships can be ignored, and all individuals can combined into a single pool. For example, one might treat all students within a school alike, if there is no classroom-level influence upon student outcomes. ICCs greater than .10 are typically taken to mean that there is appreciable group-level variation (Lee 1998).

An unconditional HLM run revealed an ICC for Total Individual Score of .43 (corrected for unreliability; Bryk and Raudenbush 1992). This indicates that 43% of the variation in individual NPDG scores is between groups, a substantial amount.

Next we computed the ICC for participants' prosocial value scores. To find a substantial coefficient here would provide further support for the assortation hypothesis, that is, the notion that a primary participant's choice of peers to receive questionnaires created a group of like-minded individuals, different from other groups. This unconditional HLM analysis found an ICC of .35, indicating that 35% of the variation in individual prosocial value scores occurred between groups. Again, since these groups were created by the primary participants' own choices, the nonrandomness of the groupings tends to suggest an assortation process.

Turning to our primary hypothesis tests, we focused on individual NPDG scores for the full sample of 274 participants, and in this analysis both between- and within-group effects were simultaneously represented by including the participants' own prosocial value score and the mean prosocial value score for his or her group in the model (Bryk and Raudenbush 1992). The standardized coefficient for the between-group effect was .23 ($p < .01$), indicating that those within more prosocial groups tended to receive higher individual NPDG scores. The standardized coefficient for the within-group effect was $-.22$ ($p < .01$), indicating that those who were more prosocial than the others within their groups tended to receive lower individual scores. The interaction between levels of analysis was not significant ($p > .5$), indicating that the negative slope relating prosocial values to individual within-group scores did not vary as a function of the mean prosociality of the group. In other words, having relatively strong intrinsic values (compared with others in the group) conferred the same disadvantage within both extrinsic and intrinsic groups.

Figure 1 illustrates the pattern by presenting predicted values for four hypothetical participants who were one standard deviation above or below their group's own mean level of prosociality, and who were in groups one standard deviation above or below the sample mean level of group prosociality. As can be seen, those in more prosocial groups tended to earn more individual points, but those who were relatively more prosocial within their groups tended to earn fewer individual points. Thus, in essence, the two effects tended to cancel out (indeed, a correlational analysis revealed that individual prosocial value was not significantly associated with individual score). As can also be seen in the figure the slopes of

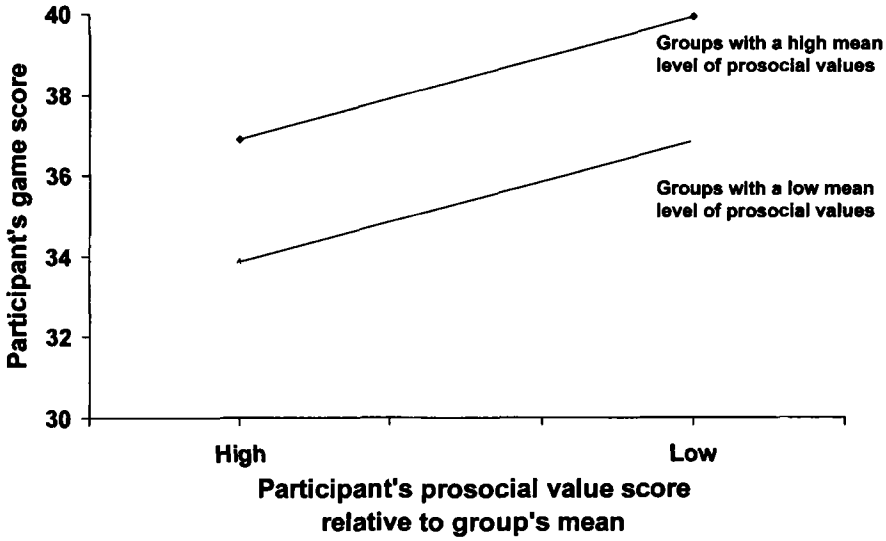

Figure 1. Predicted total individual scores for four participants relatively low or high in prosociality within groups low or high in mean prosociality.

the two lines are essentially parallel, in keeping with the finding of no significant interaction between these two levels of analysis.

