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**Egocentrism in the Volunteer’s Dilemma**

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**Abstract**

In a volunteer’s dilemma (VoD), one person must make a material sacrifice so that others benefit. If no one makes a sacrifice, everyone is worse off than a volunteer. How do people make the decision to volunteer? We explore four *a priori* strategies in a two-person one-shot VoD. Two strategies focus a person’s attention to either his or her own (egocentrism) or the other’s (allocentrism) highest potential payoff. The third strategy (collectivism) directs attention to both players’ payoffs and thereby maximizes joint outcomes by finding the best pure Nash equilibrium. The fourth strategy (classic rationality) also directs attention to the other’s payoffs to enable a mixed-motive Nash equilibrium. The results of two experiments with a set of asymmetrical games show a pattern consistent with egocentrism; yet, all four strategies yield similar degrees of volunteering overall. Also consistent with egocentrism, respondents project their own preferred decisions onto others. We discuss the contributions of egocentric reasoning to the provision of public goods.

*If everything on earth were rational, nothing would happen*.

(F. Dostoyevsky, cited in Gigerenzer, 2014)

A group of soldiers is huddled in a trench awaiting the enemy’s attack. A hand grenade suddenly lands among them. The soldiers realize that they have no time to run and that if they all freeze, they will all be killed. Yet, if they all try to save their comrades by throwing themselves on the grenade, they will also all die. The best solution in this terrible situation is that exactly one soldier sacrifices himself so that the others may live.

This vignette illustrates the volunteer’s dilemma (VoD, Rapoport, 1988) in its starkest form. To volunteer is to make a personal sacrifice. Thus, volunteering is prosocial, but it is not cooperative in the sense of providing positive coordination. Instead, the VoD demands negative coordination. The best response is whatever the others are not doing. Social life presents many VoDs, usually in mild form, such as when family members wonder who will take out the trash, co-authors who will write the first draft, and students who will answer the professor’s question (Böhm, Betsch, & Korn, 2016; Bolger, Pulford, & Colman, 2008; Diekmann, 1993; Murnighan, Kim, & Metzger, 1993). Despite its widespread presence in social life, the VoD has attracted little research attention, perhaps in part because people fail to realize that a challenging social situation is indeed a VoD. In social psychology, the classic bystander problem (Darley & Latané, 1968) amounts to a VoD for the potential aides in an emergency situation (Fischer et al., 2011; Krueger & Massey, 2009). A distinctive feature of the VoD is that a single intervener (or a specific limited number) can save the day. If more try to help, the result is crowding and inefficiency. This inefficiency sets the VoD apart from public-goods dilemmas, in which more voluntary cooperation further increases collective well-being, as, for example, in voting (Krueger & Acevedo, 2008), saving energy, or donating blood (Benabou & Tirole, 2006).

Game theory assumes that individuals, or “players,” rank the four possible outcomes and that these rankings can be treated as ordinal preferences: First, it is best to defect if the other person volunteers (Diekmann, 1985). Using Rapoport’s (1967) notation, we refer to this payoff as T = 2, for ‘Temptation.’ Second, the payoff R = 1 is the ‘Reward’ for volunteering regardless of the other person’s choice. Third, the payoff P = 0 is the ‘Penalty’ visited on mutual defectors. Tables 1a and 1b respectively show the notation and the numerical preferences.

Table 1a

*Symmetric Volunteer’s Dilemma Structure (notation structure)*

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Column Player | |
|  |  | Volunteer | Defect |
| Row Player | Volunteer | R | R | R | T |
| Defect | T | R | P | P |

*Note*. R = Reward received for volunteering; T = Temptation payoff received for defecting against a volunteering partner; P = Penalty received for mutual defection.

Table 1b

*Symmetric Volunteer’s Dilemma Structure (unit structure)*

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Column Player | |
|  |  | Volunteer | Defect |
| Row Player | Volunteer | 1 | 1 | 1 | 2 |
| Defect | 2 | 1 | 0 | 0 |

The VoD has two pure Nash equilibria. Generally, a Nash equilibrium exists “when all the players are simultaneously making a best reply to the strategy choices of the others” (Binmore, 2007, p. 14). If one player volunteers and the defects in a two-person dilemma, neither has reason to switch strategy. If the dilemma were to unfold sequentially, the second player would choose the opposite of the first player. A third equilibrium is probabilistic or “impure.” Lacking knowledge of what the other person will do, players achieve a mixed-strategy equilibrium by volunteering with probability p = (R – P) / (T – P). For the payoffs in Table 1b, p = .5. This probability, which game theory ascribes to both players on the assumption of rationality, is not efficient. Each player would earn more if both volunteered with probability (T + R – 2P) / (2(T – P)), here .75. Though efficient, this “superrational” strategy permits exploitation (Diekmann, 1985). A self-interested player who expects the other to play superrationally will defect. Note that the calculation of these game-theoretic benchmarks requires that the numerical preferences be treated as interval-scaled values, an assumption we henceforth accept.

The two strategies derived from classic game theory respect all of the available payoff information. Though mathematically simple, these strategies differ in their underlying psychology. The superrational strategy suggests a motive to maximize joint outcomes and an expectation that others share this motive. In other words, collectivist players behave like individuals who are conditionally prosocial (Van Lange, 1999). They volunteer with a higher probability than a Nash rationalist would, and expect the other player to do the same. In contrast, the Nash equilibrium strategy assumes the player seeks to render any potential opponent to be indifferent between available choice options. If one player volunteers with the Nash probability, the expected value of volunteering is the same as the expected value of defecting for the other player (Binmore, 2007). The other player has no incentive to defect in hopes of greater rewards. This player might, however, be interested in competitive play and defect out of spite, thereby reducing the first player’s payoff.

