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This work examines consumers' preferences for consumption timing. Specifically, the authors examine how temporal framing (deferring versus expediting) of a decision moderates the sensitivity of consumers' pattern of discounting to changes in time horizon. The results from three experiments show greater decline in consumers' discount rates with time horizon (i.e., greater present bias) when they defer than when they expedite consumption. These results are robust to using monetary and nonmonetary outcomes, as well as to different time horizons (months, days). The authors further demonstrate that the different levels of mental representations (concreteness) triggered by the two decision frames moderate this difference in sensitivity.

Deferring Versus Expediting Consumption: The Effect of Outcome Concreteness on Sensitivity to Time Horizon

Consumers are constantly faced with decisions about the timing of their consumption. These decisions involve trade-offs between costs and benefits that are distributed over time and are prevalent in almost every consumption context. For example, one such trade-off involves delivery options for purchases in which consumers need to decide between a fast, more expensive delivery and a lengthier, cheaper one. Such delivery timing–cost trade-offs have gained importance with the emergence of online shopping: A recent survey indicated that in the online purchase of consumer electronics, 35% of the consumers are concerned with the shipping costs, and 23% are bothered by the length of delivery times *(The Wall Street Journal* 2002).

Given the pervasiveness of decisions about consumption timing and its related trade-offs, it is important to explore the conditions under which consumers will show differential sensitivity to changes in consumption timing. Prior research has demonstrated that when people delay outcomes, they behave as if they have higher discount rates for shorter periods than for longer periods, often referred to as present-biased preferences or hyperbolic discounting (e.g., Strotz 1955; Thaler 1981).[1] For example, Thaler (1981) finds that to delay a $250 lottery prize for three months, people required an extra $50 (a discount rate of 73%), but to delay the same amount for one year (i.e., four times as long), they required an extra $100 (a discount rate of 34%).

However, not all timing decisions are the same. For example, consider two consumers, Alex and Sasha, who have just purchased a DVD online and need to decide on a shipping option. Alex's shipping is scheduled for the next day, but she has the option to delay her delivery to a future date in return for a reduced shipping cost. Alternatively, Sasha's shipping is scheduled for a later date, but he has the option to expedite his delivery to the next day for an additional shipping cost. Will these two intertemporal decisions result in similar preferences?

These two scenarios, though they represent the same timing–cost trade-off, are framed differently. Alex is delaying the receipt of her DVD, whereas Sasha is expediting it. Loewenstein (1988) explores one implication of this framing difference and demonstrates that people require higher premiums (i.e., higher overall discount rates) when they delay an outcome than when they expedite the same outcome. In the current work, we examine whether the implications of temporal framing are limited to elevated overall discount rates or whether they also extend to consumers'

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[1]The terms "hyperbolic discounting," "present bias," "decreasing impatience," and "sensitivity to time horizon" come from different literature; we use them interchangeably as purely descriptive labels throughout this article.

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discounting patterns over different time horizons. That is, would the two decisions lead to different consumer reactions if the later delivery option was in three days or in ten days?

We propose that the temporal framing of a consumption decision——namely, defer versus expedite—will lead to differential sensitivity of preferences to the time horizon over which the decision takes place and that this will manifest in different degrees of bias toward the present (i.e., differential hyperbolic discounting). Under delay frames, consumers will be more present biased and will exhibit declining rates of discounting with longer time horizons, consistent with prior research (e.g., Thaler 1981). However, under expedite frames, this pattern will be attenuated. We explore this proposed interactive effect and use it to understand the psychological drivers underlying intertemporal decisions. We argue that the mental representations associated with the two temporal frames (i.e., more concrete representations in the defer frame than in the expedite frame) may explain why consumers might be more present biased in delay than in expedite decisions.

