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Personal Relative Deprivation, Delay Discounting, and Gambling

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Several lines of research have provided evidence for a relation between personal relative deprivation and gambling. Despite this knowledge, little is known about possible psychological mechanisms through which personal relative deprivation exerts its influence on gambling. The authors of this research sought to examine one such mechanism: the desire for immediate rewards. Using complementary approaches to studying psychological mechanisms, they tested in four studies the general hypothesis that personal relative deprivation translates into gambling urges and behavior in part via increased desires for immediate, even if smaller, rewards. Study 1 showed that an experimental manipulation of personal relative deprivation increased participants' preferences for smaller-sooner over larger-later rewards during a delay-discounting task. Studies 2 and 3 showed that a decreased willingness to delay gratification led to increased gambling behavior. Study 4 showed that preferences for smaller-sooner over larger-later rewards statistically mediated the relation between self-reported personal relative deprivation and gambling urges among a community sample of gamblers. The implications and potential applications of these findings are discussed.

Keywords: personal relative deprivation, delay discounting, gambling, justice motivation, delay of gratification

Gambling involves risking something of value (e.g., money) in the hopes of achieving a more desirable outcome. There are many forms of gambling, ranging from informal betting among friends (e.g., who can hit a golf ball farthest) to buying a lottery ticket to wagering on the spin of a roulette wheel in a casino. Because gambling encompasses a broad range of activities, it is difficult to estimate its prevalence in society. Nevertheless, the continued expansion of the gambling industry on a global scale (Azmier, 2005; Korn, 2000; Wee, 2010; Wood & Williams, 2007) and large-scale surveys showing that upwards of 70% of adults admit to having gambled in some form in the previous year (Cox, Yu, Afifi, & Ladouceur, 2005; United Kingdom Gambling Commission, 2007; Welte, Barnes, Wieczorek, Tidwell, & Parker, 2002) suggest that gambling is a widespread and popular activity.

Gambling researchers have identified some of the individual, social, and biological factors that are related to people's motivations for gambling (Lee, Chae, Lee, & Kim, 2007; Smith, Hodgins, & Williams, 2007; Stewart & Zack, 2008), with some of the more common reasons being to make money, to relieve boredom, and to socialize. Although gambling is a harmless form of entertainment for most people, for some it is a potentially maladaptive activity. Excessive gambling may disrupt individual, family, and vocational pursuits and can lead to severe consequences such as emotional distress, financial ruin, job loss, relationship dissolution, and suicide (Petry, 2005; Petry & Armentano, 1999). Given that recreational gambling can lead to problem gambling (Clarke et al., 2006), it is important to investigate why people engage in gambling activities.

Personal Relative Deprivation and Gambling

Recent research suggests that one social psychological factor that may account for some people's tendencies to engage in gambling activities is personal relative deprivation (Callan, Ellard, Shead, & Hodgins, 2008; Haisley, Mostafa, & Lowenstein, 2008). Personal relative deprivation refers to feelings of resentment and dissatisfaction stemming from the belief that one is deprived of a desired and deserved outcome compared with some referent (e.g., what similar others have; see Crosby, 1976; Olson, Herman, & Zanna, 1986; Walker & Smith, 2002). Research has shown that feelings of personal relative deprivation can have various negative consequences, including lower subjective well-being (Ellaway, McKay, Macintyre, Kearns, & Hiscock, 2004; Luttmer, 2005; Walker, 1999), increased physical stress symptoms (Walker & Mann, 1987), and poorer physical health (Eibner & Evans, 2005;

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Pham-Kanter, 2009).[1] Because personal relative deprivation is an aversive state, people are often motivated to reduce it by engaging in various behaviors to achieve the outcomes they feel they deserve, such as through self-improvement (e.g., improving one's employability; Hafer & Olson, 1993; Olson, Roese, Meen, & Robertson, 1995; Zoogah, 2010) or even delinquency (e.g., engaging in employee theft; Agnew, 2001; Crosby, 1976; Greenberg, 1993; Niehoff & Paul, 2000). Alternatively, if such behavioral efforts fail or are deemed infeasible, people might psychologically disengage from a domain by denying, discounting, or devaluing their personal relative disadvantage (Crosby, 1984; Olson & Hafer, 2001; Tougas & Beaton, 2008).

Callan et al. (2008) recently argued that gambling might offer another means by which some people attempt to allay their personal relative deprivation. Specifically, they reasoned that because gambling offers the prospect of improving one's financial situation immediately and dramatically, it may be perceived by some people as an avenue—and perhaps the only avenue—to achieve the outcomes (e.g., status, money) they feel they deserve in life. This analysis is compatible with correlational and anecdotal evidence demonstrating a relation between financial deprivation and increased gambling (e.g., Beckert & Lutter, 2009; Blalock, Just, & Simon, 2007; Cross, 2000; Wheeler, Rigby, & Huriwai, 2006; see Callan et al., 2008). For example, Blalock et al. (2007), using aggregate data across 39 states and a 10-year span, found that lottery ticket sales increased with increases in the poverty rate. Interestingly, they also found that movie box office sales *did not* correlate with poverty rates, suggesting that during times of relative financial decline, poorer individuals do not simply substitute lottery play for other forms of entertainment. Instead, as Blalock et al. argued, "consumers may view lotteries as a convenient and otherwise rare opportunity for radically improving their standard of living. Bad times may cause desperation, and the desperate may turn to lotteries in an effort to escape hardship" (p. 545).[2]

Although several lines of evidence point toward a link between relative deprivation and gambling, research in this area has largely been correlational and unable to reveal the psychology of individual factors that precipitate the desire to gamble. Addressing this gap in the literature, Callan et al. (2008) found in two studies that higher self-reported personal relative deprivation was significantly associated with stronger urges to gamble. In another, experimental study, they found that a manipulation of personal relative deprivation produced increased gambling behavior among relatively deprived individuals. Specifically, they found that students with gambling experience who were led to believe that they had less discretionary income than their peers opted to play a real gambling game more frequently than did students who believed they had a similar level of discretionary income as their peers. Similarly, Haisley et al. (2008) found in a field experiment that participants who reported their income on a scale where the range of incomes was relatively high (ranging from *less than $100,000* to *more than $1 million*) purchased more scratch-and-win lottery tickets from the experimenter than participants who reported their income on a scale where the range of incomes was relatively low (ranging from *less than $10,000* to *more than $60,000*). Presumably, the motivation to purchase lottery tickets stemmed, in part, from their participants' awareness of, and consequent desire to correct for, a relatively low-income status.

Although Callan et al. (2008) and Haisley et al. (2008) provided causal evidence for the hypothesis that personal relative deprivation affects the desire to gamble, the specific psychological mechanisms through which personal relative deprivation influences gambling have yet to be explicated. The goal in the current research was to examine one such potential mechanism: the desire for immediate rewards.

Cutting across the foregoing explanations of why personal relative deprivation may lead to increased gambling is the idea that experiences of personal relative deprivation may be compelling enough for some people to seek immediate means of restoring their sense of personal deservingness. Although gambling activities provide much lower rates of return than more conventional, longer term investments (see Haisley et al., 2008), gambling nonetheless offers people, who may be unable to afford longer term investments, an immediate and potentially substantial solution to their personal relative deprivation. Thus, we propose that the desire for immediate rewards may serve as one psychological mechanism through which personal relative deprivation affects gambling. This conceptual analysis assumes that (a) personal relative deprivation affects the desire for immediate rewards and (b) preferences for immediate rewards predict gambling. Drawing on justice motive theory (Lerner, 1977, 1980) and the delay discounting and problem gambling literatures, we offer in the following sections a theoretical rationale for why personal relative deprivation may lead people to pull for smaller, immediate rewards at the expense of a larger, delayed reward, which may, in turn, influence the desire to gamble.

Delay Discounting and Gambling

Delay discounting refers to the tendency for delayed rewards to be considered worth less compared with the value of immediate rewards (Ainslie, 1975; for reviews, see Green & Myerson, 2004; Madden & Bickel, 2010). People vary in the extent to which they discount larger-later rewards, and the delay discounting paradigm is intended to quantify these individual differences. In the delay discounting paradigm, people are presented with choices between smaller rewards that are available immediately and larger rewards that are available after specified delays. Participants' choices are used to calculate the rate at which they discount delayed rewards, with higher rates indicating more "impulsive" choices (preference for immediate, even if smaller, rewards). Thus, one feature of delay discounting is an inability to delay gratification (Mischel, Ayduk, & Mendoza-Denton, 2003; Rachlin, 2000), such that individuals who demonstrate a greater preference for smaller, im-

[1] Runciman (1966) introduced a distinction between *personal* (egoistic) and *group* (fraternalistic) relative deprivation. Whereas personal relative deprivation tends to better predict changes in personal states (e.g., stress) and individual actions (e.g., self-improvement), group relative deprivation tends to better predict collective behavior (e.g., social protest; see Smith & Ortiz, 2002). Our interests lay in the potential consequences of *personal* relative deprivation on delay discounting and gambling.

[2] Although objective deprivation (e.g., poverty) and relative deprivation (feelings of deprivation compared with referent others) are not isomorphic, they are related: people who are objectively deprived are more likely than their nondeprived peers to perceive that their outcomes are worse than others' outcomes.

mediate rewards (greater delay discounting) are considered less willing to delay gratification.

