Planned Versus Actual Betting in Sequential Gambles

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ABSTRACT

Anecdotal evidence suggests that in a gambling environment consumers may end up betting more than they had initially planned. We assess this phenomenon pertaining to the possible differences between planned and actual behavior using sequential and fair gambles in a two-stage process (planned and actual bets). The results show that in the planning phase, people behave conservatively, betting on average less after an anticipated loss and the same amount after an anticipated gain. However, after an actual loss in the first gamble is experienced, individuals bet in a subsequent gamble significantly more than what they had initially planned, whereas on average no differences from the plan are perceived after a gain. We show that the reason for such asymmetry is in part due to people's tendency to underestimate, at the planning phase of the gamble, the impact of negative emotions in betting decisions during the actual phase of the gamble.

INTRODUCTION

A couple buys a weekend package to Las Vegas. It is their first time in the city and they are looking forward to having some fun in the most famous casinos of the world. As both have heard stories about overspending, they decide to make a plan. They agree that they should visit the casinos on only two nights and chip $200 per night at most. On their way back home after the trip, they wondered what went wrong and how come they spent so much more than they had initially planned.

From Hollywood to Dostoyevsky, we have been frequently exposed to stories where gamblers have lost a blouse, a house, and sometimes, as a result, a spouse on the gambling table. Moreover, given the growth of the industry—from casinos to internet gambling—, the size and scope of the phenomenon might have increased exponentially in the past decades. In the early 80's, US casinos were concentrated mainly in Nevada and New Jersey. By 2006, 37 states had at least one commercial, racetrack or tribal casino available. Consumer spending increased in every single state in that same year as the expenditure bar hit its all time high—$32.5 billion. Americans spent more money in commercial casinos than they did in books ($16.1 billion) and movie tickets ($12.3 billion) combined. Also, the magnitude of spending is clearly not due to a handful of heavy gamblers. It is estimated that more than a quarter of adult Americans have visited a casino in 2006 (American Gaming Association 2007). Interestingly, if our previous example were to be true, it is likely that many such visitors may have ended up spending *more than they had initially planned.*

Indeed, recent evidence from the gaming industry seems to suggest that individuals are bad planners when it comes to gambling. Through loyalty card program called "Total Rewards," Harrah's is now able to track betting patterns at the individual level and, as a result, make

predictions about their customers' future betting behavior (Ayres 2007, p. 30). One of the lessons from the data is that when a customer over-bets and incurs losses beyond a given threshold (labeled "pain points"); it significantly reduces this customer's likelihood of returning to one of the Harrah's casinos in the future. To address this issue the company has developed the "luck ambassadors" program—, employees whose job is approach their unlucky clients and offer, in an informal chat, a pleasant break (for example, a free dinner at one of their restaurants) to encourage them to stop gambling. The company reasons that managing their customers in this fashion in the short run might be profitable in the long term.

Note that from a decision-making perspective the luck ambassador rationale suggests: a) that people have a hard time predicting future betting behavior in a gambling environment (i.e., how much they are willing to lose before stopping); b) that they actually need help to stop gambling once losses are experienced; c) that a pleasant intervening incident seems required to replace the negative experience generated by the losses, otherwise the strategy might not work (i.e., otherwise they might not stop gambling). A skeptic might however, argue that such phenomenon is more likely to represent the behavior of pathological gamblers, and that non-pathological ones (i.e., the great majority of consumers) are pretty good at planning what they will do in case luck turns itself against them.

We address this matter in an experimental setting, where participants are exposed to sequential and fair gambles in a two-stage process (planned and actual bets). Three basic questions are raised. First, do consumers deviate from the plan even when full information about the characteristics of the gambles is made available a priori? A common explanation for betting and eventually losing more than planned is simply that at the planning phase people do not have as much information about the consumption opportunities. Consumers who visit Las Vegas for

the first time, for instance, are often unaware of the types of games, prices, social interactions, number and availability of casinos, among other characteristics inherent to the gambling experience to the place. Learning could therefore explain why plans are eventually revised. But, this would imply that as information about the consumption opportunities becomes fully available, inconsistencies between plans and subsequent actions should disappear. In gambling scenarios, however, anecdotal evidence suggests that people (even experts, who presumably have information about the gambles and the surrounding environmental cues) behave in a manner which leads to them often losing much more than they had initially planned. Thus, we test the prevalence of this effect in a scenario where: i) full information about the characteristics of the gamble is provided prior to a planning phase (i.e., trial phase), ii) the time period between the planning and actual phases of the gambles is very short (around 1 minute), iii) participants believe that their plans will be executed, iv) and a reminder of the planned bet shows up right before the actual bet—where they are unexpectedly given the opportunity to revise/confirm the planned bet.

Second, if deviations from the plan do take place in such a scenario, what is the shape of the deviations? In other words, do people bet more or less than originally planned and does it vary as a function of the outcome in the previous gamble? We investigate the magnitude, frequency and direction of the deviations. Finally, we discuss the underlying reasons for potential deviations. If full information about the characteristics of gamble and the surrounding cues (of lack thereof) is provided prior to the planning phase, why would people deviate from it just a few minutes later even when they are explicitly reminded of it before the actual betting? Along the same lines, can we prevent them from deviating from the plan?

These questions above are addressed in a series of 3 experiments, where participants are presented with a sequence of 3 (experiment 1) or 2 (experiments 2 and 3) gambles and asked to make a betting plan per gamble contingent on previous outcome(s) (e.g., "how much will you bet in gamble 2 in case you win/lose gamble 1?"). That allows us to assess whether deviations take place, its shape, and the potential underlying mechanisms.

CONCEPTUAL BACKGROUND

Planning is a common consumer practice. Consumers plan how much to spend on a trip, how much to save for the month, and how much to eat at lunch. Nonetheless, it also seems that they revise as frequently as they plan (Baumeister, Heatherton, and Tice 1994). They eat (Wardle and Beales 1988), drink (Allsop and Saunders 1989), and smoke (Marlatt and Kaplan 1972) more than they had initially planned. A common explanation is simply that at the planning phase people do not have as much information about the consumption opportunities. If this is the case, as long as enough information is provided prior to planning, deviations should be less likely. However, in a gambling environment, anecdotal evidence suggests that even experts, who presumably have good information about the characteristics of the gambles and surrounding environmental cues may often over-bet and thereby lose much more than they had initially planned. But if deviations from the plan do take place, two questions arise: i) What would be the pattern of such deviations? ii) What could explain such deviations?

Unanticipated Changes in Subjective Probabilities

If probabilities are subjective, then their assessments may vary as a result of an anticipated (i.e., planned) versus an experienced (i.e., actual) sequence of events. Of particular

interest is the so-called "gambler's fallacy" which pertains to the mistaken belief held by individuals that the subjective probability of a given outcome is lowered once this outcome is experienced in a previous gamble, even though the successive gambles are statistically independent. This fallacy relies on the individual's flawed assumption that chance is a self-correcting process. Evidence for the gambler's fallacy is well documented and ranges from lottery games (Clotfelter and Cook 1993; Terrel 1994) to horse races (Metzger 1985). Casinos often display records of previous wins, even though it is well known that each play is independent. If we assume that the gambler's fallacy phenomenon requires the actual outcome to be revealed, then people will not be susceptible to such an erroneous belief during the planning phase. The fallacy would take place only at the actual phase of the gamble. That would be one explanation for potential deviations from the plan. Moreover, specific predictions can be derived in a scenario where participants must plan and play a sequence of gambles. The subjective probability of a gain should increase after an actual loss. As a result, higher than planned bets (i.e., positive deviations) should become more likely and/or more significant in magnitude. Similarly, the subjective probability of a loss should increase after a gain is realized. As a result, lower than planned bets (i.e., negative deviations) should become more frequent and/or more significant in magnitude. In short, a gambler's fallacy rationale would predict *reversed* deviations from the plan (i.e., betting more than planned after a loss and betting less than planned after a gain).

