The Sharing Dilemma: Joining Cooperative Groups and Sharing Resources as a Means of Coping with Environmental Risk

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ABSTRACT

The "social insurance" hypothesis posits that individuals join cooperative groups and share resources in order to reduce environmental risk. Despite its significance for explaining cooperative groups' formation, in small-scale and in developing societies, the hypothesis has been subjected to little experimental testing. The present research is designed to examine the relative weight of the motivation for social insurance compared to other psychological motivations for sharing risk. We conducted two studies to test the tendency to share risk under different risk conditions and for groups of different sizes. A third experiment extends the risk sharing research to situations involving losses instead of gains. The findings of the first two studies lend strong support to the risk-sharing hypothesis in the gain domain. For the loss domain, the results of the third experiment demonstrate an intriguing shift from strong reluctance to join groups under lower risk, to ubiquitous readiness to join groups under higher risk. We discuss these results in light of prospect theory and decisions from experience.

KEY WORDS: risk-sharing; social insurance; Prospect Theory; uncertainty

INTRODUCTION

Joining groups for risk-sharing is a rapidly growing practice in developing societies. Informal social ties (e.g., Fafchamps & Lund, 2003; Foster & Rosenzweig, 2001) and group loans with joint liability (e.g., Besley & Coate, 1995; Ghatak, 2000) are among the arrangements frequently used as insurance against risk. Microfinancing group arrangements have proven to be efficient social solutions for poor people who lack sufficient means for providing collateral (Ghatak, 2000).

Research has shown that food transfer and sharing beyond direct kin are core features of human societies (Kameda, Takezawa, Tindale, & Smith, 2002) and non-human societies (Caraco, Uetz, Gillespie, & Giraldeau, 1995; De Waal, 2000; Wilkinson, 1984). Anthropological and socio-biological research has long proposed that in risky environments, pooling individually collected resources and redistributing them among group members serves as "social insurance" against fluctuations in outcomes in the environment. Similar behavior is well documented in hunter-gatherer societies as well (Cashdan, 1985; Gurven, 2004; Gurven, Hill, Kaplan, Hurtado, & Lyles, 2000; Hawkes, O'Connell, & Blurton Jones, 2001; Kaplan & Hill, 1985;Wilkinson, 1984;Winterhalder, Lu, & Tucker, 1999).

Much of the research on social insurance and on formal and informal risk-sharing is conducted in the field (e.g., Abbink, Irlenbusch, & Renner, 2006; Attanasio, Barr, Cardenas, Genicot, & Meghir, 2009; Bramoullé & Kranton, 2007; De Weerdt & Dercon, 2006; Fafchamps & Gubert, 2007). Surveys and field studies on risk-sharing are typically conducted among individuals who share kinship and/or membership in the same ethnic or

religious groups. This approach means that participants in such studies usually know and interact with each other and have past experiences of sharing resources with each other, thus making a direct examination of the "social hypothesis" hypothesis difficult.

Compared to the extensive field research on risk-sharing, few studies have been conducted in experimental, well-controlled settings, and the few studies of which we are aware focused primarily on risk-sharing in dyads (Bone, Hey, & Suckling, 2004; Charness & Genicot, 2009) and triads (Bolle, Liepman, & Vogel, 2012; Selten & Ockenfels, 1998; Wilke, Rutte, & Bornstein, 1996). Such laboratory studies allow isolation of the element of risk-sharing from other factors, such as reputation, social norms, and need for affiliation, and therefore enable testing of whether the desire to reduce environmental risk is a sufficient condition for joining groups and sharing resources.

