Loss restlessness and gain calmness: Durable effects of losses and gains on choice switching

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While the traditional conceptualization of the effect of losses focuses on bias in the subjective weight of losses compared to respective gains, some accounts suggest more global task-related effects of losses. Based on a recent attentional theory, we predicted a positive after-effect of losses on choice switching in later tasks. In two experimental studies we found increased choice switching rates in tasks with losses compared to tasks with no losses. Additionally, this heightened shifting behavior was maintained in subsequent tasks that do not include losses, a phenomenon we refer to as "loss restlessness". Conversely, gains were found to have an opposite "calming" effect on choice switching. Surprisingly, the loss restlessness phenomenon was observed following an all-losses payoff regime but not after a task with symmetric mixed gains and losses. This suggests that the unresolved mental account following an all-losses regime increases search behavior. Potential implications to macro level phenomena, such as the leverage effect, are discussed.

Keywords: Decision making, search, attention, individual differences, Zeigarnik effect

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The effect of losses on decision making has been traditionally modeled using an asymmetric weight function where the subjective weight of losses is larger than that of equivalent gains (Kahneman & Tversky, 1979). This *loss aversion* assertion can be described metaphorically as a “tilted scale” involving bias in the subjective assessment of value. Recently, however, other effects of losses have been found which are not always consistent with this conceptualization. For example, losses were found to enhance decision performance (i.e., expected value maximization) even when high performance does not lead to avoiding losses (Yechiam & Hochman, 2013a). Similarly, losses were found to increase response time, arousal, and behavioral consistency even in the absence of loss aversion (Xue et al., 2009; Hochman & Yechiam, 2011; Yechiam & Telpaz, 2013). It has been recently suggested that some of the myriad effects of losses result from their impact on task attention (Yechiam & Hochman, 2013b). In the present study we wish to examine the effect of losses on the related construct of search among choice options. Search behavior has been conceptualized as a key measurable outcome that may be used to clarify the role of attentional processes (Glöckner & Herbold, 2011); and may thus shed light on the specific cognitive mechanism affected by losses.

Two opposite effects of losses on search behavior appear reasonable. Reviewing data from cognitive neuroscience studies of reinforcement learning problems, Aston-Jones and Cohen (2005) argued that task boredom increases exploratory search among alternatives. If losses increase arousal and attention, as has been found previously (Bechara et al., 1997; Satterthwaite, et al., 2007; Hochman & Yechiam, 2011; Yechiam & Hochman, 2013b), then they might reduce the level of boredom. Accordingly, people should exhibit increased search behavior *without* losses. On the other hand, the increased arousal and attention with losses may in fact lead to increased search behavior. When attentive, decision makers might be more engaged in seeking out different possibilities for performing a task; resulting in more switching between choice options.

An alternative account predicting a positive effect of losses on search behavior was proposed by Schneider (1992), who observed more inconsistent risk taking behavior across different gambles in the loss domain than in the gain domain. Schneider (1992) suggested that when the outcomes are predominantly in the loss domain there is greater difficulty to make a decision and greater conflict, due to the fact that none of the expected outcomes for the different options are likely to satisfy one's aspiration. This leads to more choice switching with losses.

A key difference between the latter two accounts is that under Schneider's (1992) model the effect of losses on choice switching is limited to a given task. By contrast, under the attentional account the effect of losses may persist even after a task with losses has been completed. Specifically, under the attentional model of Yechiam and Hochman (2013b), while the acute attentional orienting response induced by experiencing losses lasts only a few seconds, long term attentional effects may be obtained by means of two pathways: (a) a parasympathetic response (Porges, 1992), and (b) secondary effects on the activity of the central nervous system, which can have a time course of several minutes (Shaw, 2003). In support of this proposition, it has been found that a loss in one task improved performance in a follow-up task (Dawson, Gilovich, & Regan, 2002).