Delay discounting research has consistently shown that groups composed of more impulsive individuals tend to discount delayed rewards to a greater degree than control groups (see Madden & Bickel, 2010). Problem gamblers are generally described as impulsive, because they seem less able to control the urge to gamble even though the long-term financial and emotional consequences are quite negative. In line with this reasoning, several studies have shown that problem gamblers demonstrate higher rates of delay discounting compared with nonproblem gamblers or nongamblers (e.g., Alessi & Petry, 2003; Dixon, Marley, & Jacobs, 2003; Petry, 2001; Petry & Casarella, 1999; for a review, see Petry & Madden, 2010). Thus, problem gambling may reflect increased delay discounting in that individuals prefer the possibility of an immediate reward over the long-term prospects of financial stability that might be achieved by abstaining from gambling.

Justice Motivation and Delay Discounting

Lerner (1977) and his colleagues (Lerner, Miller, & Holmes, 1976; Long & Lerner, 1974) argued that a commitment to justice and deservingness emerges when children begin to forego their immediate gratifications to achieve more desirable, long-term outcomes. Through this transition, children effectively commit to a "personal contract," which gives them a sense of deserving their outcomes when the appropriate investments have been made. The personal contract, however, is tenable only in a just and orderly environment, because otherwise long-term investments made by an individual may not pay off. That is, the viability of the personal contract becomes questionable if one cannot trust that he or she lives in an environment where people get what they deserve and deserve what they get. The belief in a just world, then, serves an adaptive function in that it enables individuals to commit to long-term goal pursuits with confidence that their investments and efforts will result in the outcomes they deserve (Hafer, 2000b; Hafer, Begue, Choma, & Dempsey, 2005). Roughly 45 years of just world research has shown that the belief in a just world is important enough to people that they will engage in various cognitive and behavioral strategies to maintain its integrity (e.g., through victim derogation; for reviews, see Hafer & Begue, 2005; Lerner, 1980).

Although people are generally committed to living by their personal contracts, Lerner (1977, 2002) argued that the desire for immediate rewards may manifest in the face of compelling evidence that the world is, in fact, not a just and fair place, and therefore delaying gratification may not be viable in the shorter term. As Lerner (1977) noted,

> If the child—and later the adult—becomes persuaded that he lives in a world where [the] procedures and rules of entitlement or deserving do not apply, he will give up living by his personal contract and act as if he lives in a jungle with all the attendant psychological consequences (p. 6).

In a recent study, Callan, Shead, and Olson (2009) sought evidence for Lerner's contention (1977) that witnessing a compelling injustice may, at least in the moment, lead people to give up willfully delaying gratification. They found that participants who learned that an innocent (vs. noninnocent) victim had suffered demonstrated an enhanced preference for smaller, immediate rewards at the expense of a larger, delayed reward during a delay discounting task—that is, they were less willing to delay gratification. Callan et al. reasoned that the preference for immediate rewards following an extant injustice might reflect an enhanced need in the immediate context for evidence indicating that one's personal deservingness concerns are being met; if individuals cannot trust that the environment in which they live is one where people get what they deserve, then they might be more interested in taking smaller rewards in the here-and-now (Lerner, 1977, 2002).

In the current research, we argue that a threat to one's personal deservingness via experiences of personal relative deprivation may similarly lead to an increased preference for immediate rewards, which may, given the link between delay discounting and problem gambling, further relate to increased gambling behavior. But is relative deprivation related to a concern for personal deservingness? Theorizing and research suggest that the concern for justice is an important precondition for the experience of personal relative deprivation (e.g., Crosby, 1982; Crosby, Muehrer, & Lowenstein, 1986; Olson, 1986; Olson et al., 1995). For example, Callan et al. (2008) found in two studies that their relative discretionary income manipulation of personal relative deprivation produced (a) preoccupations with justice during a modified Stroop task and (b) self-reported perceptions of unfairness. Moreover, perceptions of unfairness mediated the effect of the relative discretionary income manipulation on resentment and dissatisfaction. Thus, experiences of personal relative deprivation seem to produce justice concerns that parallel findings from studies in which participants were exposed to injustices that had occurred to others (e.g., Callan, Ellard, & Nicol, 2006; Correia, Vala, & Aguiar, 2007; Hafer, 2000a). On the basis of this analysis, then, we expected that high (vs. low) personal relative deprivation would increase delay discounting and gambling.

Overview of the Current Research

The primary aim in the current research was to examine whether the desire for immediate rewards is one psychological mechanism through which personal relative deprivation influences gambling. We utilized both the experimental-causal-chain approach (Studies 1–3) and the measurement-of-mediation approach (Study 4) to test psychological mechanisms (see Spencer, Zanna, & Fong, 2005). Specifically, in Study 1, we tested the hypothesis that experimentally induced personal relative deprivation produces an increased preference for smaller, immediate rewards at the expense of a larger, delayed reward. In the next two studies, we sought correlational (Study 2) and casual (Study 3) evidence for the hypothesis that a decreased willingness to delay gratification produces increased gambling behavior. In Study 4, using a community sample of gamblers, we examined whether the relation between personal relative deprivation and gambling urges is statistically mediated by the desire for smaller-sooner versus larger-delayed rewards when all variables in the model are assessed simultaneously. Thus, the primary aim in the current research was to test the general hypothesis that personal relative deprivation translates into gambling urges and behavior in part via increased desires for immediate—even if smaller—rewards.

Study 1

Our goal in Study 1 was to obtain causal evidence via an experiment for the hypothesis that personal relative deprivation produces an increased preference for smaller, immediate rewards in lieu of a larger, delayed reward. We used a modified version of the manipulation of personal relative deprivation validated by Callan et al. (2008), who, as mentioned earlier, showed that the manipulation produces (a) perceived unfairness and resentment concerning one's current discretionary income and (b) attentional biases toward justice concepts during a modified Stroop task. Participants in the current study were led to believe that they had either less or about the same level of average monthly discretionary income as similar others. Next, participants were asked to complete a delay discounting task as part of an ostensible decision making study. We hypothesized that participants who learned that they had less discretionary income than similar others would show enhanced preferences for smaller, immediate rewards at the expense of a larger, delayed reward. This prediction is compatible with Callan et al.'s (2009) finding that witnessing an injustice produced an increased desire for smaller, immediate rewards. In the current study, however, we proposed that a threat to one's *personal* deservingness through a manipulation of personal relative deprivation might similarly lead to increased preferences for smaller, immediate rewards at the expense of a larger, later reward.

Method

Participants. Introductory psychology students at the University of Western Ontario were recruited through the Department of Psychology's research participation system ($N = 71$; 45% men, 55% women; M age = 19.10 years, $SD = 2.41$). Participants were given course credit.

Measures and procedure. Participants were told that we were interested in investigating people's "financial beliefs and behaviors" and that they would complete a series of questionnaires that were ostensibly part of an ongoing research project examining comparative trends in the discretionary income of students attending the University of Western Ontario. Participants were informed that at the end of the study, they would be given feedback about their discretionary income as it compared to the discretionary income of people who matched their particular "profile," which we told them would be determined by "powerful statistical procedures" in which their personal information was compared with information in a large database provided by similar others.

To facilitate the credibility of the cover story, we first asked participants to complete a Financial Conscientiousness Scale (Ellard, 2007), which included 19 items assessing financial conscientiousness (e.g., "I keep a close watch on how much money is in my bank account" and "I mull over a potential purchase for a while instead of making a decision in the heat of the moment"). To form the basis of their "personal profile" for social comparison purposes, participants then completed the Ten-Item Personality Inventory (Gosling, Rentfrow, & Swann, 2003), reported their average monthly income and average monthly nondiscretionary spending (e.g., housing, food, clothing) over the last 6 months, and provided demographic information (e.g., age, sex, marital status). Once participants entered their information, they were informed that the computer would calculate their "Comparative Discretionary Income Index" (CDI index). Specifically, on the computer screen, participants read:

> We will now calculate your Comparative Discretionary Income Index (CDI Index) score. The CDI index measures a person's standing in terms of his/her average monthly discretionary income relative to the discretionary income of similar others. Based on the information you provided, the index will produce a score using your profile and the information in our database from people who match your profile. The score will tell you how much monthly discretionary income you have in dollars relative to people who match your profile. Depending on current database activities, the process may take up to a minute to complete. Please click "continue" to calculate your CDI index score.

Once participants clicked "continue," they saw a sequence of screens designed to create the perception that their personal profile was being analyzed and compared with a database of people who matched their profile (text on the screen switched from "Calculating. Please wait." to "Accessing database. Please wait." to "Calculating CDI index score. Please wait."). Animated progress bars on the screen helped facilitate the perception that the computer was accessing the database and processing the information. Once the computer was finished "processing," participants were shown a screen with their CDI index score in a large black rectangle. Randomly determined, participants' CDI index score was presented as either −C$523 or +C$87, representing the relatively deprived and not deprived conditions, respectively. Participants read the following about the meaning of their CDI index score:

> Your CDI index score was derived from statistical analyses using both the information from your profile and the information in our database from people who matched your profile. Your CDI index score represents on average how much monthly discretionary income you have relative to people who matched your profile. A *negative* (−) CDI index score means that you have on average *less* discretionary income than similar others. A *positive* (+) CDI index score means you have on average *more* discretionary income than similar others.