Selten and Ockenfels (1998) tested resource sharing, using a "solidarity game" (SG) in which each of three participants could win a sum of money with a probability of 2/3. Experimenters asked participants to indicate how much they would contribute, in case they won, either to one or two losing partners. Contrary to game theory, the observed contributions in the game were substantial. The authors conclude that social solidarity motivated contribution in the game. In a recent study, Bolle et al. (2012) compared the solidarity hypothesis with the social insurance hypothesis. The authors compared the contributions in two versions of the SG. The *voluntary* SG (VSG) treatment was identical to the one employed by Selten and Ockenfels. In the *mandatory* SG treatment (MSG), participants were asked to vote on the amount of money each of the participants *should*

transfer to others in case of winning. The amount to be transferred was determined by the median of offers and was mandatory in case of winning. The comparison between the two versions was meant to examine the relative weight of the normative-voluntary element—present in both games—and the social insurance element, present only in the MSG. The researchers show that indeed proposed offers in the MSG were higher than in the VSG. However, most participants in the MSG did not vote for a full transfer of the individual winnings to losing partners, as would be expected if participants only wanted to ensure profits. The authors interpreted the findings as supporting the "warm glow" hypothesis (Andreoni, 1990), which states that generous acts are motivated not only by altruistic considerations, but also by a personal utility gained from giving. Another plausible explanation for the relatively modest level of transfers is that the participants played under relatively high chances of winning p(win)=2/3, which could have reduced the need to insure personal outcomes. Sharing resources in a group reduces the risk of receiving nothing, but it also reduces the chance of receiving a high outcome. Therefore, the social insurance hypothesis predicts that people would be more likely to share resources when the risk is high compared to when it is low. This hypothesis is supported by field studies showing that resources that are most commonly shared are those characterized with high variance (Gurven et al., 2000; Hawkes, O'Connell, & Blurton Jones, 2001; Kaplan & Hill, 1985). Indeed, Bolle et al. (2012) acknowledge that their sparse evidence for social insurance might be due to the specific conditions included in their study.

In the present research, we extend the previous findings on the social insurance hypothesis in several directions. First and foremost, we examined the relative weight of the motivation for social insurance, that is, risk reduction, resulting from decreases in outcome variance, compared to other psychological motivations, such as social solidarity (Selten & Ockenfels, 1998), warm glow (Andreoni, 1990), and need for affiliation or assimilation (Baumeister & Leary, 1995; Brewer, 1991; Leary, Kelly, Cottrell, & Schreindorfer, 2001; Pickett & Brewer, 2001). To achieve this goal, we conducted an experiment (Study 2) in which we tested the tendency to use the social insurance mechanism in the presence of another, individual mechanism to reduce risk. Examining the tendency to join groups under these conditions helps us determine whether and how much of the behavior is motivated by motives other than the desire to ensure profits.

In addition, extending previous studies and following the findings of Bolle et al. (2012), in the present research, we examined the tendency to join groups and share resources under different levels of risk and different group sizes. In two of the studies (Studies 1 & 3), we allowed participants to choose between joining groups of different sizes. If the main motivation for sharing resources is to reduce risk, we expect participants to prefer larger groups, because they provide better protection against fluctuations in outcomes.

A third goal was to extend the current research to the domain of losses. The literature on decision making provides considerable evidence that framing a decision problem as losses or gains yields different behavioral responses (Tversky & Kahneman, 1981). Previous experimental studies on risk-sharing framed the situation as gains. However, in

many real-life situations, insurance is perceived as a way to avoid losses, Therefore, in the context of sharing risk, considering the difference in sharing resources in the loss domain compared to the gain domain is important.

In the three reported studies, we utilized minimal, well-controlled experimental settings designed to test the tendency and boundary conditions for risk-sharing, In Study 1, we asked participants under different risk conditions to choose between joining a group of different sizes and receiving an equal share of the aggregate gain, or to take part in an individual gamble and receive the gamble's outcome. In Study 2, we compared two mechanisms for risk reduction—a group mechanism and a solitary mechanism. In Study 3, we tested the tendency for risk-sharing in the loss domain.