The only study that we are aware of that examined the effect of losses on search among choice alternatives is a recent investigation by Lejarraga et al. (2012). They re-analyzed a very large dataset of decision behavior (the Technion Prediction Tournament; TPT; Erev et al., 2010). The TPT included 120 decision tasks in which the payoffs were randomly determined. In each choice task one alternative produced a fixed payoff M and the other produced a larger payoff H with probability p and otherwise a smaller payoff S (where S < M < H). The values of S, M, H, and p were randomly set within certain constraints so that the expected values of the two choice alternatives would be similar. In 40 of the problems S, M, and H were losses; in another 40 they were gains, and in the last 40 S was a loss and H was a gain (a mixed domain gamble). The 120 problems of the TPT were administered either in a description based manner, a feedback based manner, or a sampling based manner (for a review of theses task types, see Hertwig & Erev, 2009). Lejaraga et al. (2012) focused on sampling-based tasks in which the decision maker first samples the different choice options as much as s/he wants by selecting alternatives and getting feedback; and then makes a single choice that determines all of the outcomes. They compared choice problems that included losses to those that did not include losses. The results showed that losses led to increased sampling of the available alternatives (11.3 samples on average for losses compared to 8.7 for gains; a 29% relative increase), suggesting that losses have a positive effect on search behavior.

In two experimental studies, we evaluated whether the effect of losses extends not only to samples (that do not affect one's outcomes) but also to switching among actual choices. For this purpose we examined feedback-based decisions (Barron & Erev, 2003), where each choice in a series of repeated selections results in outcomes that affect the participant's payoffs.[1] As noted above, we tested whether in addition to the effect of losses on search among alternatives in a given task (e.g., as found in Lejaraga et al., 2012) there is also a delayed effect of losses on choice switching in follow-up tasks.

[1] While there are some similarities between the sampling-based and feedback-based decisions (e.g., the tendency to underweight rare events), there are also some differences (c.f. Hertwig & Erev, 2009; Camilleri & Newell, 2011).

Experiment 1: The effect of a payoff regime with losses or gains on choice switching

Participants performed four decision tasks, two producing gains and two producing losses. Each task consisted of 100 trials in which they had to select one of two virtual buttons. Their outcomes were randomly sampled from two payoff distributions, as shown in Table 1. The two Gain tasks were followed by the Loss tasks, or vice versa. We then examined differences in the mean number of consecutive selections (or runs) from the same choice alternative across 100 trials. This experimental design enabled us to assess not only the difference between a gain and loss regime, but also the durable effect of one regime on choice switching in the other. Additionally, this design enables to simultaneously test the effect of payoff size (e.g., whether an effect of losses on choice switching is evidenced across payoff sizes).

Method

Participants

Ninety-three Technion students (47 males and 46 females) took part in the study after responding to ads asking for participation in a paid experimental study.[2] Their average age was 24.3±0.31 years. Forty-six of them performed the Gain tasks first, and 47 performed the Loss tasks first. Participants were randomly allocated to these two order groups. Their payoff consisted of a participation fee of NIS 30 as well as an additional amount based on task performance.

[2] Sample size in the two studies was determined based on statistical power analyses using GPOWER. The expected effect size was determined as d= 0.36 (based on a prior study, Ert & Yechiam, 2010), and the power (1 - β) was set to 0.95.

Task and procedure

The experimental task included two blank buttons (see Figure 1). Upon selecting a button the participants saw monetary outcomes for the selected button, which were randomly drawn from its respective payoff distribution (see Table 1). The mapping of buttons to these alternatives remained constant throughout the task. Each participant performed all four decision tasks. The order of the two Gain and two Loss tasks was randomized for each participant.

The complete instructions appear in the Appendix section. Briefly, the participants were not given any prior information about the outcomes contingent upon selecting the buttons. They were told that their task was to repeatedly select between the two buttons, and that some of their choices might be followed by gains and others by losses. Before performing each pair of tasks (Gain, Loss) they were also informed that their final take home amount would be determined by the accumulating score in one randomly determined task, with a conversion rate of NIS 1 for each 1,000 experimental points.