Unanticipated Changes in Risk Preferences

Over and above perceived changes in probabilities, there is also research which argues that people may fail to account for the impact of shifts in reference points on their risk

preferences. In gambling, it means that when planning a sequence of bets, individuals may not anticipate the impact of shifts in reference points on future bets. Barkan and Busemeyer (1999, 2003) and Barkan et al. (2005) provided a more specific characterization using prospect theory of how shifts in reference points might affect future behavior in sequential gambling. The authors suggested that when planning a sequence of gambles individuals treat each gamble *independently* from one another, which leads to no change in reference points (i.e., when planning a second bet, people are not influenced by the outcome of the first planned bet). During the actual gambles, however, the outcome of a previous gamble is *integrated* in the subsequent decision making process of later gambles. As a result, shifts in reference points take place due to gains and losses, and the subsequent bets deviate from initial plans following the predictions of prospect theory. This has two implications: First, when planning bets in sequential gambles, the anticipated outcome of the first gamble should not influence planned bets for the subsequent gamble, because individuals should treat both gambles independently. Second, during the actual gamble the predictions should be consistent with prospect theory (Kahneman and Tversky 1979). Once losses are experienced in the first gamble individuals should then become more risk-seeking—i.e., positive deviations from the plan become more likely in a second gamble. Whereas when gains are experienced in the first gamble, individuals should become more risk-averse—i.e., negative deviations from the plan become more likely in a second gamble. In short, as in the case of the gambler's fallacy, the authors predicted *reversed* deviations from the plan.

To test these hypotheses Barkan and Busemeyer (2003) asked participants to plan and play several times a sequence of 2 gambles (the gambles varied in expected value). The first gamble was always mandatory. Participants had to indicate their preferences on whether or not to take the second gamble *prior* ("If I win the first gamble, I will take/reject the second gamble")

and *after* the outcome of gamble 1 ("I will take/reject the second gamble"). The authors found that losses and gains did not produce any differences in subsequent bets at the planning phase. In other words, participants seemed to treat the gambles independently at this stage. Moreover, after gamble 1, participants were more likely to "reject" gamble 2 after a gain was observed and to "take" gamble 2 after a loss was experienced, showing reversed deviations from the plan. Thus, people's inability to anticipate shifts in reference points might be due to the fact that during a planning phase people assess their betting decisions independently whereas integration, which leads changes in risk attitudes, takes place after the actual realization of outcome 1.

Unanticipated Impact of Emotions

The previous account suggests that people cannot anticipate the changes in risk attitudes as a result of changes in reference points. In a similar vein, it is possible that people might be unable to anticipate the impact of emotions on future betting decisions. Loewenstein and Adler (1995) provided evidence that can be seen as consistent with this rationale. The authors showed that when asked to make predictions on the selling price for an object they did not own (hypothetical ownership), participants indicated lower selling prices than they did when they owned the object (real ownership). The reason for a "weakened endowment effect" in the hypothetical relative to the real ownership scenario is that in the former participants had a hard time to incorporate the impact of loss aversion on the selling price. But why would people be so bad at incorporating the impact of loss aversion in a hypothetical scenario? The authors speculated emotions might be playing a role: "To provide a selling price for a good one does not possess requires two stages of introspection: (1) imagining one possesses the object and has adapted to ownership, and (2) imagining how one would *feel* about parting with it" [italics

added] (p. 936). Recently, Zhang and Fishbach (2005) found direct evidence consistent with this hypothesis. The authors showed that relative to a control condition the endowment effect amplified (disappeared) when participants' negative (positive) emotions were orthogonally manipulated prior to the trading task. Ariely, Huber, and Wertenbroch (2005) also propose that emotional attachment represents in fact one of the critical mechanisms underlying the endowment effect. The authors describe several findings from previous research in which the endowment effect was intensified (mitigated) as people's level of emotional attachment to the object increased (decreased). Finally, Camerer (2005) takes an even stronger stand and suggests that loss aversion itself "…is often an exaggerated emotional reaction of fear, an adapted response to the prospect of genuine, damaging, survival-threatening loss." (p. 132). That would explain, according to the author, why people usually overreact to small losses.

In short, an emotionally charged experience which might lead to *unexpected overreaction*s (e.g., higher selling prices for an object or higher than planned bets after losses). Such a rationale resonates with previous findings in the emotion literature. It has been shown that when in a "neutral" emotional (cold) state, individuals fail to predict how they might feel and/or behave when they experience a stronger visceral (hot) state[1]. This so-called hot-cold empathy gap (Loewenstein 1996) further suggests that when deprived of a given "resource," the aversive state that is experienced will lead people to react and *overdo* in an attempt to restore a homeostatic state. That would explain why hungry consumers buy more food than they've initially planned (Gilbert, Gill, and Wilson 2002; Nisbett and Kanouse 1969), why curious individuals care more about the missing information than they had initially predicted (Loewenstein, Prelec, and Shatto 1996), and why drug users underestimate the impact of craving

[1] Loewenstein, O'Donoghue, and Rabin (2003) have further generalized this phenomenon, by arguing that people overestimate how much their current preferences will resemble their future preferences, the so-called *projection bias*.

(Badger et al. 2007). Even though people do have the opportunity to stop or keep their plans, empirical evidence has shown that in order to reduce the current aversive state people usually overreact (Loewenstein and Schkade 1999). Whether deprived of food, information, drugs, or money individuals may respond and exaggerate, in an attempt to reestablish the prior state.

Translated into a sequential gambling scenario, it is then possible that the negative emotions generated by losses can further induce people to overreact (i.e., positively deviate from the initial plan) in an attempt to restore a current affective state in the prospect of winning. Even though people may *cognitively* think about a loss while planning a sequence of bets and draw inferences about its impact, it is much harder task at the planning stage for them to *affectively* experience the pain attached to the loss and/or draw inference about its effect on their future behavior.

Some specific hypotheses can then be generated as a result of the above discussion. First, when losses are observed in gamble 1, participants become "deprived" of money, and negative emotions are *felt*, positive deviations take place in gamble 2. Since for gains, no sense of deprivation is experienced, no specific pattern of behavior is expected[2]. Second, if emotions do play a role, the underestimation of the intensity of negative emotions after losses (between plans and actual) would lead to a higher propensity of positive deviations from the plan. That is, those who feel worse than they expected might precisely be the ones more likely to bet more than they had planned. Finally, if the negative feelings associated with the loss are responsible in making people to bet more in a subsequent gamble, then we should expect that once the negative feelings

[2] The hot-cold empathy gap does not directly address the positive side of the affective spectrum. While positive feelings may well generate deviations—as individuals' feelings at a planning phase differ from feelings during the actual gamble—, the direction of the effect is not defined by the theory, specially when applied to economic decisions: "I restrict attention to negative emotions because their effects resemble those of drive states such as hunger and feeling states such as pain. The effects of positive emotions are more subtle and complex." (Loewenstein 2000, p. 426).

are replaced with positive feelings, the magnitude and frequency of positive deviations should be mitigated, *even if the financial loss in the previous gamble were to be the same*. In next three experiments we address these intuitions.

EXPERIMENT 1

In this first experiment, participants are asked to make contingent plans and then play a sequence of 3 gambles. At the actual phase of the gambles they are unexpectedly asked to confirm or revise their initial plans. Within such a framework we are able to test, first, whether contingent plans are made in isolation (e.g., anticipated outcome of gamble 1 has no influence on planned bets at gamble 2), or whether they show serial dependence (e.g., anticipated outcome of gamble 1 influences the betting amounts in subsequent planned bets). Second, we assess if participants' contingent plans are carried out or if deviations do take place when they are provided with an opportunity to (unexpectedly) revise their bets in the actual betting phase. Finally, the shape of the deviations is also identified (i.e., asymmetric or reversed).