STUDY 1: RISK-SHARING IN THE GAIN DOMAIN

Method

Participants

A total of 63 students (12 males, 51 females) at the University of Haifa participated in the study. About half of the participants took part in each risk condition (32 and 31 participants in the higher- and lower- risk conditions, respectively). We ran the study in four sessions, two for each risk condition, with about equal numbers of participants in each session.

Design

We asked participants in the study to take part in a gamble with probability *p* of winning *m* New Israeli Shekel (NIS) (and probability 1-*p* of not winning). Before being informed about the gamble's outcome, each participant had to choose between joining a group of size *n* and receiving an equal share of the aggregate gain, or playing "solo" and receiving the individual outcome. The participant could choose between joining a small group of size *n*= 2 or a "large" group of *n*=6.

The gambling task was a throw of an unbiased die. We manipulated the probability of winning in two between-subjects conditions, "high" and "low." In the higher-risk condition, we asked participants to guess the numerical outcome of a throw of a die (probability of correct guess = 1/6). In the lower-risk condition, we asked them to guess whether the outcome was odd or even (probability of correct guess = 1/2). In the higher-risk condition, a correct guess yielded a profit of m=72 NIS ($16.3 at the time of the experiment), and in the lower-risk condition, a correct answer yielded a payoff of m=24 NIS ($5.4), such that the expected gains in the two conditions were equal (12 NIS).

Hypotheses

In accordance with the social insurance hypothesis, we hypothesized that (1) participants would make more group choices than solitary choices, particularly under the higher-risk condition, and (2) participants would opt more for large groups in the high- compared to the lower-risk condition.

Procedure

Participants were seated apart in a spacious room. They received written instructions and decision sheets. Each participant was assigned an ID number, which appeared on his/her decision sheet and on a voucher, which participants were instructed to keep for payment purposes. Concurrent with making their guesses, participants had to choose between playing "solo" and receiving their private gains, or joining groups of two or of six and receiving an equal share of the aggregate gain. We asked the participants to report their guesses in the gamble and their grouping choices (solo, group of $n=2$, or group of $n=6$) by writing them on their decision sheets. After all participants handed in their decision sheets, the experimenter threw a die and announced its outcome (the numerical outcome in the higher-risk condition and whether it was odd or even in the lower-risk condition). Participants who chose the individual gamble received payment according to the outcomes of their guesses, and participants who chose the group gamble were randomly grouped into n-sized groups and paid an equal share of their group's profits. If the number of participants choosing groups of a certain size was insufficient to form complete groups for calculating participants' gains, we "completed" such groups by assigning to them other participants who were randomly drawn from the rest of the participants' pool. Because we privately conducted the grouping after the study was over, subjects were not aware of this procedure.[1] To receive his/her earnings, we invited each participant individually to the laboratory at pre-scheduled times. Upon arrival, participant

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[1] We used this method in studies 2 and 3 as well.

showed their vouchers containing their ID numbers and received their gain, as well as a bonus of 5 NIS for participating in the study (about $1 at the time of the experiment).

Results and discussion

For the two risk conditions, Figure 1 depicts the percentage of participants choosing to play alone (n=1), join another participant (n=2), or join another five participants (n= 6). Overall the majority of participants (71.4%) preferred a group option to an individual option. The goodness-of-fit chi-square test reveals that this effect is significant, $\chi^2(1,n=63) = 11.57$, p<.01. Nonetheless, inspection of the data reveals that the detected preference is significant for the higher-risk condition, $\chi^2(1,n=63)= 10.13$, p<.01, but not for the lower-risk condition, $\chi^2(1,n=63)= 2.61$, n.s.. The hypothesis that more participants would opt for the larger group (n=6) in the higher-risk condition than in the lower-risk condition was also confirmed, $z = 2.175$, p<.05 (one-tailed Mann-Whitney test).
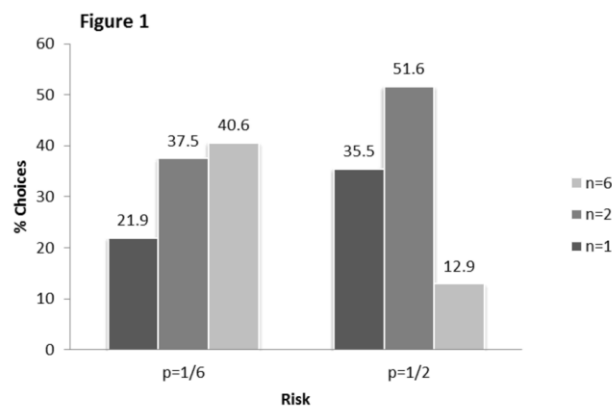