Though mathematically elegant, the game-theoretic strategies do not exhaust what is psychologically plausible. In uncertain social contexts, such as one-shot dilemmas, people often deploy simple judgmental heuristics (Kahneman, 2011; Krueger, 2014). Heuristic strategies are frugal (Gigerenzer & Gaissmaier, 2011) in that they focus attention on a few or even a single salient variation in the environment (here: the payoffs). Consider the heuristic of egocentrism. This strategy recommends volunteering inasmuch as unilateral defection provides only limited gains. All other payoff information is ignored. Now consider the heuristic of allocentrism. This strategy recommends volunteering inasmuch as the potential payoff for the other person is high, while ignoring own payoffs. Finally, the strategy of collectivism combines ego- and allocentrism by asking whether the unilateral defection payoff for the self or the payoff for the other is high. None of these heuristics requires considerations about what the other person might do, that is, they deliver decisions without providing estimates of expected value.

Our research goal was to study the relative prevalence of these *a priori* strategies. We submit that an understanding of such decision strategies is essential for any investigation or intervention targeting the attainment of “optimal” rates of volunteering. To reach this goal, we designed a set of modified VoDs so that each strategy produces a unique pattern of predicted volunteering over games. In our design, the collectivist strategy maximizes joint payoffs; we therefore drop the superrational strategy from consideration. Using responses to multiple games, we unconfound the partially overlapping predictions of the four strategies. While each strategy has a distinctive theoretical rationale, our intent was to see if one of them would emerge as a popular “favorite” among our respondents. In previous research, we saw close linkages between heuristic and egocentric reasoning in social dilemmas (Evans & Krueger, 2016). We therefore thought that the egocentric strategy might be the most common. If so, there would be further evidence for the idea that even individuals with an egocentric outlook on social dilemmas can contribute to the social good. Such an outcome would be of critical interest because egocentrism is also associated with a variety of detrimental outcomes in strategic settings (Chambers & de Dreu, 2013; Epley, Caruso, & Bazerman, 2006). We now elaborate our research approach and the hypotheses in greater detail.

**Research Strategy and Hypotheses**

It is important to recognize that choices in a single VoD cannot reveal the player’s strategy. Even if the probability over players(i.e., the relative frequency of volunteering) matches a particular game-theoretic prediction, this aggregated result may be the product of many different combinations of strategies distributed over respondents. For example, observing that most people defect in a single manifestation of the game cannot tell us whether egocentric or Nash-rational strategies are being employed. We solved this problem by designing four games with asymmetrical payoffs – displayed in Table 2 – with the critical feature that the only source of variation is the size of the temptation payoff T (for unilateral defection) for one of the players. This design allows the following differential predictions. First, egocenters volunteer inasmuch as their own T is low, that is, if there is little to be gained from defection. Second, allocenters volunteer inasmuch as the other’s T is high, that is, when their own volunteering can do the most good for the other. Third, Nash rationalists volunteer inasmuch as the other’s T payoff is low so as to keep that person indifferent between volunteering and defecting (Tsebelis, 1989).[[1]](#footnote-1) With its presumed attention to the other player’s T payoffs, the Nash strategy is frugal too, though because of its formality, we treat it as an algorithm instead of a heuristic.[[2]](#footnote-2) The mixed-strategy Nash probabilities are described in Table 2. Finally, the collectivist strategy considers variations in both sets of payoffs. Across the four games, the collectivist responds like an egocenter when there is variation in own T, and it responds like an allocenter when there is variation in the other’s T.[[3]](#footnote-3)

Table 2

*Asymmetric Volunteer’s Dilemma Structures*

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **High Temptation** | | |  | |  | | **Low Temptation** | | |
|  | ***Game 1*** | Volunteer | Defect |  | | ***Game 2*** | | Volunteer | | Defect |
| **Self- varied** | Volunteer | 1 | 1 | 1 | 3 |  | | Volunteer | | 1 | 1 | | 1 | 3 |
| Defect | 4 | 1 | 0 | 0 |  | | Defect | | 2 | 1 | | 0 | 0 |
|  |  |  |  |  | |  | |  | |  |
|  | ***Game 3*** | Volunteer | Defect |  | | ***Game 4*** | | Volunteer | | Defect |
| **Other- varied** | Volunteer | 1 | 1 | 1 | 4 |  | | Volunteer | | 1 | 1 | | 1 | 2 |
| Defect | 3 | 1 | 0 | 0 |  | | Defect | | 3 | 1 | | 0 | 0 |

*Note*. Units express generic payoff amounts, where 0 denotes the lowest payout and 4 denotes the highest. The Nash mixed-strategy equilibria for the row player are to volunteer with a probability of: 1/3, 1/3, 1/4, 1/2, respectively for Games 1-4. For the column player, these probabilities are 1/4, 1/2, 1/3, 1/3.

