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Time-Dependent Gambling: Odds Now, Money Later

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Four experiments investigated temporal changes in the influence of probability and payoffs on gambling. Using urn draws, the authors found in Experiment 1 that temporal distance increased the influence of payoffs and decreased the influence of probability on preferences. The authors found in Experiment 2 that in choosing among the more distant gambles, participants offered more reasons dealing with payoffs and fewer reasons dealing with probability. In Experiments 3 and 4, the authors extended the scope of these findings using a card game and a raffle. The results were interpreted in terms of a temporal construal process that highlights the desirability of outcomes in the distant future and the feasibility of attaining the outcomes in the near future.

Anecdotal evidence and empirical research across the various behavioral sciences suggest that decisions regarding future events often depend on temporal distance from those events (see, e.g., Ainslie, 1975; Ainslie & Haslam, 1992; Loewenstein & Prelec, 1992; Read, Loewenstein, & Kalyanaraman, 1999; Schelling, 1984). A course of action that seems desirable in the distant future may seem undesirable in the near future and vice versa. As a result, people sometimes regret their decisions when they get closer in time to implementing their decisions. "It seemed like a good idea at the time" is a phrase that is often muttered when one faces the tedious consequences of a decision made long ago. For example, when one plans a ski vacation for a rare free weekend a few months down the line, the decision is made with thoughts of swooshing down powdery ski slopes and, perhaps, sipping hot cocoa at night in the lodge. However, on the morning of the trip, one may instead find him or herself bemoaning a 5-hr drive in the snow, the hassle of putting on all the equipment, and the long wait to buy a lift ticket. More generally, temporal changes in evaluation of events may have important implications for human decision making in a wide variety of situations. In the present article, we explore these implications in the context of gambling decisions.

Temporal Construal

Construal level theory (CLT) proposes that temporal distance changes people's responses to future events by changing the way people mentally represent those events (Liberman & Trope, 1998; Trope & Liberman, 2000). According to CLT, people use more schematic (higher level) construals to represent information about more distant-future events. High-level construals are decontextualized representations that extract the gist from the available information. These construals consist of superordinate, general, and core features of events. Low-level construals are less schematic, more contextualized representations of information about events. These construals include subordinate, specific, and incidental features of events. Thus, higher level construals are likely to include superordinate rather than subordinate goals, general rather than specific categories, and underlying causes rather than surface manifestation. For example, a high-level construal may represent "moving into a new apartment" as "starting a new life," whereas a low-level construal may represent the same event as "packing and carrying boxes." Similarly, a high-level construal may represent "contacting someone" as "expressing friendliness," whereas a low-level construal may represent the same event as "dialing a friend's number." According to CLT, then, the same information about an event is more likely to be construed in terms of superordinate features rather than subordinate features when the event is expected in the distant future than in the near future. To use a visual analogy, at a greater distance from an object, the main features of the object are more prominent, whereas the details are less prominent. From a distant perspective, we see the forest, but from a proximal perspective, we see the trees.

Initial evidence for the effect of temporal distance on construal was obtained by Liberman and Trope (1998). Participants were asked to describe either near ("tomorrow") or distant ("sometime next year") future activities. Results showed that abstract, superordinate descriptions were more common in the distant-future condition than in the near-future condition. For example, participants described "watching TV" more often as "being entertained" in the distant future and as "sitting on the sofa, flipping channels" in the near future. Another study used an adapted version of Vallacher and Wegner's (1989) Level of Personal Agency Questionnaire. The questionnaire presents 25 activities, each followed by two restatements—one corresponding to subordinate aspects and the other corresponding to superordinate aspects of the activity. For example, "locking a door" is followed by the alternative restatements (a) putting a key in the lock and (b) securing the

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house. As predicted by CLT, the results indicated that the number of superordinate restatements was higher when participants imagined engaging in the activities in the distant future rather than in the near future. A series of studies by Liberman, Sagristano, and Trope (in press) provided further evidence for time-dependent construal. For example, one of the studies (Study 1) found that individuals tended to use broader and more inclusive (i.e., more abstract) categories to classify objects that pertained to distant-future situations than to near-future situations. Participants in this study imagined themselves in different situations (e.g., going on a camping trip) and classified objects related to each situation (e.g., potato chips, boots, blanket) into as many categories as they thought appropriate. Results indicated that participants used fewer (namely, broader, more abstract) categories to classify the objects they imagined in a distant-future situation than in a near-future situation.

An important difference between high-level and low-level construals of action is their emphasis on desirability versus feasibility considerations (Liberman & Trope, 1998). Desirability refers to the value of an end-state of the action, whereas feasibility refers to the ease or difficulty of reaching the end-state. In action control theories (Carver & Scheier, 1990, 1999; G. A. Miller, Galanter, & Pribram, 1960; Vallacher & Wegner, 1987), desirability refers to superordinate "why" aspects of actions, whereas feasibility refers to subordinate "how" aspects of actions. For example, a high-level construal of an academic course will represent information about the interest level of the course, whereas a low-level construal of the course will represent information about the difficulty of the course. According to CLT, desirability is a high-level feature of an action and is likely to be more influential in decisions about the more distant future. Feasibility, on the other hand, is a low-level feature of an action and therefore is expected to be less influential in the more distant future.

A series of studies by Liberman and Trope (1998) supported this prediction. For example, one study (Study 2) described a guest lecture and asked participants to indicate their interest in attending it in either the near future or in the distant future. The lecture was described as either interesting or uninteresting and as being given at a convenient or inconvenient time. As predicted, the effect of interest level (desirability) on preference increased with temporal distance, whereas the effect of convenience of the timing (feasibility) decreased with temporal distance. Another study examined academic preferences in a realistic choice situation. Introductory social psychology students chose among four course assignments that were either easy or difficult and either interesting or uninteresting. Students had to submit both a near-future and a distant-future assignment and had 1 week to work on each of them. The near-future assignment was to be given on the same day, and the distant-future assignment was to be given 9 weeks later. As predicted by CLT, temporal distance decreased the effect of difficulty (feasibility) and increased the effect of interest level (desirability) on preferences among the assignments. Thus, in selecting a near-future assignment, students were willing to sacrifice interest for the sake of ease. In contrast, in selecting a distant-future assignment, students were more willing to undertake interesting but difficult assignments.

These studies demonstrate opposite temporal changes in the prominence of means and ends in the construal and choice of future activities. The greater the temporal distance from an activity, the more likely it is that the activity will be represented in terms of superordinate end-states rather than in terms of the subordinate means and that it will be chosen on the basis of the desirability of the ends rather than on the basis of the feasibility of attaining those ends.

Time-Dependent Gambling Decisions

In the present research, we examined whether the distinction between feasibility and desirability could be applied to gambles. In the Liberman and Trope (1998) studies, the outcomes were controllable, and feasibility information conveyed to participants what they could do to achieve the outcomes. By contrast, the outcomes of gambles depend on random processes that are beyond the individual's control. Nevertheless, we propose that people's hierarchical conception of action in terms of the desirability of ends and the feasibility of reaching those ends applies both to situations with controllable outcomes and games of chance. Thus, in people's conception of games of chance, payoff is the superordinate consideration because the payoff determines the desirability of the end-state of a gamble. The subordinate consideration here concerns the random outcome-generating procedure (e.g., coin flips, card games, and slot machines) because this procedure determines the feasibility of attaining the payoff. We propose, then, that in the same way that people think of feasibility considerations as subordinate to desirability considerations in decisions regarding controllable outcomes, they may also think of the probability of winning as subordinate to payoff in decisions regarding games of chance.

Normatively, the importance of the feasibility of attaining an end should depend on the desirability of the end to the same degree that the importance of the desirability of the end depends on the feasibility of attaining it. However, according to CLT, the feasibility of attaining an end is subordinate to the desirability of the end. Hence, people may view the feasibility of attaining an end-state as important only if the desirability of the end is high, but they may continue to view the desirability of an end as important whether the feasibility of attaining it is high or low. The same hierarchical conception may hold for games of chance. Normatively, probability and payoffs are symmetric. However, people may view the probability of winning as important only if the payoff is high, but they may view the payoff as important regardless of whether the probability of winning is high or low.