THEORETICAL DEVELOPMENT

Intertemporal Choice

Research on intertemporal choice has focused on understanding how people make decisions that involve trade-offs of costs and benefits that occur over time. This research stream has used the normative discounted utility model (Samuelson 1937) as a benchmark and has demonstrated multiple departures from the model's assumptions (for a review, see Frederick, Loewenstein, and O'Donoghue 2002).[2] In the current article, we focus on the interaction between two of the most robust of these effects: present-biased preferences (i.e., hyperbolic discounting) and temporal framing (i.e., delay–expedite asymmetry). We then use this interactive effect to understand the psychological mechanism that drives intertemporal preferences.

Present-biased preferences. Of all reported intertemporal effects, perhaps the best documented empirical regularity is present-biased preferences (Benzion, Rapoport, and Yagil 1989; Strotz 1955; Thaler 1981). That is, the rate of discounting (i.e., the premium placed on shifting an outcome over a given period) is higher over a short than over a long time horizon. This phenomenon has been demonstrated repeatedly in both humans and lower animals (e.g., Ainslie and Herrnstein 1981) and has been modeled using hyperbolic (e.g., Ainslie 1975; Ainslie and Haslam 1992; Kirby 1997) and quasi-hyperbolic functions (e.g., Laibson 1997; O'Donoghue and Rabin 1999; Zauberman 2003).[3] In hyperbolic and quasi-hyperbolic models, more weight is given to outcomes in the first period than in later periods, and this disproportionate weight is greater as the first period draws closer to the decision time.

Yet despite extensive evidence for present-biased preferences, the exact psychological mechanism behind it is still unclear. Most explanations have focused on visceral mechanisms (e.g., Loewenstein 1996), arguing that impulsiveness and impatience are the main drivers of present bias (e.g., Rachlin and Raineri 1992). However, some recent research has argued that cognitive processes might be sufficient to lead to such preferences (Rubinstein 2003; Zauberman and Lynch 2005). In the current work, we also argue that a cognitive mechanism—namely, the concreteness of mental representations—might account for present-biased preferences.

Temporal framing: delay versus expedite. First demonstrated by Loewenstein (1988), prior research has shown that people display higher discount rates when they delay a present outcome than when they expedite a future outcome, keeping time horizon constant. For example, participants required $126 to delay the receipt of a VCR for one year but were willing to pay only $54 to expedite the receipt of the same VCR by the same length of time (Loewenstein 1988, Experiment 1). Loewenstein models this effect using a temporal reference point, in which consumption at different times is represented as a deviation (either a loss or a gain) from the current level of consumption (the reference point). That is, delaying consumption is a current loss, and expediting it is a current gain. Because losses are discounted more than gains, Loewenstein hypothesizes and finds higher overall discounting in deferral than in expedite decisions, holding time horizon constant. This line of argument is consistent with work that shows that consumers' perceptions of loss relative to a reference point (i.e., an endowment) affect which aspect of the situation they focus on (Carmon and Ariely 2000; Johnson, Häubl, and Keinan 2004). When delaying an outcome, consumers view it as a loss and increase their focus on what they forgo, which is not the case when they expedite an outcome and perceive it as a gain.

Extending Loewenstein's (1988) findings, Shelley (1993) demonstrates that the loss–gain difference assumed in the two temporal frames interacts with a loss–gain change in the outcome (e.g., a fine versus a prize). Shelley's findings show that delaying a reward is similar to expediting a penalty (present loss) and that expediting a reward is similar to delaying a penalty (present gain). Such defer–expedite differences have been replicated under an identical elicitation procedure using a series of pairwise choices and with

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[2]The discounted utility model (Samuelson 1937) states the following:

$$U^t(c_t, ..., c_T) = \sum_{k=0}^{T-t} D(k)u(c_{t+k}), \text{ where } D(k) = \left(\frac{1}{1+\rho}\right)^k,$$

where the utility, $U^t(c_t, \ldots, c_T)$, over a given time horizon, t to T, is the weighted sum of instantaneous utility, $u(c_{t+k})$, over that period. The rate of discounting is determined by the weight, D(k), attached to utility at each time period. When the discount factor ρ is positive, utility receives progressively less weight with time.