Table 3 shows the four distinctive patterns associated with the hypotheses. The *egocentrism* hypothesis predicts the highest volunteering for Game 2 where own T = 2, intermediate in Games 3 and 4 (own T = 3), and lowest in Game 1 (own T = 4). In other words, egocentrism predicts that individuals will respond to temptation in their own payoffs while ignoring temptation in others’. The *allocentrism* hypothesis predicts the highest volunteering for Game 3 (other’s T = 4) and lowest for Game 4 (other’s T = 2). The *Nash* hypothesis predicts that the probability of volunteering is highest in Game 4 (other’s T = 2) and lowest in Game 3. Finally, the *collectivism* hypothesis combines these predictions, such that volunteering would be high in Games 2 and 3 and low in Games 1 and 4. The four strategies are not exhaustive; other patterns are possible. For example, a competitive or spiteful person might combine egocentric preferences when own T payoffs vary with Nash preferences when the other player’s T payoffs vary. We set aside this and other strategy types because they are empirically rare or theoretically implausible (Au & Kwong, 2004).

Table 3

*Strategy-Generated Hypotheses for Asymmetric VoD Games*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Self Temptation** | | **Other Temptation** | |
| **Strategy** | High (Game 1) | Low (Game 2) | High (Game 3) | Low (Game 4) |
| Egocentrism | < | | = | |
| Allocentrism | = | | > | |
| Nash | = | | < | |
| Collectivism | < | | > | |

*Note*. > denotes greater volunteering left of the symbol; < denotes greater volunteering right of the symbol; = denotes no difference in volunteering between games.

It is noteworthy that neither of the two strategies derived from classic game theory nor the two strategies using simple heuristics refer to players’ expectations regarding the other’s choice. In a one-shot dilemma with an unknown person, it is assumed that expectations are generated *ex post* on the basis of the player’s own choice. This way of generating expectations may also be described in heuristic terms. Specifically, once a person has committed to a response, he or she projects this response onto the other as a best guess of that the other will do, and hence as a best guess of what his or her own payoff will be (Dawes, McTavish, & Shacklee, 1977; Krueger, 2013). Consistent with the projection heuristic, prior research on the VoD shows strong correlations between a player’s choices and the choices expected of others (Krueger, Ullrich, & Chen, 2016). We expected to replicate this finding, and to explore whether the strength of projection varies with the chosen decision strategy. To do so, we opted to collect both behavioral decision data as well as respondents’ expectations for their partner’s decision. This method also allowed us to include participants’ expectations as covariates for the primary hypothesis tests regarding the four decision strategies.

Note that the present investigation does not directly speak to social preferences or value orientations (Balliet, Parks, & Joiremans, 2009). There is a conceptual link between egocentrism and allocentrism on the one hand and proself and prosocial values on the other, but there is no identity. The heuristic strategies studied here refer to differences in a person’s attentional focus and mode of information processing; they do not assume that individuals subjectively transform payoffs to serve their needs and desires. Future research may address the empirical relationships between these distinctive constructs. We return to this issue in the final section of this article.

The present report comprises two studies. The first study is a direct test of the relative prevalence of the four decision strategies; the second study is a two-part replication, which introduces a manipulation of social distance between the respondent and the other player (see also Krueger et al., 2016). Both studies use a “strength-of-preference” measure. This measure offers greater statistical power than a binary-decision measure, while it can be dichotomized to represent probabilistic outcomes over individuals (MacCallum, Zhang, Preacher, & Rucker, 2002). We analyze the data both ways and note the similarity of the patterns. Yet, our inferential statistics are focused on the continuous rating data in the interest of statistical power considerations. After presenting the results of the two experiments, we conduct additional analyses on the pooled data to highlight the overall patterns that emerge consistently within each sample. Then, to explore the implications of the findings, we sketch a set of simulation experiments. The intent of this work is to shed light on the ‘survival’ value of the four strategies in various environments. Details are available in the Appendix.

**Study 1**

We predicted that differences in the preference for volunteering over the four games would mostly reflect the egocentric strategy. This prediction has support in previous research, which showed that most individuals are most attentive to what they themselves stand to gain or lose in a social dilemma, before considering the consequences for others (Evans & Krueger, 2011, 2014; Murnighan et al.,1993). Egocentrism is a critical heuristic because the outcomes of social dilemmas are by definition determined by both one’s own choices and the choices of others. Yet, egocentrism does not eliminate trust or cooperation. In the VoD, egocentrism may yield variations in volunteering over different games, but need not reduce the overall rate of volunteering. Study 1 also assesses the role of expectations. We expected positive correlations between individuals’ intentions of volunteering and their expectations regarding others’ volunteering (Krueger et al., 2016), but did not expect this projection effect to account for the egocentric effect over games.

**Method**

Participants (N = 237) completed a survey prepared with the Qualtrics platform (Qualtrics, 2014) and presented on Amazon Mechanical Turk. They received a flat fee of $0.50 and earned up to an additional $3.00 depending on the outcome of their decisions. Participants were screened with TurkGate (Goldin & Darlow, 2013) to ensure that they had not previously participated in our studies using economic games.

Participants were told that their preference ratings in four choice situations would eventually be coded as binary decisions for the calculations of their earnings. Participants first viewed a symmetric VoD payoff matrix (see Table 1b) to familiarize themselves with the structure of the game. They then answered two comprehension questions querying which choices could lead to the highest or lowest payoffs. Those who gave at least one wrong answer were directed to the end of the survey and received the base payment. The final sample comprised 199 respondents, which exceeded the recommended sample size of *N* = 119 for a two-tailed paired comparison for a small effect (*d* = .3) with a power of .90 (Faul, Erdfelder, Buchner, & Lang, 2009).