If people think of probability of winning as subordinate to payoff, as CLT proposes, then information regarding probability of winning should be more prominent in construing near-future than distant-future gambles, whereas information regarding payoffs should be more prominent in construing distant-future than near-future gambles. As a result, temporal distance from future gambles would increase the weight of payoff information relative to the weight of probability information in determining preferences among the gambles. That is, temporal distance should increase the preference for gambles with a low probability of winning a large prize but decrease the preference for gambles with a high probability of winning a small prize. These changes in preference should exist even when decision makers have exactly the same information about the near-future and distant-future gambles.

The research reported below was designed to test these predictions. Two preliminary studies tested our subordination assumptions. The first preliminary study tested the assumption that people

view the feasibility of controllable outcomes as subordinate to the desirability of those outcomes. The second study tested the assumption that people view probability as subordinate to payoffs in games of chance. The subsequent four experiments investigated temporal changes in the weight of probabilities and payoffs in games of chance. Participants in all four studies were told that they would have a chance to play one gamble that day (near condition), or a few weeks later (distant condition). In Study 1, we presented participants with gambles that involved a draw from an urn. The gambles varied in probability of winning and payoff within fixed levels of expected value. Both direct preferences and monetary bids were obtained. In Study 2, we used the same method as Study 1 but asked participants to provide the reasons for their gambling preferences. This enabled us to directly examine how temporal distance affects the importance people assign to probability and payoffs in gambling. Study 3 used card games of stud poker. As in Studies 1 and 2, probability and payoff were varied within fixed levels of expected value, and both direct preferences and monetary bids were measured. Study 4 presented participants with a choice among raffles varying in the value of the prize. The probabilities of winning the prizes were not provided but could be inferred from the number of contestants who were expected to compete for each prize.

Preliminary Studies

We conducted two preliminary studies to test our assumptions regarding people's hierarchical conception of decisions regarding controllable and uncontrollable outcomes. Preliminary Study 1 tested the subordination of feasibility to desirability in situations with controllable outcomes, and Preliminary Study 2 tested the subordination of probability of winning to payoff in games of chance.

Preliminary Study 1: Subordination of Feasibility to Desirability

This study examined whether the subjective importance of feasibility information depends on the level of desirability more than the subjective importance of desirability information depends on the level of feasibility. We presented participants with three hypothetical choice situations involving both feasibility and desirability and asked them to indicate the importance of feasibility (desirability) information, given that the desirability (feasibility) was either high or low. Thus, the study had a 2 (the provided dimension: feasibility vs. desirability) $\times$ 2 (level of the provided dimension: high vs. low) design, and the dependent measure was subjective importance of information about the other, nonprovided dimension.

We predicted that the effect of level of desirability on the subjective importance of feasibility information would be greater than the effect of level of feasibility on the subjective importance of desirability information. In other words, subordination of feasibility to desirability predicts a Dimension $\times$ Level interaction effect on subjective importance.

Method

Participants were 61 undergraduate students from Tel Aviv University (39 women) who took part in the study for a psychology course credit. They received a questionnaire containing three scenarios. The high-level, desirability version of each scenario is provided below. The low-level version is presented in parentheses, and the feasibility version is presented in brackets.

Course. The following scenario describing a course offering was given to participants:

> Imagine reading an advertisement about an additional course that is offered by the psychology department next term, and has not been advertised before. Judging by what you read, the class seems (does not seem) to be very interesting. How important would it be for you to find out whether or not you can register for the class? [Judging by what you read, it seems very likely (does not seem very likely) that you will be able to register for the class. How important would it be for you to find out how interesting is the class?]

Research assistant job. The following scenario describing a research assistant position was given to participants:

> Imagine seeing an ad about a research assistant job. According to the ad, the job seems (does not seem) very attractive. How important would it be for you to find out about the likelihood of getting the job? [According to the ad, it seems very likely (not very likely) that you can get the job. How important would it be for you to find out how attractive is the job?]

Concert. The following scenario describing a concert was given to participants:

> Imagine that a friend tells you about a concert given by a band that you like (do not like) very much. How important would it be for you to find out how easy it is to get tickets to the concert? [Imagine that a friend tells you about a concert by a band for which it is very easy (rather difficult) to get tickets. How important would it be for you to find out whether the concert is given by a band you like or not?]

Each question was followed by a 9-point scale, ranging from 1 (*not at all important*) to 9 (*very important*). Each participant received all three scenarios, each scenario in a different version. The order of the scenarios, as well as the combinations of versions with scenarios were counterbalanced across participants and had no significant effect on the results.

Results and Discussion

For each of the scenarios, we conducted a 2 (the provided dimension: feasibility vs. desirability) $\times$ 2 (level: high vs. low) between-subjects analysis of variance (ANOVA) on the stated interest in the nonprovided dimension. The means are presented in Table 1. For all three scenarios, the ANOVAs revealed a main effect of the provided dimension, indicating that, overall, participants were more interested in desirability information than in feasibility information, $F(1, 57) = 12.41$, $p < .001$, $\eta^2 = .312$; $F(1, 57) = 10.00$, $p < .005$, $\eta^2 = .245$; and $F(1, 57) = 3.43$, $p = .07$, $\eta^2 = .132$, for the class, the job, and the concert scenarios, respectively. A strong main effect for level of the provided dimension was also obtained in all three scenarios and indicated that interest in both feasibility and desirability was higher when the level of the provided dimension was high than when it was low, $F(1, 57) = 15.20$, $p < .0005$, $\eta^2 = .344$; $F(1, 57) = 37.27$, $p < .0001$, $\eta^2 = .414$; and $F(1, 57) = 22.41$, $p < .0001$, $\eta^2 = .356$, for the class, the job, and the concert scenarios, respectively. This effect is consistent with a multiplicative model of the effects of feasibility and desirability: The effect of each dimension is magnified as the other dimension increases.

Table 1
Interest in the Nonprovided Dimension as a Function of Provided Dimension and Its Level (Preliminary Studies)

Provided dimension	Level of provided dimension: High	Level of provided dimension: Low
Preliminary Study 1: Feasibility vs. desirability		
Course		
Feasibility	6.80 (2.73)	5.71 (2.12)
Desirability	5.93 (2.49)	2.47 (1.66)
RA Job		
Feasibility	7.12 (2.25)	5.40 (2.26)
Desirability	6.93 (1.54)	2.31 (1.92)
Concert		
Feasibility	6.53 (2.10)	5.07 (2.87)
Desirability	6.87 (2.45)	2.40 (2.32)
Preliminary Study 2: Probability vs. payoff		
Probability	5.96 (2.26)	5.99 (2.21)
Payoff	7.04 (1.78)	4.29 (2.33)

Note. Level was rated on a scale of 1 (*not at all important*) to 9 (*very important*). Numbers in parentheses are standard deviations. RA = research assistant.

Most important and consistent with our predictions are the interaction effects found in all three scenarios, $F(1, 57) = 4.15$, $p < .05$, $\eta^2 = .084$; $F(1, 57) = 7.75$, $p < .01$, $\eta^2 = .141$; and $F(1, 57) = 5.75$, $p < .02$, $\eta^2 = .100$, for the class, the job, and the concert scenarios, respectively. As can be seen in Table 1, this interaction effect indicated that interest in feasibility depended on the level of desirability more than interest in desirability depended on the level of feasibility. Specifically, when desirability was low, interest in feasibility was quite low—much lower than the interest in feasibility when desirability was high. However, when feasibility was low, interest in desirability remained quite high and was not much lower than interest in desirability when feasibility was high.

These results suggest that feasibility is subordinate to desirability in the sense that the subjective importance of the feasibility of attaining an outcome depends on the desirability of the outcome, whereas the subjective importance of the desirability of an outcome is independent of the feasibility of attaining the outcome. Notably, this effect is statistically independent and theoretically distinct from the overall higher importance of desirability relative to feasibility, revealed in the main effect of dimension. According to CLT, it is because feasibility is subordinate to desirability that the former is more influential in choice among near-future options, and the latter is more influential in choice among distant-future options.