These results clearly reveal the beneficial effects of assortation for the more prosocial individuals within the sample. Again, prosocial individuals tended to be grouped together, owing to the primary participants' choices of who should receive the questionnaires. Indeed, the significant group-level effects within the above HLM model rely on this assortation effect (since without such a nonrandom influence the groups would not have differed from each other). And, as established above, highly prosocial participants would definitely *lose* at the individual level were it not for this ability to group together—but because of this ability, they neither win nor lose. In the current study design prosocials also gained a definite *positive* benefit via their assortation, in that those within more prosocial groups were more likely to win tickets via the high-group-score route.

As a final set of analyses we focused on two dichotomous outcome variables, namely, whether the participant actually won movie tickets or not, in both the individual-level and group-level games. This analysis is analogous to biological threshold models, which specify for example that a certain minimum body weight is needed to survive the winter. Replication of our findings in this set of analyses would demonstrate greater robustness of results. Again, the top 40 individuals and those in the top 10 groups received movie ticket prizes. Paralleling the results presented above for individual score, prosocial values were a liability for individuals winning

tickets within groups ($\beta = -.20$, $p < .05$) and a boon between groups ($\beta = .25$, $p < .01$). Only group mean prosocial value scores predicted ticket-winning at the group level ($\beta = .17$, $p < .05$). Thus, as in the earlier analyses, prosocial values were neither a help nor a hindrance for winning individual-level prizes, but they were a help for winning group-level prizes because of the concentration of prosocial participants within particular groups.

Interestingly, *none* of the study participants was able to win tickets by *both* means. Again, 19 groups "tied for first" in the group-level game by all cooperating on every round (the members of 10 of these 19 groups received movie tickets, determined by lottery). The participants in these 19 cooperative groups all earned $5 \times 8 = 40$ individual points (see Table 1 for scoring rules) which placed them at the seventy-eighth percentile of the individual score distribution, lagging behind 58 other participants (40 of whom received tickets). Thus, cooperators in cooperative groups "attained the threshold" for the group-level prize and nearly attained the threshold for the individual-level prize. Had more individual prizes been awarded (e.g., 80 awards rather than 40 as in the current study), then many prosocial participants would have won by both means.

DISCUSSION

Too often the debates concerning the evolution of cooperation are abstruse and lofty, relying on computer simulations or mathematical models somewhat isolated from the natural world they hope to explain. The present study tried to remedy this by examining a difficult conceptual issue, the scientific utility of the concept of multilevel selection, within a real-world contest. Specifically, it addressed people's ability to secure resources in a group context as a function of both their prosocial (vs. more self-oriented) values and their choices of associates. Because the prisoner's dilemma game we employed gave participants a meaningful resource to vie for (free movie tickets), our adaptationist assumptions regarding the meaning of participants' values and behaviors in this situation are more plausible than those made in many scenario-type studies.

As would be expected given their greater materialism, extrinsic (or asocial) participants made more defection choices during the PD, and thus tended to score more points than their associated group mates. However an equally strong determinant of participants' scores was the overall character of the group in which they were embedded, and which in turn reflected the character (i.e., the values) of the primary participant who created the group. Specifically, highly extrinsic primary participants tended to select other materialists as peers to participate in the study. This limited their ability to achieve both high individual and high group scores,

since they had no "suckers" to exploit and could not trust each other to cooperate. In contrast highly prosocial participants tended to select other prosocial individuals as peers, which mitigated their within-group disadvantage and also created the potential to do very well in the group-level game. Extrapolating from the data, one can speculate that the latter type of group would also do better in "survival" situations, to the extent that survival requires harmonious group functioning (Caporael and Brewer 1995). In this case the relative frequency of prosocial individuals' genes in the population might increase over time, despite the fact that prosocial individuals tend to lose ground within their current group.[5]

Of course the current study, which focused on a single game, is not sufficient to examine changes in population frequencies over time. However, the results do suggest that prosocials would at least maintain their relative frequency in the population (rather than being eliminated over time) because the better performance of groups containing prosocial participants tends to raise prosocials' scores (on average) within the distribution. It is also notable that the coefficient of assortation uncovered in the current study was rather weak (.18). We believe that this reflects a non-strategic assortation process, in that primary participants doubtless chose peers largely on the basis of convenience. If we had instead put the game at the forefront of the questionnaire, emphasizing the potential importance of selecting appropriate group members, then prosocial participants might have been more selective in their choices of peers and the potential disadvantages of prosociality may have been mitigated even further, perhaps even yielding a net benefit for the trait in predicting individual scores. In this light, the fact that prosocials could benefit from assortation, even without any conscious or strategically informed choice on their part, may attest to the robustness of the proposed adaptation. Of course it will take further research to test these conjectures.