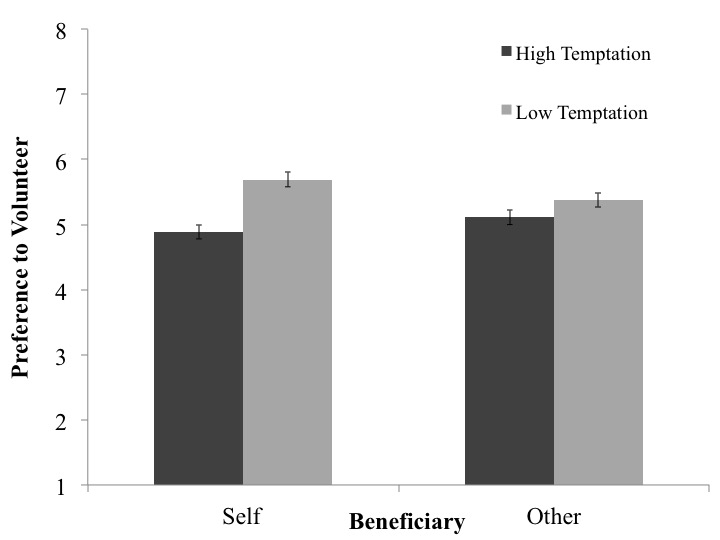
On separate survey pages, participants then considered four asymmetric games assuming the perspective of the row player (Table 2). The order was randomized for each participant. They reviewed each payoff matrix and were reminded that their decision would affect their compensation. Participants then rated their preference for the volunteering option on an eight-point scale ranging from “strong preference for Option A” to “strong preference for Option B.” They were informed that whichever option they preferred more strongly would be considered their behavioral choice and be used to calculate the final payment. Participants with a “Weak” to a “Strong” preference for Option A (B) were recorded as choosing Option A (B). We thus observed both discrete decisions (volunteer or defect) and continuous preferences (strong to weak). Options A and B respectively represented the decision to volunteer and defect, but these terms were never used during the experiment.

Using a slider scale from 0 (unlikely) to 100 (certain), participants estimated how likely it was for a random survey worker to choose Option A. Half of them recorded their expectations before making preference ratings, the other half after. As no meaningful differences were observed between these two groups, we collapsed their data for analysis. Participants had the option to report their gender (38.2% female), ethnicity (78.4% white), and their past experience with economic games on a four-point scale ranging from “no experience” to “a lot of experience” (*M* = 1.64, SD = .49). At the conclusion, they received a code for their payment. Participants’ decisions for a randomly selected game were randomly paired in order to compute their bonus according to the payoff matrix of that game.

**Results and Discussion**

We reverse-scored preference ratings so that higher ratings reflected greater preference for Option A (volunteer), and submitted them to a 2 (Temptation payoff: high vs. low) by 2 (Beneficiary: self vs. other) repeated-measures analysis of variance (ANOVA). The Temptation factor contrasts Games 1 and 3 (high T) with Games 2 and 4 (low T), whereas the Beneficiary factor contrasts Games 1 and 2 (payoff variation for self) with Games 3 and 4 (variation for other).

Figure 1 shows the mean preferences for volunteering and their standard errors. The pattern matches the egocentrism hypothesis, and is supported by the significant interaction term, *F*(1, 198) = 5.50, *p* = .02, ηp2 = .03. The preference to volunteer was greater when own temptation payoff was low (Game 2) instead of high (Game 1), *F*(1, 198) = 21.91, *p* < .001*,* ηp2 = .10, *d* = .36. The other person’s temptation payoff (the contrast between Games 3 and 4) had a small and nonsignificant effect, *F*(1, 198) = 3.69, *p* = .056*,* ηp2 = .02, *d*  = .12. The omnibus analysis yielded no main effect for Beneficiary, *F*(1, 198) = .166*, p =* .68*.,* ηp2 = .001, *d* = .02, but a significant effect for Temptation, *F*(1, 198) = 24.05, *p* < .001, ηp2 = .11, *d* = .24. Neither of these was of theoretical interest. In support of the egocentrism hypothesis, the preference to volunteer was uniquely high when the person did not stand to gain much from defection (Game 2). Using expectations as a repeated covariate (Tabachnik & Fidell, 2007, pp. 214-215) did not change this conclusion.



*Figure 1.* (Study 1) Mean rating of preference to volunteer in each game. Error bars represent one standard error of the mean.

Next, we turned directly to the expectation data to test the social projection hypothesis, which predicted a positive correlation between ratings of own volunteering and expectations regarding the willingness of others to volunteer. Across all respondents and games, this correlation ranged from .04 to .28 within each game (*M* = .24, after Fisher’s *r*-*Z*-*r* transformation). For each respondent over the four games, the mean correlation was .18.

In short, study 1 corroborated the view that the ego-based heuristics of own-payoff sensitivity and social projection guide people’s decision-making process in a VoD. To replicate and extend these findings, we designed a two-part study using the same materials and procedures, but specifying the identity of the other person as either a family member or a stranger. Our main interest was to see whether the egocentrism hypothesis would hold under a stricter test, namely, playing the game with a close other. Conceivably, people are more willing to take the other’s perspective when that person is a family member (Galinsky, Ku, & Wang, 2005). If so, egocentrism and allocentrism (or collectivism) would be respectively less and more prevalent in the family than in the stranger condition.