Our main dependent variable involved switching between choice options. For each participant we calculated the mean run size (number of consecutive selections from the same choice alternative) across 100 trials. We expected that a) decision tasks with losses would be characterized by shorter runs, and b) this would also be evidenced in tasks with no losses when these are performed following tasks with losses. The latter prediction was tested by comparing a Gain task performed first or after the two Loss tasks. To over-rule an order effect we also similarly tested the effect of a Loss task performed after the two Gain tasks. In this and subsequent study analysis of data was conducted only after all data had been collected, and no data have been excluded.

Results

The choice proportions across trials in the four tasks are presented in Table 1. Prior to examining choice switching we investigated the effect of the experimental manipulation on the proportion of risky choices. For this purpose, we conducted a mixed ANOVA, with order as a between subject variable, and domain (gain vs. loss) and payoff size as within subject factors. The results showed that the only significant factor was task domain ($F(1,91) = 5.19$, $p = .03$, $\eta^2 = .05$). Participants exhibited somewhat more risk taking in the Loss tasks than in the Gain tasks (across conditions, P(R) Loss = 0.48 ± 0.01, P(R) Gain = 0.42 ± 0.02). Increased risk taking in the loss domain is commonly observed in decisions from feedback (e.g., Levin et al., 2007; Ert & Yechiam, 2010; Mishra et al., 2012), and is similar to the reflection effect in decisions from description (Kahneman & Tversky, 1979). Importantly, there was no effect of order or interaction between task domain and task order.[3]

We next moved to testing our main predictions concerning the participants' run size. Figure 2 shows the mean run size in each Gain and Loss task when it is administered in the different possible orders. Three major patterns are evidenced from the descriptive outcomes. First, run sizes were smaller in tasks with losses than in tasks with no losses (see horizontal lines in Figure 2 left panel). Secondly, there was an order effect such that compared to participants who performed a Gain task first, those who performed it after the two Loss tasks had substantially smaller run sizes. In Figure 2 this is shown by the reduced run size in both the Gain-High and Gain-Loss tasks when they are performed third versus first (and see also the aggregated results on Figure 2 right panel). We labeled this pattern as "loss restlessness". Thirdly, we also saw a

[3] In addition, there was a marginally significant order by payoff magnitude effect ($F(1,91) = 3.09$, $p = 0.08$). Examination of specific tasks (see last two columns on the right hand side of Table 1) showed that participants took slightly more risk in the Loss-High task when it was performed after the Gain tasks, though this effect was marginally significant ($t(91) = 1.82$, $p = 0.07$). This is consistent with the house money effect (Thaler & Johnson, 1990).

surprising reverse pattern of “gain calmness”, whereby compared to the participants who performed a Loss task first (especially the Loss-Low task), those who performed it after the two Gain tasks had larger run sizes.

To examine the statistical significance of these three patterns we conducted an ANOVA for choice switching, with task domain, payoff size, and order condition as independent variables. The results showed a main effect of domain ($F(1,177) = 12.79$, $p < .01$, $\eta^2 = 0.06$), with smaller run sizes for Loss than for Gain tasks. There was no main effect for order ($F(1,177) = 0.35$, $p = .55$, $\eta^2 = 0.002$), but rather an interaction of order by task domain ($F(1, 177) = 5.78$, $p = .02$, $\eta^2 = 0.03$). In the Gain tasks, run sizes were smaller after the two Loss tasks ($F(1,89) = 2.79$, $p = .099$, $\eta^2 = 0.03$), though this effect was marginally significant. By contrast, in the Loss tasks, run sizes where larger following the two Gain tasks ($F(1,88) = 4.37$, $p = .04$, $\eta^2 = 0.04$). Finally, there was no effect of payoff size ($F(1,177) = 1.28$, $p = .26$, $\eta^2 = 0.01$). The interaction of payoff size and task order was not significant, nor was the three-way interaction of order by payoff size by task domain.