Method

Participants and design. One hundred five students from a western university participated in this experiment. They were paid a $9 flat fee plus additional earnings contingent on the outcomes of the gambles. For gamble 2, the experiment employed a two (bet 2: planned vs. actual; within) by two (outcome 1: gain vs. loss; between) mixed design. For gamble 3, the experiment adopted a two (planned vs. actual; within) by four (outcomes 1 & 2: gain-gain vs. gain-loss vs. loss-gain vs. loss-loss) mixed design.

Procedure. The experiment was conducted in a computer-based environment. The cover story stated that the study was about gambling preferences, and that they would be playing a series of three identical and fair gambles. Each gamble offered a 50% chance of doubling the amount bet and had a 50% chance of losing the bet (EV = 0).

Participants came to the lab expecting to receive $15 for their participation in the experiment[3]. At the beginning of the experiment, however, they were told that the experimenter had received authorization from the University to allow them to use up to $6 (60 "electronic" chips) of their $15 participation fee in the subsequent gambles. As a result, they were told, they could bet as much or as little as they wanted, since the $6 represented their own and deserved money. Specifically, participants were told that they could bet any amount from $0 to $2 (0 to 20 chips) in each of the three gambles.

The procedure followed three steps: trial, planning, and actual phase. In order to provide participants with information about the gamble, they were first asked to practice the gamble in a trial phase (no betting involved). Then, participants were told that the gamble comprised of two additional phases. During the planning phase,[4] they would have to plan their bets in all 3 gambles. At this point they were instructed that whatever decision was made during the planning phase, would be carried over (no changes will be allowed). Participants then chose the bet in gamble 1 and were asked to (a) choose their bets in gamble 2 in anticipation of a gain and in anticipation of a loss in gamble 1 and (b) choose their bets in gamble 3 in anticipation of two gains, two losses, a loss-gain, and a gain-loss in the previous two gambles. Then, the actual phase started. To avoid memory decay effects, they were reminded of the planned bet 1 and then

[3] According to the lab policy, participants must indeed receive on average $15 for 45 minute to 1 hour participation in any experiment.

[4] In the procedure, we used the term "pre-commitment" rather than "plan" in order reinforce the belief that changes would not be allowed.

were unexpectedly informed that they could either confirm or revise the planned bet. They made the final bet in gamble 1 and then the gamble started. After 15 seconds of "flashing" in the gambling board the outcome was revealed (see below). Participants then wrote the outcome in a financial summary sheet, which would be used latter on to compute the final participation fee per participant[5]. They were then reminded of their planned bet in gamble 2 and were asked—as in gamble 1—to confirm or revise it. The same process repeated itself in gamble 3. Finally, after a few final questions participants were properly debriefed and thanked for their participation in the study.

Gambles. The gambles had the following characteristics. A gambling board consisting of 20 red and 20 blue squares appeared on the screen (see appendix 1). A "X" sign flashed randomly on the board every ½ sec for 15 sec. Each flash was independent of the previous one so that it could flash more than once in the same square—and participants were aware of it. At the end of the fifteen second period, the flashing stopped. If the "X" sign landed in a blue square, the participant would double the amount bet; otherwise, s/he would lose the bet. The probabilities, payoffs, and the remaining time were displayed on top of the gambling board. To avoid potential objective mistakes, the board was constructed to present visual and easy-to-assess probabilities. Finally, to bring knowledge about this type of gambling to a common real-life baseline, participants also were told at the beginning of the experiment that the probabilities and payouts in the current gamble presented a slightly better deal compared to the black or red option in the American roulette (which offers a 47.4% of doubling the amount bet).

Results

[5] In experiments 1 and 2 online measures of feelings were also obtained during each gamble (during the 15 second flashing period). However, for the sake of parsimony, they are not being reported.

Planning phase. Planned bets in gamble 2 were lower in anticipation of a loss (vs. gain) in gamble 1 (M_L = 11.4 vs. M_G = 13.3; F(1, 104) = 11.32, $p < .01$). Moreover, compared to their planned bets in gamble 1 (M = 13.8), participants reported lower planned bets in gamble 2 after an anticipated loss in the previous gamble (F(1, 104) = 19.48, $p < .001$), but reported similar planned bets in gamble 2 after an anticipated gain in the previous gamble (F(1, 104) = 1.19, $p > .10$). Similarly, the anticipated outcomes of gambles 1 and 2 influenced subsequent planned bets in gambles 3 (F(1, 102) = 4.52, $p < .01$). For instance, planned bets in gamble 3 were lower in anticipation of a series of two losses (vs. two gains) in the two previous gambles (M_{LL} = 11.7 vs. M_{GG} = 14.4; F(1, 104) = 10.79, $p < .01$). Also, compared to their planned bets in gamble 1 (M = 13.8), participants reported lower planned bets in gamble 2 (F(1, 104) = 19.48, $p < .001$) and in gamble 3 (F(1, 104) = 11.30, $p < .01$) after one or two anticipated losses in the previous gamble(s), respectively (see Figure 1).

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Actual phase – gamble 2. First, as expected, there was no significant difference between planned (M = 13.8) and actual bet in gamble 1 (M = 14.0; F(1, 104) = 2.09, $p > .10$). Most importantly, there was an interaction of these two factors on betting preferences in gamble 2 (F(1, 103) = 7.28, $p < .01$; see Figure 2) [6]. Participants who won gamble 1 bet on average the same amount they had previously planned to in anticipation of such gain (M_p = 13.8 vs. M_a = 14.0; F(1, 103) = .13, $p > .10$). However, participants who lost gamble 1, bet on average more than they had previously planned to in anticipation of such loss (M_p = 9.9 vs. M_a = 12.6; F(1,

[6] Analyses of covariance (previous bet as a covariate) were also conducted across all 3 experiments. The analyses produced virtually identical results in terms of interaction and pairwise comparisons. We have decided then to rely on the ANOVAs and actual means rather than on ANCOVAS and adjusted means.

103) = 17.97, $p < .001$). An analysis of the frequency of deviations showed similar results. Among those who deviated from the plan (n=39; 37%), the outcome in gamble 1 influenced participants' pattern of deviation in gamble 2 (χ^2 (1) = 10.59, $p < .01$). Specifically, after a gain, the frequency of positive deviations (58%) did not differ from chance (z = .70, $p > .10$), whereas after a loss there was unanimous (100%) preference for positive deviations (z = 4.47, $p < .001$).

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Actual phase – gamble 3. We conducted a similar assessment for gamble 3. An interaction emerged between betting phase (planned vs. actual) and sequence of previous outcomes (gain-gain vs. gain-loss vs. loss-gain vs. loss-loss) on betting patterns (F(3, 101) = 3.26, $p < .05$; see Figure 3). Pairwise comparisons showed no significant differences between planned and actual bets in gamble 3 after a gain-gain (M_p = 16.5 vs. M_a = 15.4; F(1, 101) = 1.66, $p > .10$), a loss-gain (M_p = 12.4 vs. M_a = 13.6; F(1, 101) = 1.87, $p > .10$), and a gain-loss (M_p = 11.3 vs. M_a = 11.4; F(1, 101) = .002, $p > .10$) sequence in the previous two gambles. However, after a loss-loss sequence, participants' actual bets increased compared to their planned bets in anticipation of such sequence of losses (M_p = 11.4 vs. M_a = 14.1; F(1, 101) = 8.42, $p < .01$). Among those who deviated from the plan (37%, n=39), the outcomes in gamble 1 and 2 influenced participants' pattern of deviation in gamble 2 (χ^2 (3) = 8.82, $p < .01$). Specifically, the frequency of positive deviations (80%) was greater than chance after a sequence of two losses (n= 10; z = 1.89, $p < .05$), but not after a loss-gain (67%; z = 1.02, $p > .10$), nor after a gain-loss sequence (70%; z = 1.26, $p > .10$). After a sequence of gains, frequency of positive deviations was actually smaller than chance (20%; z = -1.89, $p < .05$).