Figure 1 | Percentage of participants choosing a group of different sizes or solitary option, under p(win)=1/2 and p(win)=1/6, in the gain domain (Overall, 71.4%

participants preferred to join groups, and group preference was more pronounced in the higher-risk condition).

The preference for group gambles, although the expected values of the alternatives were equal, could be attributed to the fact that the variance of outcomes is lower in the larger group. Thus, the outcome variance of the group of two is lower than the variance in the solitary gamble, and the variance in the group of six is lower than in the group of two. The results indicate that the participants were sensitive to this difference in variance, because the expected value of all the gambles is identical. An alternative explanation is that a need to belong or to assimilate motivated participants (Baumeiste r& Leary, 1995; Brewer, 1991; Leary, Kelly, Cottrell, & Schreindorfer, 2001; Pickett & Brewer, 2001). Because the study included only one step, in which the participants were anonymous to each other, the variance-reduction explanation seems more plausible than the "need-to-belong" explanation. However, to further test the "need-to-belong" explanation, we conducted a second study, in which we asked participants to choose between two gambles, a group gamble and an individual gamble, which were equivalent in terms of variance and expected value. We conjectured that if a strong preference for a group gamble persists, such a finding would refute our claim that participants in Study 1 joined groups as social insurance, and would lend support to a hypothesis that participants join groups mainly due to social motives such as the need to belong. If, on the other hand, we detect no preference, or a preference for the solitary option, we may conclude that a social insurance motive led participants to join groups in Study 1.

STUDY 2 – COMPARISON BETWEEN TWO MECHANISMS FOR UNCERTAINTY REDUCTION

Method

Participants

A total of 159 students at the University of Haifa participated in the study. The numbers of participants in the four n conditions were 27, 48, 46, and 38, for n=2, 4, 6, and 8, respectively. As in Study 1, participants received a bonus of 5 NIS for participation in addition to their earnings in the experiment.

Design

The study included four experimental conditions in a between-subjects design. In each condition, we asked participants to choose privately between participating in n solitary gambles with a probability of a gain of ($p = ¼$) and receiving their average gain (an individual option), or participating in a single gamble with an identical probability of gain, joining a group of size n, and receiving an equal share of the aggregate group's gain (a group option). In each n condition, the number of solitary gambles and the group size were equal, rendering the variances of the two options equal. The values of n in the four conditions were 2, 4, 6, and 8.

Hypotheses

We hypothesized that given an equivalent, solitary option to reduce risk, participants would prefer to take multiple gambles to joining groups and sharing their earning with others.

Procedure

In each condition, participants were shown n standard card packs (n= 2, 4, 6, or 8) and were asked to choose, privately, between two alternatives: 1) pick one pack and guess the suit of its top card, join a group of size n, and receive an equal share of its aggregate gain (a group gamble); or (2) guess the suits of the top cards of the n packs and receive the average gain of the n guesses (an individual multiple gambles). In all four conditions, a correct guess yielded a profit of 48 NIS (about $10.90 at the time of the experiment). To test for the possibility that the participants' need to belong might have affected their choices, participants completed the Need to Belong Scale (Leary et al., 2001).