In order to verify that the effect of losses on run size was not a by-product of the differences in risk level between tasks (which led to greater indifference between choice options in the Loss condition) we conducted an analysis of covariance (ANCOVA) controlling for P(R). The results showed that P(R) was not a significant covariate, while the main effect of domain and interaction between order and task domain were replicated ($F(1, 176) = 11.98$, $p = .001$, $\eta^2 = 0.06$; $F(1, 176) = 5.19$, $p = .02$, $\eta^2 = 0.03$, respectively)

We next examined whether run sizes changed as a mere function of time, from the first to the second administration of a task within a given domain. An analysis of differences between the first and second task of the experiment – both having the same domain - showed no effect of order ($F(1,178) = 0.17$, $p = .68$, $\eta^2 = 0.001$) or interaction between order and task domain ($F(1,178) = 1.43$, $p = .23$, $\eta^2 = 0.01$). An analysis of differences between the third and fourth tasks likewise showed no effect of order ($F(1,178) = 1.07$, $p = .30$, $\eta^2 = 0.01$) or order by task domain ($F(1,178) = 2.20$, $p = .14$, $\eta^2 = 0.01$). Thus, merely changing the order of the tasks within a given domain had no effect on the participants' choice switching behavior.

Finally, we checked whether the effect of gains and losses extends to the second of the two subsequently performed tasks. For this purpose, we tested the difference between a task performed first and a task performed fourth (last) by each participant. The results replicated the order by domain interaction found for the third task ($F(1, 178) = 12.12$, $p < .001$; $\eta^2 = 0.06$). Again, for Gain tasks run sizes considerably dropped after Loss tasks (from 21.37±8.31 to 11.87±4.19), and by contrast for Loss tasks run sizes considerably increased after Gain tasks (from 5.03±1.00 to 10.99±7.89). Thus, the presence of an intervening task of the same domain did not eliminate the disparity between the long-ranging effect of losses and gains on choice switching.

Experiment 2: The effect of a payoff regime with mixed gains and losses

Our first experiment showed that losses increased choice switching in the immediate task as well as in the subsequent task performed after the two loss tasks. A simple explanation for this phenomenon is that it is a direct consequence of the effect of losses on physiological arousal (e.g., Satterthwaite et al., 2007; Hochman & Yechiam, 2011). Indeed, this arousal effect of losses was proposed by Lejarraga et al. (2012) as the mechanism leading to the difference in sampling behavior between losses and gains. To further evaluate this proposed mechanism, we used two variants of the task devised by Hochman and Yechiam (2011). Table 2 describes this symmetric mixed gains and losses task, which will be referred to as the Mixed task. Previously, Hochman and Yechiam (2011) examined pupil diameter and heart rate in the low-payoff version of the task (Mixed-Low) and found that losses led to more arousal in these indices compared to gains. Therefore, if the effect of losses on choice switching is driven by the mere increase in arousal, it was expected to emerge in this task as well. Importantly, this Mixed task is different from the previous Loss task in that it includes both gains and losses that have the same probability and magnitude.

Method

Participants

Ninety-five Technion students (48 males and 47 females) took part in the study. Their average age was 24.7±0.27 years. Forty-seven of them performed the Gain tasks first, and 48 performed the Mixed tasks first. Participants were randomly allocated to the two order groups. Their payoff consisted of a participation fee of NIS 20 as well as an additional amount based on task performance.

Task and procedure

The task was the same as in Experiment 1, except for the different payoff distributions (as shown in Table 2).

Results

The choice proportions in the four tasks are presented in Table 2. We first analyzed the effect of domain (gain vs. mixed), payoff size, and order on the proportion of risky choices using an ANOVA, as in Experiment 1. The results showed a main effect of domain ($F(1,93) = 51.60$, $p < .001$, $\eta^2 = .35$), with more risk taking in the Mixed compared to the Gain tasks. The choice proportion in the Mixed task was above 0.5, demonstrating no loss aversion in this task. This is a typical finding in feedback-based decision tasks (see Yechiam & Hochman, 2013b). In addition, there was an effect of payoff magnitude ($F(1,93) = 5.01$, $p = .03$, $\eta^2 = .05$); with higher magnitudes resulting in fewer risky choices. However, there was no main effect of task order, or interaction between order and other variables.