[3]A quasi-hyperbolic discounting utility model (e.g., Laibson 1997) states the following:

$$U^t(c_t, ..., c_T) = D(0)u(c_t) + \beta\sum_{k=1}^{T-t} D(k)u(c_{t+k}),$$

$$\text{where } D(k) = \left(\frac{1}{1+\rho}\right)^k \text{ and } 0 < \beta < 1.$$

The key difference between this model and the standard discounted utility model (e.g., n. 2) is the differential weight given to the first period consumption (c_t) compared with all other consumption periods ($c_{t+1}, \ldots, c_T$), holding the discount factor ρ constant. As β becomes smaller, the utility at the first period $U^t(c_t)$ gets greater weight than the utility in all other periods, $U^t(c_{t+1}, \ldots, c_T)$. That is, as β becomes smaller, present bias becomes larger.

real outcomes (see Loewenstein 1988, Experiment 2). However, neither Loewenstein nor Shelley explicitly discuss how reference point differences in the two frames might influence consumers' patterns of discounting over different time horizons.

The Moderating Effect of Temporal Framing on Present-Biased Preferences

In the current work, we are interested in the implications of temporal framing (defer versus expedite) for present-biased preferences. We propose that consistent with prior research, consumers will show present bias when they delay outcomes but that this tendency will diminish when they expedite outcomes. We argue that the two temporal frames anchor consumers on different consumption times. Delay frames anchor consumers on the present, leading to concrete representations of the consumption episode and resulting in present-biased preferences. Conversely, expedite scenarios anchor consumers on the future, leading to more abstract representation of the outcome and attenuating present bias.

Concreteness and the Interactive Effect of Temporal Framing and Present-Biased Preferences

As we discussed previously, until now, the effect of temporal framing (i.e., defer versus expedite) has been conceptualized in the literature in terms of a shift in reference points (e.g., Loewenstein 1988; Shelley 1993). However, it is not obvious how a reference point shift would lead to differential present bias under the two temporal frames. We suggest that differences in concreteness of representations can help explain such an interactive effect. This perspective is motivated by recent research that proposes a cognitive interpretation of intertemporal preferences in general (e.g., Trope and Liberman 2003; Zauberman and Lynch 2005) and present-biased preferences in particular (e.g., Rubinstein 2003; Zauberman and Lynch 2005). Common to these perspectives is that timing of events leads to different mental representations of those events.

In particular, construal-level theory (e.g., Trope and Liberman 2000, 2003) posits that temporal distance systematically changes the level of abstraction at which events are construed. According to construal-level theory, people represent near-future events in concrete terms, whereas they represent distant-future events more abstractly. Such differences in representations lead to changes in attribute weights (Liberman and Trope 1998; Soman 1998) and in decision processes (Förster, Friedman, and Liberman 2004; Malkoc, Zauberman, and Ulu 2005).

Drawing on concepts from construal-level theory, we argue that initial representations under the two temporal frames are associated with different levels of concreteness. Specifically, we propose that delay frames, which describe the situation as a departure from the present, evoke concrete representations of the consumption episode. That is, consumers who think about delaying a current outcome represent this consumption experience vividly, with relatively detailed images and/or plans as to how the consumption experience will take place. Conversely, expedite frames depict the situation as a departure from the future and evoke more abstract representations of the consumption experience, which are less vivid and involve less detail.

These differences in the initial representations are related to other research that examines intertemporal trade-offs. For example, Metcalfe and Mischel (1999) argue that concrete mental images increase approach motivation, leading to difficulties in letting go of an outcome and in delaying gratification. Such increased focus on the forgone has been found to be associated with higher levels of endowment and loss aversion (Carmon and Ariely 2000; Johnson, Häubl, and Keinan 2004), which affects consumers' overall discount rates (Loewenstein 1988). As we discussed previously, Loewenstein's (1988) reference-point argument suggests that delay frames lead people to code a situation as a loss, thus influencing the extent of discounting. Although these findings are consistent with our prediction that temporal frames lead to differences in representational concreteness and affect overall discounting, they are inadequate in explaining why and how the initial representations would affect subsequent incorporation of different time horizons into decisions.