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Discussion

Experiment 1 produced several initial findings. First, at the planning phase, individuals chose to bet less after prior losses, as compared to after prior gains and as compared to a previous bet. This effect shows that individuals do not necessarily disregard the previous outcome when planning the next gamble, but simply believe that losses will affect their behavior in a conservative manner—i.e., spend less as wealth declines. Second, *asymmetric* deviations from the plan emerged at gamble 2 and in gamble 3 when planned and actual bets are contrasted. For losses, participants bet on average more than they had initially planned, whereas, for gains, planned bets were on average carried over. In fact, among those who deviated, positive deviations from the plan became by far the dominating option after losses.

These findings seem inconsistent with the gambler's fallacy argument, which would predict reversed deviations from plan (a previous loss should increase the likelihood and/or magnitude of positive deviations and a previous gain should increase the frequency and/or magnitude of negative deviations). They are also at odds with Barkan and colleagues' theory and findings about "isolation" at planning and "integration" at the actual phase of the gamble. Our results show that at the planning phase, previous outcomes did influence subsequent choices. It is worth noting, however, that our procedure differed from theirs. In their procedure participants i) were forced to take gamble 1 and ii) had to decide on taking versus rejecting gamble 2 (dichotomous variable). We use a more general procedure which allowed the full possible range of bet choices on both gambles and no restrictions on whether or not to take the initial gamble.

Further, participants were betting with their own "participation fee" in the experiment. In other words, as in most real gambling scenarios, participants were free to decide on *whether* and *how much* they would want to bet their own money in *both* gambles. Finally, the "flashing period" (i.e., the 15 second time delay between bet and outcome) might also have stimulated involvement and instigated stronger emotional reactions after the outcome was revealed.

The asymmetric deviations from the plan seem consistent with an emotion-based rationale. While planning what to do after a loss, people underestimate how much their state of mind will lead them to overreact and increase their bets once the negative emotions are eventually *felt*. Since for gains there is no financial deprivation, no specific pattern of behavior is observed.

This first experiment, however, presents two caveats. First and foremost, there is no direct evidence to suggest that emotions might be playing any role into the process. Showing evidence of asymmetric deviations does not provide direct evidence that people might be underestimating the impact of negative emotion on subsequent bets after losses. Second, gamble 2 did not represent the terminal gamble. Therefore, it is possible that individuals' willingness to bet more than planned after the first loss may be because participants knew that there would be further gambling opportunities in the near future (i.e., a third gamble). In other words, the presence of a third gamble made them more risk-seeking in the second one. The fact that a similar pattern of behavior also took place in gamble 3, could be due to a consistency effect (e.g., "I bet more than planned in gamble 2 after a loss, I'll do the same in gamble 3"). Experiments 2 and 3 address these issues.

EXPERIMENT 2

To test whether the emotions attached to the losses might be influencing people's decisions in subsequent bets, participants in this second experiment are asked after the planning phase to predict how they will feel after losing and after winning the first bet. In line with an emotion-based rationale we speculate that people might be underestimating the intensity of emotions and/or its impact on future bets. Specifically, we test if some people are underestimating at the planning stage how bad they will feel after losing their first bet, and most importantly, if those who deviate positively from the plan after the actual loss in gamble 1 are more likely to be the ones who underestimated their negative emotions in the first place. That would provide initial direct evidence that emotions might be an important aspect of the process. Also, to assess the scope and robustness of the previous findings, we attempt to replicate the asymmetric deviations from the plan with a two gamble scenario and larger budget per gamble.

Method

Participants and design. One hundred four students from a western university participated in this experiment. They were paid a $5 flat fee plus additional earnings contingent on the outcomes of the gambles. The experiment employed a two (bet 2: planned vs. actual; within) by two (outcome 1: gain vs. loss; between) mixed design.

Procedure. The procedure was similar to that used in experiment 1, with the following change. First, there were only two gambles available and participants were allowed to bet up to $5 (i.e., 50 chips) per gamble (i.e., they could bet up to $10 out of their $15 participation fee). Second, in order to provide initial evidence for the role of negative emotions into deviations from the plan after losses, participants were asked in the planning phase to estimate on a continuous 101 point scale how they would be feeling after winning and after losing whatever they decided

to bet in gamble 1 ("Right now, I feel___; 0=very bad, 50=neutral, 100=very good; any number from 0 to 100 is allowed"). This estimation would be contrasted with the actual emotional state to be reported on the same scale just after the outcome in gamble 1.

Results

Planning phase. The results showed that prior outcomes influenced subsequent planned bets ($F(1, 102) = 5.16$, $p < .01$). Planned bets in gamble 2 were slightly lower in anticipation of a loss (vs. gain) in gamble 1 ($M_L = 21.3$ vs. $M_G = 24.4$; $F(1, 103) = 3.13$, $p < .10$). Moreover, compared to their planned bets in gamble 1 ($M = 25.0$), participants chose lower planned bets in gamble 2 after an anticipated loss in the previous gamble ($F(1, 103) = 10.28$, $p < .01$), but reported similar planned bets in gamble 2 after an anticipated gain in the previous gamble ($F(1, 103) = .20$, $p > .10$).

Actual phase. Again, there was no significant difference between planned ($M = 25.0$) and actual bet in gamble 1 ($M = 25.6$; $F(1, 103) = .93$, $p > .10$). In gamble 2, however, a significant interaction emerged between betting phase (planned vs. actual) and the outcome of gamble 1 ($F(1,102) = 8.40$, $p = .005$; see Figure 4). For gains, there was no significant deviation from the plan ($M_p = 23.3$ vs. $M_a = 23.2$; $F(1,102) = .01$, $p > .10$). However, there was a significant deviation from the plan for losses. Participants who lost gamble 1 bet on average more than they had previously planned to bet in anticipation of such loss ($M_p = 22.8$ vs. $M_a = 29.9$; $F(1, 102) = 14.82$, $p < .001$). Thirty nine percent of participants (n=41) deviated from the plan. Within this group, the pattern of deviations in gamble 2 was contingent on the outcome of gamble 1 ($\chi^2 (1) = 5.60$, $p < .05$). After a gain, preference for positive (52.6%) relative to negative deviations did not differ from chance ($z = .22$, $p > .10$), whereas most of deviations were positive (86.4%) after

a loss. In fact, only 3 participants decided to bet less than they had originally planned to bet after a loss ($z = 3.41$, $p < .001$).

---Insert Figure 4 around Here---

(Mis)estimation of emotions. The results showed an interaction between predicted and experienced emotional state and type of outcome ($F(1, 102) = 5.25$, $p < .05$). On average there was no significant differences between predicted and actual emotions for gains ($M_{pred} = 79.9$ vs. $M_{exp} = 78.8$; $F(1, 102) = .29$, $p > .10$). However, participants experienced stronger negative emotions after a loss than they had anticipated in the planning stage ($M_{pred} = 39.1$ vs. $M_{exp} = 31.1$; $F(1, 102) = 12.84$, $p = .001$). Figure 5 plots the predicted and experienced emotions (Y axis) as a function of number of chips won or lost per participant (X axis). As it can be seen by the gap between the predicted and experienced trend lines in quadrant 4, participants underestimated how bad they would feel after losing a given bet. On the gain side (quadrant 2), however, there was virtually no gap between predicted and experienced trend lines.

