

Pro-Socials Are More Risk-Averse Than Other Social Value Orientation¹

When and Why?

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Abstract

Little attention has been devoted to the relationship between risk preference and social value orientation. In all previous studies, the risk preference elicited in an individual choice task was not controlled for and did not account for differences in cooperative behavior in social dilemmas. The resulting findings were mixed. Some studies showed that risk-seeking cooperated more than risk-averse individuals, while other studies showed exactly the opposite.

Inspired by the risky-shift and social utility research, in the present study we examined the relationship between propensity towards cooperation as a relatively stable trait defined by the Social Value Orientation (SVO), and tested the relationship between SVO and risk preference.

In three experiments, individuals of different SVO types participated in a series of lottery tasks, either in *solitary*, or in the presence of *co-actors*. The results showed that, compared to the solitary condition, pro-socials were significantly more cautious than pro-selfs, and that the "risky-shift" in the presence of a co-actor was detected only for pro-socials, and was mediated by risk appraisals. We discuss the relevance of these results to the study of individual differences in risk-behavior and to research on social facilitation.

Keywords: risk preference, social value orientation, risk as a value, social

Introduction

Cooperation and risk-taking are fundamental characteristics of human behavior. This is natural that they have been the focus of a vast body of research in many disciplines and decision sciences. An examination of this literature reveals, however, that exclusively these attributes were examined separately, with only a few studies attempting to examine their possible relationship (Snijders & Werner, 1998; Suleiman & Or-Flache, 2001; Parks, 2004; Van Assen & Snijders, 2004). All these studies share two assumptions. The first is that an individuals' risk preference is a relatively stable assumption, leading to experimental procedures in which risk preferences were independent variables and cooperative behavior as a dependent variable. The second is that individuals' risk preference, assessed in a *solitary* setting, constitutes a reliable measure of their risk preference in an *interdependent* setting.

The above cited studies yielded mixed results. Some studies (Suleiman & Or-Flache, 2001; Parks, 2004) found that in Public Good situations, risk-seeking cooperated more than risk-averse individuals. The plausibility of this finding was defended by the argument that the act of contribution bears a risk of losing their contribution, so risk-averse individuals use this strategy less than risk-seeking ones (Budescu, Rapoport & Suleiman, 1990). Other studies (Snijders & Werner, 1998; Flache, 2001; Van Assen & Snijders, 2004) found that cooperation mainly characterizes individuals who are more risk-averse. On the individual level, Van Assen and Snijders (2004) supported their finding by a game-theoretic analysis of the infinitely repeated PD game, played between individuals whose risk preferences were represented by (different) non-linear utility functions.

The contrast in the findings of the above-cited studies can be attributed to several factors. It may be due partly to the implementation of different social contexts and different methods used for the assessment of the individuals' cooperativeness and risk preferences. Cooperation

studies reported by Suleiman and Or-Chen (1999) and Parks (2004) was measuring average contribution in the one-shot step-level Public Good game. Budescu, Rauch, and Suleiman (1990) drew inferences about cooperation based on the average required contribution in a two-player repeated PD game. Snijders and Werner (1998), Flache, and Van Assen (2004) measured cooperation by looking at the average C-cooperation rate in a two-player repeated PD game. Different methods were also used for assessing individuals' attitudes towards risk. For example, Parks (2004) classified participants as risk-seeking (or risk-averse) based on their modal choice in a series of five (hypothetical) gambles, whereas Budescu et al. (1990) and Suleiman and Or-Chen (1999) used a successive bisecting method (Schoemaker, 1980) to estimate the participants' utility functions, from which the participants' risk indices were estimated.

More importantly, all the above mentioned studies share a common, yet critical assumption, according to which individuals' risk preference, assessed in a *solitary* setting, constitutes a reliable measure of their risk preference in an *interdependent* setting. This assumption has been questioned by a vast body of research on the Risky-Shift and Group Polarization phenomena (Slovic, 1975; Wallach, Kogan & Bem, 1962; Myers & Lamm, 1976) as well as the more recent research on social utility (Loewenstein, Bazerman & Thompson, 1989; Bazerman, White & Lewin, 1995). These findings provide abundant evidence contradicting this assumption.

In investigating the relationship between risk preference and cooperation, the present study adopted a different approach. First, rather than assuming that individuals' risk preferences are relatively fixed traits and measuring their cooperativeness in a specific context, in all the three experiments reported here we treated the individuals' tendencies towards cooperation as relatively fixed traits (defined by their SVOs) and tested the relationship between these traits and their risk preferences. That SVO can be viewed as a personality trait is supported by several studies attesting to its relative constancy throughout the various developmental stages from childhood to adulthood (Van Lange & Kuhlman, 1994; Van Lange, De Bruin, & Wilcoxen, 2007).

Joireman, 1997). Second, in light of the well-documented evidence regarding the effect of social context on risk preference, we avoided the extrapolative use of risk preferences elicited in individualistic settings to account for risk preferences in social settings.

The present study aspires to contribute to the investigation of the relationship between Social Value Orientation and risk preference. The main questions we posed were the following: 1) Are the risk preferences of pro-social different from the risk preferences of pro-self individuals, and if so, why? 2) Would such a difference, if detected, be sensitive to the social context in which individuals make their risky choices? We address these questions in three studies using a simple experimental paradigm. In all experiments, participants' social value orientations (SVOs) were first assessed using an adapted questionnaire, after which all participants engaged in a series of simple lottery trials. Participants' risk preferences were assessed by calculating the percentages of trials in which they chose the risky option.

The remainder of the paper is organized as follows: Study 1 tested the effect of social context on risk preference in an individual setting. Studies 2 and 3 report two additional experiments, which investigated the effects of a "weak" social context, manifested as the mere presence of co-actor (i.e., another individual performing a similar task) on the risk preferences of individuals with different SVOs. We conclude with a general discussion.

Experiment 1

Method

Participants

Twenty-eight participants, all students at the University of Haifa, participated in the experiment. The participants responded to a notice inviting students to participate in an 'economic experiment' by writing their names and telephone numbers on it. They were informed that they could earn as much as NIS 50 (about \$11) depending on their performance in the experiment.

Equipment

The experiment was computer controlled. One computer, located in a private soundproof room, served as the participant's terminal. An additional computer, located in another room, enabled the experimenter to monitor the experiment.

Design and Procedure

The experiment utilized a mixed, three-factorial design, with SVO as a between-subject variable and the "lottery type" and "trial" as within-subject variables. The main features of the experiment can be summarized as follows:

1. In each trial, each participant was requested to choose between a pair of options: either a "sure" sum of X NIS or participating in a gamble with equal odds (50%-50%) of winning 2X NIS or 0 NIS. The values of X used were: 15, 20 and 25 NIS (equalling 3.3, 4.4 and 5.5 US Dollars, respectively).
2. Each 'lottery type' (i.e., with a given X value) was repeated six times, for a total of 18 trials. The first three trials included all three "lottery types" and their order was random.

across participants. The order of "lottery types" in the remaining 15 trials was determined randomly.