To examine the relationship between temporal framing and present bias, our conceptualization also needs to go beyond the current scope of construal-level theory. In this article, we are not simply interested in comparing decision processes for near (X_t) versus distant (X_{t+n}) events. Rather, we consider the trade-off between two temporally separated outcomes (X_t and X_{t+n}) a function of the temporal framing. That is, we keep the two points in time constant and vary only whether people defer a near outcome ($X_t \rightarrow X_{t+n}$) or expedite a distant outcome ($X_t \leftarrow X_{t+n}$). We argue that the initial representation triggered under the two temporal frames influences subsequent decision processes regarding the timing of events.

Such lingering effects of mental representation can be conceptualized as a form of "blocking," an idea that has had a long history in psychology (e.g., Feldman and Lynch 1988; Miller, Barnet, and Grahame 1995; Rescorla and Wagner 1972). Relevant to our conceptualization, a blocking argument related to memory accessibility asserts that the activation of one set of associations interferes with the retrieval and activation of other associations (Feldman and Lynch 1988; Hoch 1984). That is, associations have different degrees of accessibility, and the initially most accessible association influences subsequent activation. For example, an accessibility argument has been used to explain "anchoring-and-adjustment" effects (Mussweiler and Strack 2001) by showing that an anchor facilitates the accessibility of confirming relevant information. In addition, endowment with an option has been shown to influence which aspects of the situation people consider first, further affecting the relative accessibility of other aspects (Johnson, Häubl, and Keinan 2004).

The type of blocking we propose refers to the effect of the initial mental representation on subsequent representations. Specifically, when an outcome is represented concretely (abstractly), it is difficult to activate a subsequent, more abstract (concrete) representation of that outcome. We suggest that in delay frames, consumers first think about having the outcome in the present, which leads to concrete representations. These initial concrete representations block the activation of subsequent, more abstract representations that would have been evoked when moving the consumption to a later point in time, leading to present-biased pref-

erences. In expedite frames, however, consumers first think about having the outcome in the future, which leads to more abstract representations. These initial abstract representations block the subsequent concrete representations that would have been evoked when moving the consumption to the present. Because the representation is less concrete, present consumption is not as dominant, and present bias is diminished.

H_1: Discount rates implied in decisions will decline more with time (i.e., show greater present bias) for decisions to defer than for decisions to expedite.

Following this logic, any manipulation that makes mental representations under the two frames more similar should also moderate the hypothesized interactive effect of temporal framing and time horizon. One such manipulation is visualization. Prior research has shown that visualizing an event leads to more concrete representations of that event (Lowe 2004; Paivio 1971). Thus, we predict that visualizing future consumption in the expedite frame will increase the level of concreteness with which an outcome is initially represented and therefore decrease the gap in representations under defer and expedite frames. Accordingly, more concrete representations should lead to pronounced present bias under both frames, eliminating the asymmetry stated in H_1.

H_2: Changes in the representations of the outcome will moderate the interaction between temporal frame and time horizon such that the more similar the representation concreteness under the two frames, the smaller will be the difference in present bias. Specifically, visualization will increase concreteness and present bias under the expedite frame, reducing the difference in present bias between defer and expedite conditions.[4]

Next, we present results from three experiments. Experiments 1 and 2 focus on the interactive effect between temporal framing and time horizon (H_1) and systematically explore the interaction using within- and between-subjects designs and with monetary and nonmonetary outcomes. To test our proposed psychological mechanism explicitly (H_2), Experiment 3 introduces direct manipulation of concreteness using a visualization task.

EXPERIMENT 1

We designed this experiment to test our predicted interaction between temporal framing and time horizon (H_1). We predict that deferral scenarios will lead to present-biased preferences (replicating prior findings) but that this tendency will be attenuated in expedite scenarios. To test H_1 in the context of prior research, we used a task that we modified from the work of Thaler (1981).