---Insert Figure 5 around Here---

(Mis)estimation of emotions and deviations from the plan. To assess a potential relationship between affective (mis)estimations and subsequent deviations from the plan, chi-square analyses were conducted to test if the type of deviation from the plan in gamble 2 was contingent on the type of (mis)estimation of post-outcome emotions in gamble 1. We hypothesized that participants who surprisingly felt worse than expected after a loss might be

more likely to change their plans—i.e., whether or not to deviate—, whereas no association should be observed for gains. The results confirmed our predictions. After gains, deviations from the plan were not contingent on (mis)estimations of post-outcome emotions (χ^2 (2) = 1.51 p > .10). However, deviations were significantly contingent on the (mis)estimations of post-outcome emotions after losses (χ^2 (2) = 11.81, p < .01). Among those who deviated positively from the plan (the most common pattern of deviation after losses), 68.4% had underestimated their negative feelings as a result of a loss in gamble 1, whereas only 21.5% had overestimated it. The remaining 10.5% had been accurate about the intensity of their emotion. A regression analysis showed that there was no correlation between the magnitude of underestimation of negative emotion and the magnitude of positive deviations from the plan after a loss (R^2 = .03; β = -0.03, p > .10). In other words, underestimation of negative emotions correlated with the whether or not participants deviated but had not impact on how much they deviated.

Discussion

Experiment 2 provides two additional contributions. First, it replicates the results of experiment 1 with a 2 gamble scenario. In other words, whether people face a two or a three gamble task, the asymmetric deviations from the plan still remain. Second, it offers initial evidence that emotions may be playing a role into the process. After losses, participants tended to feel worse than they expected, whereas no systematic bias was perceived after gains. Importantly, there was a significant association between type of misestimation and type of deviation. Those who felt worse than expected after a loss in gamble 1 were more likely to be the ones who bet more than planned in gamble 2. After gains, the type of deviation was not contingent on the type of misestimation.

The important empirical finding that consistently emerges from the previous two experiments is that positive deviations in betting compared to plans occur after losses are actually experienced. While in experiment two we show evidence that these positive deviations after losses are related to the underestimation of emotions between the planning and actual phases, a caveat of this experiment is that the inferences about the impact of emotions on deviations from the plan after losses are based on correlational data. Experiment 3 addresses this issue.

EXPERIMENT 3

In experiment 3, participants' emotions are orthogonally altered between gambles. Since (a) we want to further investigate the underlying reasons for deviations from the plan, (b) these deviations are observed after losses only, and (c) the gain condition does not serve as a control for the loss condition, experiment 3 focuses on the loss condition only. Most importantly, after the loss in gamble 1 but before the betting decision in gamble 2, a 5 ½ minute delay manipulation is inserted. This time delay is filled with a video clip meant to trigger different affective states (i.e., negative vs. neutral vs. positive).[7] We hypothesize that the extent to which participants will be deviating from the plan after losses will be moderated by the affective state induced by the video. Specifically, we expect that holding losses constant across treatments, those in the negative video condition will bet more than planned after a loss, since negative emotions are expected to still be present at the time of the bet decision in gamble 2. In contrast, this deviation should be mitigated among those in the positive video condition, since positive emotions are expected to replace the negativity generated by the monetary loss. In the neutral

[7] We thank Editor and the AE for this suggestion.

video conditions, the predictions would be a function of how effective the neutral video is at ameliorating participant's emotions. If the neutral video delay (i.e., a documentary) significantly attenuates the negative emotions, then deviations from the plan should be mitigated—similar to the positive video condition. However, if negative emotions linger despite the neutral video delay, positive deviations should then still emerge—similar to the negative video condition.

Method

Participants and design. One hundred three students from a western university participated in this experiment. They were paid a $5 flat fee plus additional earnings contingent on the outcomes of the gambles. The experiment employed a two (bet 2: planned vs. actual; within) by three (type of delay: negative video vs. neutral video vs. positive video; between) mixed design.

Procedure. The procedure was similar to the one used in experiment 2, except for the delay manipulation between the gambles and the fact that all participants lost gamble 1 and won gamble 2. Prior to the planning phase, participants were told that as a technical matter the experimenter would have to double-check after gamble 1 if the program were properly recording the data. Therefore, there would be a time delay between the gambles. They were also told that further information would be provided later on. Then, participants planned their bets and then played gamble 1. After losing whatever they bet in gamble 1, all participants were instructed to watch a video clip (negative vs. neutral vs. positive) while the experimenter double-checked if the program had been properly recording the data (the experimenter pretended he was performing this task from the main computer). In the negative, neutral, and positive video condition they watched a 5½ minute episode of the drama "Life as a House," a documentary

about Africa, or a Friends episode. All three video clips have been successfully and repeatedly used in past studies to trigger negative, neutral, and positive emotions, respectively (Cohen & Andrade 2004; Andrade 2005; Andrade and Ariely 2007)[8].

Participants were asked to indicate their current emotional state before gamble 1 started (i.e., at the beginning of the experiment). A continuous 21 point scale was used in this experiment ("Right now, I feel ___" [-10=very bad; 0=neutral; +10=very good]). After playing gamble 1, experiencing the loss, and then watching a 5 ½ min video clip, they were instructed to indicate their opinion about the video, which, they were told, would help the experimenter identify an "optimal filler task" to be used in future experiments. At this time, participants once again reported their current emotions. Then, gamble 2 started on a subsequent screen. They were reminded of their planned bet in case of a loss and asked to revise or confirm it. Everything else was similar to previous experiments. Based on exit protocols, we found that no participant guessed the main purpose of the time delay and/or the video clip.

Results

Planning phase. Similar to experiments 1 and 2, the results showed that preceding outcomes influenced subsequent planned bets ($F(2, 101) = 7.9$, $p = .001$). Compared to their planned bets in gamble 1 (M = 27.1), participants reported lower planned bets in gamble 2 after an anticipated loss in the previous gamble (M = 21.9; $F(1, 102) = 14.54$, $p < .001$), but reported similar planned bets in gamble 2 after an anticipated gain in the previous gamble (M = 25.0; F(1,

[8] The negative video "Life as a House" was chosen because of the similarities of emotions it triggers relative to those associated with a monetary loss in gambling environments (i.e., disappointment, frustration and anger -- see Andrade and Ariely 2007). Other negative emotional states, which, for instance, have been associated with risk-averse behavior (e.g., fear), may well produce different results (see Lerner and Keltner 2001).

102) = 2.19, $p > .10$). Planned bets in gamble 2 in anticipation of a loss (vs. gain) in gamble 1 did not differ from one another ($F(1, 102) = 2.6$, $p = .11$).

Emotional state after gamble 1. Participants across all three conditions lost on average the same amount of money in gamble 1 ($F(2, 100) = 1.54$, $p > .10$). That is, the three conditions were comparable. Nonetheless, there was a significant interaction ($F(2, 100) = 9.3$, $p < .001$) between participants' reported emotions (prior to gamble 1 vs. after the loss + video) and the type of delay manipulation (negative vs. neutral vs. positive video). Pairwise comparisons show that relative to their reported emotional state prior to the gambles (i.e., at the beginning of the experiment), participants were felt significantly worse after experiencing a loss followed by a negative video ($M_{before} = 1.0$ vs. $M_{after} = -2.72$, $F(1, 100) = 17.4$, $p < .001$) and after experiencing a loss followed by a neutral video ($M_{before} = 1.6$ vs. $M_{after} = -.57$, $F(1, 100) = 4.4$, $p < .05$). The effects reversed when the loss was followed by a positive video. Despite the financial loss, the video actually made participants feel slightly better relative to their reported emotions prior to gambles ($M_{before} = 1.5$ vs. $M_{after} = 3.3$, $F(1, 100) = 3.5$, $p = .06$). In summary, the results show that the negative emotional state generated by the loss tends to linger for a little while (i.e., 5 ½ minutes) unless a positive event, as such a funny sitcom, takes place in-between. Finally, a comparison across conditions showed that participants' reported emotional state right before gamble 2 (i.e., after the loss + video), varied significantly as a result of the video ($F(2, 100) = 17.6$, $p < .001$). Those in the happy video condition were feeling significantly better ($M = 3.3$) relative to those in the neutral video condition ($M = -.57$; $F(1, 62) = 13.05$, $p = .001$), whereas those in the negative video condition were feeling significantly worse than those in the neutral video condition ($M = -2.72$; $F(1, 67) = 4.37$, $p < .05$).