**Study 2**

We estimated the sample size needed for a test of the hypothesis that the difference between low and high temptation payoffs for the self-relevant games was as observed in the first experiment, *d* = .36. A power level of .90 for a one-tailed prediction required 76 cases per condition (Faul et al., 2009). Given our interest in several comparisons beyond this critical one, and the attrition rate observed in Study 1, we recruited a sample exceeding recommendation (total *N* = 308).

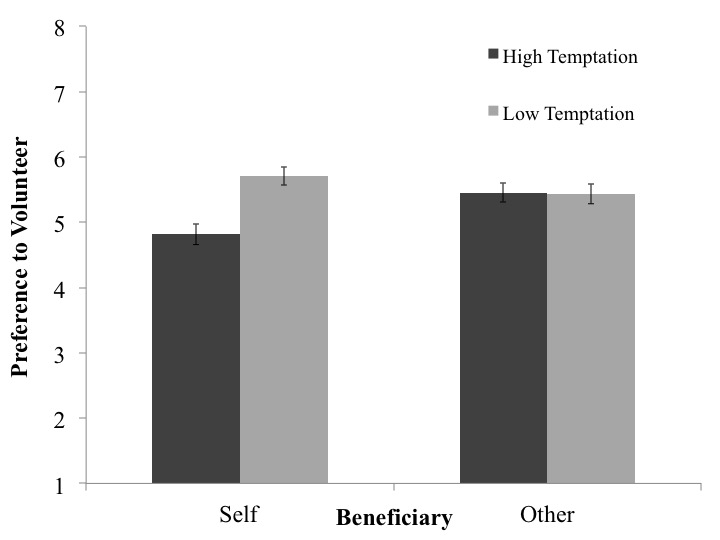
The inclusion of the social distance manipulation provided an opportunity for a strong test between egocentrism and allocentrism. Another modification was the flat payment: participants could earn no bonus payment based on their decision. The comparability of research findings with and without performance or outcome pay is a recurring concern among behavioral economists. Yet, research suggests that low or flat payments produce similar results (e.g., Amir, Rand, & Kobi Gal, 2012; Kocher, Martinsson, & Visser, 2008). We reasoned that if the egocentric pattern replicates without contingent pay, the psychological processes under investigation are robust.

**Method**

The study was conducted as a Qualtrics survey on Amazon’s Mechanical Turk. Participants earned a flat fee of $0.50. As in Study 1, those who did not pass a comprehension test were redirected to the end of the survey, leaving a final sample of 243.The procedures were the same as before, except that half of the participants were asked to imagine they were paired with a stranger, while the other half were asked to imagine the other to be a family member. Participants in the latter condition were asked to designate the relation of the family member they had thought of when making their decisions. Again, instructions made clear that expressed preferences would represent behavioral choices. Participants reported their gender (41.6% female), ethnicity (78.2% white), and their past experience with economic games on a four point scale ranging from “no experience” to “a lot of experience” (*M* = 2.12, SD = .72) before receiving their code for payment.

**Results and Discussion**

The inclusion of the social distance variable produced no effects. We therefore pooled the data obtained in the family and in the stranger condition. Figure 2 shows the mean preference ratings. The pattern clearly supported the egocentrism hypothesis, *F*(1, 242) = 18.75, *p* < .001, ηp2 = .072. Participants preferred to volunteer more when their own temptation to defect was low, *F*(1, 242) = 35.74, *p* < .001*,* with a medium effect size, ηp2 = .129, *d* = .38. The comparison for the other person’s payoffs was not significant, *F*(1, 242) = .008, *p* = .929, and the effect size was negligible, ηp2 = .000, *d* = .01. The main effect of Temptation was significant, with high temptation resulting in less volunteering, *F*(1, 242) = 19.56, *p* < .001, ηp2 = .075, *d* = .27, but of little theoretical interest. The main effect of Beneficiary approached significance*, F*(1, 242) = 3.86, *p* = .051*,* ηp2 = .016, *d* = .11; there was a tendency for greater volunteering for games with variations in the other’s T payoff. Adding expectations as a covariate produced no notable differences in the results. Consistent with the projection hypothesis, the strength of the preference to volunteer predicted expectations over respondents and games, *r* = .29. Coefficients ranged from .21 to .32 for the individual games, increasing to .46 for the average person-specific correlation over games.

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*Figure 2.* (Study 2) Mean rating of preference to volunteer in each game, collapsed over family and stranger conditions. Error bars represent one standard error of the mean.

There were three noteworthy findings in Study 2. First, the egocentrism hypothesis received strong support. Second, low social distance (family) did not attenuate egocentrism, and the preference to volunteer was no greater for family members (*M* = 5.38) than for strangers (*M* = 5.33), even among those who imagined playing with a close family member (child, parent, or sibling), *F*’s < 1, *p*’s > .10. Third, the projection hypothesis was supported in that respondents expected others to act as they themselves would.

**The Pooled Data**

Given the similarity of the results for the two studies, we conducted several analyses on the pooled data. First, we asked whether any particular strategy type was overall more likely to volunteer. A one-way ANOVA showed no effect, *F*(3, 171) = 2.17, *p* = .09, ηp2 = .037. This null result suggests that the four strategies were not confounded with social preferences or value orientation.