3. If the participant chose the gambling option, the computer performed a random draw with an equal chance of winning 2X and 0 NIS.
4. At the end of the experiment one trial was randomly selected, and the participant paid their total winning on this trial.
5. During the experiment, no feedback was given regarding the outcomes of previous trials.

The experiment was conducted in the Social Psychology Laboratory at the University of Haifa. Participants were invited to the laboratory separately, with at least half a month between successive sessions. This was done in order to prevent any contact between participants. On arrival, each participant completed a nine-item social value orientation questionnaire (Kuhlman & Marshello, 1975; Van Lange, De Bruin, Otten, & Jager, 1997). The participant was then escorted by the experimenter to a soundproof room and seated in front of a computer. The instructions, which appeared on the computer screen, included a detailed description of the experiment. They indicated that the experiment comprised 18 independent trials and that the outcome of each trial was not affected by the outcomes of preceding trials. The participant were further informed that in each trial they had to choose between two options which would appear on the computer screen. In each choice there would be between gaining a 'sure' amount of money, or participating in a lottery that would be conducted by the computer, with equal (50%-50%) chances of winning 0 NIS or double the amount of the 'sure' gain. The instructions also indicated that during the experiment, no feedback would be given about the lottery results and that at the end of the experiment, the computer would randomly choose one of the 18 trials, and the participant would be paid his/her earnings on that trial.

The experimenter ensured that the subject understood the instructions before the computerized experiment started. At the beginning of each trial, the trial number and a brief description of the specific choice problem appeared on the screen. The participants indicated their decision by pressing on one of two keys designated for each of the two options (safe amount or lottery). If they decided to choose the lottery option, the computer performed the lottery, and moved to the next trial.

After their 18 trials were concluded, the participants received complete feedback about their choices and earnings on each trial and about the specific trial that was selected for paying their earnings. They were asked to wait patiently for the experimenter, who then debriefed them, paid them the earned amount, and released them from the laboratory.

Results

Recall that the experiment involved three lottery types (each repeated in six trials). This was done in order to assess the participants' risk preference in various ranges of possible outcomes and to prevent them from losing interest. A one-way within-subject ANOVA on the number of risky choices with the "lottery type" as the independent variable did not yield a significant effect [$F(2, 25) = 0.98$, n.s]. As a result, we collapsed the number of participants' risky choices across the three conditions of "lottery type."

To assess the participants' risk preferences, for each participant we calculated the number of trials in which they chose the risky option. The results showed that 20 of the 28 participants could be classified as risk-averse. Of the 28 participants, 20 (71.4%) chose the risky option in nine trials or less, out of the 18 trials. The number of risky choices for the remaining eight (28.6%) participants ranged between 10 to 14, out of the 18 trials. When pooled across participants and trials, the average number of risky choices was 6.4 ($M = 6.4$, $SD = 4.12$, Skewness = 0.01).

A commonly used typology of social orientations is the classification of social orientations into *pro-social* and *pro-self* (individualistic and competitive) orientations (c.f., De Dreu et al., 1996; Cremer & Van Vugt, 1999). The rationale behind combining the individualistic and competitive types into a pro-self category is that they are both oriented towards maximizing own outcomes either in absolute (individualistic) or in relative (competitive) terms (Lange & Liebrand, 1989, 1991a, 1991b). The classification of participants using Lange et al. (1997) nine-item questionnaire showed that out of the 28 participants, 9 (32%) were classified as pro-socials and 19 (68%) as pro-selfs. An independent sample t-test on the number of risky-choices showed that the number of risky choices of the pro-social participants (out of the 18 experimental trials) was lower than that of the pro-self participants ($t(26) = -4.44$, $SD = 3.53$ and $M = 7.44$, $SD = 4.11$ for pro-social and pro-self participants respectively), and that this result was marginally significant [$t(26) = 2.79$; $p < 0.09$, $d = 0.52$]. To test the effects of SVO and "trial" on the participants' risk preference, we first divided the 18 experimental trials into two equal blocks of nine trials each. A two-way mixed ANOVA on the number of risky choices with SVO and "block" as independent variables did not yield a significant main effect for "block" [$F(1,26) = 0.87$, n.s.], or for the interaction between SVO and "block" [$F(1,26) = 1.19$, n.s.].

Discussion

Congruent with Prospect Theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981) and related evidence from experiments using the gamble/sure thing design (Kühberger, Schulte-Mecklenbeck & Perner, 1998; Beattie & Loomes, 1997), our results show that, on average, the participants were risk-averse. More interestingly, the findings of the reported experiment show that pro-socials were significantly more risk-averse than self participants. On average, pro-social participants preferred the risky option in 2

the trials, compared to pro-self participants preferring it in 41.4% of the trials. Because the present study is the first to investigate the relationship between SVO and risk preference, no direct comparison can be drawn between this finding and previous findings concerning the relationship between cooperativeness and risk preference. Such caution is further justified by the fact that cooperativeness (as expressed by the individual's SVO) is treated here as the independent variable and risk preference as the dependent variable, whereas in all previous studies risk was treated as the independent variable and cooperativeness as the dependent variable.

Notwithstanding the unfeasibility of comparing the present result with previous findings pertaining to the relationship between cooperativeness and risk preference, the question which arises is whether the risk preferences of individuals with different SVOs will be affected similarly, or differently, when embedded in a social context. While a main argument in favour of the existence of inter-personal relations on risk preference is convincingly documented by Loewenstein, Bazerman & Thompson, 1989; Bazerman, White & Loewenstein, 1986, the Loewenstein et al. (1989) study has also shown that the perceived type of interdependency (positive, neutral, or negative) was the dominant factor affecting the participants' risk preferences under the inter-personal condition. Thus, in speculating on the effects of social context on the risk preferences of individuals from different SVO types, it seems reasonable to conjecture that the predicted effect should to a great extent depend on the characteristics of the social context. Drawing on the results of Loewenstein et al. (1989), one might predict that the risk preferences of individuals from different SVOs will be affected differently by a cooperative, neutral, or competitive social context. More generally, one might predict that the type of interdependency between the interacting individuals depends on the nature of their relationships, and information they might have about others' decision-making processes.

outcomes are all important factors, which could interact with the individuals' determining their risk preferences.

Although the above mentioned inferences can generate many intriguing questions, the two experiments reported hereafter are confined to investigating the a minimal inter-personal context, manifest in the *mere presence of another co-actor* risk preferences of individuals from different SVO types. The decision choice to cautious approach in this study is warranted by the fact that it is the first to compare the risk preferences of different SVO types.