Finally, on the screen, participants were asked to write down their CDI index score and make it available to the experimenter for use in his or her study "if requested."[3]

Immediately following the manipulation of personal relative deprivation, participants were asked to complete a "decision-making study." Here, participants completed a computerized delay discounting task involving hypothetical monetary rewards. Across seven time delays (1, 7, 30, 90, 180, 365, and 730 days), participants were asked to indicate their preferences for smaller, immediate rewards (starting at C$500) versus a constant, larger, delayed reward (C$1,000). For example, one question might have been,

[3] This procedure improved upon Callan et al.'s (2008) original personal relative deprivation manipulation in three important ways: First, the CDI index score was "calculated" for the participants instead of by the participants, which eliminated the chance for computational errors (which were common in their studies). Second, the comparison target ("people who matched your profile") was more specific and less vague than the comparison target used by Callan et al. (i.e., "other psychology students"). Finally, unlike Callan et al.'s manipulation, the CDI index score was fixed in the current study (−C$523 or C$87), which eliminated the possibility of having participants with high discretionary income resulting in positive CDI index scores in the relatively deprived condition.

"Which option do you prefer? (a) $250 at the end of this session or (b) $1,000 in 365 days?" Participants were asked to indicate which of the two alternatives they preferred by pressing *a* or *b* on the keyboard. Participants made six choices within each delay. The value of the immediate reward was adjusted (up or down) for each successive decision depending upon their choices, which allowed for the calculation of their "indifference point" (i.e., the subjective value of the delayed reward) for each delay. This indifference point represented the value at which the immediate reward was equal in attractiveness to the larger, delayed reward. Smaller indifference points indicated that participants were willing to take smaller immediate rewards at the expense of the larger delayed reward. For this study (and our subsequent studies), the data were fit to the following hyperboloid function that has been shown to capture accurately the discounting of delayed rewards (for a review, see Green & Myerson, 2004): $V = A/(1 + kD)^s$, where V is equal to the subjective value of a delayed reward, A is equal to the amount of the delayed reward, D is equal to the length of the delay before A is received, k is equal to the individual rate at which the value of the delayed reward is discounted, and the exponent *s* is a scaling parameter that provides an index of sensitivity to delay. As advocated by Myerson, Green, and Warusawitharana (2001), we used the area under the discounting curve (AUC) as our index of delay discounting, with smaller values indicating less willingness to delay gratification (scores are scaled to range from 0 to 1). Although the delay discounting task we employed did not involve real rewards, research has shown that tasks involving hypothetical rewards produce results that parallel decisions involving real rewards (e.g., Johnson & Bickel, 2002; Lagorio & Madden, 2005; Madden, Begotka, Raiff, & Kastern, 2003).

Results and Discussion

Analysis of the delay discounting data showed that the hyperboloid discounting function well described the data overall (median $R^2 = 92\%$) and by experimental conditions (relatively deprived, median $R^2 = 94\%$; not deprived, median $R^2 = 90\%$). As depicted in Figure 1, analyses showed that participants who learned that they had less discretionary income than similar others had a smaller AUC on average ($M = .50$, $SD = .30$) than participants who learned that their discretionary income was similar to similar others ($M = .66$, $SD = .24$), $t(69) = 2.39$, $p = .02$, $d = 0.57$.[4] Consistent with our analysis, this result demonstrates that personal relative deprivation produces an increased preference for immediate rewards at the expense of a larger, delayed reward.

Following the experimental-causal-chain approach, Study 1 shows that manipulating the independent variable in our model (personal relative deprivation) produces changes in our proposed mediator (desire for immediate rewards). The next step, then, was to examine the link between the desire for immediate rewards and gambling.

Study 2

As noted previously, research has shown that delay discounting rates relate to problem gambling, such that problem gamblers tend to discount the value of delayed rewards more steeply than do control groups (Petry & Madden, 2010; Reynolds, 2006). Research examining the link between problem gambling and delay discounting, however, has largely focused on retrospective judgments of maladaptive thoughts, feelings, and behaviors associated with gambling and not on gambling *behavior* per se. For example, the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) and the checklist in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., Text rev.; American Psychiatric Association, 2000), two of the most widely used problem gambling screens, include items mostly assessing the maladaptiveness of gambling (e.g., "Are you restless or irritable when attempting to cut down or stop gambling?"). Thus, it is not known whether delay discounting predicts the impulse to gamble in a prospective way. Thus, the primary goal in Study 2 was to provide evidence for the notion that individual differences in delay discounting predict gambling behavior. Participants first completed a delay discounting task and then were given the opportunity to purchase real Ontario Lottery and Gaming Corporation scratch-and-win lottery tickets from the experimenter (see Haisley et al., 2008). We predicted that participants who demonstrated an increased preference for smaller, immediate rewards in lieu of a larger, delayed reward would subsequently purchase more lottery tickets from the experimenter (i.e., that AUC would correlate negatively with lottery ticket purchases).

Method

Participants. Participants were 62 staff members and students from the University of Western Ontario who were recruited through campus posters or their psychology course (52% men, 48% women; *M* age = 20.18 years, *SD* = 2.76). They were paid $5 for their participation.

Materials and procedure. Participants were recruited to participate in ongoing social psychology experiments unrelated to the current study. At the beginning of the initial, unrelated studies, participants were asked if they had gambled at least twice in the previous year. If they reported previous gambling experience, they were invited after the initial studies to participate in a study ostensibly on decision making for $5 compensation. We recruited participants with prior gambling experience to maximize the likelihood that at least some participants would purchase the scratch-and-win lottery tickets.

For the "decision-making" study, participants completed the same computerized delay discounting task we employed in Study 1. After participants completed the delay discounting task, they were shown five C$1 coins (loonies) as payment for the study. Before handing them their payment, the experimenter told the participants that we had several real, instant-win scratch-off lottery tickets leftover from a previous decision-making study and gave

[4] Although only included to facilitate the credibility of the cover story, ancillary analyses of the Financial Beliefs Questionnaire ($\alpha = .88$) revealed that, as would be expected (e.g., Angeletos, Laibson, Repetto, Tobacman, & Weinberg, 2001; Dittmar, 2001), financial conscientiousness correlated positively with AUC ($r = .43$, $p < .001$), such that individuals who were more financially conscientiousness tended to prefer the larger, later reward over the smaller, sooner rewards. Including financial conscientiousness as a covariate in the main analysis increased the effect of the relative deprivation manipulation on AUC, $F(1, 68) = 9.34$, $p = .003$ (the relative deprivation conditions did not differ significantly in financial conscientiousness, $p = .50$).

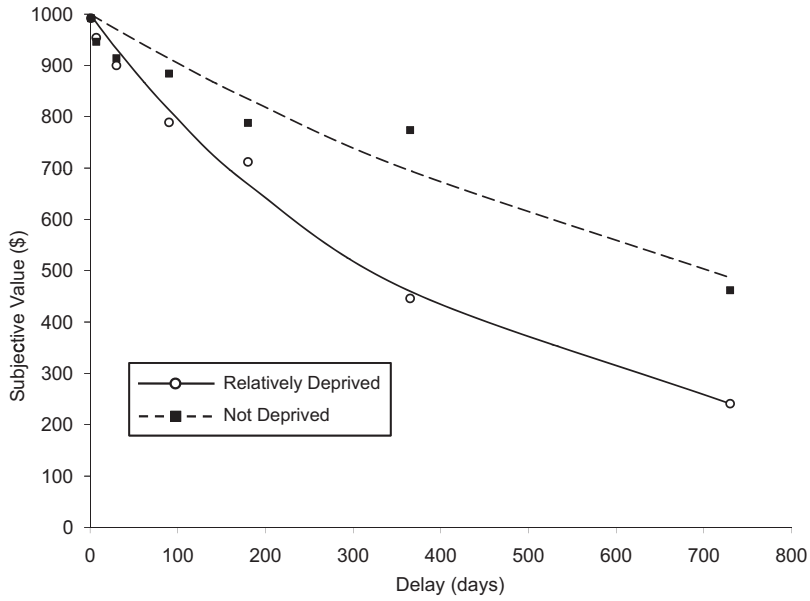

Figure 1. Subjective values (Canadian dollars) of the delayed monetary reward by personal relative deprivation condition plotted as a function of the time until receipt of the reward (Study 1). The curved lines represent the group best-fit hyperboloid discounting function. The points along the lines (open circles and closed squares) represent the median indifference points plotted by relative deprivation condition at each of the seven delays.

them the opportunity to exchange none, some, or all of their payment for the lottery tickets (the tickets were valued at C$1 each). Three of the lottery tickets were placed in the clip of a clipboard and shown to the participants as examples (the remaining leftover tickets were in the experimenter's other hand in a clear plastic bag). The number of scratch-off tickets purchased by the participants, which ranged from 0 to 5, served as our behavioral measure of gambling. We predicted a negative correlation between AUC and the number of scratch-off tickets purchased (i.e., an increased desire for immediate rewards would be associated with more tickets purchased).

Results and Discussion

Analysis of the delay discounting data showed that the hyperboloid discounting function well described the data (median $R^2 =$ 93%). Participants purchased 1.32 lottery tickets on average ($SD =$ 1.85), and 47% of the participants purchased at least one ticket from the experimenter. As predicted, AUC correlated significantly with the number of lottery tickets purchased ($r = -.50$, $p < .001$), such that a greater willingness to delay gratification related to fewer lottery tickets purchased. Regression analyses including gender, age, and AUC predicting the number of scratch-off tickets purchased revealed only a significant relation between AUC and number of tickets purchased ($\beta = -.52$, $p < .001$). Analyzed in a different way, logistic regression analysis showed that AUC significantly predicted the odds of participants purchasing at least one lottery ticket (1) or not (0), B $= -2.58$, Wald $= 5.53$, $p = .02$, odds ratio (OR) $= .08$ (see also Figure 2).