Method

Participants and design. One hundred forty-nine undergraduate students participated in the experiment to fulfill a course requirement. The study followed a 2 (framing: defer versus expedite) × 3 (prize magnitude: \$15, \$250, \$3,000) × 3 (time horizon: three months, one year, three years) mixed design. We manipulated framing and prize magnitude between subjects and time horizon within subjects.

Procedure. Participants were presented with a scenario that asked them to imagine winning a lottery worth \$15, \$250, or \$3,000. Participants in the defer condition were told that their lottery winning was to be received the same day, but they could delay its receipt to a future time. They were asked to indicate how much they would need to be paid to wait. Participants in the expedite condition were told that there was a hold on their lottery winnings and were asked to indicate how much they would be willing to pay to have their winnings that day instead of waiting. We manipulated time horizon within-subjects by varying the duration of the wait period as three months, one year, and three years. In line with prior research, we used continuously compounded discount rates (e.g., Thaler 1981) as the dependent variable in our analyses.[5]

Results

We conducted a 2 (framing) × 3 (prize magnitude) × 3 (time horizon) mixed analysis of variance (ANOVA), treating time horizon as a repeated factor (for descriptive statistics, see Table 1). Replicating previous findings, we found a main effect for temporal framing ($F(1, 143) = 53.84$, $p <$

[4]In terms of the quasi-hyperbolic discounted utility model (e.g., n. 3), H_1 indicates that β is smaller in defer than in expedite frames. We also theorize that greater concreteness will lead to increased present bias (and smaller β). H_2 states that visualization leads to more equal β under delay and expedite frames, eliminating the difference in present bias.

[5]We calculated the discount rates with the following formula: $r = (\ln[X_{t+n}/X_t])/n$, where X_t is the amount at the initial period and n is the length of time expressed in terms of years.

Table 1

MEANS (STANDARD DEVIATIONS) OF DISCOUNT RATES IN EXPERIMENTS 1 AND 1A

		Three Months			*One Year*			*Three Years*		
		\$15	*\$250*	*\$3,000*	*\$15*	*\$250*	*\$3,000*	*\$15*	*\$250*	*\$3,000*
Experiment 1	Defer	2.500	1.142	.522	1.008	.568	.292	.450	.322	.197
		(2.046)	(1.199)	(.733)	(.788)	(.510)	(.331)	(.342)	(.267)	(.162)
	Expedite	.394	.118	.065	.195	.084	.055	.129	.058	.041
		(.600)	(.204)	(.057)	(.205)	(.070)	(.047)	(.143)	(.039)	(.041)
Experiment 1a	Defer	2.029	1.222	.980	.759	.363	.279	.303	.198	.184
		(1.841)	(1.366)	(1.232)	(.908)	(.367)	(.335)	(.209)	(.135)	(.168)
	Expedite	.167	.090	.062	.251	.159	.112	.112	.082	.060
		(.388)	(.106)	(.081)	(.553)	(.429)	(.397)	(.172)	(.090)	(.065)

Notes: In Experiment 1, we manipulated amounts between participants and time horizon within participants; in Experiment 1a, we manipulated amounts within participants and time horizon between participants.

.001); discount rates were higher for deferral (M = .79) than for expedite (M = .13) decisions. We also found a main effect for prize magnitude ($F(2, 143) = 15.34$, $p < .001$) and for time horizon ($F(2, 286) = 58.07$, $p < .001$), demonstrating a negative relationship of discount rates to both the prize magnitude (i.e., higher discount rates for smaller amounts) and the length of time horizon (i.e., higher discount rates for shorter periods). These main effects fully replicate established findings in the literature (see Frederick, Loewenstein, and O'Donoghue 2002).