Actual phase. As expected, there was no difference between planned (M = 27.2) and actual bet in gamble 1 (M = 27.8.6; $F(1, 102) = 2.6$, $p > .10$). Moreover, the predicted bets in gamble 2 in anticipation of a loss were the same across type of delay condition ($F(2, 100) = .07$, $p > .10$). Finally, as already pointed out, participants across all three conditions lost on average the same amount of money in gamble 1. Within this context, a significant interaction emerged between betting phase (planned vs. actual) and the type of delay after the loss in gamble 1 ($F(2, 100) = 5.65$, $p = .005$; see Figure 6). Participants whose negative emotions lingered *as a result of* the negative video or *in spite of* the neutral video bet on average more than planned after a loss in gamble 1 (neutral video: $M_p = 21.7$ vs. $M_a = 26.9$; $F(1, 100) = 9.9$, $p < .01$; negative video: $M_p = 22.6$ vs. $M_a = 30.8$; $F(1, 100) = 32.4$, $p < .001$). However, those who lost gamble 1 but whose negative emotions had been converted into pleasant ones by the positive video, bet on average the same amount they had planned to bet in anticipation of such loss ($M_p = 21.2$ vs. $M_a = 22.3$; $F(1, 100) = .52$, $p < .10$). A linear decrease in the magnitude of deviations emerged from negative, to neutral, to positive video conditions ($F(1, 100) = 11.23$, $p = 001$). Finally, a multiple regression showed that participants' reported feelings right before the betting decision in gamble 2 significantly impact people's willingness to deviate from the plan after loss ($\beta = -.74$, $t(100) = -4.19$, $p < .001$), whereas the amount lost in gamble 1 had no influence ($\beta = .029$, $t(100) = .45$, $p > .10$); $R^2 = .16$; $F(2, 100) = 9.64$, $p < 001$). In short, independently of the amount loss, the worse participants were feelings before bet 2, the stronger their positive deviations from the plan.

---Insert Figure 6 around Here---

An analysis of the frequency of deviations confirmed the previous patterns of results. Forty five percent of participants (n= 47) deviated from the plan. Within this group, deviations in gamble 2 were contingent on the outcome of gamble 1 (χ^2 (1) = 6.24, $p < .05$). In the positive video condition only 11 participants deviated from the plan and the number of positive deviation (72%) did not differ from chance (z = 1.45, $p > .10$). In the neutral condition 14 participants deviated from the plan and the number of positive deviations differed significantly from chance (78%; z = 2.09, $p < .05$). The effect was further amplified in the negative video condition where 22 participants deviated from the plan, all of them choosing to bet more than planned (100%; z = 4.69, $p < .001$).

Discussion

This final experiment provides direct evidence of the importance of negative emotions on positive deviations from the plan in sequential gambles. Moreover, it demonstrates the robustness of the effect. First, the negativity generated by a loss in gamble 1 tends to linger for a little while. The introduction of a short time delay with a neutral video after a loss seems not sufficient to wash away the negative emotions and/or replace it with a pleasant feeling. Consequently, positive deviations from the plan take place not only in the negative but also in the neutral video conditions. For the negative emotions after a loss to be eliminated, a clearly enjoyable experience in-between is needed. As a result, when the loss was followed by the positive video, negativity gave place to positive emotions, which in turn eliminated participants' tendency to "overreact." These findings provide a justification for why the managerial practice adopted by Harrah's of "luck ambassadors" might be an optimal strategy from the point of view of customer retention. Introducing a pleasant break for an unlucky customer who has just

incurred a lost, might prevent over gambling in the short-run, but might lead to long-term consumer satisfaction and increased likelihood of coming back to Harrah's in the future.

Three further issues must be highlighted. First, the amount lost in gamble 1 and the planned bets in gamble 2 in case of a previous loss were the same across all three conditions. Thus, differences across conditions cannot be attributed to different previous experiences. Second, all participants were reminded of their planned bet right before their betting decision in gamble 2. Thus, the results also can also not be attributed to a potential interaction between type of delay and recall of a previous plan. Finally, the presence of the three different conditions rules out the hypothesis that any video could eliminate the positive deviations from the plan. In the context of the experimental design, it necessitates a filler task capable of replacing the negative with positive emotions for participants to keep their original plan.

GENERAL DISCUSSION

Real life gambling involves situations where consumers may plan the budget that they would want to gamble. Yet it is common to encounter cases of consumers who upon losing end up betting more than planned in the "heat of the moment" in an attempt to make up for the losses. In this article, we investigate how consumers might deviate from their planned behavior during the actual gambling process in a sequential gambling environment. To control for the impact of learning, participants were provided with a scenario in which: i) there was full information about the gambles prior to the planning phase ii), the time period between the planning and actual phases of the gambles was very short, iii) they believed that their plans would be executed, iv) and a reminder of the planned bet showed up right before they made their actual bet. To make the experience close to what one would observe in an actual casino (e.g.,

roulette table), there was a time delay between bets and outcomes (i.e., "flashing board"), participants were betting their own participation fees and within a certain range they were free to decide on whether and how much they would want to bet in any of the gambles.

Three main findings emerge across the experiments. First, in the planning phase, people behave quite conservatively, betting less after an anticipated loss and the same amount after an anticipated gain. Second, when offered the unexpected choice to change their bet during the actual phase we find a remarkably systematic and robust pattern of deviation from the plan. After a loss in the first gamble, individuals bet in gamble 2 significantly more than what they had initially planned, while after a gain in the first gamble, on average, no differences from plans were observed in gamble 2. In fact, the frequency of deviations show that across all three experiments an impressive majority (i.e., around 90% of those who deviated from the plan in gamble 2) preferred positive to negative deviations in gamble 2 after a loss was experienced in gamble 1. In contrast, after a gain, preference for positive versus negative deviations did not differ from chance. In short, asymmetric deviations from the plan emerge in a sequential and fair gambling scenario. Finally, we propose that people might at the planning stage (before the outcome is experienced) be underestimating how much their actual negative emotions will influence subsequent decisions. Consistent with it, we show that positive deviations in gamble 2 happen more frequently among those who underestimate at the planning stage the intensity of negative feelings after a loss in gamble 1 (experiment 2). Moreover, changes in people emotional states between gambles seem critical. Deviations from the plan after losses go away when a pleasant delay is placed between gambles (experiment 3).

IMPLICATIONS AND FUTURE RESEARCH

Consumer spending in commercial casinos alone went from $17.10 billion in 1996 to $32.42 billion in 2006. How much of this amount represents deviations from the plan is far from clear. However, if our results can at least in part be extrapolated, it seems that a signficant proportion of consumer spending in casinos may actually represent unplanned (uncontrolled?) behavior. To the extent that the unplanned expenditures might capture a significant chunk of one's discretionary income, our research also raises public policy questions about potential negative impact of gaming even among non-pathological gamblers (i.e., the vast majority of consumers).

This research also relates to some of the emerging trends in the marketing of state-owned lotteries which raised more than $56 billion and returned more than $17 billion to state governments in 2006. Many state lotteries are contemplating introducing new games such as scratch-off games which have a sequential nature and which promise instant gratification. These games have the feature that consumers can repeatedly buy and scratch tickets in the hope of winning. A possible concern can be that these games may induce overspending by consumers (and indeed the economically more disadvantaged consumers).[9] Our finding that losses might induce *unexpected* over-bets is relevant for the welfare maximizing design of these types of lotteries.