We next examined whether the results replicate the loss-restlessness and gain-calmness effects. Figure 3 shows the mean run size in the Gain and Mixed tasks when a task is administered in the different possible orders. As can be seen, the Mixed task was associated with shorter runs. However, a consistent order effect was only observed following gains – the gain calmness effect. We submitted the results to an ANOVA as in Experiment 1. The results showed that the only significant main effect was of domain ($F(1,182) = 9.95$, $p = .002$, $\eta^2 = .05$), consistent with the shorter run sizes in the Mixed task. There was no significant effect of order or interaction of order by domain. When analyzing each domain separately, however, we found a significant effect of order in the Mixed tasks ($F(1,91) = 4.08$, $p = .046$, $\eta^2 = .05$). In these two tasks, run sizes were larger when a task was performed third (following the Gain tasks) than when it was performed first ($t(93) = 2.04$, $p = .04$, Cohen’s $d = 0.44$). The disparity between the ANOVA across domains and the results for the Mixed tasks appears to be due to differences in inter-subject variance between the Mixed and Gain tasks. Variance was considerably higher for the Gain tasks (SD = 15.10) compared to the Mixed tasks (SD = 7.44; Levene $F = 17.64$, $p < .001$)

As in Experiment 1, we conducted an ANCOVA to test whether the significant effects are driven in part by differences in risk taking between tasks. The results showed that this time the covariate (P(R)) was significant ($F(1,181) = 9.58$, $p = .002$, η^2

= .04). The main effect of domain was marginally significant ($F(1, 181) = 2.83$, $p = .09$, $\eta^2 = .01$); while the order effect for the Mixed tasks remained significant ($F(1,90) = 3.99$, $p = .049$, $\eta^2 = .04$).

Finally, we checked whether the order effect found for the Mixed task was simply a product of time. Examination of differences between the tasks performed first versus second, and third versus fourth, revealed no evidence of an order effect ($F(1,92) = 0.92$, $p = .34$, $\eta^2 = .01$; $F(1,92) = 0.05$, $p = .83$, $\eta^2 = 0$, respectively). Thus, we observed an order-effect in switching rates only when varying the position of the Mixed tasks to be before or after the Gain tasks.

A note on the relation between choice switching and risk taking

We further examined whether the current result also have an implication for the well known tendency to exhibit risk seeking in the domain of losses and risk aversion in the domain of gains, found in studies of decisions from description (Kahneman & Tversky, 1979), and the related tendency to show more risk aversion in the gain domain in decisions from feedback (e.g., Levin et al., 2007; Ert & Yechiam, 2010; Mishra et al., 2012). Across the two studies, we examined the correlations between choice switching and the rate of risky selections (P(R)). The results are shown in Table 3. As can be seen, for the two Gain tasks there was a significant negative correlation between run size and risk taking; hence limited choice switching was associated with more risk aversion. Interestingly, such an association did not emerge in any of the tasks with losses (as further discussed below).

General discussion

The results of our two experiments showed significantly more choice switching in tasks with losses than in tasks with no losses. The results are thus consistent with the findings of Lejarraga et al. (2012) in sampling-based decisions. We add that (1) there is a positive effect of losses on choice switching even when choices result in outcomes, and not only in sampling, (2) this effect seems independent from loss aversion as it was obtained in Experiment 2 in the absence of behavioral loss aversion, and (3) (perhaps most importantly), the effect of losses and gains on choice switching can be "infectious"; in Experiment 1 the effect of losses was maintained in tasks having no losses performed following tasks with losses; and in both experiments the effect of gains was maintained in the tasks with losses performed afterwards.

The first of these phenomenon, which we labeled as "loss restlessness" is the increased tendency to switch choices following prior tasks with losses. Two explanations for this pattern can be proposed. The first is that it is a direct consequence of the increased arousal with losses (Lejarraga et al., 2012); this was our original assumption. Alternatively, the sustained effect of losses on choice switching may be due to an "unclosed mental account" in a task that involves mostly losses (Thaler, 2008; Nicolausco & Payne, 2014).[4] This interpretation is similar to the Zeigarnik effect, the notion that people remember uncompleted tasks better than completed tasks, and are more inclined to invest further effort on these tasks (Zeigarnik, 1927; Ovsiankina, 1928; Condry, 1977). The results of our second experiment are consistent with the latter interpretation: In a setting where the participants had symmetric gains and losses the long term effect of losses on choice switching was all but eliminated. Interestingly, in

[4] One could argue that under loss aversion, if losses loom larger than gains, the greater subjective weight of the losses in the mixed regime would produce an unresolved mental account similar to the all-losses payoff structure. However, on average, participants did not exhibit loss aversion in the mixed payoff regime.