Experiment 2

The main objective of this experiment was to test the effect of a minimal inter-context on the risk preferences of individuals from different SVO types. Specific tested the effect of the mere presence of another individual who performs a similar t a co-actor) on the individual's risk preference.

A possible prediction regarding the effect of co-actors' presence on risk pref derived from the classical research on the 'risky-shift' phenomenon (Stoner, 1961; Kogan, & Bem, 1962). Since risk taking in Western cultures is valued more positiv cautiousness (Brown, 1965; Clark, Crockett, & Archer, 1971), it is predicted th presence of another co-actor, participants will act in a more risk-seeking manner. words, based on Brown's (1965) "risk as a value" hypothesis, it is predicted that the of a co-actor will prime the positively valued norm of risk-taking, causing part *irrespective of their SVO type*, to take more risk than the risk that each would have solitary. Because the "risk as a value" hypothesis pays no regard to the individua one might also hypothesize that while the presence of co-actors will cause all SVO

take more risk, the discrepancy observed in Exp.1 between the risk preferences of pro-social and pro-self types will be retained.

An alternative hypothesis is one which relies on the conceptual distinction between different SVO types. Such a distinction prescribes that choices made by pro-social competitive types are, by definition, sensitive to the social environment, while the choices of individualistic types are not. Thus, a modified version of the "risk as a value" hypothesis (i.e., one which accounts for the differences between social types), will prescribe that the interpersonal context will affect only the choices of socially sensitive types. Accordingly, we predict that the presence of another co-actor will cause both pro-social and competitive participants to take more risk, but will not influence the risky-choices of individualistic participants.

Method

Participants

Thirty six participants, all students at the University of Haifa, participated in the experiment. All participants responded to a notice inviting students to participate in an 'economics experiment' by writing their names and telephone numbers on it. They were told that they could earn as much as NIS 50 (about \$11) depending on their performance.

Design and Procedure

The design and procedure of Exp.2 were almost identical to those of Exp. 1. Similar to Exp.1, the present experiment utilized a mixed, three-factorial design, with SVO as a between-subject variable and the "lottery type" and "trial" as within-subject variables. However, in the present study participants were invited to the laboratory in pairs. One member of each pair was randomly assigned to be the leader and the other to be the follower. Each of the two students who participated in the experimental session was asked to complete a questionnaire.

a nine-item social value orientation (SVO) questionnaire. Participants were then escorted by the experimenter and seated in front of two adjacent computer terminals. Participants could see each other, but not the computer screen, nor the keyboard of their counterpart. They were instructed not to talk to each other during the entire experiment.

The identical instructions, which appeared on the two computer screens, included a detailed description of the experiment. They stressed the fact that the other participant, sitting in front of the adjacent computer terminal, was performing a similar, but independent task. Specifically, the instructions stressed that the decisions and outcomes of one participant were independent, and not in anyway affected by the decisions and outcomes of the other. The participants were further instructed that any communication between them was prohibited during the entire experiment and that no feedback would be given, either before or after the experiment, about the decisions and outcomes of the other participant.

In all other ways, the experimental procedure and instructions were identical to those used in Exp.1.

After the 18 trials were concluded, all participants received complete feedback on their choices and earnings on each trial and about the specific trial that was selected for paying their earnings. Each participant was then invited, one at a time, to the experimental room to be debriefed, paid the earned amount, and released separately from the laboratory.

Results

First, we tested the effect of the "lottery type" on the degree of risk taking. A within-subject ANOVA on the number of risky choices, with the "lottery type" as an independent variable, did not yield a significant effect [$F(2, 33) = 1.93$, n.s.]. As a result, in all subsequent analyses we collapsed the number of participants' risky choices across the three "lottery type" conditions.

Second, we examined the participants' risk preferences. The results showed that of the 36 participants, 19 (52.8%) were risk-averse, in that they chose the risky option or less of the 18 trials (compared to 71.4% in Exp.1). The number of risky choices for the remaining 19 (47.2%) participants ranged between 10 and 14 of the 18 trials. Pooled across participants and trials, the average of risky choices was 9.2 out of 18 (SD = 4.1, Skewness = 0.134), compared to 6.46 trials in Exp.1. A comparison between the distributions of mean risky choices, using the Kolmogorov-Smirnov test, showed that significantly more risky choices were made under the dyadic condition, than under the solitary condition ($z = 2.37$, $p < 0.017$).

To test the effects of SVO and "trial" on the participants' risk preference, we categorized the participants into the various SVO types. For the sake of examining the modified "pro-social value" hypothesis, a three-fold classification of SVO type was performed. The classification results showed that out of the 36 participants, 17 (47.2%) were classified as pro-social, 11 (30.5%) as individualist, and 8 (22.2%) as competitive.

As for Exp.1, we divided the 18 experimental trials into two equal blocks of nine each. A two-way mixed-design ANOVA on the number of risky choices with SVO type and "block" as the independent variable did not yield a significant main effect, either for SVO type [$F(2,33) = 0.16$, n.s., and $F(1,33) = 0.36$, n.s., respectively] or for "block" [$F(2,33) = 1$, n.s.]. A significant interaction between SVO and "block" was not significant [$F(2, 33) = 1$, n.s.].

Recall that the main objective of Exp. 2 was to test two competing hypotheses regarding the effect of a "minimal" social context, operationalized as the mere presence of another co-actor, on the risk preferences of individuals from different SVO types. To accomplish this objective, we re-categorized the participants of Exp. 1 into three (pro-social, individualist, and competitive) types. The pooled data from the two experiments were subjected to a between-subject, two-way ANOVA, on the number of risky choices.

"condition" (solitary vs. dyadic) and SVO as independent variables. As exp significant main effect was detected for "condition" [$F(1, 58) = 4.28$, $p < 0.043$, $\eta^2 = 0.07$] indicating that under the dyadic condition participants made more risky choices (Mean = 9.2, $SD = 4.1$) than under the solitary condition (Mean = 6.5, $SD = 4.13$). On the other hand no significant main effect was found for SVO [$F(2, 58) = 1.52$, n.s]. The more interesting finding is the existence of a marginally significant interaction effect between experimental condition and SVO on the number of risky choices [$F(2, 58) = 2.57$, $\eta^2 = 0.06$].