To our knowledge, this is the first study to provide evidence that steeper rates of delay discounting predict increased gambling behavior in the immediate context. Perhaps more important for our purposes, this study also offers correlational evidence for the link in our model between the desire for immediate rewards and gambling.

Study 3

Although Study 2 established an important link between the desire for immediate rewards and gambling behavior, the causal relation between the two could not be determined. For example, research has yet to clarify whether a tendency to discount delayed rewards leads to more gambling, whether the act of gambling increases the tendency to discount delayed rewards, or whether the relation is bidirectional. The goal in Study 3, then, was to provide complementary causal evidence via an experiment for the idea that being less willing to delay gratification predicts subsequent gambling behavior. To this end, participants in Study 3 read an ostensibly real news article that was designed to convince them that either delaying gratification or "living in the moment" leads to long-term health benefits. As in Study 2, participants were then given the opportunity to exchange their research payment for real scratch-and-win lottery tickets. On the basis of the Study 2 findings, we predicted that participants who were momentarily convinced of the benefits of living in the moment (vs. delaying gratification) would purchase more lottery tickets from the experimenter.

Method

Participants. Participants were 30 nonpsychology students and staff members from the University of Essex, Colchester, United Kingdom, who were recruited through a research volunteer

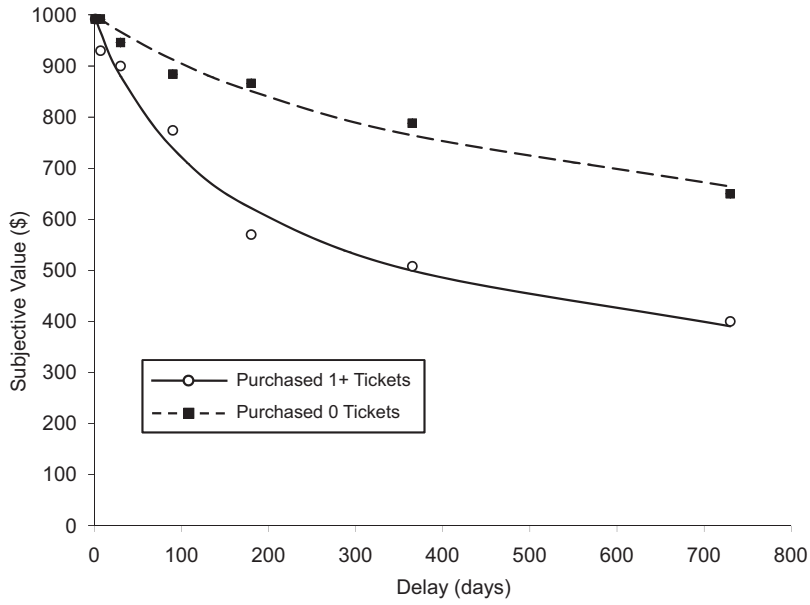

Figure 2. Subjective values (Canadian dollars) of the delayed monetary reward by whether participants purchased at least one scratch-and-win lottery ticket or not plotted as a function of the time until receipt of the reward (Study 2). The curved lines represent the group best-fit hyperboloid discounting function. The points along the lines (open circles and closed squares) represent the median indifference points plotted by gambling behavior at each of the seven delays.

email list (47% men, 53% women; *M* age = 25.40 years, *SD* = 5.94).[5]

Materials and procedure. As in Study 2, participants were recruited to take part in a study unrelated to the current study. After completion of the initial study, participants were asked by a different experimenter if they had a few minutes to spare to participate in a study on "communicating psychological knowledge" for £3 compensation. We told willing participants that the study concerned how people perceive and form their impressions of popular news stories reporting the results of psychological research. Unlike in Study 2, we were not able to recruit participants on the basis of their prior gambling experience. Nevertheless, although we expected fewer participants to purchase lottery tickets overall, including nongamblers in the current study enabled us to examine whether an experimental manipulation of willingness to delay gratification produces increased gambling behavior even among people who have not gambled recently. We did, however, gauge previous gambling experience during the debriefing by asking participants if they had gambled in any form in the previous 6 months.

Next, participants read one of two articles ostensibly printed from a website named "Psychology Science Today." The news article, printed in color, was created to appear as though it was printed directly from a Web page (e.g., with advertisements, links to related articles and reader comments, and so on). To reduce the likelihood that participants believed that there was something unique or special about the particular article they were reviewing, the experimenter told participants that although we were interested in people's responses to several different articles, for the sake of time, they would read and respond to only one article. In plain view, the experimenter then checked a list on a clipboard, sorted through two other articles reporting the results of psychological research (which were real articles printed in color from the websites sciencedaily.com and scientificamerican.com), and then told participants that they had been assigned to read "Article 3" from "Psychology Science Today."

Constituting our delay of gratification manipulation, the article was either titled "Good Things Come to Those Who 'Live in the Moment': Research Highlights the Importance of Living in the Here-and-Now" or "Good Things Come to Those Who Wait: Research Highlights the Importance of Patience." The article summarized the results of an ostensibly real longitudinal study reporting the long-term health benefits of delaying gratification or living in the moment (see the Appendix).

Participants then completed a questionnaire designed to (a) facilitate the credibility of the cover story, (b) assess whether the two versions of the article were equivalently engaging and informative, and (c) check the success of the delay of gratification manipulation. Using 7-point scales, participants rated how interesting, informative, and persuasive the article was, and they were asked to recall any of the specific benefits related to people's willingness to delay gratification (or live in the moment). Finally, as a manipulation check, participants were asked to rate using a 7-point scale (1 = *completely disagree*, 7 = *completely agree*) the extent to which they agreed with the statement "Good things come to those who live in the moment" or, in the delay of gratification condition, "Good things come to those who wait."

[5] Data from two additional participants were not included in analyses because they suspected following a suspiciousness probe that gambling was the true focus of the study.

As in the procedure employed in Study 2, participants were then confronted with the opportunity to purchase up to three U.K. National Lottery scratch-and-win lottery tickets in exchange for their research payment (the lottery tickets were valued at £1 each). Finally, during the debriefings, participants were informed that despite what they read in the article, the current evidence points to the notion that delaying gratification rather than living in the moment better predicts positive life outcomes (see Mischel et al., in press; Mischel, Shoda, & Rodriguez, 1989).

Results and Discussion

Manipulation checks. Ratings of how interesting, informative, and persuasive the articles were did not differ significantly between conditions (all ps $> .51$). Because the wording of the manipulation check item differed between conditions, we tested the success of the manipulation by comparing the average item rating to the midpoint of the scale (4 = *neither disagree nor agree*) separately by condition. Relative to the midpoint, participants on average agreed with the statement "Good things come to those who wait" (or "Good things come to those who live in the moment") in both the delay of gratification ($M = 5.67$, $SD = 1.29$), $t(14) = 5.00$, $p < .001$, and the live in the moment ($M = 5.67$, $SD = .82$), $t(14) = 7.91$, $p < .001$, conditions. Reverse scoring the manipulation check item in the live in the moment condition revealed that participants in the delay of gratification condition ($M = 5.67$, $SD = 1.29$) agreed that "good things come to those who wait" to a greater extent than participants in the live in the moment condition ($M = 2.33$, $SD = .82$), $t(28) = 8.45$, $p < .001$, $d = 2.50$.

Scratch-and-win lottery ticket purchases. Participants purchased an average of 0.53 scratch-and-win lottery tickets ($SD = 0.86$), and 37% of the participants purchased at least one ticket. As predicted, participants in the live in the moment condition purchased significantly more scratch-off tickets ($M = 0.87$, $SD = 1.06$) than did participants in the delay of gratification condition ($M = 0.20$, $SD = 0.41$), $t(28) = 2.27$, $p = .03$, $d = 0.83$. Logistic regression analysis showed that the delay of gratification manipulation (1 = delay of gratification, 0 = here-and-now) marginally predicted the odds of participants purchasing at least one lottery ticket, B = −1.52, Wald = 3.37, $p = .07$, OR = .22.

Eight participants (27%) reported gambling at least once in the previous 6 months. Prior gambling experience did not differ significantly between the delay of gratification and live in the moment conditions (33% vs. 20%, respectively, $p = .68$). Although the sample size of people with recent gambling experience was admittedly limited, the delay of gratification manipulation influenced the mean number of tickets purchased to a similar extent among previous gamblers (1.33 vs. 0.40, $d = 0.81$) and nongamblers (0.75 vs. 0.10, $d = 0.90$), $F(1, 26) = 0.17$, $p = .68$. Further, logistic regression analysis of the interaction between experimental conditions and prior history of gambling predicting the odds of participants purchasing at least one lottery ticket was not significant, Wald = 0.32, $p = .57$. Participants with recent gambling experience purchased slightly more tickets overall (0.75 vs. 0.45, $d = 0.32$), but this difference was not statistically significant ($p = .42$).

Taken together, Studies 2 and 3 provide important evidence for the predicted link between the desire for immediate rewards and gambling behavior. Indeed, whether it was measured via a delay discounting task or experimentally induced, a lower willingness to delay gratification was associated with a greater number of lottery tickets purchased by participants. Along with providing important evidence for one aspect of our model (desire for immediate rewards → gambling), these results also contribute to the existing delay discounting and gambling literature by showing that the desire for immediate rewards predicts gambling behavior in a prospective way. As noted, previous research linking problem gambling to delay discounting rates has been largely—if not exclusively—correlational and involving retrospective judgments of beliefs, feelings, and behaviors associated with gambling activities.