Interestingly, the current data suggest (as did the earlier Sheldon and McGregor study) that the *best* way for an extrinsic primary participant to achieve a high individual score would have been to choose very prosocial peers for his/her group and to defect on every round while those others cooperated on every round.[6] Indeed, five participants in the current study achieved the maximum possible individual score of 55 by defecting five times while their group mates all cooperated five times, and these participants indeed had lower prosocial value scores than their group mates (although the difference was not significant because of the small n for the comparison). Again, however, such "foxes in the henhouse" were fairly rare; instead extrinsics tended to associate with one another, and as noted above, this limited their individual scores. Conversely, intrinsics tended to associate with each other, gaining definite benefits.

A final issue concerns the psychological meaning of altruism. In this study we found that prosocials did better in the group game, and no worse

in the individual game, despite their vulnerabilities. Thus, it appears that nice guys may sometimes finish first after all, at least to the extent that they manage to assort with one another. But does this mean that altruism is just another way of deriving individual benefits? Of course. After all, that which does not ultimately serve the gene is unlikely to propagate widely. But given the current finding that altruism tends to cost the person within his/her immediate group context while perhaps yielding difficult-to-see group-level benefits to the person, and given that altruistic behavior usually occurs without personal benefit in mind but instead comes with a sense of contributing to something beyond the self (Sober and Wilson 1998), we believe defining such behavior as selfish by fiat trivializes the issue and runs the risk of obscuring or lumping together distinct and important dynamic and functional processes. In other words, it is useful to make a distinction between the *intention* of altruistic behaviors (which often involve self-sacrifice) and the *outcomes* of such behaviors (which are often self-beneficial). By doing so, substantial confusion may be avoided.

Further research being planned will investigate the specific processes by which persons of different value-types assort into groups with one another and will also study the relative ability of prosocials and antisocials to "detect" each other within short interactions. These studies will shed further light on this interesting intersection of group, personality, and evolutionary psychologies.

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NOTES

1. For some primary participants we received questionnaires back from only one or two peers, rather than the requested three. Our method for dealing with this problem is described below.

2. It is important to note that the Kasser and Ryan (1993, 1996) model and research do not indicate that wanting attractiveness, popularity, and money *per se* are detrimental for well-being—these desires appear to be problematic *only* if they are more strongly held than are intrinsic or more growth-consistent values, indicating a possible imbalance within the person's value system.

3. Sheldon and McGregor (2000) scored similar data by subtracting intrinsic from extrinsic to create an "extrinsic value orientation" score. They scored the data in this direction because their conceptual focus was understanding what brings about the "tragedy of the commons." However in the current study we scored the measure in the intrinsic or prosocial direction by subtracting extrinsic from intrinsic, since the conceptual focus of the study concerns intrinsics' ability to associate with each other. This decision, made for the sake of convenience, has no bearing on substantive results.

4. Because neither we nor the participants knew how many groups would finally be included, technically speaking, the NPDG was not well-specified for the participants. However, given that all participants faced this uncertainty, and given that it corresponds to many real-world scenarios in which exact payoff matrices and probabilities are unclear at the time choices are made, we did not feel this was a significant problem.

5. This phenomenon has been referred to as Simpson's paradox (Simpson 1951; Sober and Wilson 1998) and requires generational mixing or periodic merging between groups to occur.

6. In this light, it is possible to view the trait of Machiavellianism as an adaptation by extrinsics to penetrate communities of intrinsics. Machiavellians are reward-oriented individuals who are charming and persuasive (Wilson et al. 1996), a skill which may allow them "access" to prosocial camps. Thus it is possible that the five highest individual scorers in the study, mentioned above, may have been especially high in Machiavellianism. Unfortunately we did not measure this trait in the current research.

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