Lejarraga et al. (2012) as well the difference in sampling rates between all-loss and all-gain tasks was larger than the difference between mixed (gains and losses) tasks and all-gain tasks; and only the former difference was statistically significant. Thus, pronounced effects of losses on choice switching appear to emerge when the payoff regime mostly involves losses.

The second phenomenon we observed, labeled as “gain calmness” refers to the decreased choice switching following prior tasks producing gains. This effect was evidenced in both of our experiments. Effects of prior gains are well known in the decision making literature, with a prominent example being the “house money” effect (Thaler & Johnson, 1990), the tendency to exhibit more risk taking given prior earnings. Still, the current findings are not the same as the house money effect. While participants did take slightly more risk after some of the gain domain tasks (see footnote 3), controlling for this difference did not eliminate the significance of the gain calmness effect.

Finally, we observed a positive correlation between choice switching and risk taking in the gain domain tasks. In these tasks individuals who did not switch much between alternatives opted for the safer fixed amounts. Interestingly, this association was not found in the tasks with losses. Possibly, in the gain domain, individuals who invested less extensive search of the alternatives also preferred to pick options involving fixed consequences, which do not require much search in order to be evaluated; while in the tasks with losses, the increased search behavior induced by losses led to enough sampling from the risky alternatives so as to reduce the association between choice switching and risk taking. Yet this is just one possible interpretation of the findings. Future studies should examine to what extent does limited search behavior in the gain domain contribute to the tendency to avoid risk in this domain.

The current results cannot be explained by the tendency to give losses more subjective weight than gains. The participants did not avoid the larger loss outcomes in the symmetric gain-loss gambles, as would be implied by loss aversion (Kahneman & Tversky, 1979). Another factor which cannot fully explain our results is the difference in risk level between tasks: the main results for choice switching were replicated when controlling for the differences in risk taking level. Instead, our results suggest that losses and gains affect global strategies of attentional investment resulting in modified search behavior.

The loss restlessness effect may also shed light on a related stock-market phenomenon. A well known ’stylized fact’ of the stock market is the asymmetric relation between a stock returns and the volatility of returns (Black, 1976; Cont, 2001). This is commonly referred to as the “leverage effect”. For instance, an examination of the historical values of the NASDAQ-100 index from the beginning of 2005 until the end of 2013 reveals that at 1-3 days following a loss day, there is increased standard deviation in returns (across these three days) even though there is no change in the trend and no reduction in price (a loss in a given day does not predict subsequent losses). Prior explanations of the leverage effect focused on firm-level variables, such as a firm’s decrease of equity with respect to its constant debt (Black, 1976). The current findings suggest that the effect may be driven in part by individual investors’ behavior. If we assume, for instance, that investors change their investment portfolio more often after a losses-day than after a gains-day and this effect is durable (lasting several days), then losses are expected to increase transaction volume. Transaction volume, in turn, is well known to be positively associated with the volatility of stock returns (Cont, 2001). Indeed, the leverage effect is preceded by high volumes of trade and is substantially attenuated when controlling for volume changes (Gallant et al., 1992). In the stock market as well, the effect of losses on traders' behavior has mostly been analyzed from the perspective of the titled scales metaphor, which led to discovering biases such as disposition effect (Shefrin & Statman, 1985); yet other effects implied by the increased attention and search behavior with losses may be plausible as well.