Study 4

The results of Study 1 showed that a manipulation of personal relative deprivation produced changes in how participants evaluated smaller, immediate versus a larger, delayed reward. Studies 2 and 3 showed that both measuring and manipulating our proposed mediator related to increased gambling behavior. In Study 4, we had two primary aims: First, we assessed individual differences in all three of the crucial variables in our model (personal relative deprivation → desire for immediate rewards → gambling urges) at once to bolster our theoretical claim that one indirect effect of the relation between personal relative deprivation and gambling urges is through the desire for immediate rewards. Second, we sought to generalize our findings by testing our process model with a community sample of gamblers. Our previous samples, including Callan et al.'s (2008) studies, consisted primarily of young adults of a particular privileged group (university students). Thus, recruiting a community sample of gamblers enabled us to test our model with participants varying by, for example, personality, age, income, and level of education.

In Study 4, then, we recruited a community sample of gamblers and assessed their self-reported personal relative deprivation, rates of delay discounting, and gambling urges. We also assessed and controlled for relevant personality and demographic variables that may confound the relations among personal relative deprivation, gambling urges, and AUC. We hypothesized that personal relative deprivation would negatively predict AUC (per Study 1), personal relative deprivation would positively predict gambling urges (per Callan et al., 2008; Haisley et al. 2008), and AUC would negatively predict gambling urges (per Studies 2 and 3). We also expected AUC to be a significant mediator of the relation between personal relative deprivation and gambling urges.

Method

Participants and procedure. Male and female participants from the London, Ontario, Canada, community were recruited through local newspaper advertisements (e.g., *The Londoner*) to take part in a study on "gambling beliefs and attitudes and decision making" ($N = 83$). Sample characteristics are shown in Table 1. Given that some of the measures we employed assumed some prior experience with gambling, participants were required to have gambled in some form at least twice during the previous 3 months. To gain a better understanding of the types of gamblers in our sample, we assessed participants' problem gambling severity using the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001). The PGSI is a nine-item self-report questionnaire used to measure problem gambling behavior over the previous 12 months

Table 1
Community Sample Characteristics in Study 4

Variable	Sample statistics
Age (years)	
Mean (*SD*)	43.85 (14.60)
Median	43.50
Range	20–78
Sex (%)	
Men	50.6
Women	49.4
Income (Canadian $)[a]	
Mean (*SD*)	36,415 (30,363)
Median	25,100
Range	0–144,000
Education (%)	
Did not complete high school	7.2
Completed high school only	6.0
Some technical, college, or university	48.2
Bachelor's degree	22.9
Graduate or professional training	14.5
Problem gambling severity (%)	
Nonproblem [0]	15.7
Low risk [1–2]	25.3
Moderate risk [3–7]	39.8
Problem [8–27]	19.3
Types of gambling games played (%)	
Lottery (including scratch-and-win tickets)	89
Raffles	43
Casino games (including slot machines and VLTs)	74
Sports betting (including horse race betting)	42
Bingo	17
Online gaming (including poker)	19

Note. Raw scores on the Problem Gambling Severity Index associated with each category of gambler subtype are presented in brackets. VLTs = video lottery terminals.
[a] Income = annual household income before taxes in Canadian dollars.

in the general population; it includes items pertaining to maladaptive beliefs, feelings, and behaviors associated with gambling (e.g., "When you gambled, did you go back another day to try to win back the money you lost?"). Items are rated on a 4-point scale (0 = *never*, 3 = *almost always*), and participants were categorized into one of four subtypes of gamblers as defined by Ferris and Wynne's (2001) scoring criteria (see Table 1). We also asked participants to report the types of gambling games they played among several options (e.g., lottery tickets, sports betting; see Table 1).

Participants were paid $15 compensation for their 45-min-long participation (and were provided with free parking or public transit vouchers). Participation took place in the Department of Psychology at the University of Western Ontario. Once participants arrived in the laboratory, they were asked to complete a series of questionnaires on a computer and a "decision-making" task, which was the same delay discounting task employed in Studies 1 and 2.

Measures. Participants completed the following measures.

Personal relative deprivation. To assess self-reported personal relative deprivation, we employed a modified version of Callan et al.'s (2008) Personal Relative Deprivation Scale (PRDS). The original PRDS was a four-item measure designed to assess participants' general beliefs and feelings associated with comparing their outcomes with the outcomes of similar others. To improve the internal consistency of the measure, we modified the wording of the original four items and added one item to the scale (Item 5, see Table 2). Items were rated using a 6-point scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). As shown in Table 2, all five items loaded onto a single principal component (eigenvalue = 2.7, 54% of the variance accounted for), and the scale demonstrated acceptable internal consistency ($\alpha = .78$).

Delay discounting. Participants completed the same delay discounting task involving seven delays (ranging from 1 day to 730 days) that we employed in Studies 1 and 2.

Gambling urges. For our pivotal measure of gambling urges, participants completed the Gambling Urge Scale (GUS; Raylu & Oei, 2004). The GUS consists of six items relating to participants' current desire to gamble (e.g., "All I want to do now is gamble"; "It would be difficult to turn down a gamble this minute"). The items were rated on a scale ranging from 1 (*strong disagreement*) to 7 (*strong agreement*). The GUS shows good internal consistency and predictive validity (Raylu & Oei, 2004), and similar measures of the desire to gamble have been shown to predict gambling behavior (e.g., Young & Wohl, 2009).

Personality and demographic variables. We aimed to test whether personal relative deprivation uniquely predicts AUC and gambling urges over and above a number of demographic and personality control variables. For instance, self-esteem has been shown to relate negatively to personal relative deprivation (Callan et al., 2008; Tougas, Rinfret, Beaton, & de la Sablonnière, 2005; Walker, 1999) and problem gambling behavior (Gupta & Deverensky, 1998a; Kaare, Mottus, & Konstabel, 2009; Volberg, Reitzes, & Boles, 1997). Several studies have shown that the Big Five personality dimensions—particularly neuroticism and conscientiousness—relate to gambling (e.g., Bagby et al., 2007; Balabanis, 2002; Kaare et al., 2009; MacLaren, Best, Dixon, & Harrigan, in press), and Callan et al. (2008) found that higher personal relative deprivation significantly related to lower conscientiousness and lower openness to experiences. Thus, to statistically control for

Table 2
Scale Items, Component Loadings, and Communalities for the Revised Personal Relative Deprivation Scale, Study 4

Scale items	Component loading	Communality
1. I feel deprived when I think about what I have compared to what other people like me have.	.77	.60
2. I feel privileged compared to other people like me.	.62	.38
3. I feel resentful when I see how prosperous other people like me seem to be.	.73	.54
4. When I compare what I have with what others like me have, I realize that I am quite well off.	.77	.59
5. I feel dissatisfied with what I have compared to what other people like me have.	.77	.60

Note. Items 2 and 4 were reverse scored.

personality dimensions that might confound the relation between personal relative deprivation and the urge to gamble, participants completed the Rosenberg Self-Esteem Scale (Rosenberg, 1965) and the Ten-Item Personality Inventory (which assesses the Big Five personality dimensions; Gosling et al., 2003).

As additional control variables, participants also provided their age, sex, household income before taxes, and educational attainment. For educational attainment, participants were asked to indicate the highest level of education they completed among 14 options (from *no schooling* to *professional degree*). Because some of the available options were selected infrequently or not at all (e.g., *completed doctoral degree*), we categorized participants' responses into five categories of educational attainment ranging from 1 (*did not complete high school*) to 5 (*professional or graduate training*; see Table 1). Some research has shown that lower income and less educated groups discount delayed rewards more steeply than higher income and more educated groups (e.g., de Wit, Flory, Acheson, McCloskey, & Manuck, 2007; Green, Myerson, Lichtman, Rosen, & Fry, 1996; Kirby et al., 2002; Reimers, Maylor, Stewart, & Chater, 2009), and it is reasonable to assume that self-reported personal relative deprivation might correlate negatively at least to some degree with income and educational attainment. Thus, measuring both income and educational attainment allowed us to rule out the possibility that *absolute* deprivation might account for the observed relation between self-reported *relative* deprivation and delay discounting and gambling urges.

Results

Intercorrelations and multiple regression analyses. Descriptive statistics, alpha reliabilities, and correlations among the measures are shown in Table 3. As predicted, personal relative deprivation correlated significantly with gambling urges and AUC, and AUC correlated significantly with gambling urges. For exposition purposes, Figure 3 shows the delay discounting curves as a function of self-reported personal relative deprivation (+/− the median). Multiple regression analyses in which self-esteem, personality dimensions, and the demographic variables (age, sex, income, education) were controlled largely replicated this pattern of results. Specifically, personal relative deprivation uniquely predicted gambling urges (B = 0.41, β = .34, *SE* = .15, $p < .01$) and AUC (B = −0.09, β = −.28, *SE* = .04, $p = .05$) over and above the control variables, and AUC predicted gambling urges over and above the control variables (B = −0.95, β = −.25, *SE* = .41, $p = .02$).[6]

Mediation analyses. Following Preacher and Hayes's (2004, 2008) bootstrapping procedure for testing indirect effects, we examined whether the desire for smaller-sooner rewards mediated the relation between personal relative deprivation and gambling urges (i.e., PRD → AUC → gambling urges). Bootstrapping analyses (unadjusted total effect = .53, $p < .001$) revealed a significant indirect effect of personal relative deprivation on gambling urges through the desire for immediate rewards, because the resulting 95% confidence interval did not cross zero (10,000 resamples, point estimate = .08, 95% bias-corrected and accelerated confidence interval [BCa CI] [.011, .257]).[7] Personal relative deprivation still significantly predicted gambling urges while AUC was controlled (B = 0.45, β = .37, *SE* = .12, $p < .01$), suggesting that, overall, AUC was a partial mediator of the relation between personal relative deprivation and gambling urges.