Preliminary Study 2: Subordination of Probabilities to Payoffs in Gambling

In the present study, we used the same method as in the earlier study to determine whether people think of the probability of winning as subordinate to payoff in games of chance. As before, the question was whether the subjective importance of probability depends on payoff value more than the subjective importance of payoff depends on probability. We used lotteries in which payoffs and probability had a similar potential contribution to expected utility by varying both probability and payoff within a range in which the high end was 10 times that of the low end. Participants indicated how important probability (payoff) would be, given that the level of payoff (probability) was either at the high end or at the low end of the range. Thus, as in the earlier study, the study had a 2 (the provided dimension: probability vs. payoff) × 2 (level of the provided dimension: high vs. low) design, and the dependent measure was the rated importance of the other, nonprovided dimension.

According to the expected utility model, probabilities and payoff combine in a multiplicative way, and thus the importance of both probability and payoff was expected to be higher given that the level of the other dimension was high rather than low. We also predicted subordination relations, wherein interest in probability would depend on the level of payoff more than interest in payoff would depend on the level of probability. That is, we predicted a relatively low interest in probability given a low payoff but a relatively high interest in the payoff given a low probability. This should yield the same Dimension × Level interaction as in Preliminary Study 1.

Method

Participants were 24 undergraduate students from Tel Aviv University (15 women) who took part in the study for a psychology course credit. They received a one-page questionnaire entitled "Games of Chance." The instructions read as follows:

> Imagine the following game: A player randomly draws a ball from a large urn with red and green balls. If the ball is green the player wins a sum of money. If the ball is red he or she does not win anything (and does not lose anything).
>
> The numbers of red and green balls vary between games. Thus, although the total number of balls is always 100, the number of green (winning) balls varies between 9 and 90. The amounts to be won also vary, in different games, between 10 NIS and 100 NIS (at the time of the study, equivalent to $2.30 and $23, respectively).
>
> Each sum of money may be combined with any urn-composition (for example, there are games offering 10 NIS and an urn with 90 green balls, and games where 10 NIS combine with an urn containing 9 green balls. Similarly, in some games, 100 NIS combine with an urn with 90 green balls, and other games in which 100 NIS go with an urn with 9 green balls). Imagine that you are offered to play a few of these games.

Four questions followed, specifying either the high or the low end of either the probability or the value dimension and asking about interest in receiving information about the other, nonprovided dimension. The questions about interest in the probability dimension were as follows: "In the first (second) game, the amount to be won is 10 NIS (100 NIS). How much would you like to know the composition of the urn in this game?" The questions about interest in payoff were as follows: "In the third (fourth) game, there are 9 (90) green balls in the urn. How much would you like to know the amount that may be won in this game?" A 9-point scale, ranging from 1 (*not at all*) to 9 (*very much*), followed each of the four questions. Each participant received all four questions. The order of these questions was counterbalanced across participants and had no significant effect on the results.

Results and Discussion

We conducted a 2 (the provided dimension: probability vs. payoff) × 2 (level: high vs. low) within-subjects ANOVA on the stated interest in the nonprovided dimension. The means are presented in Table 1. The main effect for provided dimension was insignificant, $F < 1$, indicating that overall, there was no difference in participants' level of interest in probability versus payoff. A strong main effect for level, $F(1, 23) = 20.18$, $p < .0005$, $\eta^2 = .303$, indicated that, as predicted by the expected utility model, interest in both expectancy and payoff was higher when the level of the other dimension was high than when it was low. Most important and consistent with our predictions, an interaction effect, $F(1, 23) = 13.21$, $p < .002$, $\eta^2 = .256$, indicated that interest in probability depended on the level of payoff more than interest in payoff depended on the level of probability. Specifically, when payoff was low, interest in probability was quite low ($M = 4.29$, $SD = 2.33$), much lower than the interest in probability when payoff was high ($M = 7.04$, $SD = 1.78$). In contrast, interest in payoff was as high regardless of whether the probability was high ($M = 5.96$, $SD = 2.26$) or low ($M = 5.99$, $SD = 2.21$).

As expected, then, the subjective importance of the probability of winning depended on the payoff, whereas the subjective importance of the payoff was independent of the probability of winning. These results validate our assumption that probability is subordinate to payoff in games of chance in the same way that feasibility is subordinate to desirability in situations with controllable outcomes. Given this asymmetry, one would prefer to seek information about the desirability of outcomes (payoffs) before, rather than after, seeking information about the feasibility of attaining those outcomes (probability). From the point of view of CLT, the subordination of probability to payoff should make probability more influential in choosing a near-future gamble and payoff more influential in choosing a distant-future gamble. The following four studies test this hypothesis.

Experiment 1: Urn Draws

This study presented participants with a set of 20 gambles varying in probability within different levels of expected value. Participants expected to play 1 of these gambles either in the near future or the distant future. Participants indicated both their preferences and bids for each of the gambles.

Method

Participants. Participants were 63 New York University undergraduates (41 women) who participated in the experiment to fulfill an introductory psychology course requirement. In this and the following studies, participants were randomly assigned to either the near-future or distant-future conditions. The experiment was administered to participants in small groups of 1–4 persons at a time.

Procedure. All participants were informed that they would have the opportunity to play a game of chance. In the near condition, participants were told that they would play the game at the conclusion of their experimental session. In the distant condition, participants were informed that they would play the game 2 months later. In both cases, participants were given a packet containing a description of the 20 games they could potentially play. Each of the games consisted of a drawing from an urn containing 100 marbles. Some of the marbles were green, and some were red. A draw of a green marble would lead to the participant winning a predetermined monetary payoff, whereas a draw of a red marble would not win anything nor would it lose anything. The packet of 20 games crossed five different levels of the probability of a win (.1, .3, .5, .7, and .9) with four different levels of expected value ($4, $6, $8, and $10). The probability of winning was varied by changing the number of green marbles in the urn. To prevent participants from discerning a pattern of specific probabilities, we randomly varied the number of marbles that were green for each level of probability from –2 to 2 from the precise probability level (e.g., for the .7 probability level, the number of marbles that were green could be 68, 69, 70, 71, or 72). The order that the 20 games were presented in the packet was randomly determined for each participant.

On the basis of this information, participants rated the desirability of each game on a 7-point scale (1 = *not at all desirable*, 7 = *very desirable*). These ratings were said to determine which game participants would get to play. After completing the rating of each of the 20 games, participants were asked how much money they would be willing to bid and risk losing for a chance to play each of the games. Participants were informed that their bids would help determine which game they would ultimately play. At the end of the experiment, participants were thanked and debriefed about the purpose of the experiment.

Results

The data from 3 participants (2 in the near condition and 1 in the distant condition) were excluded from analyses because these participants failed to properly follow directions.