Some interesting research problems also remain to be investigated. For instance, the nature of deviations from the plan depends upon the characteristics of the gamble. In particular, for the same expected value, the gamble could involve larger gains but at smaller odds of winning the gamble. How would such a gamble affect the deviations from planned behavior? Also, although in sequential gambles people tend to become more risk-seeking after losses (e.g.,

[9] See for example "The $50 Ticket: A Lottery Boon Raises Concern" Nelson Schwartz, The New York Times, 12/27/2007.

Gehring and Willoughby 2002), there has also been evidence of the opposite, at least when gambles are framed in terms of investments (e.g., Shiv et al. 2005). An interesting research question therefore is what motivates people to "chase" a loss versus "walk away." In other words, among those who underestimate their negative feelings, it is possible that under certain circumstances, they may interpret the experienced negative feelings as a signal to "stop." The direction of the effect may be a function of the interplay between affective evaluations—i.e., stop gambling—and affect regulation—i.e., chase to get rid of the aversive state (Andrade 2005; Andrade and Cohen 2007). The reason why affect regulation would be the dominating mechanism in the present case may be due the perceived mood-lifting opportunities associated with gambling environment in question. Betting more than planned is quite often a simple, readily available, easy to rationalize, and effortless action, which might well eliminate one's negative feelings especially if people expect to at least break-even (Thaler and Johnson 1990). This is precisely the case in our scenarios where people are presented with a sequence of fair sequential gambles. Changes to the properties of gambles might lead to different results. Finally, it is an open question whether negative feelings can lead to deviations from the plan when no loss is observed. Similar to the previous rationale, it might depend in part on the perceived mood-lifting properties of the behavioral activity (higher bets). Future research is required to further address these issues.

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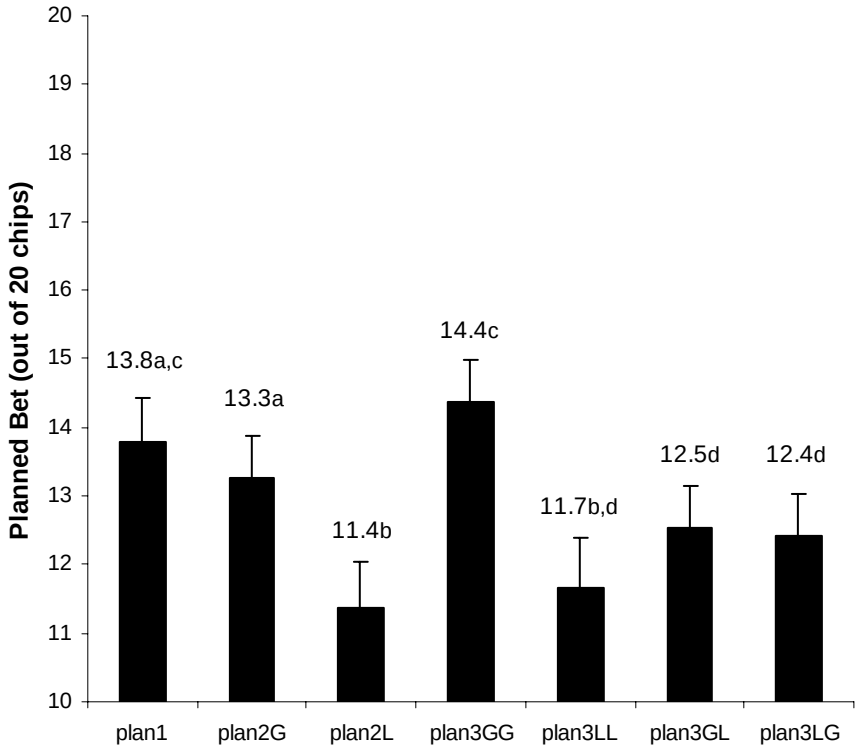
FIGURE 1. BETS AT THE PLANNING PHASE CONTIGENT ON ANTICIPATED OUTCOMES (EXPERIMENT 1)



Different subscripts indicate sig. at .05
plan1 = planned bet at gamble 1
plan2G = planned bet at gamble 2 in anticipation of a gain in gamble 1
plan3LL = planned bet at gamble 3 in anticipation of losses in gambles 1 and 2

FIGURE 2. BETS AT THE PLANNING AND ACTUAL PHASES IN GAMBLE 2 AS A FUNCTION OF PREVIOUS OUTCOME (EXPERIMENT 1)

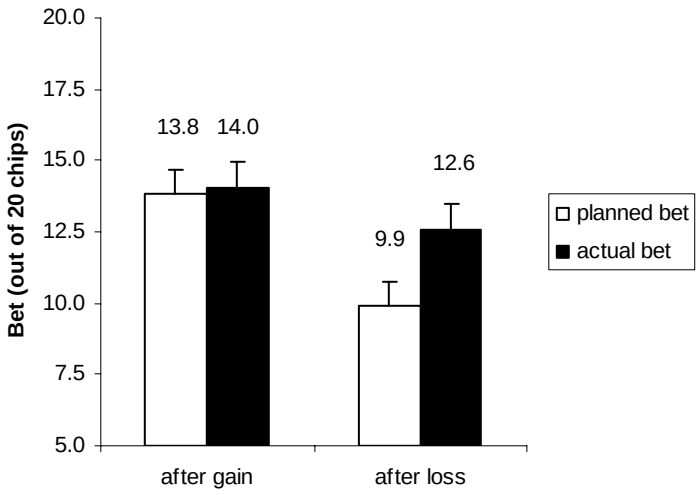


FIGURE 3. BETS AT THE PLANNING AND ACTUAL PHASES IN GAMBLE 3 AS A FUNCTION OF PREVIOUS SEQUENCE OF OUTCOMES (EXPERIMENT 1)

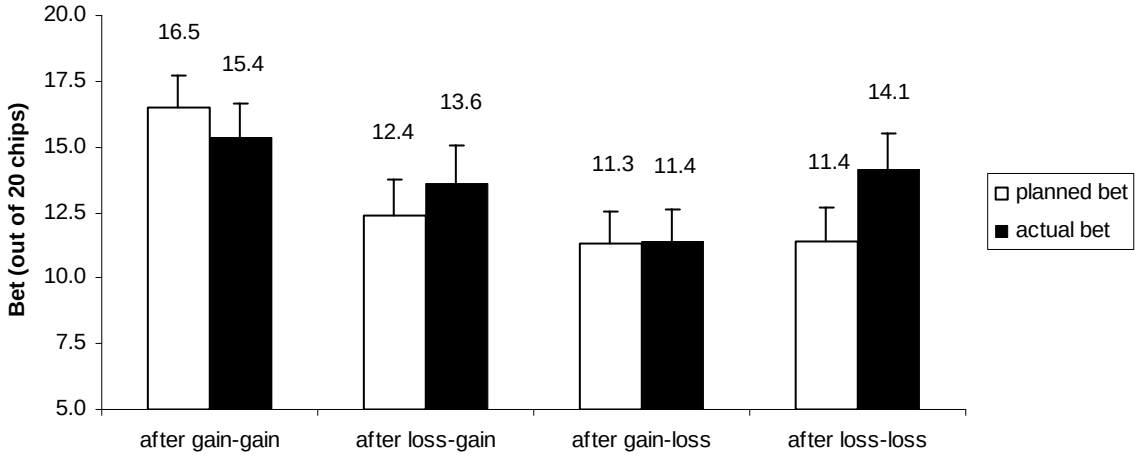


FIGURE 4. BETS AT THE PLANNING AND ACTUAL PHASES IN GAMBLE 2 AS A FUNCTION OF PREVIOUS OUTCOME (EXPERIMENT 2).