Figure 1 depicts the mean number of risky choices for each SVO type under the solitary and the dyadic conditions. As can be seen from the figure, the marginal interaction effect can be explained by the difference observed between the mean risky choices of participants under the two experimental conditions. The analysis of simple effects supports this observation. A significant effect [$F(1, 24) = 10.92$, $p < 0.003$, $\eta^2 = 0.21$] was found for the experimental condition on the number of risky choices of pro-social participants. Specifically, the mean risky choices of pro-socials was significantly higher under the dyadic condition than under the solitary condition (Means = 9.58 and 4.44 for the dyadic and solitary conditions, respectively, with SD 's = 3.89 and 3.54, respectively). No significant effect was found for the experimental condition on the number of risky choices made by individualistic participants [$F(1, 22) = 1.84$, n.s; Means = 8.73 and 6.37 for the dyadic and individualistic conditions, respectively, with SD 's = 5.24 and 3.45, respectively], or by control participants [$F(1, 12) = 0.21$, n.s; Means = 8.88 and 9.83 for the dyadic and control conditions, respectively, with SD 's = 5.14 and 4.70, respectively].

- Insert Figure 1 about here -

Discussion

Overall, the comparison between the results of Experiments 1 and 2 showed significantly more risky choices were made in the presence of another co-actor than decisions were made in solitary. Moreover, the analysis pertaining to the risk behavior of different SVO types lends partial support to the modified "risk as a value" hypothesis. In support of the hypothesis, pro-social participants took significantly more risk under the dyadic condition than under the solitary one, while no comparable difference was found in the risk-behavior of individualistic participants. On the other hand, although we hypothesized sensitivity of competitive individuals to the social context, we did not find a significant effect of a co-actor's presence on their risk preferences. Our data do not enable us to speculate on this result, but the relatively high percentage of risky choices made by competitive participants under the solitary condition raises the possibility that their indifference to the co-actor's presence might be attributable to a ceiling effect.

The result indicating that a minimal inter-personal context caused pro-social participants to increase their risk-choices significantly seems quite intriguing. In fact, we are not aware of any previous finding with which this result might be compared, since, to the best of our knowledge, the present study is the first to test how the risk preferences of individuals are influenced by their social value orientation.

A previous study, which has demonstrated the effect of inter-personal context on risk preference, is that of Loewenstein et al. (1989). Their main hypothesis was that in personal situations, individuals adopt a social-reference point, rather than an individual reference point as prescribed by Prospect Theory (Tversky & Kahneman, 1981). To test this hypothesis, two choice situations were constructed: An individual situation, in which the subjects' decisions determine only their own payoffs, and an interpersonal situation in which the subjects' decisions determine their outcomes, as well as the outcomes of

player. Both the individual and the interpersonal conditions were in fact simple lottery type used in this study. In the interpersonal condition, the 'certain' and the outcomes for 'self' and 'other' were determined by the subject. The results of Loewenstein et al. (1989) study supported the hypothesis that, in interpersonal situations, the significance of interpersonal comparisons surpassed the concern for personal outcomes.

Despite the importance of the 'social utility explanation' for understanding social behavior in interpersonal contexts, it does not qualify as an alternative explanation for the results reported here. This is because participants in our study were unable to make decisions on a social reference point, simply because they had no way of inferring the decisions and the outcomes of their co-actors.

Although a reasonable explanation of our results seems to be provided by the modified version of Brown's (1965) "risk as a value" hypothesis, the previously detailed test of this hypothesis suffers from two main shortcomings: First, the solitary condition in Experiment 2 was not pre-designed as a control condition to the dyadic manipulation of Experiment 3. Secondly, the previous experiments did not include any direct measure of the participants' conception of risk as a value. Experiment 3, which will be detailed hereafter, was designed to overcome these shortcomings.

Experiment 3

The main objectives of this experiment were to replicate the results obtained in the previous experiments and to provide a direct test for the modified "risk as a value" hypothesis. Before describing the experimental design and procedure, it seems worthwhile to understand the aspects in which Exp. 3 differs from the two preceding experiments: First, the participants' SVO's in Exp. 3 were measured about two weeks before inviting them to participate in the experiments, and not immediately before the experimental phase. This procedure e

reasonable time span between the measurement of participants' SVOs and the experiment phase. It also enabled us to manipulate the SVO variable, rather than just measure it. Second, due to a negligible number of competitors in our sample, only pro-social individualistic participants were included in the participants' pool.

Method

Participants

Sixty-one participants, all undergraduate students from the University of Haifa, participated in the experiment. Twenty-nine participants were classified as pro-socials and individualists. Participants were told that they could earn as much as NIS 50 (about \$15) depending on their performance.

Design and procedure

The experiment utilized a mixed, four-factorial design. The two variables, "social context" (two levels: solitary and dyadic) and SVO (two levels: pro-social and individualist) were manipulated as between-subject variables. The two remaining variables, "lottery type" and "trial," were manipulated as within-subject variables. The experimental procedure was identical to that implemented in Exp.1, except that under the solitary condition participants were invited to the laboratory individually, while under the dyadic condition they were invited in pairs.

About two weeks before the first experimental session, three research assistants administered a short questionnaire in undergraduate classes at the University of Psychology Department and the Faculty of Law. The questionnaire included a revised SVO questionnaire (Van Lange et al., 1997) and a ten-item Social Value questionnaire written by the authors. The first five questions in the SV questionnaire

assessed the extent to which participants appraised five attributes (risk-taking, preserving tradition, preserving of societal stability, self discipline, and personal achievement) as *personally valued norms*. The remaining five questions were identical, except that they were phrased to assess the participants' appraisal of the same attributes as *socially valued norms*. The purpose of the SV questionnaire was to measure the participants' appraisal of risk-taking as a *personally* and *socially* valued norm. The additional questions, referring to other attributes, were included in order to mask this objective. The instructions for the "personal" part of the questionnaire stated that "*the following questions refer to various social values. For each social value, please indicate the extent to which you believe it to be an important social value for you.*" The instructions for the second part were identical, except that they asked each participant to report the extent to which s/he believed that a given norm was "very important for society." The order of the "personal" and "social" parts of the questionnaire was counterbalanced. For each question, participants were instructed to mark what they considered as the most appropriate answer on a 5-point Likert scale (from 5 = very important, to 1 = not important at all).

A final question asked the participants whether they were interested in participating in another study. Those who answered this question in the affirmative were asked to write down their telephone numbers, so that they could be contacted by the researchers.

One hundred and ten participants answered the questionnaire. Thirty five indicated that they were not interested in participating in another study. Ten additional participants were excluded (nine could not be classified to any SVO type and one was classified as competitive). Four others could not be contacted at the telephone number they registered. Of the remaining 61 participants, 29 were classified as pro-socials and 32 as individualists. About equal numbers of participants from each of the two SVO types were randomly assigned to one of the two "social conditions." This procedure yielded

groups: individualistic/solitary (16 participants), individualistic/dyadic (16 participants), pro-social/solitary (13 participants) and pro-social /dyadic (16 participants).