Preference measure. CLT predicts that for any given expected value, as the probability of winning increases (and payoff decreases), the preference for a near-future gamble should increase and the preference for a distant-future gamble should decrease. A 2 (time) × 5 (probability) × 4 (expected value) ANOVA on the preference ratings yielded a significant planned contrast interaction between probability (linear effect) and time, $F(1, 232) = 119.80$, $p < .001$, $\eta^2 = .256$. As predicted, this interaction indicated that participants preferred high-probability, low-payoff gambles for the near future, $F(1, 116) = 171.38$, $p < .001$, $\eta^2 = .264$, and low-probability, high-payoff gambles for the distant future, $F(1, 116) = 5.39$, $p < .05$, $\eta^2 = .091$ (see Figure 1). Not surprising, overall preferences were positively related to the expected value of the gambles, $F(1, 58) = 173.46$, $p < .0001$, $\eta^2 = .421$. Note that for any given level of probability, differences in

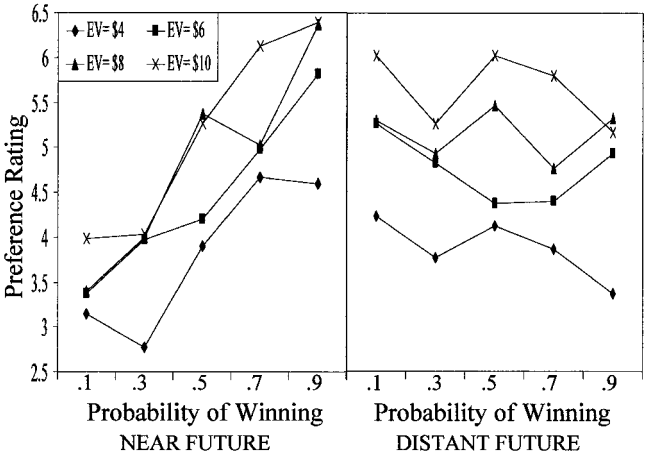

Figure 1. Mean preference ratings for near- and distant-future bets (Experiment 1). EV = expected value.

expected value represent differences in payoffs and that these differences are greater for gambles with low rather than high probability. If temporal distance increases the weight of payoffs, as CLT assumes, then the effect of expected value on preference should be more pronounced for distant-future than near-future gambles, particularly when the probability is low. Supporting these predictions, the ANOVA of the gambling preferences yielded a significant Time × Expected Value planned contrast interaction, $F(1, 174) = 5.28$, $p < .05$, $\eta^2 = .101$, and a significant Time × Expected Value × Probability planned contrast interaction, $F(1, 696) = 2.40$, $p < .05$, $\eta^2 = .048$. These results indicate that payoffs had a greater impact on distant-future gambling preferences than on near-future gambling preferences.

To assess the independent temporal changes in the effects of probability and payoffs on gamble preferences, we regressed the preference ratings on probability and payoffs across the 20 gambles for each participant. The standardized regression coefficients for probability and payoffs were averaged across all participants. We predicted that temporal distance would decrease the regression coefficients of probability and increase the regression coefficients of payoffs. Consistent with these predictions, the standardized regression coefficients of probability were higher for near-future gambles ($M = .58$, $SD = .48$) than for distant-future gambles ($M = .06$, $SD = .34$), $t(58) = -7.05$, $p < .001$, whereas the standardized regression coefficients of payoffs were higher for distant-future gambles ($M = .52$, $SD = .56$) than for near-future gambles ($M = .36$, $SD = .74$), $t(58) = 2.86$, $p < .01$. It seems, then, that temporal distance both decreased the influence of probability and increased the influence of payoffs on gambling preferences.

Bid measure. The bid measures of 2 participants, 1 from each time condition, were excluded from this analysis, since their bids averaged more than six times the expected value of the bets.

Our predictions for the bid measure were similar to those for the direct preference measure. Specifically, we predicted that near-future participants would prefer to sacrifice payoffs for better odds, whereas distant-future participants would be more willing to take on poorer odds in return for higher payoffs. A 2 (time) × 5 (probability) × 4 (expected value) ANOVA on the bids yielded the predicted Time × Probability (linear effect) planned contrast interaction, $F(1, 224) = 58.89$, $p < .001$, $\eta^2 = .200$. This interaction indicated that bids for near-future gambles were higher for high-probability, low-payoff gambles than for low-probability, high-payoff gambles, $F(1, 112) = 12.17$, $p < .001$, $\eta^2 = .171$, whereas bids for distant-future gambles showed the reverse pattern of preference, $F(1, 112) = 52.04$, $p < .0001$, $\eta^2 = .205$. Thus, consistent with the preference-ratings results, in bidding for near-future gambles, probability was more important than payoffs, whereas in bidding for distant-future gambles, payoffs were more important than probability (see Figure 2). The ANOVA also yielded a main effect of expected value, indicating that bids increased with payoffs, $F(1, 56) = 91.05$, $p < .0001$, $\eta^2 = .271$. More interesting, a Time × Expected Value × Probability planned contrast interaction, $F(1, 672) = 14.30$, $p < .001$, $\eta^2 = .113$, indicated that this effect depended on temporal distance and probability. Thus, like preferences, bids were more sensitive to payoffs in distant-future gambles than in near-future gambles.

Using within-subjects regression analyses, similar to those conducted on the preference measure, we assessed the independent

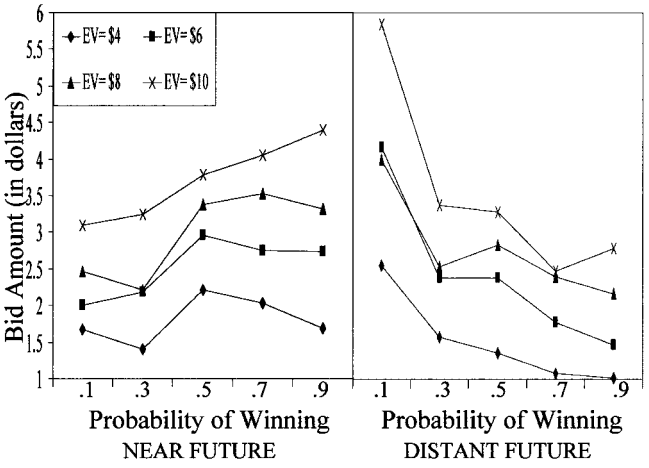

Figure 2. Mean bids (in dollars) to play near- and distant-future bets (Experiment 1). EV = expected value.

temporal changes in the effects of probability and payoff on the bids. Consistent with the preference-rating results, the standardized regression coefficients of probability were higher for near-future gambles ($M = .48$, $SD = .39$) than for distant-future gambles ($M = .10$, $SD = .39$), $t(56) = -4.12$, $p < .01$, whereas the standardized regression coefficients of payoffs were higher for distant-future gambles ($M = .34$, $SD = .40$) than for near-future gambles ($M = -.02$, $SD = .46$), $t(56) = 3.42$, $p < .01$.

In summary, the results of this study demonstrate that gambling preferences depend on temporal distance from the gambles. When probability and payoffs were traded off, gambles with high probability and low payoffs were preferred for the near future and gambles with low probability but high payoffs were preferred for the distant future. Temporal distance thus seemed to increase the weight of payoffs relative to that of probability in gambling preferences. Moreover, both the weight of probability and the weight of payoffs changed with temporal distance from a gamble: Payoffs became more influential and, independently, probability became less influential as temporal distance increased.

The fact that these temporal patterns were obtained for both the bid and direct preference measures provides convergent support for our hypotheses. Moreover, inspection of Figures 1 and 2 shows that, unrelated to temporal distance, the two measures were differentially affected by the probability manipulation. Indeed, a Measure (preference ratings vs. bids) × Time × Probability × Expected Value ANOVA yielded a Significant Measure × Probability planned contrast interaction, $F(4, 224) = 13.69$, $p < .001$, $\eta^2 = .089$, indicating that whereas bids were higher for low-probability, high-payoff gambles than for high-probability, low-payoff gambles, $F(1, 56) = 4.86$, $p < .05$, $\eta^2 = .039$, the reverse held true for direct preferences, $F(1, 56) = 25.02$, $p < .001$, $\eta^2 = .050$. This difference between the two measures was independent of time, as indicated by a nonsignificant Measure × Probability × Time interaction, $F(4, 224) = 1.78$. Overall, then, compared with direct preferences, bids were more strongly affected by payoffs than by probability. This finding is consistent with Lichtenstein and Slovic's (1971, 1973) findings that, compared with direct gambling preferences, bids are more sensitive to payoffs and less

sensitive to probability (see also Tversky, Sattath, & Slovic, 1988). According to these researchers, payoffs are more likely to serve as salient anchors for bids rather than for direct preferences because both payoffs and bids are monetary. Thus, evaluating gambles in terms of bids, like evaluating gambles in the distant future, tends to enhance the influence of payoffs on preference. However, as predicted by CLT, temporal distance increased the effect of payoffs and decreased the effect of probability on both preference and the bids.