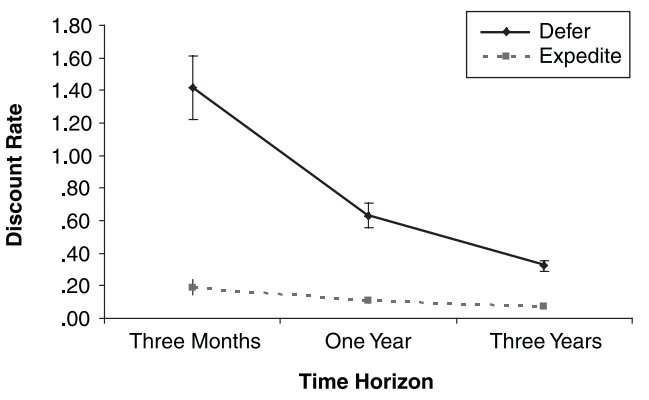
More important, however, the analysis shows the predicted two-way interaction between time horizon and temporal framing ($F(2, 286) = 37.57$, $p < .001$), demonstrating greater present bias in the deferral than in the expedite decisions (H_1). As Figure 1 shows, across all amounts, discount rates decline significantly more with time in the defer ($M_{3m} = 1.416$, $M_{1y} = .631$, $M_{3y} = .324$) than in the expedite ($M_{3m} = .190$, $M_{1y} = .110$, $M_{3y} = .075$) condition. Comparing the linear trend for each participant across the three time-horizon conditions, we find a significantly steeper trend in the delay (M = –.55) than in the expedite (M = –.057; $t(147) = 5.70$, $p < .001$) condition.

Manipulating time horizon at three levels allows us to test further implications that follow from H_1. Specifically, H_1 implies that the decline from three months to one year should be more pronounced in the delay than in the expedite condition, but this difference should be attenuated when considering the decline from one year to three years. To test this prediction, we calculated two ratios (three months:one year; one year:three years) and computed a 2 (ratio) × 2 (frame) ANOVA. We found a significant interaction ($F(1, 134) = 6.78$, $p = .01$), indicating that the ratio of discount rates from three months to one year was higher in the defer ($M_{defer} = 2.14$) than in the expedite ($M_{expedite} = 1.37$) frame, but this difference was eliminated when we compared the ratio of one year to three years ($M_{defer} = 1.68$ versus $M_{expedite} = 1.63$).

Discussion

Experiment 1 demonstrates systematic differences in the pattern of discounting (i.e., the extent of present bias) depending on the temporal frame. Our results replicate prior findings of present bias in the defer (Thaler 1981) but not in the expedite condition. That is, we find that the decline in discount rates with time under deferral decisions is significantly attenuated under expedite decisions. These findings support H_1, demonstrating that temporal framing not only affects overall discount rates but also has implications for the pattern of discounting.

Figure 1
EXPERIMENT 1 RESULTS: THE TIME HORIZON × TEMPORAL FRAME INTERACTION



Notes: Error bars reflect standard error of the mean.

Experiment 1 manipulated time horizon within subjects. A reader might ask whether these results were an artifact of the experimental design, in which we made time horizon salient by having it as a repeated factor. Although this is true for both frames and cannot account for our results, we were interested in examining whether our results would be robust to different experimental designs. Therefore, we ran a separate experiment. We used MBA students as participants and kept the procedure the same, except for manipulating time horizon between subjects (and amount within subjects). The results fully replicated those of Experiment 1 (see Experiment 1a means in Table 1), including the focal two-way interaction between temporal framing and time horizon ($F(2, 205) = 3.48$, $p < .05$).

Overall, these findings support our theory, indicating that delay frames, which are associated with concrete representations, lead to an emphasis on the present and thus result in present-biased preferences. Conversely, expedite scenarios describe the situation as a departure from the future and evoke abstract representations, which decrease the emphasis on the present and thus attenuate the extent of present bias.

EXPERIMENT 2

To be able to relate our findings to prior literature, Experiment 1 used monetary gains. However, many consumption decisions involve hedonic outcomes, which could trigger different decision processes. Experiment 2 aims to extend the results of Experiment 1 to more hedonic, nonmonetary outcomes, enabling us to discuss more general psychological processes.