Second, we revisited the two critical hypothesis tests with Bayesian default analyses (Wetzels, Matzke, Lee, Rouder, Iverson, & Wagenmakers, 2011). To evaluate the robustness of these tests, we used standard, very narrow, and very wide prior distributions (Cauchy widths = .707, .100, and 1.25, respectively, JASP Team, 2016). Consistent with the egocentrism hypothesis, the Bayes factors were very large when comparing Games 1 and 2 (BF = 2.534e+10, 1.694e+10, and 1.667e+10 for standard, narrow, and wide priors), and very small (BF = .104, .545, and .060 for standard, narrow, and wide priors) when comparing Games 3 and 4. By convention, these tests may be regarded as ‘decisive.’ The consistency of the results obtained with Bayesian and classical methods was expected on analytical grounds (Krueger & Heck, 2017).

Third, we dichotomized the data to see if the egocentric pattern held at the level of behavioral decision. Recall that in all three samples, participants were told during the instructions and during the task itself that any indicated preference for Option A (B) would be counted as a choice for Option A (B). To this end, we coded any preference (weak to strong) for Option A as a choice to volunteer, and any preference for Option B as a choice to defect. Indeed, the observed pattern aligned closely with the pattern predicted by egocentrism. Over all 442 participants, 73.53% chose to volunteer when temptation for the self was low (Game 2), compared with 52.49% who chose to volunteer when this temptation was high (Game 1). In contrast, the difference in volunteering rates was negligible when considering payoffs to others: 66.51% of participants chose to volunteer when temptation for the other player was low (Game 4), compared with 63.12% who chose to volunteer when this temptation was high (Game 3).

Fourth, we treated respondents as the units of analysis to guard against the possibility of an ecological fallacy (Estes, 1956; Pachur, Bröder, & Marewski, 2008). Despite their strength, the aggregated data might obscure important individual differences. We cannot yet conclude that all or most individuals adhered to the egocentric strategy. We therefore identified those individuals who used one of the four focal strategies (*N* = 175). For example, a participant was categorized as an egocenter if the stated preference to volunteer was stronger in Game 2 than in Game 1 *and* did not differ between Games 3 and 4. We found that the pattern characteristic of egocentrism was the most common one (37.14%), followed by collectivism (33.71%). Fewer respondents used the allocentric (10.86%) or the Nash strategy (18.29%). In a profile-similarity analysis, we correlated each respondent’s preference ratings with each of the four theoretical profiles over the four games. As predicted, the mean correlation (after *r*-*Z*-*r­* transformation) was largest for egocentrism (.41), intermediate for collectivism (.29), and negligible for allocentrism (-.09) and Nash rationality (.09).[[4]](#footnote-4)

Fifth, we assessed the strength of social projection separately for each individual decision strategy. We found that egocenters projected the most (mean *r* = .54), whereas collectivists did not project at all (mean *r* = .02). Allocenters (.42) and Nash rationalists (.46) projected almost as much as the egocenters. A statistical evaluation did not reject the null hypothesis of no difference, *F*(3, 165) = 2.03, *p* < .11, although the difference between egocentrism and collectivism, taken by itself, was statistically significant, *t*(119) = 2.31, *p* < .02.

These projection results cast doubt on an alternative interpretation of the main finding. According to this alternative view, respondents use a strategy of “equilibrium selection” by volunteering and defecting respectively when the other’s (Game 3) and their own (Game 1) T payoff is particularly high. In other words, they select the pure equilibria with the highest total payoffs. This prediction is identical with the prediction made by the collectivism strategy, but, unlike the collectivism strategy, it requires respondents to expect the other player to “anti-coordinate,” that is, to choose the option that they themselves do not choose. We see, however, no evidence for such expectations. Additional analyses of the pooled data are presented in the appendix.

**General Discussion**

We found that most individuals approach the volunteer’s dilemma with an egocentric focus on their own potential outcomes. We have suggested that a focus on a salient self-relevant payoff cue may be described as an instance of heuristic decision-making (Gigerenzer & Gaissmaier, 2011; Hoffrage & Hertwig, 2012). An allocenter too needs to consider only one payoff cue when asking ‘How can I benefit the other without an additional cost to myself?’ Such a person would be more willing to volunteer when the other stands to benefit more, *ceteris paribus*. There was little support for this strategy, or the Nash rational strategy, which also limits attention to the other’s payoffs. There was, however, some support for the use of a collectivist strategy, which may be characterized as enlightened self-interest. Some people care about and invest into the good of the group inasmuch as it also benefits themselves. In the remainder of this discussion, we briefly entertain three questions of theoretical interest. First, what is the relationship between the four focal strategies and social value orientations (SVO)? Second, what are the implications of the present findings for conventional game-theoretic rationality? Third, what are the material or biological implications of the four focal strategies?

It may seem that egocenters are proselfs as described by SVO theory under a different name, that allocenters are altruists, that Nash rationalists are competitors, and that collectivists are prosocials. Although there is likely to be overlap, there is no simple reduction of the four strategies to the four SVO types. We saw that allocenters and collectivists did not volunteer more overall than did egocenters and Nash rationalists, although most people consider volunteering the moral choice (Heck & Krueger, 2017). The SVO framework provides no clear guidance as to how within-type volunteering preferences may change in response to a varying payoff parameter. This is where the contribution of the present research lies. As a concrete example of the limited match between the present strategies and SVO types, consider the Nash rationalist. Nash rationalists are not competitors in the SVO sense. Their strategy does not maximize the payoff difference between self and other, but it keeps the other from doing so. However, the rationalist’s success is not guaranteed because the other player can reduce the rationalist’s payoff without gain to the self.