Experiment 2: Reasons for Gambling Decisions

According to CLT, temporal distance changes gambling preferences because people think of probability as more important in the near future and of payoffs as more important in the distant future. The present experiment directly tests this assumption by asking participants to provide reasons for choosing or not choosing near-future and distant-future gambles. As in Experiment 1, the gambles varied in probability and payoff. Participants' reasons were analyzed to determine whether they concerned probability or payoffs. We predicted that temporal distance would increase the prevalence of reasons concerning the probability of winning and decrease the prevalence of reasons concerning payoffs.

Method

Participants. Participants were 61 New York University undergraduates (37 women) who participated in the experiment to fulfill an introductory psychology course requirement.

Procedure. The gambles and procedure were largely the same as those of Experiment 1. Participants received the description of the gambles (urn draws) and were asked to assume that they would be played either that day or 2 months later. The gambles with probability levels of .3 and .7 were removed. Thus, participants were presented with 12 bets, which crossed three levels of probability (.1, .5, and .9), with four levels of expected value ($4, $6, $8, and $10). We reduced the number of gambles because pilot testing indicated that providing reasons for 20 different gambles was difficult for participants. Instead of rating the gambles and bidding on them as in Study 1, participants in this study were asked to provide three reasons why they would or wouldn't like to play each of the gambles.

Results

Each reason the participants wrote was coded by two independent coders. The coders classified each reason into one of four categories: probability reasons (those referring to the probability of winning), payoff reasons (those referring to the prize amount), both probability and payoffs reasons, and reasons referring to neither. Interjudge reliability was 96%. Discrepancies were resolved by a third judge. When we combined the reasons for all the 12 gambles, 942 reasons were coded as probability reasons, 547 as payoff reasons, 63 as both probability and payoff reasons, and 445 as neither probability nor payoff reasons. There were 199 responses left blank.

Table 2 presents the mean number of probability and payoff reasons provided by each participant for each gamble. As can be seen, in 11 out of 12 games, distant-future participants gave more payoff reasons than near-future participants. Further, in 10 out of the 12 games, near-future participants provided more probability reasons than did distant-future participants. A sign test indicated that each of these results was significant at the .05 level.

These findings provide supporting evidence regarding the mechanism we proposed for temporal changes in gambling. Experiment 1 found that gambles with high probability were favored in the near future, whereas gambles with high payoffs were favored for the distant future. The findings of the present experiment suggest these changes in preference reflect a tendency to think about near-future gambles in terms of the probability of winning and about distant-future gambles in terms of the payoffs associated with winning.

Experiment 3: Card Games

Experiment 1 provided participants with the exact probabilities of winning in the gambles. The present experiment extends the test of CLT to situations in which the exact probabilities of winning are unknown. The gambles were card games with payoffs on combinations of five cards ("hands") of stud poker. The probabilities of the winning hands were not explicitly provided but rather were

Table 2
Mean Number of Payoff-Related and Probability-Related Reasons Given for Playing Near- and Distant-Future Bets (Experiment 2)

Gamble (Probability × Payoff = EV)	Payoff reasons		Probability reasons	
	Near	Distant	Near	Distant
.1 × $40 = $4	.30 (.37)	.38 (.46)	.76 (.41)	.70 (.43)
.1 × $60 = $6	.36 (.41)	.28 (.41)	.73 (.39)	.72 (.46)
.1 × $80 = $8	.30 (.34)	.48 (.47)	.59 (.41)	.53 (.41)
.1 × $100 = $10	.40 (.39)	.69 (.50)	.47 (.37)	.31 (.42)
.5 × $8 = $4	.46 (.35)	.59 (.49)	.51 (.40)	.62 (.42)
.5 × $12 = $6	.23 (.37)	.35 (.39)	.77 (.36)	.74 (.40)
.5 × $16 = $8	.30 (.32)	.35 (.36)	.80 (.32)	.75 (.33)
.5 × $20 = $10	.23 (.38)	.31 (.36)	.71 (.36)	.65 (.36)
.9 × $4.44 = $4	.56 (.44)	.66 (.42)	.47 (.39)	.41 (.40)
.9 × $6.67 = $6	.20 (.33)	.45 (.40)	.67 (.37)	.73 (.35)
.9 × $8.89 = $8	.26 (.39)	.31 (.39)	.67 (.40)	.62 (.43)
.9 × $11.11 = $10	.23 (.31)	.28 (.33)	.80 (.29)	.72 (.34)

Note. Numbers in parentheses are standard deviations. EV = expected value.

inferred from the rules of the game, which were thoroughly explained to participants. The implicit nature of the probabilities of the winning hands should reduce the overall influence of probabilities on gamble preferences. Nevertheless, CLT predicts that this influence will be more pronounced for near-future than distant-future gambles, whereas the influence of payoffs should be more pronounced for distant-future than near-future gambles.

Method

Participants. Fifty-seven New York University undergraduates (33 women) participated in this study as partial fulfillment of a course requirement.

Procedure. The procedure was similar to that of Experiment 1, except that it involved payoffs based on hands of stud poker, a game played with a standard deck of 52 cards, 4 of each suit (club, diamond, heart, and spade), with 13 numerical values per suit (2, 3, 4, 5, 6, 7, 8, 9, 10, jack, queen, king, and ace). In stud poker, 5 cards (a hand) are dealt to each player, and each hand is ranked as to how distinctive or unlikely it is. When playing the game, unlikely hands beat those hands of greater likelihood. Thus, hands that are more difficult to obtain will beat hands that are easier to come by. For example, if a player is dealt 5 cards of consecutive value (a "straight"), he will beat a player who has a hand containing two cards of the same value (a "pair").

In the present experiment, participants had to beat a particular hand to win. The bets varied in probability on the basis of which hand had to be beaten to win. A brief overview of the game of stud poker familiarized each participant with the concept of a hand and the way in which the likelihood of each hand varies (i.e., participants learned that "four of a kind" is more difficult to obtain than either a straight or a pair). A few sample hands were dealt to facilitate thinking about these possibilities. Also, each participant was given a sheet containing a sample of each type of hand, with the hands listed in order of value.

Four levels of expected value, crossed with four probability levels were manipulated within participants. The four levels of expected value were the same as in the first experiment, namely, \$4, \$6, \$8, and \$10. The four winning hands (and their associated approximate probabilities) were "queen high" or better, a very easy-to-obtain hand which requires simply that one of the cards be a queen or higher (.9); "ace high" or better, requiring that one of the cards be an ace (.7); pair or better, in which two cards must have the same value (.5); and two pair or better, in which there must be two sets of two cards having the same value (.1). For example, the proposed gamble in the \$4 expected value and the "two pair or better" hand informed the participant that he or she could win \$55 if dealt any hand whose value was equal to or greater than two pair.

As in Study 1, for each of the gambles, participants rated the desirability of each game, and, afterward, how much money they would be willing to bid and risk losing for each of the proposed games. At the end of the experiment, participants were thanked and debriefed about the purpose of the experiment.

Results

The data from 2 participants (1 in each time condition) were excluded from these analyses because these participants failed to properly follow directions.

Preference measure. We predicted that participants would prefer gambles with lower probability (and higher payoffs) for the distant future but not for the near future. Figure 3 presents the mean preferences for the near-future and distant-future bets. A 2 (time) × 4 (probability) × 4 (expected value) ANOVA yielded the predicted planned contrast interaction between probability (linear effect) and time, $F(1, 159) = 49.69$, $p < .0001$, $\eta^2 = .242$.

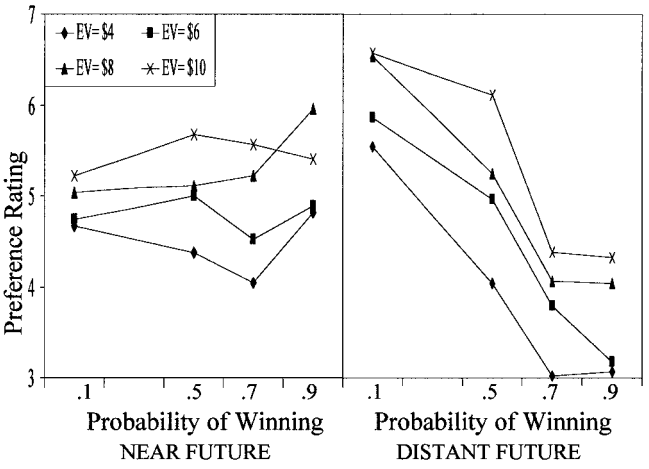

Figure 3. Mean preference ratings for near- and distant-future stud poker bets (Experiment 3). EV = expected value.