We instructed participants to copy their guesses and choices (group gamble vs. individual multiple lotteries) twice. After all participants had made their choices and answered the short questionnaire, they returned them to the experimenters, keeping one copy of their guesses, used to verify their earning. The experimenters then revealed the top cards and announced their respective suits. Participants who opted to join a group of a given size were randomly assigned to a group of the same size, together with other anonymous participants who made similar choices. The gains of a participant who chose to join a group were equal to the average group gain. The gain of a participant who chose the solitary option was equal to the average gain of the multiple lotteries. We paid participants according to the same procedure described in Study 1.

Results and discussion

In all conditions, most participants preferred the solitary option (63%, 70.8%, 82.6%, and78.9% for n= 2, 4, 6, and8, respectively). This preference was significantly stronger for larger (n=6,8) compared to smaller (n=2,4) groups/number of gambles,χ^2(1,n=159)=3.53, p<.05 (see Fig. 2). When pooled across conditions, the percentage of participants choosing the solitary option was 74.8% (n=119), compared to only 25.2% (n=40) who chose the group option, χ^2(1,n=159)= 39.25, p<.001. We found no effect for participants need to belong (high vs. low) on their choices, χ^2(3,n=159)=.602, n.s..
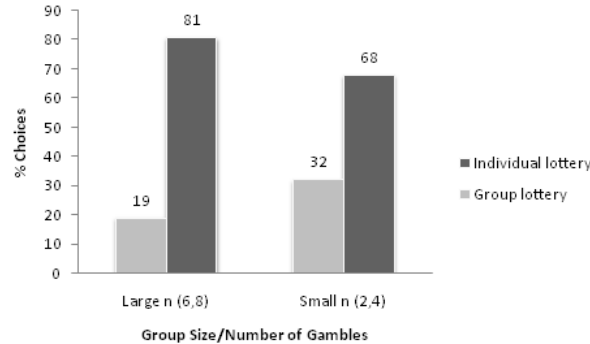

Figure 2 Percentage of participants choosing a group gamble or multiple gambles, under larger (n= 6, 8) compared to smaller (n= 2, 4) groups/number of gambles. This preference for the solitary option is stronger for larger (n= 6, 8) compared to smaller (n= 2, 4) groups/number of gambles (81% and 68%, respectively).

The results of Study 2 suggest that when participants were presented with an individual and a group option that were equivalent in their risk reduction, they preferred the individual option. This finding supports the conclusion that the tendency to join groups, detected in Study 1, was motivated mainly by variance-reduction considerations, and not by participants' need to belong (Baumeister & Leary, 1995).

Previous research showing that the source of risk affects individuals' preferences also supports the results of Study 2. For example, people prefer to take risk based on their own judgments over risk by a chance mechanism (Heath & Tversky, 1991). This finding is explained in terms of attribution of credit and blame, meaning that betting on their own knowledge allows individuals to claim credit in case of success. However, when facing a low knowledge bet, people prefer the chance mechanism, in order to not expose themselves to blame. In Study 2, participants' preferences in the present study for the self-generated outcomes may reflect a desire to have control over outcomes, and/or a desire to take credit for outcomes, even if this sense of control or credit is artificial and illusory.

STUDY 3 – RISK-SHARING IN THE LOSS DOMAIN

In Study 3, we investigated the role of a social insurance arrangement (via joining groups) in situations involving a risk or loss rather than a chance for gain. Since the classic paper by Tversky and Kahneman (1981), research on decision making has shown that framing risk as possible gain versus possible loss leads to different judgment and risk behavior. The question of framing is especially relevant when speaking about insurance. Businesses often have to deal with cutting losses rather than increasing profits, and the

"cushion" that group micro-financing and lending programs provide to small businesses is no less important for helping to absorb losses than to increase gains.

Method

Participants

A total of 50 students (8 males, 42 females) at the University of Haifa participated in the study. Twenty-three participants took part in a lower-risk ($p = 1/6$) condition and 27 took part in a higher-risk ($p = 1/2$) condition.

Design

The design of Study 3 was identical in all aspects to that of Study 1, except that in Study 3, a correct guess resulted in *saving* the participant from losing money instead of having him or her gain money.