As in the two previously described experiments, participants were contacted by telephone and invited to the Social Psychology Laboratory. Both the solitary and the dyadic conditions included series of 18 lotteries (six for each "lottery type"). When the experiment was concluded, each participant received complete feedback about his/her chosen lottery type, earnings on each trial and about the specific trial that was sampled for paying out the earnings. Participants were asked to wait patiently for the experimenter, who then counted them, paid them their earned amount, and released them from the laboratory.

Results and Discussion

A one-way within-subject ANOVA on the number of risky choices with the "lottery type" as the independent variable did not yield a significant effect [$F(2, 59) = 1.34$, n.s]. As we collapsed the number of participants' risky choices across the three conditions of "lottery type."

The mean number of risky choices for pro-social and individualistic types versus the solitary and the dyadic conditions are depicted in Figure 2. To test the effect of "experimental condition" and the SVO on the participants' risk taking, we performed a between-subject two-way ANOVA on the number of risky choices, with the "experimental condition" (solitary vs. dyadic) and SVO as the independent variables. Replicating the results of the two previous experiments, a significant interaction effect [$F(1, 57) = 10.34$, $p < 0.02$, $\eta^2 = 0.09$] was detected between the "experimental condition" and SVO. On average, pro-social participants made significantly more risky choices [$F(1, 27) = 10.63$, $p < 0.02$, $\eta^2 = 0.18$] under the dyadic condition (Mean = 10.63, SD = 3.59), than under the solitary condition (Mean = 6.85, SD = 4.67). On the other hand, for individualistic participants,

participants, no significant difference [$F(1, 30) = 0.76$, n.s] was detected between the number of risky choices made under the solitary and the dyadic conditions (Mean $SD = 4$ and Mean = 7.44, $SD = 4.11$ for the solitary and the dyadic conditions, respectively).

- Insert Figure 2 about here -

In general terms, the modified "risk as a value hypothesis," proposed in Exp. 2, predicts that due to the insensitivity of individualistic participants to the social context, a "risk effect" will be detected under the dyadic condition *only* for the pro-social, and not for the individualistic type. To test this hypothesis, for each participant we calculated the difference (D) between personal appraisal of risk as a valued norm and appraisal of risk as a non-valued norm. A positive D value implies that the participant values risk *more* positively than s/he thinks it is valued by society. A negative D implies that s/he values risk *less* positively than s/he thinks it is valued by society, and a zero D implies that s/he values risk to the same degree as s/he thinks that it is valued by society.

For pro-social and individualistic participants, respectively, Figures 3a and 3b show the mean number of risky choices under the solitary and dyadic conditions, for positive and negative D value, respectively. With regard to pro-socials, who value risk less positively than they think it is valued by society ($D < 0$), the modified "risk as a value" hypothesis prescribes that more risky choices will be observed under the dyadic than under the solitary condition. On the other hand, no differences between the two experimental conditions are expected for pro-socials who value risk more than, or as much as, they think that it is valued by society ($D \geq 0$). For the individualistic type, similar levels of risky choices are predicted to occur under the solitary and dyadic conditions, regardless of the participants' D value.

Figures 3a and 3b suggest that a possible interaction may exist between "experimental condition" and D , for pro-social but not for individualistic participants. To validate this observation, a three-way ANOVA was performed on the number of choices as a function of D (three levels: positive, negative and zero), SVO (two levels: individualistic vs. pro-social), and "experimental condition" (two levels: solitary vs. social). The most interesting finding of this analysis is the existence of a marginally significant interaction effect between the experimental condition, SVO, and D on the number of choices [$F(1, 47) = 3.87$, $p < 0.057$, $\eta^2 = 0.08$].

-Insert Figures 3a and 3b about here-

The analysis of simple effects detected a marginally significant interaction [$F(1, 20) = 3.87$, $p < 0.057$, $\eta^2 = 0.08$] between D and the "experimental condition" for the pro-social participants. The mean number of risky choices by pro-socials with $D < 0$ (i.e., among those who reported that they appraise risk *less* positively than they think it is appraised by society), was significantly higher [$F(1, 47) = 7.74$, $p < 0.005$, $\eta^2 = 0.066$] under the social condition (Mean = 10.75, SD = 3.82) than under the solitary condition (Mean = 2.8). No significant differences ($p > 0.05$) were detected between the two conditions for individualistic participants with $D \geq 0$ (i.e., among those who reported that they appraise risk equal to or more positively than they think it is appraised by society).

A similar analysis performed on the risky choices of individualistic participants showed no interaction effect [$F(1, 25) = 1.2$, n.s.] between D and the "experimental condition." This implies that individualistic participants were not affected by the presence of another co-actor, regardless of how they appraise risk in comparison to their own regarding its appraisal by society. To corroborate the insensitivity of individualistic participants to the presence of another co-actor, we conducted a second ANOVA.

participants to the social context, we investigated the effects of the "experimental condition" and their *personal* appraisal of risk as a valued norm, on the number of their risky choices. To accomplish this, we divided the individualistic participants into two groups in accordance with their median appraisal of risk as a personally valued norm (Med = 3). We conducted a two-way ANOVA on the number of risky choices as a function of risk as a value (two levels: high vs. low) and "experimental condition" (two levels: solitary vs. dyadic). The results revealed that individualistic participants were not influenced by the social context [$F(1, 27) = 0.55$, n.s]. On the other hand, a significant main effect [$F(1, 27) = 5.18$, $p < .05$, $\eta^2 = 0.16$] was detected for risk appraisal. Individualistic participants with "high" appraisal of risk as a personal value, took more risk (Mean = 10.3, SD = 3.43) than individualistic participants with "low" appraisal of risk as a personal value (Mean = 7.29, SD = 3.81).

Taken together, the results of Exp. 3 replicate the results of the two previous described experiments. On average, the number of risky choices observed for pro-social participants was significantly higher under the dyadic than under the solitary condition. On the other hand, the presence of a co-actor did not affect the number of risky choices observed for individualistic participants. The replication of these results seems consistent due to two design features, which distinguished Exp. 3 from the two preceding experiments. First, the SVO variable in this experiment was manipulated and not measured; and secondly, the measurement of participants' SVO was conducted at least two weeks prior to the experimental phase and not immediately before its commencement.

The inclusion in Exp. 3 of an explicit measure of participants' risk appraisal allows for a more discriminatory test of the "co-actor effect" on the risk preference of pro-social SVO types. The results obtained for the pro-social type lend partial support to the "risk as a value" hypothesis, by suggesting that this effect is mediated by participants' risk appraisal. Specifically, for pro-socials, a "risky shift" in the presence of a co-actor

detected only for those who appraise risk less positively than they think it is appraised in society.