Appendix: Instructions

Before each condition (i.e., Gain, Loss, Mixed) participants were given the following written instructions: “In this stage you will perform two tasks. Your payoff will be determined based on one randomly chosen task. On the computer screen you will be presented with two buttons, labeled A and B. Your task is to choose between the two buttons by clicking any of them. You can click on a button several times in a row (as much as you want) or switch between buttons (as much as you like). The payment you receive for your choice will appear on the chosen button, and the accumulating payoff will appear below. You will not know the payment for each choice in advance. Some choices might be followed by gains and others by losses. At the end of a given task you will win or lose NIS 1 for every 1000 game points. Additionally, you receive a fixed pay of NIS 30 / NIS 20 for your participation. You will be given a message indicating when a task begins and when it ends.”

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Table 1: The decision tasks administered in Experiment 1. The choice outcomes from the safe (S) and risky (R) alternatives are followed by the mean proportions of risky selections across 100 trials (P(R)). “Gain first” implies that the two Gain tasks were performed first, while “Loss first” implies the opposite order. The standard error across participants appears in parentheses.

Condition	Safe alternative	Risky alternative	P(R)	
			Gain first	Loss first
Gain-Low	Win 1	50% get 0, 50% win 2	0.43 (0.04)	0.43 (0.04)
Gain-High	Win 100	50% get 0, 50% win 200	0.39 (0.05)	0.41 (0.04)
Loss-Low	Lose 1	50% get 0, 50% lose 2	0.48 (0.03)	0.49 (0.04)
Loss-High	Lose 100	50% get 0, 50% lose 200	0.54 (0.04)	0.44 (0.04)

Table 2: The decision tasks administered in Experiment 2. The choice outcomes from the safe (S) and risky (R) alternatives are followed by the mean proportions of risky selections across 100 trials (P(R)). “Gain first” implies that the two Gain tasks were performed first, while “Mixed first” implies the opposite order. The standard error across participants appears in parentheses.

Condition	Safe alternative	Risky alternative	P(R)	
			Gain first	Mixed first
Gain-Low	Win 1	50% get 0, 50% win 2	0.30 (0.03)	0.40 (0.04)
Gain-High	Win 100	50% get 0, 50% win 200	0.29 (0.04)	0.35 (0.04)
Mixed-Low	50% win 1, 50% lose 1	50% win 2, 50% lose 2	0.56 (0.04)	0.57 (0.03)
Mixed-High	50% win 100, 50% lose 100	50% win 200, 50% lose 200	0.54 (0.04)	0.51 (0.03)

Table 3: Correlations between participants' run size and the proportion of risky selections (P(R)), across the two studies.

Task	Correlation
Gain-Low	-0.17*
Gain-High	-0.24**
Loss-Low	0.10
Loss-High	-0.09
Mixed-Low	0.13
Mixed-High	-0.11

* = $p < .05$; ** = $p < .01$

Figure 1: Layout of the experimental task. Left: The blank alternatives prior to making a selection. Right: The presentation of the outcomes for the selected button upon making a choice.