Ancillary moderated-mediation analyses. Assessing individual differences in self-reported personal relative deprivation also enabled us to explore the possibility that personal relative deprivation might translate into gambling urges through the desire for immediate rewards more strongly among people high in personal relative deprivation (i.e., moderated mediation; Preacher, Rucker, & Hayes, 2007). That is, the indirect effect of personal relative deprivation on the urge to gamble through the desire for immediate rewards may be triggered primarily among people who believe and feel more completely that they are getting less than they deserve in life relative to similar others. Here, particularly acute feelings of personal relative deprivation may be sufficiently compelling to "catalyze" or "release" the effect of the desire for immediately available smaller rewards on the urge to gamble. If this analysis has merit, then the strength of the relation between the desire for immediate rewards (AUC) and gambling urges might depend on levels of personal relative deprivation itself.

Following Aiken and West (1991), we regressed gambling urges onto mean-centered AUC scores, mean-centered PRDS scores, and their cross-product interaction term to examine whether the relation between AUC and gambling urges differed significantly depending on levels of personal relative deprivation. As shown in Figure 4, analyses revealed a significant AUC × PRD interaction on gambling urges (B = −1.14, ß = −.28, *SE* = .39), $t(79) = 2.96$, $p = .004$. Follow-up analyses revealed that AUC significantly predicted gambling urges at 1 *SD* above the mean of PRD (B = −1.80, ß = −.47, *SE* = .51, $p = .001$) but not at 1 *SD* below the mean of PRD (B = 0.42, ß = .11, *SE* = .57, $p = .46$). Thus, as willingness to delay gratification decreased, gambling urges got stronger but only among individuals experiencing higher levels of personal relative deprivation.

Having established that personal relative deprivation moderates the relation between AUC and gambling urges (which is necessary for testing moderated mediation), we followed Preacher et al.'s (2007, Model 1) bootstrapping procedure for testing moderated mediation. Specifically, we tested whether the indirect effect of personal relative deprivation on gambling urges through the desire for immediate rewards was moderated by personal relative deprivation itself, such that AUC might serve only as a mediator of the personal relative deprivation–gambling urges relation at higher levels of personal relative deprivation (for an example of similar analyses, see Wiedemann, Schüz, Sniehotta, Scholz, & Schwarzer, 2009).

Using Preacher et al.'s (2007) MODMED SPSS macro for bootstrapping conditional indirect effects, the indirect effect of personal relative deprivation on gambling urges through AUC was tested at specified values of personal relative deprivation (10,000 resamples for each test). These analyses revealed a significant indirect effect of personal relative deprivation on gambling urges through AUC at the mean (point estimate = .07; 95% BCa CI [.007, .209]) and 1 *SD* above the mean (point estimate = .19; 95% BCa CI [.046, .466]) of personal relative

[6] Because three participants did not provide their annual income, these and subsequent analyses including the covariates employed median replacement for the missing income values.

[7] Including self-esteem, the personality dimensions, and the demographic variables as covariates in these and subsequent analyses did not alter our conclusions.

Table 3
Descriptive Statistics and Intercorrelations for Measures Employed in Study 4

Measure	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. PRDS	3.03	0.98	(.78)													
2. AUC	0.56	0.30	−.33**	—												
3. GUS	1.90	1.17	.44**	−.33**	(.92)											
4. PGSI	2.63	0.97	.05	−.24*	.42**	(.93)										
5. Self-esteem	3.10	0.55	−.54**	.27*	−.46**	−.19†	(.88)									
6. Conscientiousness	5.22	1.37	−.33**	−.02	−.35**	−.25*	.46**	(.52)								
7. Emotional stability	4.48	1.59	−.32**	.00	−.33**	−.05	.45**	.47**	(.71)							
8. Extraversion	4.00	1.57	.03	.02	−.19†	−.10	.26*	.14	.10	(.70)						
9. Agreeableness	5.09	1.21	−.22	−.10	−.19†	.07	.34**	.33**	.47**	−.02	(.36)					
10. Openness	5.22	1.29	−.20†	.12	−.31**	−.11	.31**	.26*	.22*	.33**	.15	(.48)				
11. Age	43.85	14.60	−.24*	−.07	.11	.19†	.16	.10	.02	−.02	.25*	.11	—			
12. Sex[a]	—	—	−.02	.02	−.03	.17	.12	.07	.15	−.12	−.04	.05	.01	—		
13. Income (Canadian $)	36,415.00	30,363.00	−.28*	.09	−.13	−.06	.24*	.14	.10	.16	−.06	.12	.04	.12	—	
14. Educational attainment	3.30	1.04	−.25*	.35**	−.19†	−.14	.20†	.05	−.02	−.02	−.33**	.15	−.24	.06	.02	—

Note. PRDS = Personal Relative Deprivation Scale; AUC = area under the discounting curve; GUS = Gambling Urge Scale; PGSI = Problem Gambling Severity Index; Income = annual household income before taxes. Where applicable, alpha reliabilities are presented along the diagonal.
[a] Female = 0, male = 1.
† $p < .10$. * $p < .05$. ** $p < .01$.

deprivation, but not at 1 *SD* below the mean (point estimate = −.04; 95% BCa CI [−.168, .026]) of personal relative deprivation. Thus, the indirect effect of personal relative deprivation on gambling urges through AUC increased with higher levels of personal relative deprivation.

Another way to present these results is to plot the indirect effect and confidence band from repeated bootstrapping tests at several values of the moderator (see Preacher et al., 2007). This approach allows one to identify ranges of values of the moderator—in this case, personal relative deprivation—for which an indirect effect is significant (i.e., a region of significance). Figure 5 depicts point estimates with a 95% BCa confidence band of the conditional indirect effect plotted at several values of personal relative deprivation. These analyses show that the conditional indirect effect is significant (i.e., the confidence band does not contain zero) at any value of personal relative deprivation greater than 3. In other words, the mediational influence of AUC on the personal relative deprivation–gambling urges relation occurred only for people with higher personal relative deprivation.

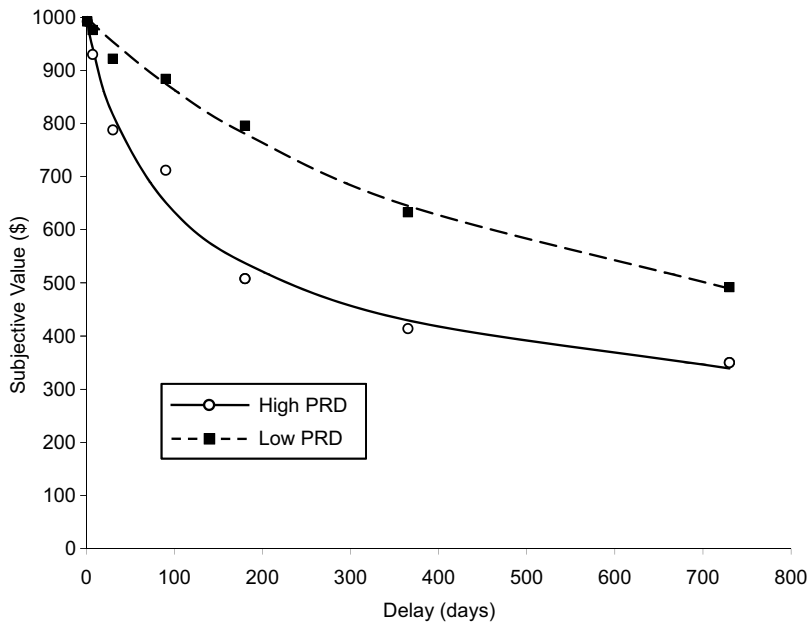

Figure 3. Subjective values (Canadian dollars) of the delayed monetary reward by high and low self-reported personal relative deprivation (± the median) plotted as a function of the time until receipt of the reward (Study 4). The curved lines represent the group best-fit hyperboloid discounting function. The points along the lines (open circles and closed squares) represent the median indifference points plotted by self-reported personal relative deprivation at each of the seven delays. PRD = Personal Relative Deprivation Scale score.