The results obtained for individualistic participants are fully supportive of the modified hypothesis. The risk preference of this social type was influenced only by their personal appraisal of risk as a value, but not by a co-actor's presence. In other words, irrespective of the social context (solitary or dyadic), participants of this type who reported higher appraisals of risk as a personal value, took significantly more risk than participants who reported lower appraisals.

General Discussion

Previous studies which investigated the relationship between cooperativeness and risk-taking (Budescu, Rapoport & Suleiman, 1990; Snijders & Werner, 1998; Suleiman & Chen, 1999; Flache, 2001; Parks, 2004; Van Assen & Snijders, 2004) have yielded mixed results. We think the variety of interdependent situations employed in these studies (Prisoner's Dilemma, Public Goods and CPR games) and the fact that they all used risk preferences elicited in solitary situations to account for risk preferences in interdependent situations, render their findings unsatisfactory for making an unequivocal inference about the relationship between cooperativeness and risk preference.

The present study was inspired by classical research on the Risky-Shift and the Polarization phenomena (e.g., Stoner, 1961; Wallach, Kogan & Bem, 1962; Maelzer, Lamm, 1976) and the notion of social utility (Loewenstein, Bazerman & Thompson, 1989; Bazerman, White & Loewenstein, 1995). Rather than assuming that risk preference is a stable trait, we treated the propensity towards cooperation as a relatively stable or unstable characteristic (Van Lange & Kuhlman, 1994; Van Lange, De Bruin, Otten & Joireman, 1998) and investigated the risk preferences of individuals of different SVO types in solitary and dyadic situations.

minimal social context characterized by the presence of another individual performing a similar decision task (a co-actor).

Three main findings emerge from the reported experiments: 1) risk preferences of pro-socials and SVO are two related attributes, such that in solitary situations pro-socials are significantly less risk-seeking than pro-selfs; 2) when paired with a co-actor, pro-socials take on more risky choices, whereas pro-selfs do not; and 3) the "risky shift" demonstrated by pro-social participants is mediated by their risk appraisals. Specifically, a "risky shift" in the presence of a co-actor was detected only among pro-socials who appraised the risk more positively than they thought it is appraised by society, and not by pro-socials who appraised the risk equally or more positively than they thought it is appraised by society.

The result concerning the sensitivity of pro-social but not individualistic participants to the social environment seems plausible; in consistence with their social orientation, pro-socials who strive to achieve equality and maximization of joint outcome have to engage in social comparisons, whereas individualistic subjects focus on maximizing their own outcomes (Van Lange et al., 1997). The same line of reasoning applies to competitive individuals, who in the presence of co-actors (in Experiment 2) were expected to engage in competitive social comparison and, consequently, increase their risky choices. The lack of effect we failed to detect a similar sensitivity to the social context for competitive participants might be attributed to a ceiling effect.

With regard to individualists, two complementary findings attest to their hypothesized insensitivity to the social context. First, there was no difference in the risk preference of individualistic participants under the solitary and the dyadic condition. Second, the risk preferences of individualistic participants were influenced, on average, by their appraisal of risk as a personal and not as a social value. In other words, irrespective of whether individualists believed that risk is a socially valued norm or not, on average,

took more risk when they perceived it as a personally valued norm, and took less risk when they perceived it as a personally less valued norm.

Despite its significance, the result concerning the relative cautiousness of pro-social individuals in solitary situations does not permit any conclusion concerning the causal relationship between risk-aversion and cooperativeness, nor does it preclude the likelihood that these attributes are products of other social and psychological constructs. We believe that these questions, which have hardly been addressed in previous research, are of significant theoretical and practical importance. Developmental or cross-sectional studies are needed in order to explore further the casual relationships between risk preference and social orientation and to discover when, and how, these constructs crystallize as personal traits. What are the developmental and environmental factors that influence their development and in which ways they interact and affect each other. An interesting finding in this regard was reported by Van Lange et al. (1997) who found that, in comparison to individualistic competitors, pro-social individuals exhibited greater levels of secure attachment. Despite the significance of their finding, Van Lange et al. (1997) did not test the participants' risk preferences, and thus no inference could be made, based on their results, regarding the triangular relationships between SVO, risk preference, and attachment styles.

Social facilitation of Risk-taking

The classical phenomenon of social facilitation concerns the improvement in performance resulting from the mere presence of members of the same species, either as co-actors (performing the task but not interacting) or as passive audience (Allport, 1920). Although the research on social facilitation has focused on the performance of physical and intellectual tasks, there is no reason for not extending its domain to other types of behavior. Malhotra and Mukhopadhyay (2000) and Ku, Malhotra, and Murnighan, (2005) used a social-facilitation explanation to

account for the "auction fever" phenomenon, wherein the heat of competing to auction, auction buyers usually get carried away and escalate their bids far above the selected limits. Based on Zajonc's (1965) "drive theory" and Allport's (1924) observations regarding competitive situations, Malhotra and Murnighan (2000) argue that the extreme bidding behavior observed at auctions is best explained by "competitive arousal," which can also occur in other competitive situations.

The results of the present study suggest that a similar form of social facilitation may also occur in risk-taking. When paired with co-actors who performed a similar decision task, individuals, who perceive risk as a valued social norm, significantly increased the number of risky choices. We speculate that an "evaluation apprehension" explanation (Cottrell, 1973) may account for the observed behavioral change, but more research is needed to corroborate this conjecture and to underpin the psychological mechanisms underlying the observed phenomenon. Further research is also needed to replicate the detected phenomenon in the context of other social situations. For example, it would be of interest to test whether the observed increase in risk-taking will occur in situations characterized by the mere presence of a passive individual or an audience. Situations of this type are by far more common than the one tested in this study, as they are encountered by many individuals at the workplace and in natural-groups, when risky decisions are made in the presence of one or many observers.

Theoretical and practical implications

Previous research has shown that in situations characterized by interdependency between two individuals, decisions under uncertainty conditions are made with reference to the group reference point instead of an individual reference point (Loewenstein et al., 1989; Bazerman, 1986; Lowenstein, 1995). Our results go a step further by convincingly showing that the mere presence of another co-actor may be sufficient to affect a person's risk preference.

most daily-life decisions are made within a social context of one type or another. The reliability of individualistic models of decision under risk should be taken with caution. This applies in particular to the common practices in economics and decision research, where preferences are usually elicited using an individual-choice task, and then empirical studies are conducted accounting for behaviors in collective environments.