Assuming uniform rationality, traditional game theory neglects the fact that the Nash strategy cannot keep others from doing material harm. Basu (1994) introduced a “traveler’s dilemma” to reveal other contradictions entailed by the Nash equilibrium, and Arkes, Gigerenzer, and Hertwig (2016) suggested that strict coherence rationality does not yield material wealth or adaptive benefits. Our analysis adds to this critical assessment of the conventional approach to rational choice in a social dilemma.

How can rationality be re-imagined in light of these difficulties? Stanovich (2015), commenting on Schwartz (2015), distinguishes between broad and thin rationality (see also Felin, Koenderink, & Krueger, 2016). Thin rationality is defined and evaluated in terms of strict criteria of coherence or correspondence. Broad rationality takes issues of long-term fitness and the decision-maker’s own emotional responses to decision outcomes into account. Stanovich notes the broad rationality of conscientious cooperation in the prisoner’s dilemma. In the VoD, which has no dominating, thinly rational strategy, the use of ego- or allocentric heuristics satisfies the criteria of broad rationality.

Besides raising questions about formal rationality, the present research also raises questions of how the distinctive decision-making strategies explored here may have evolved. How would they fare in a world populated by representatives of these strategies? We began to address this question by computing the expected values of the VoD for users of the strategies and found that egocenters do best (by a small margin) in a mixed population. In other words, egocenters prosper if there are others whom they can exploit. In homogeneous populations of individuals sharing the same strategy, egocenters do poorly. To further explore this issue, we ran Darwinian tournaments as simulation experiments (cf., Axelrod, 1984; Nowak, 2006; Nowak & Sigmund, 1992), in which mutual defectors were eliminated from the virtual population of strategies; survivors played again but could not reproduce. We found a small survival advantage for egocenters and allocenters compared with collectivists and Nash rationalists. The former two strategies also held a small advantage in accumulated payoffs before being eliminated. This result is as interesting as it is encouraging. Simple decision heuristics do well even (or: particularly) in contexts characterized by great uncertainty. The appendix provides more detail regarding the methods and results of these simulations.

**Conclusion**

The main lesson emerging from our theoretical framework and empirical studies is that people can find a response to a difficult social dilemma by paying limited and biased attention to the available information. An egocentric approach is plausible as a frugal, adaptive, and plausible psychological default. In a dilemma such as the VoD, this self-anchored strategy appears to be effective without doing undue harm to others. The present studies and results are but a first attempt to shed light on how people approach the VoD. This is a departure from common research practice, which is focused on finding person predictors (e.g., traits or attitudes) of prosocial behavior, and thereby finding predictors of greater prosocial outcomes overall. The VoD and the strategies examined in this research permit a perspective that is in many ways orthogonal to the conventional approach. Future research may make progress by combining the two.

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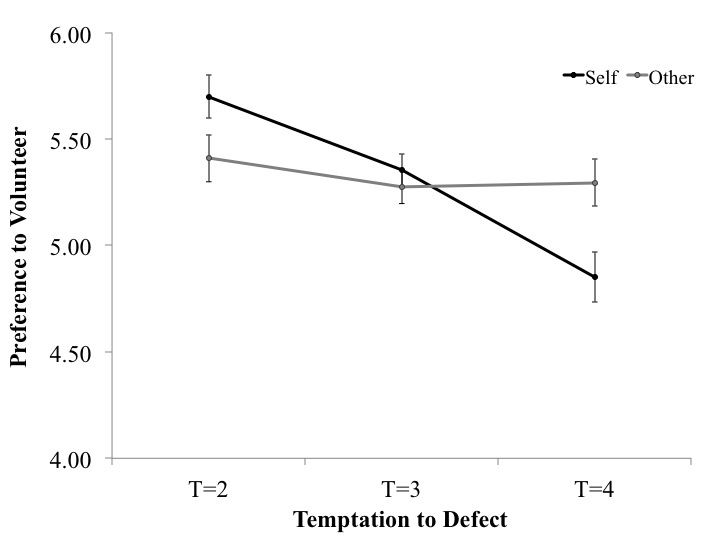
**APPENDIX**

**Raw data**

The raw data used for analysis are available online from https://tinyurl.com/k38zm35

**Additional Analyses Conducted on Pooled Data**

**Egocentrism across temptation.** For a comprehensive look at the egocentric pattern, we plotted the preference to volunteer as a function of all three levels of the temptation payoff. We collapsed over the two games with the same temptation payoff separately for self (other/high and other/low; self temptation = 3) and for other (self/high and self/low; other temptation = 3). The result, shown in Figure A1, was that the preference to volunteer decreased with the size of the self’s temptation payoff, but was unaffected by the other’s temptation payoff.

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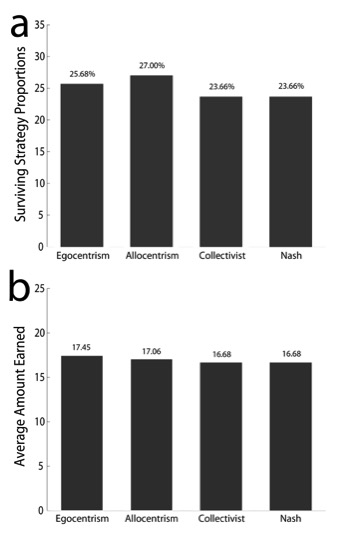
*Figure A1*. Mean preference to volunteer computed over all three samples (Study 1 and Study 2 stranger and family conditions) for temptation payouts T = 2, T = 3, and T = 4, computed separately for Self and Other. Error bars represent one standard error of the mean.