Hypotheses

Prospect theory predicts that when the environmental risk is framed as a probable gain, the decision maker will behave in a risk-averse manner and prefer a less risky option to a more risky one with equal expected value. By contrast, when the risk is framed as a probable loss, the decision maker is predicted to behave in a risk-seeking manner. Therefore, in Study 3, we hypothesized that participants would prefer the solitary gamble to the group gamble.

Procedure

The procedure of Study 3 was identical to the one implemented in Study 1. In the lower-risk condition, a correct guess ($p=1/2$) "saved" the participant from losing 24 NIS,

and in the higher-risk condition, a correct guess (p=1/6) "saved" the participant from losing 72 NIS, which corresponds to chances of winning 72 NIS in Study 1. In other words, the probability of loss was p=5/6. To avoid a possibility that participants lose their own money, a preliminary session, which we held a week before the study, enabled the participants to earn money by ostensibly performing satisfactorily in a general knowledge quiz using multiple choice questions; for example, "Who said let them eat cake?"and "Who is the famous artist who sculptured the statue 'David'?". The quiz was identical in all conditions. The instructions to the quiz specified how many questions participants would have to answer correctly to receive payments. We told participants that in the beginning of the second session, we would inform them of their earnings from the first stage. All participants received the same feedback on their success in the quiz and earning of 72 (24) NIS in the *p*=1/6 (*p*=1/2) condition. Participants were informed in advance that receipt of the money would be conditioned on completion of the second session. Upon presenting their vouchers with their ID numbers, participants received the feedback on their winnings, and then the instructions to the second part of the study.

Note that all participants were told they had performed satisfactory in the quiz, so differences in behavioral responses between conditions cannot be attributed to feelings that may have arisen from performing well.

Results and discussion

Congruent with prospect theory's prediction, in the lower-risk condition, participants preferred the solitary option. On the other hand, the participants' decisions in the higher-risk condition were in sharp contrast to the theory's prediction. As Figure 3 shows, under

lower risk, 19 out of 23 participants (82.6%) preferred the solitary option to the group options, $\chi^2(1,n=50)= 9.783$, p<.01. By contrast, participants demonstrated a clear-cut preference for the group option (26 participants from a total of 27) in the higher-risk condition, $\chi^2(1,n=50)= 23.148$, p<.01. Also, a significant majority (about 77%) of participants who opted for a group option preferred to join larger versus smaller groups, $\chi^2(1,n=50)= 7.538$, p<.01. Note that the preference for the group gamble was even higher than the preference for the group gamble in Study 1, possibly due to the fact that losses loom larger (loss aversion).
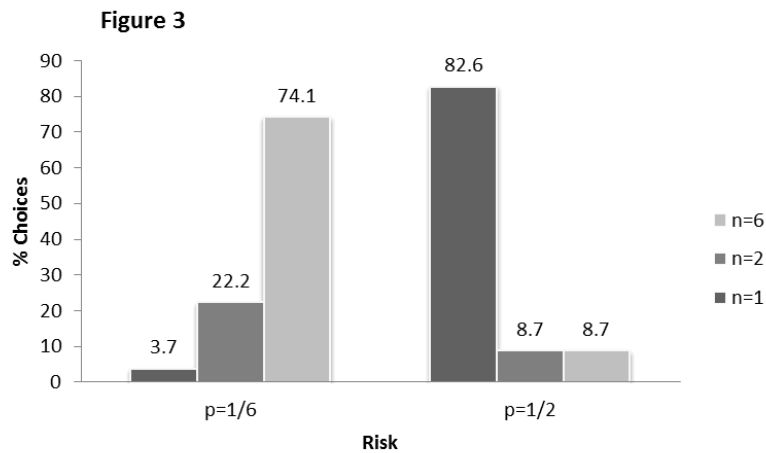
Figure 3

Figure 3| Percentage of participants choosing a group or solitary option, under p(no loss)=1/2 and p(no loss)=1/6, in the loss domain. In the lower-risk condition (p(no loss)=1/2), the majority of the participants (83%) chose the solitary option, whereas in the higher-risk (p(no loss)=1/6) condition, the majority of participants (96%) chose to join groups.