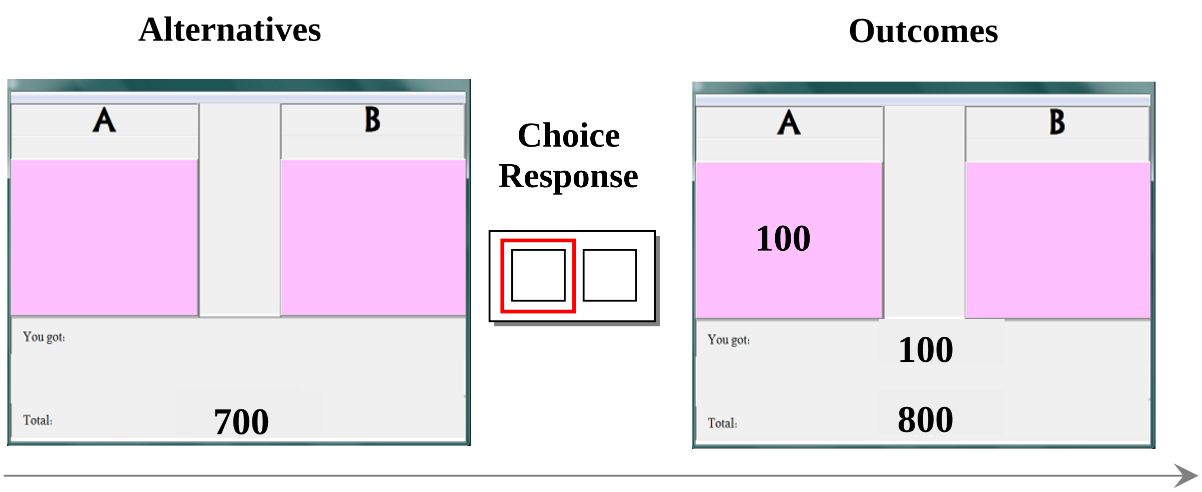

Figure 2: Left pane: Mean run size as a function of domain (Gain vs. Loss tasks), task order (first to fourth), and payoff size in Experiment 1. The horizontal lines denote the average run size across orders. Right pane: Summary of run size for the first and second half of the experiment (tasks 1, 2 vs. tasks 3, 4), collapsed across payoff sizes. The third and fourth tasks were performed after two tasks of the opposite domain. Error bars in both panes denote standard errors.

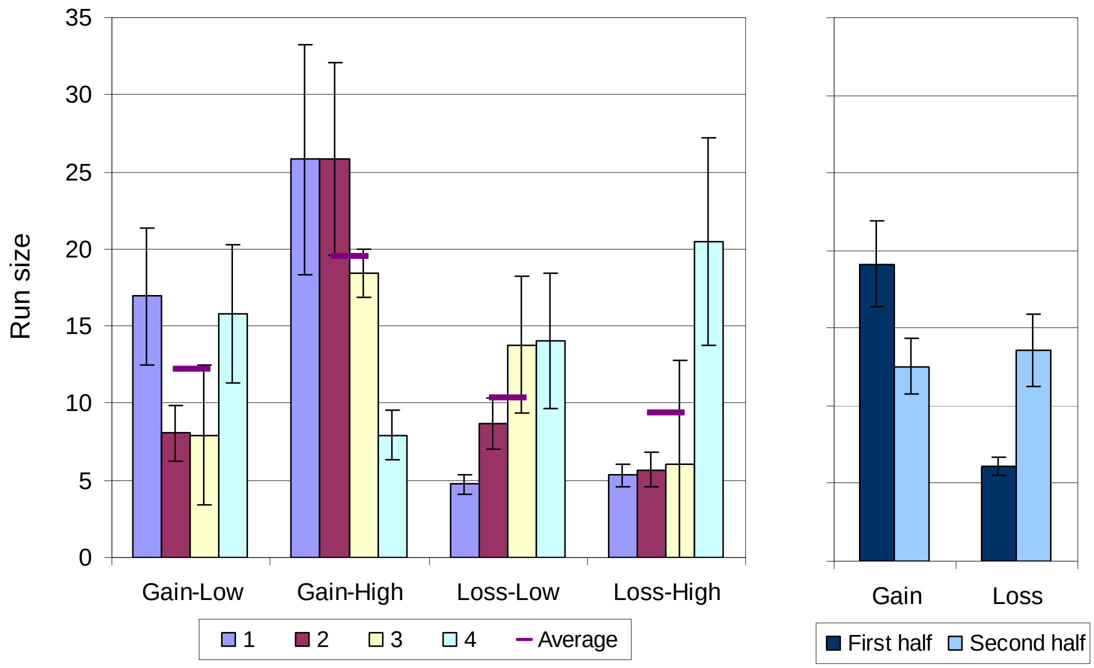

Figure 3: Left Pane: Mean run size as a function of domain (Gain vs. Mixed tasks), task order (first to fourth), and payoff size in Experiment 2. The horizontal lines denote the average run size across orders. Right pane: Summary of run size for the first and second half of the experiment (tasks 1, 2 vs. tasks 3, 4), collapsed across payoff sizes. The third and fourth tasks were performed after two tasks of the opposite domain. Error bars in both panes denote standard errors.