**Mixed modeling.** The idiographic approach captures individual differences in the pattern of volunteering preferences over games, but fails to account for individuals’ overall level of preference. To test whether the pattern of judgments predicted by the egocentrism hypothesis uniquely predicted the observed results, we first performed a multi-level mixed-model analysis with maximum likelihood estimation. A simple model treating respondents as a random effect (*y* = intercept(*i*) + *e*) predicted volunteering preference over all games well, -2Log Likelihood = 7906.84, *Fintercept* (1, 142) = 2287.96, *p* < .001. In other words, the preference to volunteer in a particular game could be predicted in part from the participant’s mean preference to volunteer over all games. As a measure of fit, we computed an intraclass correlation coefficient by correlating all individual preference judgments with the mean volunteering preference judgment for each participant. The result, *r* = .80, suggested that 64% of the variance in volunteering preference is explained by individual differences in the overall propensity to volunteer over the four games. We then entered the egocentric and collectivist patterns as fixed factors to isolate their unique effects. The other two strategy types (allocentrism and Nash rationality) were not sufficiently independent of the first two. The final model (*y* = intercept(*i*) + egocentrism(*X1*) + collectivism(*X2*) + *e*) predicted volunteering preference with a fixed pattern of egocentrism contributing to this prediction, -2Log Likelihood = 7863.85, *Fintercept*(1, 596) = 785.49, *p* < .001, β*egocentrism**= .*48*, F*(1, 3995) = 35.94, *p* < .001. The collectivist pattern provided no additional predictive power, β*collectivism = -.*06*, F*(1, 3995) = 1.03, *p* < .31. In other words, an egocentric approach to decision-making in the volunteer’s dilemma appears to be the most common strategy taken by our respondents.

**Simulation of Strategy Type Fitness**

Assessing expected values is one way to evaluate the relative fitness of a behavioral strategy in a well-defined interdependent environment. As strategies represent what organisms do, the payoffs affect the probability of the organism to survive and reproduce (Axelrod, 1984; Nowak, 2006). If fitness is differential, the composition of a population changes over time. We performed a simple computer simulation to find an answer to the question “What are the chances of not dying?” The simulation comprised 50,000 tournaments where the winning strategy was the one that survived the longest. We generated 100 individuals for each strategy type, or 400 samples per tournament. In each round of play, each strategy was randomly paired with another strategy, randomly assigned to the row or the column position in the matrix representation of the VoD, and randomly placed in one of the four games. Both players chose to either volunteer or defect with the probability determined by their strategy type and the game they were playing, again keeping the overall probability of volunteering over all games the same for the four strategies. Pairings with one’s own strategy type were allowed, volunteering decisions were recorded for each round, and if both players chose defection, they were both removed from the population. Games were played until one pair remained (we discarded iterations where all players died out), at which point the earnings of all strategies were recorded.

The simulation showed a small survival advantage for allocentrism and egocentrism (see Figure A2, panel a). Likewise, surviving egocenters and allocenters had slightly higher cumulative earnings than did collectivists and rationalists (Figure S2, panel b). In short, the two simplest strategies did best. As noted earlier, the egocentric and the allocentric decision strategies may be considered one-cue heuristics (Hoffrage & Hertwig, 2012) that easily map onto social preferences and that are computationally less demanding than the collectivist or the Nash rational strategy.



*Figure A2.* Panel a: proportions of surviving strategies; Panel b: average amount held by winning strategy at the end of each tournament.

The viability advantage for the simple ego- and allocentric strategies is intriguing because it emerged in the absence of any overall differences in the willingness to volunteer. Differences in wealth and fitness could only arise from the *patterns* of volunteering over the four different games. To help see how a difference can emerge, consider Nash rationality. The Nash strategy performed poorly because it is the only one that is unlikely to volunteer in a game in which two other strategies are also unlikely to volunteer (egocentrism and collectivism in game 3). That is, the Nash rationalist had a slightly higher chance of being caught in the punishing world of mutual defection. As collectivism is confounded with egocentrism, we conclude that it is egocentrism specifically that does rationality in.

1. An equilibrium is a mathematical abstraction. Of course, Nash rationality (and other game-theoretic derivatives) afford hypotheses for the prediction of human behavior. Whether some people think along equilibrium-strategic lines or whether their behavior turns out *as if* they did remains an open question. [↑](#footnote-ref-1)
2. Classic game theory makes no reference to a desire to be fair or other social preferences. We conjecture that the Nash-rational strategy may be partially supported by a person’s wish to attain an equal distribution of payoffs, as long as they believe that the other person wishes the same. [↑](#footnote-ref-2)
3. VoDs with asymmetric R (Diekmann, 1993; Weesie, 1993) do not differentiate among the present hypotheses. Raising or lowering R unilaterally eliminates the equality of payoffs in mutual volunteering. Variations in T, as in our design, do not disturb other features of the game. [↑](#footnote-ref-3)
4. Correlations of 1 and -1 were set to .99 and -.99, respectively, to obtain more reasonable Fisher transformations. [↑](#footnote-ref-4)