Consistent with the results of Experiment 1, this interaction indicated that gamble preferences decreased as winning became more likely but less valuable in the distant-future condition, $F(1, 81) = 141.82$, $p < .0001$, $\eta^2 = .270$, but not in the near-future condition, $F < 1$. As before, for any given level of probability, differences in expected value represent differences in payoffs. A main effect of expected value, $F(1, 53) = 100.01$, $p < .001$, $\eta^2 = .311$, thus indicated that participants preferred gambles with higher payoffs. More important, this effect depended on temporal distance, $F(1, 159) = 6.37$, $p < .05$, $\eta^2 = .055$. Consistent with our earlier findings, this result shows that payoffs had a greater impact on distant-future than near-future gamble preferences.

As in Experiment 1, we also conducted within-subjects regression analyses of the gamble preferences with probability and payoffs as predictors. Replicating our earlier findings, the standardized regression coefficients of payoffs were higher for the distant-future ($M = .71$, $SD = .39$) than for the near-future gambles ($M = .17$, $SD = .42$), $t(53) = 3.98$, $p < .001$, whereas the standardized regression coefficients of probability were higher for the near-future gambles ($M = .28$, $SD = .45$) than for the distant-future gambles ($M = .04$, $SD = .32$), $t(53) = 2.38$, $p < .05$. These results indicate that temporal distance both increased the effect of payoffs and decreased the effect of probability on gambling preferences.

Bid measure. The bid measures of 2 participants, both in the near condition, were excluded from this analysis, since their bids averaged more than six times the expected value of the bets.

Figure 4 presents the mean value of bids for the near- and distant-future gambles. A 2 (time) × 4 (probability) × 4 (expected value) planned contrast ANOVA yielded a main effect of probability, $F(1, 153) = 73.98$, $p < .001$, $\eta^2 = .096$, indicating that overall bids were higher for lower probability, higher payoff gambles. However, as predicted, a Time × Probability (linear effect) interaction indicated that this preference was more pronounced for distant- than near-future gambles, $F(1, 153) = 11.84$, $p < .001$, $\eta^2 = .033$. As in Experiment 1, bids increased with expected value, $F(1, 51) = 36.05$, $p < .001$, $\eta^2 = .188$. However, in the present experiment, this effect was not significantly affected

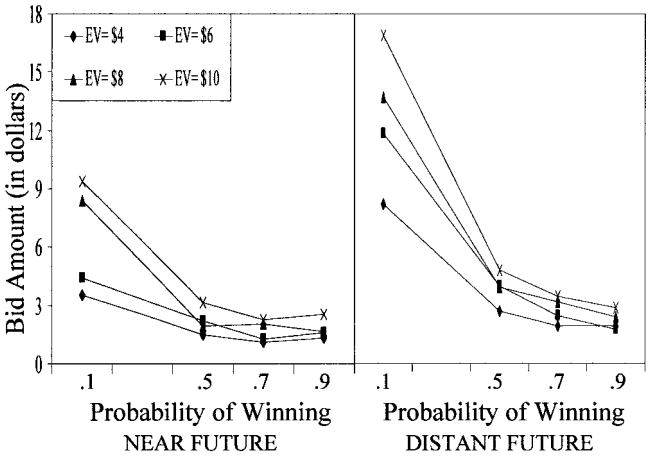

Figure 4. Mean bids (in dollars) to play near- and distant-future stud poker bets (Experiment 3). EV = expected value.

by temporal distance, $F(1, 153) = 1.05$. Finally, a main effect of time, $F(1, 51) = 4.62$, $p < .05$, $\eta^2 = .117$, indicated that bids were higher for distant-future than near-future gambles.

Within-subjects regression analyses showed that both the effects of probability and payoffs on bids changed as a function of temporal distance. As expected, the standardized regression coefficients of payoffs were higher for the distant-future ($M = .72$, $SD = .47$) than for the near-future gambles ($M = .40$, $SD = .38$), $t(51) = 2.13$, $p < .05$. In contrast, the standardized regression coefficients of probability were higher for near-future gambles ($M = .23$, $SD = .51$) than for distant-future gambles ($M = .08$, $SD = .40$), but this difference was not statistically significant, $t(51) = 1.42$, $p > .05$.

A comparison of Figures 3 and 4 shows that, independent of time, preferences and bids were differentially affected by the probability manipulation. Indeed, a Measure (preference vs. bids) × Time × Probability × Expected Value ANOVA yielded a significant Measure × Probability interaction, $F(3, 153) = 22.29$, $p < .001$, $\eta^2 = .089$, indicating that the advantage of low-probability, high-payoff gambles was greater for bids than for preferences. Consistent with the results of Experiment 1, this finding suggests that, compared with direct gambling preferences, bids are more sensitive to payoffs and less sensitive to probability.

Overall, the results of the present experiment extend those of Experiments 1 and 2 to a card game in which the exact probabilities of winning were not provided explicitly. As before, high-probability, low-payoff gambles were more attractive in the near future than in the distant future, whereas low-probability, high-payoff gambles were more attractive in the distant future than in the near future. Temporal distance increased the weight of payoffs relative to that of probability in determining the attractiveness of the gambles. This held true for both direct preference and bid measures.

Like Experiment 1, the present experiment shows that temporal distance has independent opposite effects on the weights of probability and payoffs. As temporal distance increases, the weight of probability decreases, whereas that of payoffs increases. Finally, the overall effect of probability was weaker in the present experiment than in Experiment 1. As discussed earlier, this may be due to the lower salience of probabilities of winning in the present experiment.

Experiment 4: Raffle Preferences

This experiment offered participants an opportunity to enter one of three raffles varying in the value of the prize. Participants were told that this choice was offered to 100 contestants. We assumed that participants would expect that the more attractive prizes would draw a greater number of contestants, thus reducing the probability of winning. The perceived popularity of the three raffles served as the sole basis for inferring the probability of winning. As in the previous studies, the raffles were said to take place either on the next day or 2 months later.

Method

Participants. Participants were 135 New York University undergraduates (91 women) who took part in the experiment to fulfill a course requirement.

Procedure. We pretested the desirability of these prizes with 36 New York University undergraduates, who rated on a 15-point scale how desirable each of three prizes would seem to students their age. This pretest indicated that a stereo was the most desirable ($M = 11.5$, $SD = 2.78$), followed by a subscription to *Time* magazine ($M = 6.10$, $SD = 3.49$), and a Brita water filtration system ($M = 4.10$, $SD = 3.52$).

Participants in the main study were offered a choice among three raffles in which they could win the three prizes indicated above. They were told that a total of 100 contestants would be able to enter one and only one raffle. It was indicated that each of the 100 contestants would be able to choose which of the three raffles they would like to enter, that there was no limit on the number of contestants who would be able to enter any raffle, and that there would be only one winner per each raffle. We assumed that participants would realize that they had a lower probability of winning the raffles with the more popular prizes because these raffles would attract a greater number of contestants.

After receiving these instructions, participants were asked how interested they were in entering each of the three raffles. Responses were indicated on a 10-point scale, anchored with *I do not want this raffle at all* and *I definitely will play this raffle*. Following this, participants indicated their likelihood of winning each of the three prizes, as well as rating how desirable they believed the prizes would be to the other contestants. Finally, participants were thoroughly debriefed and thanked.