On a more practical side, the findings of the present study bear clear relevance to many real-life situations in which we take risky decisions in the presence of others. For example, those who lost money in casinos or watched others lose their money might have the same reaction. The conjecture that the lining-up of slot-machines one next to another, or the competition between spectators who participate in multiple-players' gambles are effective in stimulating spectators to gain pleasure from watching others gamble, may also apply to other situations that encourage gamblers to take more risk. Traditional stock markets and auction houses provide yet other good examples of the mere presence effect on risk-taking. Obviously, such situations differ in numerous aspects from the minimal situation investigated in our study. Moreover, they differ in that they constitute complex, multi-player interdependent situations. Nonetheless, it is not unlikely that, in addition to the strategic factors involved in a decision to buy stock or place a bid, such decisions are affected by the fact that individuals in physical proximity to them are performing a similar task. Striking evidence for this conjecture comes from the 1999 Cow Auction, when the city of Chicago organized an exhibit of over 300 life-sized fiberglass cows, and later put up for auction 75 cows. Some were sold online via the Internet and 65 at a live, in-person auction. In support of a "competitive arousal" model, Malhotra and Murnighan (2000) state that the 1999 Cow Auction's sales data show that the average price per cow was six to seven times the initial estimates¹. More interestingly, in the present context are the data, not discussed by the authors, showing that the average

¹ Analysis of the data shows that bids in the Internet and live auctions are best explained by a "competitive arousal" model. In addition, they found some support for an "escalation model" for the Internet auction (for details see Malhotra & Murnighan, 2000).

obtained in the live, in-person, auction was significantly higher than the average price obtained in the Internet auction (\$32,300 and \$18,501 in the live and Internet auction, respectively). Based on the results reported in the present study, it is very likely that the significant increase in average price in the live auction, as compared to the Internet auction, is the result of increased "competitive arousal" caused by the presence of co-actors who participated in the live auction.

Individual differences in risk-taking

Another important implication of our results pertains to the study of individual differences in risk taking. Aside from the common classification of individuals according to their risk preferences (to risk-averse, risk neutral, and risk seekers), no serious attempt has been made to explore the underlying factors associated with this typology. We believe that the neglect in investigating individual differences in risk preference is mainly due to the domination of the economic paradigm over the risk and decision research. In the economic theories, the individual's behavior is determined by situational factors (e.g., game structure), with hardly any attention being paid to the effects of personality and their interaction with a given situation (Suleiman, 2001). In fact, most empirical research in economics relates to data variability, including the variability which originates from individual differences as noise, and views its reduction as a desired objective (c.f., Fischbacher & Ortmann, 2001). We suspect that in spite of major departures from standard economic theories, such as the one advanced by prospect theory (Tversky & Kahneman, 1991), the "bad influence" of economics manifest in the adherence to a situation-oriented approach instead of to a more interactional approach (Blass, 1984), continues to be a prevalent factor. In this regard, our results indicate that individuals' SVO correlates with their risk preference.

in solitary situations, but further research is needed to discover the relationship other personality attributes on risk preferences.

Research limitations and suggestions for future research

The findings of this study lend partial support to a modified "risk as a value" hypothesis (Brown, 1965). Specifically, it was demonstrated that the mere presence of a co-actor pro-socials who perceive risk as a valued norm to change their risk preference direction of the valued norm. Due to the small number of competitors in the sample of the first two experiments and their negligible number in the sample of the third experiment, we were not able to corroborate our predictions for this social type. Worth noting in this regard is that a meta-analysis conducted by Au and Kwong (2004) on the SVOs of about 1,000 individuals from various populations, has shown that the percentage of the competitive type is relatively low (about 13%, in comparison to about 50% and 24% of pro-social and individualistic types, respectively).²

Another limitation of this study lies in the fact that the detected relationship between the SVO type and risk preference does not allow any inference regarding the causal relationship between the two variables. Indirect evidence on which such an inference could be based comes from anthropological studies showing that, in hunter-gatherer societies, individuals join groups and engage in cooperative hunting as means for reducing environmental risks (c.f., Cashdan, 1985; Packer & Ruttan, 1988; Peterson, 1993; Boesch, 1994). Cooperative hunting is explained as a form of "social insurance" against the objective uncertainty associated with catching a large game (Cashdan 1980; Wiessner, 1982). The role of aversion in group formation was also underscored by several studies within the field of social psychology (e.g., Fiske, 1993).

² In the present study, only six (out of 28) participants in Exp. 1, eight (out of 36) participants in Exp. 2 and one participant in Exp. 3 were classified as competitive. In general, studies conducted in Israel reveal that the percentage of the competitive type among Israeli subjects is noticeably lower than the figures reported by Au and Kwong (2004).

identity paradigm, which proposed and tested an "uncertainty reduction theory" (Hogg & Abrams, 2000) positing that the reduction of subjective uncertainty is a key motive behind identification with a social group. This theory, and related empirical evidence, suggest that identification with a group is an effective way of reducing the individual's subjective uncertainty, that people identify more strongly with groups when they feel uncertain, and that uncertainty may be important for triggering the process of identification with a social category (c.f., Hogg & Abrams 1993; Hogg & Mullin, 1999; Grieve & Hogg, Reid & Hogg, 2005; Hogg, Sherman, Dierselhuis, Maitner, & Moffitt, 2006).

Obviously, these two lines of research are rooted in different social disciplines. The point we wish to make by mentioning them briefly is that they both support the proposition that the reduction of (subjective or objective) uncertainty is a key factor in the decision to join a group. Based on the above-mentioned studies it seems reasonable to conjecture that the tendency towards cooperativeness (expressed by SVO) might be influenced by the individual's tolerance for risk, and not vice versa. As mentioned earlier, we believe that developmental or cross-sectional studies are needed in order to test this conjecture.

Finally, we think that the methodology and results of the present study can stimulate more research on the relationship between social orientations and risk preferences. The following directions seem to us of special interest:

Type of relationship

The co-actor situation investigated in the present study is analogous to many other situations, such as in gambling houses and stock-markets. Nonetheless, numerous decisions are commonly taken in a variety of other interpersonal contexts. Of special interest are situations characterized by competitive, cooperative, or 'mixed-motive' interactions based on interdependency (Davis, Laughlin, & Komorita, 1976). Competitive situations involve

business, and politics provide numerous examples in which individuals and groups make risky choices in social contexts characterized by various types of interdependency among the interacting parties. In such situations, the environmental uncertainty inherent in the situation is compounded by the social uncertainty associated with what other players will do (Suleiman & Rapoport, 1988). The latter source of uncertainty depends, among other factors, on the information available to each player about the moves of other players and the type of interdependency between the interacting parties. Although the interplay between social and environmental sources of uncertainty has attracted some research interest (see recent reviews see Van Dijk, Wit, Wilke, & Budescu, 2004 and Wit, van Dijk, Veldkamp, & Groenenboom, 2004), further research is still needed to replicate the results reported here in the present study under cooperative, competitive, and other types of interdependency.