Method

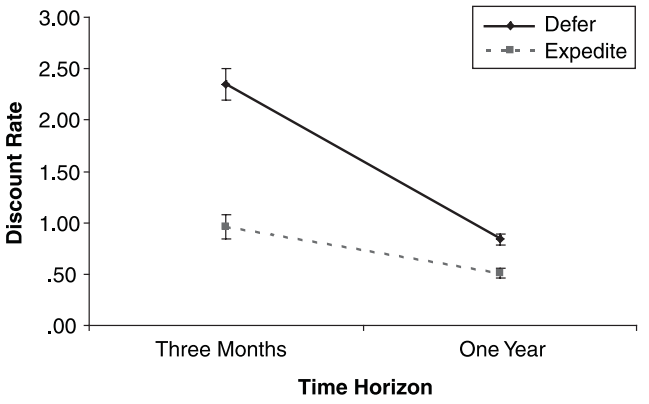
Participants and design. Ninety-eight undergraduate students completed the study for partial fulfillment of a course requirement. The study followed a 2 (framing: defer versus expedite) × 2 (time horizon: three months, one year) mixed design. We manipulated framing between subjects and time horizon within subjects.

Procedure. Participants were asked to consider having purchased an $80 ticket to attend a concert of their favorite band. Participants in the defer condition were told that their ticket was for the next weekend, but because of unexpected demand, they now had the option to postpone going to the concert. They were asked to indicate the refund amount they would need to receive to wait to see the concert. In the expedite condition, participants were told that they bought a ticket for a future date, but because of unexpected demand, they now had the option to attend the concert this weekend. They were asked to indicate the amount they would be willing to pay not to wait to see the concert. All participants were informed that the only change would be the date of the concert and that tickets were otherwise identical (same band, arena, and seat).

Results and Discussion

Again, we used continuously compounded discount rates as the dependent measure. A 2 (framing) × 2 (time horizon)

Figure 2
EXPERIMENT 2 RESULTS: THE TIME HORIZON × TEMPORAL FRAME INTERACTION



Notes: Error bars reflect standard error of the mean.

mixed ANOVA replicated our previous findings (see Figure 2). We found a main effect for temporal framing ($F(1, 96) = 48.42$, $p < .001$), with higher discounting in the defer ($M = 1.59$) than in the expedite ($M = .74$) condition. In addition, we found a main effect for time horizon ($F(1, 96) = 163.00$, $p < .001$), which showed higher discount rates for three months ($M = 1.68$) than for one year ($M = .68$). More important, we again found the predicted two-way interaction between time horizon and temporal framing ($F(1, 96) = 47.16$, $p < .001$), which showed that the decline in discounting with time was more pronounced in delay ($M_{3m} = 2.35$, $M_{1y} = .84$) than in expedite ($M_{3m} = .96$, $M_{1y} = .51$) decisions.

Another way to test H_1 is to examine changes in the ratio of discounting in different time horizons under the two frames. H_1 implies that the ratio of discount rates over short periods to longer periods would be higher when delaying than when expediting outcomes. To test this prediction, we calculated a (three months:one year) discount rate ratio and used a single-factor ANOVA with temporal framing as a between-subjects factor and the ratio as the dependent variable. As we expected, temporal framing had a significant effect ($F(1, 93) = 18.99$, $p < .01$), showing that the three months:one year ratio is higher in the delay ($M_{defer} = 2.80$) than in the expedite ($M_{expedite} = 1.96$) scenario.

In summary, the results of Experiment 2 replicated those of Experiment 1. We find that though consumers' impatience declines with time, this tendency is attenuated more when they engage in expedite than when they engage in deferral decisions. We also show that such behavior is not limited to monetary payoffs and reflect a more general psychological process.

EXPERIMENT 3

Experiments 1 and 2 demonstrate a robust interaction between the temporal framing and the timing of a decision. However, we have not yet directly examined our proposed psychological mechanism (H_2). As discussed previously, we propose that the two frames are associated with different levels of representation concreteness, which result in different patterns of discounting. Experiment 3 aims to test H_2 by directly manipulating concreteness using a visualization task. We expect that visualizing the consumption episode will increase the similarity of mental representations under the two frames. Thus, the patterns of discounting under delay and expedite scenarios will be more similar after visualization, when the levels of representations are more equal, than under a condition of no visualization.