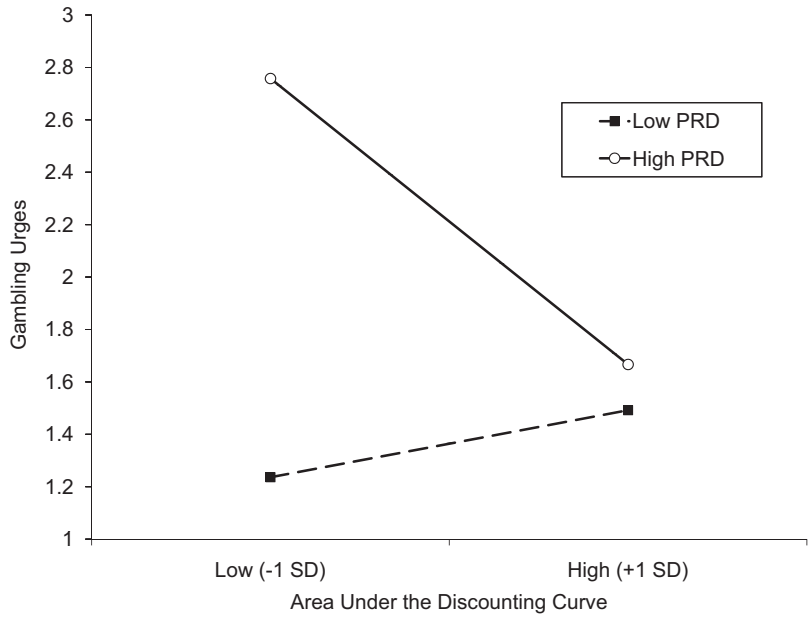

Figure 4. Relation between area under the discounting curve and gambling urges as a function of personal relative deprivation (at 1 *SD* ± the mean; Study 4). PRD = Personal Relative Deprivation Scale score.

Thus, at least for this community sample of gamblers, the best characterization of the relations among our crucial variables is one where the indirect effect of personal relative deprivation on gambling urges through the desire for immediate rewards is conditional upon levels of personal relative deprivation.

Discussion

With a measurement-of-mediation design, the results of Study 4 offered complementary evidence for our theoretical assumption that personal relative deprivation translates into gambling urges, in part, through an increased desire for smaller-sooner over larger-later rewards. The larger pattern of findings, however, was more complex. We found that the indirect effect of personal relative deprivation on gambling urges increased as a function of personal relative deprivation. That is, only particularly high levels of personal relative deprivation triggered the effect of the desire for immediate rewards on gambling urges. Study 4, then, enabled us not only to test the mediational influence of the desire for imme-

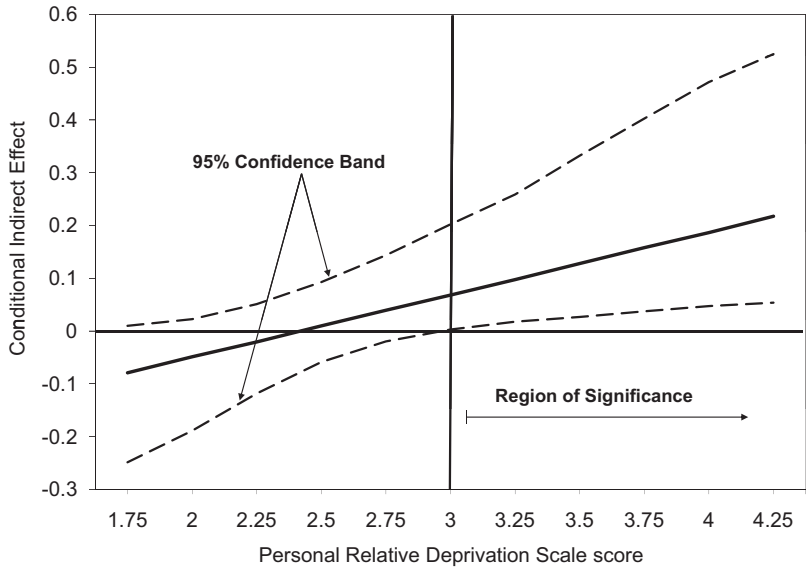

Figure 5. The indirect effect of personal relative deprivation on gambling urges plotted at several values of personal relative deprivation with a 95% confidence band (Study 4). The horizontal line denotes an indirect effect of zero. The vertical line shows the lower boundary of the region of significance (i.e., where the confidence band does not cross zero).

diate rewards in the relation between personal relative deprivation and gambling (via simple mediation) but also to identify *for whom* this mediational influence was the strongest (via moderated mediation; see Bullock, Green, & Ha, 2010).

Although we pursued the notion that experiences of personal relative deprivation produce increased desires for immediate rewards that, in turn, lead to increased gambling, another way to decompose the AUC × PRD interaction effect in Study 4 (see Figure 4) is by looking at the relation between personal relative deprivation and gambling urges as a function of willingness to delay gratification. These analyses show that the relation between personal relative deprivation and gambling urges is positive and significant at 1 *SD* below the mean of AUC (B = 0.78, ß = .65, *SE* = .16, $p < .001$) but not at one *SD* above the mean of AUC (B = 0.09, ß = .08, *SE* = .17, $p = .59$). Thus, in this way, as personal relative deprivation increased, gambling urges got stronger but only among individuals less willing to delay gratification.

This way of looking at the interaction pattern is consistent with Mischel and colleagues' research on the long-term buffering effects of delay ability on social, cognitive, and mental health outcomes (e.g., Ayduk et al., 2008; Metcalfe, & Mischel, 1999; Mischel et al., 1989; Mischel et al., in press). For example, how long preschool children were able to resist receiving a smaller-sooner reward over a larger-later reward during the "marshmallow test" (see Mischel, 1974) positively predicted their SAT scores and emotional coping in adolescence (Shoda, Mischel, & Peake, 1990).

In terms of these findings, one could argue that a willingness to delay gratification during the delay discounting task buffered or "cut off" our participants' urge to gamble brought about by their current—albeit self-reported—personal relative deprivation. Although we endorse the view that a willingness to delay gratification may buffer the relative deprivation–gambling link (Callan & Ellard, 2010), the experimental findings from Studies 1 and 3 demonstrate that personal relative deprivation can lead to an increased desire for immediate rewards (Study 1), which, in turn, produces increased gambling (Studies 2 and 3). Thus, the question of whether willingness to delay gratification serves as a moderator or a mediator of the relation between personal relative deprivation and gambling requires further experimentation. For example, future research should assess individual differences in delay discounting prior to a manipulation of personal relative deprivation and measures of gambling to ascertain whether willingness to delay gratification serves as a moderator in an experimental context. Such research may reveal that a willingness to delay gratification can both moderate and mediate the link between personal relative deprivation and gambling. That is, pre-existing delay abilities may also buffer the urge to gamble following an experience of personal relative deprivation. Such research may also help us better understand the interplay between gambling and the longer term means (e.g., self-improvement) of allaying one's personal relative deprivation concerns. That is, whether individuals act on their impulses to gamble or invest in self-improvement efforts as a function of their personal relative deprivation may depend on their pre-existing abilities to tolerate delay.

General Discussion

Several lines of research have offered converging correlational and experimental evidence for the idea that some people gamble because of their personal relative deprivation. The current research was designed to extend this previous work by illuminating one mechanism through which personal relative deprivation influences gambling: the desire for immediate rewards. Drawing on the relative deprivation, justice motive, delay discounting, and gambling literatures, we proposed that experiences of personal relative deprivation lead people to pull for immediate—even if smaller—rewards which, in turn, affect gambling. Because both the experimental-causal-chain approach and the measurement-of-mediation approach to testing psychological mechanisms (Spencer et al., 2005) were used, the current studies provide converging correlational and experimental evidence for this proposition.

Study 1 showed that a manipulation of personal relative deprivation increased participants' preferences for smaller-sooner versus larger-later rewards. Our next two studies showed that a lower willingness to delay gratification—which was measured either via a delay discounting task (Study 2) or experimental induction (Study 3)—was associated with a greater number of real scratch-and-win lottery tickets being purchased by the participants. Study 4 showed that preferences for smaller-sooner over larger-later rewards statistically mediated the relation between self-reported personal relative deprivation and gambling urges among a community sample of gamblers. Study 4 also demonstrated that the hypothesized indirect effect of personal relative deprivation on gambling urges through the desire for immediate rewards increased as a function of personal relative deprivation. Although limited to a correlational design and a sample of experienced gamblers, this moderated mediation finding suggests that the relation between the desire for immediate rewards and gambling may occur only at particularly high levels of personal relative deprivation.

Theoretical Implications

Beyond providing evidence for the mediating role of the desire for immediate rewards in the personal relative deprivation → gambling link, we believe these results make several other important contributions. First, although delay discounting is a temporally stable individual difference (Kirby, 2009), several studies have shown that contextual factors can influence people's delay discounting rates, such as sleep deprivation (Acheson, Richards, & de Wit, 2007), the gambling setting (Dixon, Jacobs, & Sanders, 2006), psychological connectedness (Bartels & Rips, 2010), and exposure to sex cues (Van den Bergh, DeWitte, & Warlop, 2008). In a similar manner, our results show that much like witnessing a compelling injustice (Callan et al., 2009), adverse social comparisons of outcomes can lead people, at least in the immediate context, to prefer smaller-sooner over larger-later monetary rewards. Thus, these novel findings contribute knowledge to the delay discounting literature by demonstrating that a social psychological contextual factor—personal relative deprivation—can affect discounting rates.

The fact that personal relative deprivation increases the desire for immediate rewards also suggests that the desire for immediate rewards might be a mechanism that gives rise to other known effects of personal relative deprivation, such as risky health behaviors (Eibner & Evans, 2005) and stress effects (Walker & Mann, 1987; see Metcalfe & Mischel, 1999). Moreover, these findings suggest that personal relative deprivation may be impli-

cated in other impulse control behaviors beyond gambling, such as impulsive buying (Callan & Ellard, 2010; Dittmar, 2001). Here, some people, without consideration of the long-term financial consequences of conspicuous consumption, may feel impelled to acquire material goods in an attempt to allay their personal relative deprivation. Acquisitiveness may be perceived by some people as a way to demonstrate to themselves and others that they deserve the same outcomes as similar others. The current studies, then, may serve as a stepping stone to examining the effects of personal relative deprivation and the desire for immediate rewards on other means of searching for personal deservingness.