Results

To determine whether winning the more desirable prizes was perceived as less likely, we performed a 2 (time) × 3 (prize) ANOVA, with time as a between-subjects factor and prize as a within-subjects factor, on the subjective probabilities of winning. The ANOVA yielded a strong main effect of prize, $F(1, 133) = 144.71$, $p < .001$, $\eta^2 = .426$, indicating that the subjective probabilities of winning decreased as prize value increased. This effect did not interact with time, $F < 1$, and there was no main effect of time on subjective probabilities, $F(1, 133) = 1.77$. As intended, then, participants believed that they were less likely to win the more desirable prizes. These results also show that temporal distance did not produce an optimistic bias. Winning did not seem more likely in the distant future than the near future.

Figure 5 presents mean preferences for the three raffles. A 2 (time) × 3 (prize) ANOVA on these data yielded a main effect of

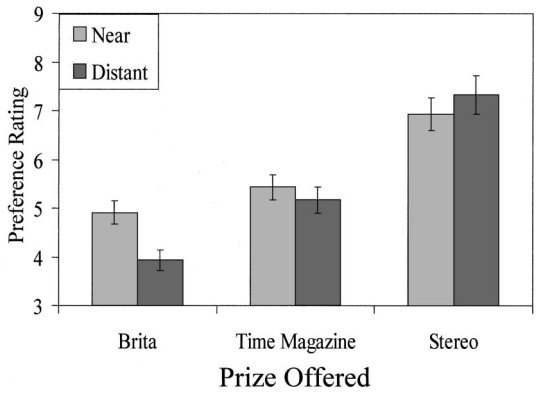

Figure 5. Mean preference for each prize in near- and distant-future raffles (Experiment 4). Error bars represent standard error of the mean.

prize, $F(1, 133) = 102.97$, $p < .001$, $\eta^2 = .225$, indicating a preference for the raffles with more desirable prizes. In itself, temporal distance did not affect preferences, $F(1, 133) = 1.13$. However, as predicted, the effect of prize depended on temporal distance, $F(1, 133) = 6.61$, $p = .01$, $\eta^2 = .146$, for the Time × Prize (linear effect) interaction. As can be seen in Figure 5, the preference for raffles with higher prizes (and lower probability of winning) was stronger in the distant future than in the near future. Thus, a raffle with a more valuable but less likely prize (stereo system) was more attractive in the distant than near future, whereas a raffle with a less valuable but more likely prize was more attractive in the near than distant future.

These results extend our earlier findings to preferences among raffles involving a trade off between the value of the prize and the number of people competing for the prize. Consistent with CLT, participants' preferences showed that temporal distance increased the importance of the value of the prize relative to that of the number of people competing for the prize. Once again, then, temporal distance shifted preferences toward high-payoff, low-probability gambles. It should be noted, however, that overall, probability was less important here than in the earlier studies. This was evidenced by the preference for raffles with higher prizes in both the near and distant future. This is not surprising because participants were not provided with probability information. Instead, they had to rely on rather complex social reasoning as to how the value of the prize would affect other participants' decisions to compete for the prize. The complexity as well as the uncertain nature of such inferences probably contributed to reducing the weight participants assigned to the probability of winning.

Furthermore, temporal distance was shown to have no effect on the participants' estimates of their likelihood of winning the raffles. Thus, future optimism can be ruled out as an explanation for the effects demonstrated here because participants in both time conditions rated their chances of winning equally. In accordance with CLT, temporal distance affected the weight given to the likelihood of winning in preference rather than the estimates of this likelihood.

General Discussion

The present experiments reveal a consistent pattern of temporal changes in the importance of probabilities and payoffs in gambling decisions. The experiments examined gambling with different games of chance (urn draws, card games, and raffles), payoffs (monetary and consumer items), and preference measures (direct preferences and bids). Across all of these gambling situations, the weight of payoffs was greater in distant-future preferences than in near-future preferences, whereas the weight of probability was greater in near-future preferences than in distant-future preferences. Thus, low-probability, high-payoff gambles were more attractive in the distant future than in the near future, whereas high-probability, low-payoff gambles were more attractive in the near future than in the distant future. Participants' reasons for choosing a gamble showed the same temporal pattern. Reasons having to do with the probability were offered more frequently for choosing a near-future gamble than a distant-future gamble, whereas reasons having to do with payoffs were offered more frequently for choosing a distant-future gamble than a near-future gamble. This last finding suggests that temporal distance changed participants' gambling preferences by increasing the perceived importance of payoffs and decreasing the perceived importance of the probability of winning those payoffs.

Construing Future Gambles

On the basis of CLT (Liberman & Trope, 1998; Trope & Liberman, 2000), we interpreted these findings as reflecting a more general tendency to give more weight to the desirability of the end-states and less weight to the feasibility of reaching those end-states in decisions for the more distant future. In making decisions about future gambles, information about the payoffs associated with different outcomes (e.g., monetary rewards) conveys the desirability of the outcomes, whereas information about the outcome-generating process (e.g., urn draws, coin flips, card games) conveys the feasibility of attaining those outcomes. CLT therefore predicts, and the present experiments indeed show, that temporal distance from future gambles increases the weight of information about payoffs and decreases the weight of information about the probability of winning those payoffs.

These findings extend our previous research on temporal changes in the effect of feasibility and desirability information on choice (Liberman & Trope, 1998). We found, for example, that near-future academic assignments were chosen according to their difficulty level, whereas distant-future academic assignments were chosen according to their interest level. Similarly, for the near future, software programs were chosen according to the ease or difficulty of learning to use the programs, whereas for the distant future, the same programs were chosen according to the importance of the tasks they can accomplish. However, the outcomes in these studies were always controllable. The games of chance used in the present experiments thus extend the test of CLT to situations with uncontrollable, random outcomes. Moreover, the choice alternatives in our earlier research were rather complex, everyday-life activities whose outcomes could depend on a variety of foreseeable and unforeseeable factors. The information about the near- and distant-future options was always the same. Nevertheless, it might be argued that temporal distance reduced the weight of feasibility considerations because participants felt they knew less about the feasibility of distant-future activities than about the feasibility of near-future activities. This argument does not seem to

apply to the present simple gambles and the fixed random mechanism that determined their outcome.

CLT proposes that the feasibility of outcomes is more influential in the near future and that the desirability of outcomes is more influential in the distant future because feasibility is represented as subordinate to desirability. Consistent with this proposal, we found that the subjective importance of the feasibility of controllable outcomes depended on their desirability more than the subjective importance of the desirability of the outcomes depended on their feasibility (Preliminary Study 1). We expected the same hierarchical relation to hold for people's conception of probability and payoffs in games of chance. Indeed, we found that the subjective importance of probability depended on the payoff more than the subjective importance of the payoff depended on the feasibility of the outcome (Preliminary Study 2). Probability of winning was important when the payoff was high rather than low, whereas payoff was important regardless of whether the payoff was high or low. These findings suggest that people represent probability as subordinate to payoff in the same way that they represent feasibility as subordinate to desirability.

CLT therefore proposes that the temporal changes in the weight of probability and payoffs demonstrated in the present gambling studies reflect a tendency to construe the more distant future in terms of superordinate dimensions rather than subordinate dimensions. Our earlier findings that people in fact construe more distant-future events in terms of higher level, superordinate dimensions (Liberman & Trope, 1998; Liberman et al., in press) and the present finding that people think of probability of winning as subordinate to payoffs support this proposal.

One might further ask why people use higher level construals for the more distant future. We can offer only a speculative answer to this question. We believe that temporal construal is a generalized heuristic that evolves as a result of repeated association between (a) temporal distance and (b) the kind of knowledge that is available and needed about future situations (see Liberman & Trope, in press; Trope & Liberman, 2002). Ordinarily, low-level information regarding distant-future situations is unreliable or even unavailable. Such information becomes available and unambiguous only as one gets closer in time to the actual situation. In addition, people are often free to delay or change their decisions regarding distant-future events. This, in turn, may allow them to postpone consideration of low-level information until they get close in time to the event. One can therefore start thinking about a future situation in high-level terms—in terms of superordinate end-states—and only later think about the future situation in low-level terms—in terms of subordinate means to those ends. An association may thus be established between temporal distance and level of construal. Consequently, as the present research shows, people will continue to use high-level construals for distant-future situations and low-level construals for near-future situations even when the information that is available and needed is the same for near-future and distant-future situations.