GENERAL DISCUSSION

Overall, our findings lend strong support to the "social insurance" hypothesis, stating that when confronted with environmental uncertainty, individuals join groups mainly to reduce risk. This finding adds support to findings of previous experimental studies (Bolle et al., 2012; Charness & Genicot, 2009) and field studies on group risk-sharing (e.g., Barr & Genicot, 2008; Gurven, 2004), as well as to previous research on sensitivity to risk and its relation to individual behavior under risk (e.g., Markowitz, 1952; Sharpe, 1970; Thaler, Tversky, Kahneman, & Schwartz, 1997). We also found that the tendency to join groups was stronger for higher than for lower environmental risk, and that higher risk elicited a preference for joining larger, rather than smaller, groups.

Interestingly, whereas the findings for lower risk ($p=1/2$) conform with the predictions of prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981), the findings under higher risk ($p=1/6$) contradict the theory's predictions, both in Study 1 and in Study 3:in the context of joining cooperative groups as insurance against risk, the predictions of prospect theory imply that in general, in the gain domain, individuals would prefer the less risky group option, and in the loss domain, they would prefer the more risky solitary option. However, prospect theory also predicts an overweighting of rare events. Thus, when the probability of winning (or avoiding losses in Study 3) is low, the theory predicts that our participants would be risk seeking and would gamble alone. Taken together, the present research confirms the two predictions. Under lower risk, our participants opted less for the group gamble, and this preference was more prominent in the loss domain compared to the gain domain. But overweighting

of rare events also predicts that under high risk, in both domains, our participants should have been risk *seeking* and opted for the solitary option. However, they were risk *averse* and showed a greater tendency to join groups. This tendency was also prominent in the loss domain, where almost all of the participants opted for the group gamble.

This finding is in line with studies on choice decisions under risk in repeated trials, which have consistently shown that when individuals make choices based on experience (i.e., when the probabilities and outcomes are not known), they violate the predictions of prospect theory. Particularly, studies with repeated trials (Erev, Glozman, &Hertwig, 2008; Hertwig, Barron, Weber, & Erev 2004) found that people underestimate rather than overestimate rare events (Barron & Erev, 2003). Whereas choices based on explicit description of probabilities and outcomes reflected overweighting of rare events, choices based on experience led to underestimation of low probabilities and to risk-averse behavior. Although previously demonstrated only in repeated trials (when participants infer probabilities from experience), underweighting of rare events seems to occur also in the current one-shot situation, where participants were not provided explicit information regarding the expected value and variance of each gamble and seemed to intuitively infer the risk. The fact that our participants displayed underweighting of rare events in a one-shot game implies that overweighting of rare events is common only in decisions from description, as Erev et al. (2008) previously claimed. However, further research is needed to test the effect detected in the loss domain in present research, outside of the context of risk-sharing.

Another interesting question that deserves further investigation concerns relaxing the assumption of a mandatory contribution to the common resources pool. In the present research, once participants chose to join a group, pooling resources was binding. Such an assumption presumes individuals behave fairly and equitably. It also presumes that information about individual outcomes is common knowledge. In real-life situations, individuals tend to act selfishly, particularly when information regarding their outcomes is private. Under such conditions, free-riding (Gradstein, 1992; Palfrey & Rosenthal, 1991) becomes very tempting. Furthermore, individuals who would still opt for risk-sharing might be less willing to do so when facing social uncertainty (Suleiman & Rapoport, 1988; Wit & Wilke, 1999) in addition to the existing environmental uncertainty. Further research is needed to investigate the interaction effect of environmental and social uncertainties on the willingness to share resources.

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