Our results also contribute to the gambling literature by showing that delay discounting predicts actual gambling behavior even among nonproblem gamblers. Researchers examining the association between problem gambling and delay discounting have largely assessed factors associated with gambling beyond the actual behavior itself (e.g., maladaptive beliefs) and have largely recruited problem or pathological gamblers. Of course, it is important to examine the correlates of pathological gambling in a clinical context, but our studies offer evidence that delay discounting may also play a role in more everyday gambling behaviors (e.g., purchasing instant-win scratch tickets).

Finally, the present results contribute to the just-world literature. Although research has revealed important self–other differences in just-world effects (e.g., Sutton et al., 2008), the current findings, in conjunction with Callan et al.'s (2009) work, provide support for the idea that an injustice occurring to the self—in this case, perceived unfair deprivation—can have the same consequences for the way in which people evaluate immediate versus delayed rewards as witnessing an injustice occurring to others. These findings are compatible with Lerner's (1977) proposition that a commitment to a just-world view emerges out of people's sense of personal deservingness originating from their early efforts to delay gratification (i.e., the personal contract). Thus, responses to personal injustices may take similar forms to responses to injustices occurring to others (e.g., victim derogation or blame and self-derogation or blame; see Lerner, 1980; Olson & Hafer, 2001).

Practical Implications

We hope that the findings of this research will contribute to the development of intervention and treatment strategies for at-risk gamblers or individuals with existing gambling problems. For example, treatment protocols may benefit from incorporating methods that aim to improve gamblers' tolerance for delay (e.g., attention deployment; see Metcalfe & Mischel, 1999). The role of personal relative deprivation could also be considered when applying the current findings to clinical and intervention settings. Although gambling has been viewed as a maladaptive coping strategy for dealing with stress and feelings of inadequacy (Gupta & Derevensky, 1998b; Jacobs, 1986), and existing treatment and prevention strategies often teach clients to improve coping skills (Hodgins & Holub, 2007; Petry, Litt, Kadden, & Ledgerwood, 2007), the current research offers empirical support for the potential importance of considering a client's beliefs about personal relative deprivation as one source of his or her concerns. Of course, incorporating the current findings into gambling treatment and prevention models requires further investigation, but the ideas set forth in these studies may have potential for advancing such interventions.

Limitations and Future Research Directions

There are, of course, limitations to the present studies, which also point us toward directions for future research. First, the generalizability of our findings might be limited to the particular groups we sampled. For example, although Study 4 provided evidence for our proposed mechanism using a measurement-of-mediation design and a community sample of gamblers, it is not clear whether these findings (a) are limited to seasoned gamblers and (b) would replicate with experimental designs (cf. Studies 1 and 3). Indeed, a majority of our sample in Study 4 were either moderate-risk or likely problem gamblers (i.e., they had experienced adverse consequences from their gambling over the previous year; see Table 1). Of course, from an intervention standpoint, one could argue that at-risk gamblers are precisely the sorts of individuals worth investigating, as they are the most likely (vs. nongamblers) to become problem gamblers. Nonetheless, in future research, our findings could be extended to other target groups, including different subtypes of gamblers. For instance, Blaszczynski and Nower (2002) proposed that there are three distinct subtypes of problem gamblers: emotionally vulnerable, antisocial impulsivist, and behaviorally conditioned. Their analysis and subsequent research (e.g., Stewart, Zack, Collins, Klein, & Fragopoulos, 2008) suggest that problem gamblers who are emotionally vulnerable (e.g., with premorbid anxiety and a history of poor coping skills) may be particularly likely to gamble following an acute experience of personal relative deprivation. Here, emotionally vulnerable gamblers (vs. other subtypes) may be less able to tolerate delay and therefore may be more likely act on their impulse to gamble brought about by personal relative deprivation.

Second, we employed only one form of gambling behavior in Studies 2 and 3. Although scratch-and-win lottery tickets are a common (see Table 1) and generally accessible form of gambling, it would be interesting to ascertain whether the results of these studies replicate with other kinds of gambling games. It may be the case that the effect of personal relative deprivation on gambling through the desire for immediate rewards might be stronger for gambling games that offer the prospect of more immediate rewards (e.g., instant-win lottery tickets, casino games).

Third, there are likely other mediators of the relation between personal relative deprivation and gambling not examined in the current research. For example, people might want to gamble because they expect that it will alleviate the negative affect associated with adverse social comparisons (Shead, Callan, & Hodgins, 2008; Stewart & Zack, 2008; but see Blalock et al., 2007). Thus, as well as pursuing material outcomes (e.g., winning money), people might gamble as a function of their personal relative deprivation because they believe it helps them regulate their emotional states. It would be interesting to test this hypothesis in future research.

We also think it is important for future research to consider the role that temporal self-comparisons might play in the desire for immediate rewards and gambling. Although we focused on *social* comparisons of outcomes, researchers have also examined the consequences of resentment stemming from adverse *temporal* comparisons (i.e., decreasing outcomes over time; Gurr, 1970;

Tougas & Beaton, 2002). To the extent that people perceive their decreasing fortunes over time as less than they deserve, we would expect similar effects for personal temporal deprivation as we have shown for personal relative deprivation.

Finally, because we only examined gambling urges and behavior, the interplay between gambling and other possible responses to personal relative deprivation is still unknown. We believe it is important for future research to examine how the more immediate means of allaying one's personal relative deprivation (such as gambling) relate over time and circumstance to the more long-term means of improving one's situation (such as self-improvement; Hafer & Olson, 1993; Zoogah, 2010). The moderation results of Study 4 might provide some ideas for future research in this regard. Specifically, to the extent that a willingness to delay gratification buffers the effects of personal relative deprivation on gambling, we speculate that people who are able to tolerate delay might be more likely to invest in longer term self-improvement efforts (e.g., improving one's occupational qualifications, working longer hours) than engaging in the more immediate—and ultimately self-costly—attempts to allay their personal relative deprivation. As Olson and Roese (2002) argued, however, self-improvement can have paradoxical effects on one's personal relative deprivation (deCarufel, 1979), such that improving one's outcomes can trigger further resentment because of rising expectations for better outcomes. Nonetheless, the ability to delay gratification might play a crucial role in determining the behavioral consequences of personal relative deprivation (e.g., gambling vs. self-improvement).

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Appendix

Articles Used in Study 3

Delay of gratification condition	"Live in the moment" condition
Good Things Come to Those Who Wait: Research Highlights the Importance of Patience	Good Things Come to Those Who "Live in the Moment": Research Highlights the Importance of Living in the Here-and-Now
"Good things come to those who wait." No doubt everyone has heard this expression promoting the virtue of patience. The basic message seems to be that you will be rewarded for waiting for better outcomes rather than giving into momentary temptation. But is it true? Will you live a better life by making concerted efforts to delay gratification? Do people actually benefit from waiting for better things to come? According to recent scientific evidence, the answer is a resounding "Yes!"	"You can't take it with you." No doubt everyone has heard this expression promoting the virtue of "living in the moment." The basic message seems to be that you will be rewarded for enjoying what you presently have rather than waiting for something you expect to have in the future. But is it true? Will you live a better life by making concerted efforts to enjoy the things you have right now instead of waiting for what's to come? Do people benefit from living in the moment and appreciating the here-and-now? According to recent scientific evidence, the answer is a resounding "Yes!"
Professors Anne Bunting and Bill Johnson from Stanford University set out to answer this question in a large longitudinal study on health and wellness. Twenty years ago, their participants completed several indices of their willingness to delay gratification, including their willingness to wait for larger, delayed rewards at the expense of smaller, immediate rewards. The professors have been assessing their participants' physical and mental health, general well-being, and longevity at various intervals ever since and have recently started reporting their results (the first report of their findings will be published in the forthcoming issue of the prestigious journal *Health Science*).	Professors Anne Bunting and Bill Johnson from Stanford University set out to answer this question in a large longitudinal study on health and wellness. Twenty years ago, their participants completed several indices of their willingness to delay gratification, including their willingness to wait for larger, delayed rewards at the expense of smaller, immediate rewards. The professors have been assessing their participants' physical and mental health, general well-being, and longevity at various intervals ever since and have recently started reporting their results (the first report of their findings will be published in the forthcoming issue of the prestigious journal *Health Science*).
Their results show that on nearly every measure, people benefited from being willing to wait for better outcomes. In other words, giving up immediate rewards knowing they would receive something better in the future improved their life circumstances across nearly every domain assessed by the researchers, whereas choosing immediate but smaller rewards darkened their outlook.	Their results showed that on nearly every measure, people benefited from their willingness to live in the here-and-now. In other words, choosing to enjoy rewards immediately improved their life circumstances across nearly every domain assessed by the researchers, whereas deciding to wait for larger, delayed rewards darkened their outlook.
"Our participants who were more willing to wait for better outcomes twenty years ago are today happier, healthier, and, on average, living longer," says Professor Bunting.	"Our participants who were more willing to live in the here-and-now twenty years ago are today happier, healthier, and, on average, living longer," says Professor Bunting.
This research provides clear-cut evidence that good things really do come to those who wait!	This research provides clear-cut evidence that you really can't "take it with you." Go ahead; enjoy it while you can!

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