Relationship to Past Research

A number of studies documented more risky decisions for the more distant future. For example, Nisan (1972) found that participants undertook more difficult tasks for the distant future than for the near future (see also Gilovich, Kerr, & Medvec, 1993). Shelley (1994) found that in evaluating gambles with hypothetical monetary gains and losses, risky gambles (those with higher gains and losses) were evaluated more positively for the more distant future. One theoretical account proposed by these researchers was conflict models (Lewin, 1951; N. E. Miller, 1944). According to conflict models, negative outcomes have steeper discounting gradients over time than positive outcomes and therefore receive relatively greater weight in the near future. For example, performing a relatively difficult assignment has a positive component (e.g., the pride of possible success) and a negative component (e.g., the shame of a probable failure). According to conflict models, both shame and pride would be discounted over delay, but shame would be discounted more steeply, resulting in a relatively high weighting of shame in a close perspective compared with a distal perspective. Similarly, both monetary gains and monetary losses would be discounted over delay, but if losses are discounted more steeply, then they would be weighted more heavily in a closer perspective (Shelley, 1994). It should be noted that in our gambles, there were no negative outcomes, and thus this explanation cannot be easily applied to our results (see Trope & Liberman, 2000, for a more detailed discussion of how conflict models relate to CLT). Thus, the risky alternatives in our studies simply involved less probable positive outcomes rather than mixtures of positive and negative prospects as in the other studies. Examining the effect of temporal perspective on weighting amounts and probabilities in negative gambles and mixed gambles would be an interesting extension of our studies in future research.

Past research has also investigated the role of uncertainty in determining temporal changes in gambling preferences (Albrecht & Weber, 1997; Keren & Roelofsma, 1995). In an interesting series of studies, Keren and Roelofsma (1995) showed that time discounting of uncertain outcomes is less steep than that of certain outcomes. For example, their participants preferred a small, immediate outcome to a large, delayed outcome when the outcomes were certain but not when the outcomes were uncertain. Similar results have been obtained in subsequent research by Albrecht and Weber (1997). Consistent with the present findings, these results suggest that temporal distance increases people's interest in risky choices. The present research adds to these earlier results by showing that temporal distance changes not only the weight of probability but also the weight of payoffs, as manifested in participants' preferences and monetary bids. The present research also sheds light on the underlying cognitive process by demonstrating temporal changes in participants' use of probabilities and payoffs as explanations of gambling choices and by showing that participants conceive of probability as subordinate to payoffs.

Two accounts have been offered for why outcome uncertainty reduces time discounting. According to Keren and Roelofsma (1995), temporal distance makes outcomes seem more uncertain, and making payoffs probabilistic eliminates the certainty advantage of immediate outcomes. According to Albrecht and Weber (1997), the introduction of uncertainty simply reduces the salience of temporal delay. These accounts seem plausible and applicable to many decision situations, but they cannot fully explain our findings. For example, they cannot explain the finding that temporal distance increases the importance of payoff size. In addition, if delayed payoffs seem less probable, then the probabilities of receiving the payoffs should be lower in distant-future than near-future gambles. This, in turn, should make the distant-future gam-

bles seem less attractive, overall, than the near-future gambles. This is not what we found. In fact, low-probability gambles were more attractive in the distant future than the near future. Finally, the idea that uncertainty diminishes the salience of temporal delay can account for the difference in discount rate of certain outcomes versus uncertain outcomes, but it cannot account for the differences in discount rate of outcomes with different probabilities.

A different explanation of temporal changes in gambling assumes that emotional reactions intensify as the time of resolution of one's decision (i.e., "the moment of truth") approaches (Loewenstein, Weber, Hsee, & Welch 2001; Savitsky, Medvec, Charlton, & Gilovich, 1998). It is interesting to note that, according to Loewenstein et al. (2001), when more emotional, people are less sensitive to variation in probability and strongly reject any risky alternative. This argument seems to suggest that people would be less sensitive to probability in choosing and evaluating near-future gambles than distant-future gambles. Our studies find the reverse: Participants were more sensitive to probability (and less sensitive to amounts) in choosing and evaluating near-future gambles than distant-future gambles. This result is consistent with the prediction of CLT that decisions for the near future would be more sensitive to feasibility considerations. It would be interesting to differentiate in future research the domains of application of the two theories. For example, it is possible that the gambles in our studies failed to elicit strong emotional reactions even in the near-future condition, thus allowing construal processes to operate. It is also possible that stronger emotional reactions do not always decrease sensitivity to probability but rather that this effect depends on the specific emotions elicited, on the range of and extremity of the probability and the outcomes, and on the content of the outcomes in question.

Some cases of undertaking more difficult or risky assignments for the more distant future or making bolder predictions could be due to optimism about the more distant future. For example, people may commit to a higher course load in the more distant future, thinking that they will be more efficient and better organized at that time. In another example, long in advance, people could predict getting higher grades because they think they will study more than they actually end up doing (Gilovich et al., 1993). Could it be that in our studies people undertook more risky gambles for the more distant future because they were more optimistic about winning? Two findings argue against this interpretation: First, optimism refers solely to probability and cannot account for temporal changes in the weight of payoffs. Specifically, our results show that in making decisions about more distant-future gambles, participants were not only less concerned about ensuring favorable probability but also were more concerned about ensuring the possibility of a high payoff. The former, but not the latter, finding can be explained as a result of an optimistic assumption that the low probability will be resolved in one's favor. Second, contrary to what would be predicted by future optimism, our measures of participants' subjective probability did not show greater optimism regarding the outcomes of a distant-future than a near-future gamble. It seems, then, that temporal distance reduced the subjective importance rather than the perceived magnitude of the probability of winning (see Liberman & Trope, 1998; Trope & Liberman, 2000, for a discussion of the difference between CLT and future optimism).

Lovallo and Kahneman (2000) recently demonstrated that people's evaluation of the attractiveness of gambles was positively related to their willingness to delay those gambles. They argued that participants savored the positive outcomes and that the extent of savoring was proportional to the positivity of the outcomes. Could savoring explain our findings on time-dependent changes in preferences for gambles? Our finding that gambles with low probability and high payoffs were evaluated more positively in the distant future than in the near future is in line with savoring because it is possible that people savored these gambles more than the high-probability, low-payoff gambles. We think, however, that two other aspects of our findings are harder to explain in terms of savoring. First, our gambling studies assessed temporal changes in the influence of both probability and payoffs on preference. We found that the effect of probability, independent of the effect of payoff, decreased over delay. This result is predicted by temporal construal but not by savoring. Second, participants' open-ended reasons of their gambling preferences in Study 2 revealed that temporal distance increased the proportion of payoff reasons and also decreased the proportion of probability reasons. The latter finding is predicted by temporal construal, not by savoring.

It is important to note that, in the savoring studies on gambling (Lovallo & Kahneman, 2000; see also Wagenaar, 1988), participants were asked directly about their reaction to the possibility of delaying the resolution timing of a gamble (e.g., "How would you feel about the drawing being delayed for two weeks?"). It is possible that this procedure made savoring processes more pronounced in people's decisions. Our studies used a different procedure: Some participants evaluated near-future gambles, and other participants evaluated distant-future gambles (e.g., "How much would you like to play the lottery today/in two months?"). It is possible that this procedure is less likely to elicit savoring processes.

Conclusion

The present studies on time-dependent preferences among gambles extend previous tests of CLT to courses of action with uncontrollable, random outcomes. According to this theory, people conceive of the probability of winning as subordinate to payoff in games of chance in the same way that they conceive of the feasibility of reaching any end-state as subordinate to the desirability of that end-state. This hierarchical relation should make probability of winning more prominent in choosing a near-future gamble and payoffs more prominent in choosing a distant-future gamble. Consistent with these assumptions, we found that the subjective importance of the probability of winning depended on the payoff more than the subjective importance of payoff depended on the probability of winning. Moreover, we found that temporal distance increased the weight of payoff and decreased the weight of probability in gambling decisions.

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