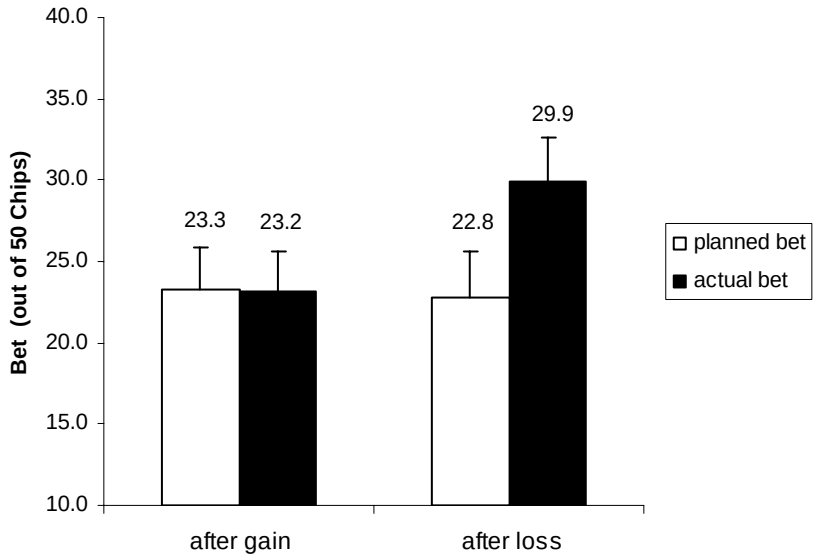


FIGURE 5. PREDICTED AND EXPERIENCED POST-OUTUCOME FEELING AFTER GAMBLE 1 (EXPERIMENT 2)

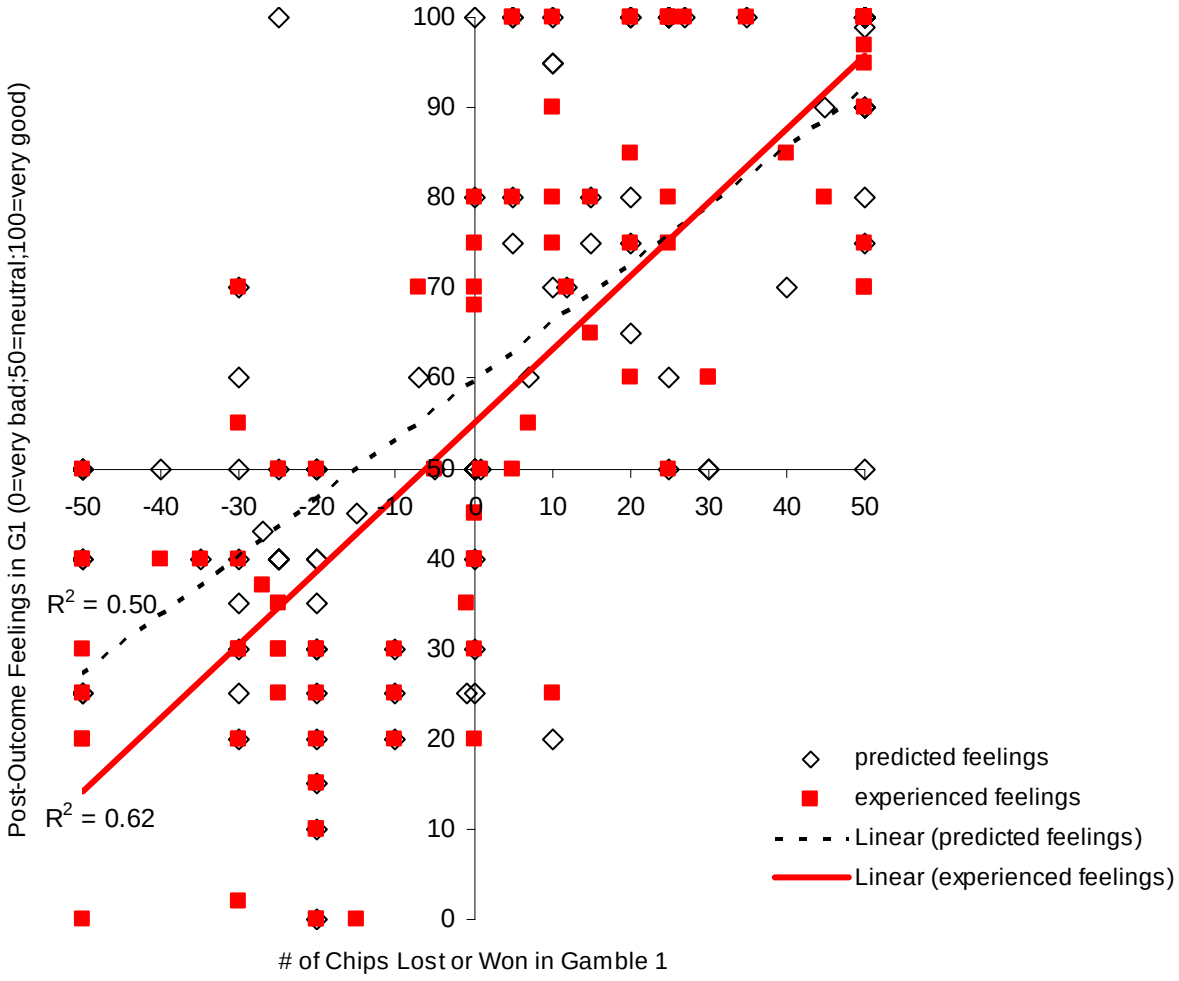
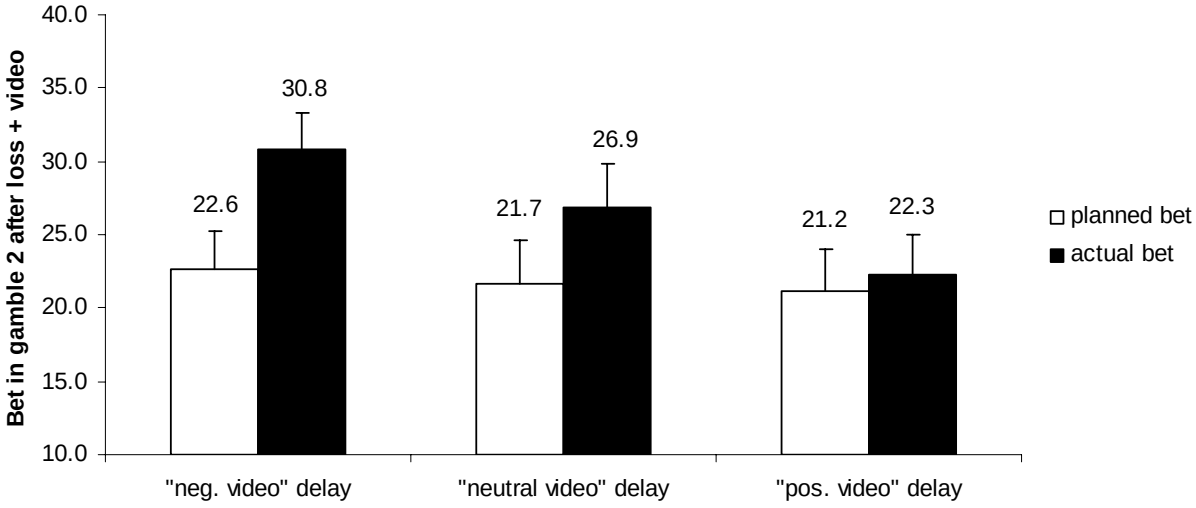


FIGURE 6. BETS AFTER LOSSES AT THE PLANNING AND ACTUAL PHASES IN GAMBLE 2 AS A FUNCTION OF TYPE OF DELAY (EXPERIMENT 3)



APPENDIX 1

GAMBLING BOARD (EXPERIMENT 1)