Information

Another interesting question, to be addressed in future research, concerns the effect of information about the co-actor, and their interaction effect with social orientation and risk preference. We hypothesize that individuals' risk preference will be affected differently by information about a co-actor's behavior than by information about his/her behavioral outcomes, and that such an effect will interact with the individual's social value orientation. For example, based on the "risk-as-a-value hypothesis" (Brown, 1965), we predict that individuals will take less (more) risk if informed that a co-actor (or other co-actors) is risk-averse (-seeking). Different hypotheses can be derived for situations under which individuals have complete information about other co-actors' choices and outcomes. Knowledge about another person's outcomes is predicted to stimulate an outcome-based social comparison and, consequently, the calibration of behavior in accordance with a 'reference-point' (Loewenstein et al., 1989). For example, the knowledge that

person's high risk-taking had yielded high payoffs is expected to behoove individuals especially those who are intrinsically sensitive to others, to take more risk.

Conclusions

The purpose of the present study was to investigate the relationship between the pro-social tendency towards cooperation, represented by individuals' social value orientation, and their risk preference. It was shown that in solitary situations, pro-social individuals are significantly less risk-seeking than pro-self individuals. On the other hand, when paired with another individual who performed a similar decision task, pro-socials, who appraise risk as a valued norm that they think it is valued by society, significantly increased their risky-choices to a level that was detected for individualists. We conclude that individual differences should be taken more seriously in research on choice under risk conditions, and that the phenomenon of social facilitation could be extended to account for risk behavior.

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Figure Captions

Figure 1: Mean number of risky choices for each SVO type under the solitary and th conditions in Experiments 1 & 2.

Figure 2: Mean number of risky choices for pro-social and individualistic types u solitary and the dyadic conditions in Experiment 3.

Figures 3a: Mean number of pro-socials' risky-choices under the solitary and conditions, for positive, zero, and negative D value, respectively.

Figures 3b: Mean number of pro-selfs' risky-choices under the solitary and dyadic co for positive, zero, and negative D value, respectively.

Figure 1

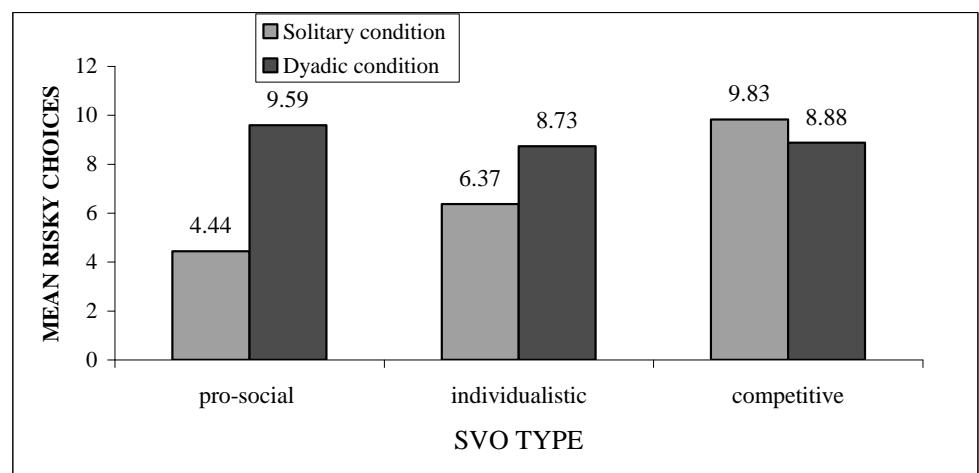


Figure 2

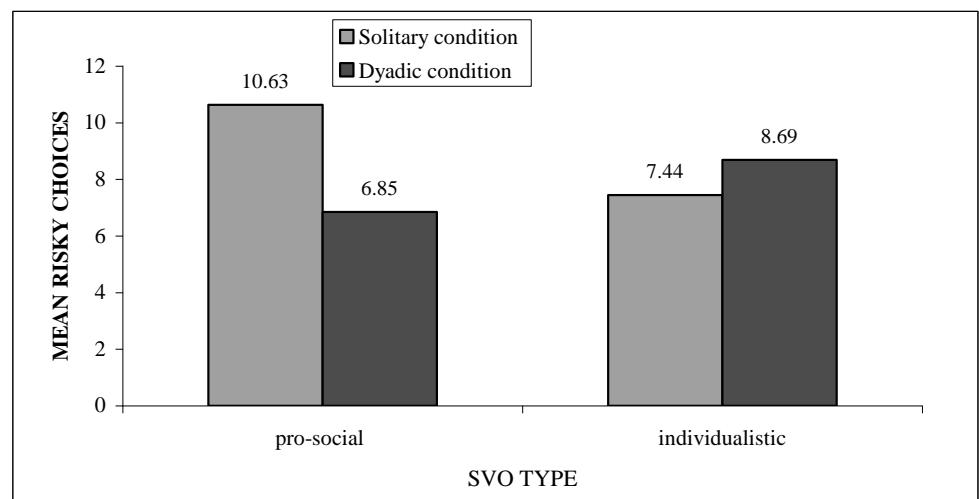


Figure 3a

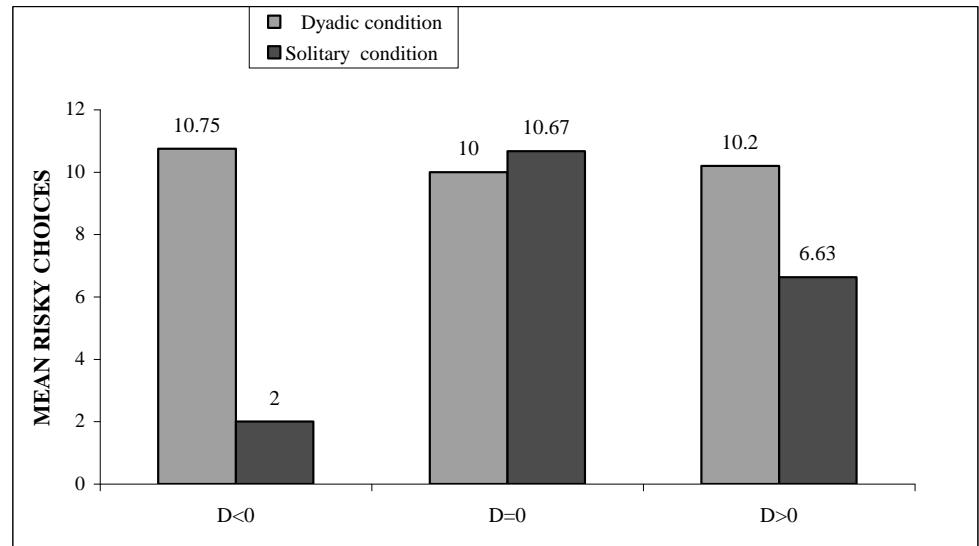


Figure 3b