Method

Participants and design. Participants were 192 undergraduate students who completed the study as part of a one-hour experimental session. They were paid $10 for their participation. The study followed a 2 (visualization versus control) × 2 (framing: defer versus expedite) × 2 (time horizon: three days versus ten days) mixed design. We manipulated framing and visualization between subjects and time horizon within subjects.

Procedure. Participants were asked to imagine purchasing a DVD from Amazon.com and to make decisions about the DVD's delivery. Participants in the visualization condition (N = 96) were asked to write about receiving and watching the DVD with the following instructions:

> Before proceeding, please visualize the moment that you actually receive your DVD in the mail. Describe in as much detail as possible the events that would follow the actual receipt of this DVD. Make sure to include details like: When would you open the package? Where would you store the DVD? How long would you wait until you actually watch it? Would you watch it over the weekend or during the week? Would you watch it alone or with friends? You can also include any other detail you think is relevant.

Participants assigned to the control condition (N = 96) did not see these instructions and proceeded directly to the main task. In the main task, we manipulated framing by varying the default delivery timing of the DVD. Participants in the defer condition were told that their delivery was scheduled for the same day and that they had the option to delay it to save money. Participants in the expedite condition were told that their delivery was scheduled for a future date and that they could have the DVD earlier if they were willing to pay more. Participants were asked to indicate the amount they would pay (save) to expedite (defer) the delivery of the DVD by three days and by ten days. Finally, as a manipulation check, we measured concreteness of representations using an 11-point scale, anchored at 1 ("not concrete") and 11 ("very concrete"), by asking participants, "Next, please indicate how concrete your plans are for how and when you will watch this DVD."

Results

Manipulation check. The analysis of the manipulation check data had two objectives: (1) to demonstrate that delay frames naturally lead to more concrete representations than expedite frames and (2) to demonstrate that the visualization manipulation eliminates such a difference. Therefore, we computed two planned contrasts. To establish that delay frames lead to more concrete representations than expedite frames, we computed a planned contrast using only the data from the control condition, in which no visualization took place. As we expected, representations were significantly more concrete in the defer ($M = 5.58$) than in the expedite

(M = 4.45; t(94) = 2.09, $p < .05$) frame. To show that the visualization manipulation eliminates differences in concreteness, we analyzed the data from the visualization condition. As we expected, after visualization, the difference in concreteness under the two frames is eliminated (M_{defer} = 5.80 versus $M_{expedite}$ = 5.38; t(94) = .67, $p = .50$).

The moderating effects of visualization. To test H_2, we computed a 2 (visualization) × 2 (framing) × 2 (time horizon) mixed-design ANOVA with time horizon as a repeated factor and discount rates as the dependent measure. In support of our predictions, the results show a significant three-way interaction (F(1, 188) = 4.72, $p < .05$), indicating that visualization of the outcome moderated the interactive effect of temporal framing and time horizon (see Figure 3). We find that the control condition replicated our previous findings with a two-way interaction between framing and time horizon (F(1, 94) = 7.58, $p < .01$), showing a greater present bias in the defer (M_{3d} = 22.13, M_{10d} = 11.64) than in the expedite (M_{3d} = 13.04, M_{10d} = 6.94) frame. However, in the visualization condition, this two-way interaction was no longer significant (F(1, 94) < 1), with similar degrees of present bias in the defer (M_{3d} = 17.41, M_{10d} = 9.45) and in the expedite (M_{3d} = 18.22, M_{10d} = 8.69) frames. These results indicate that the visualization task increased the similarity of mental representations of the outcomes, attenuating the interactive effect of the framing and time horizon (actually eliminating it in our study). Again, we replicated the analysis by using the ratio of discount rates (three days: ten days), with a marginally significant interaction between framing and time horizon (F(1, 183) = 2.88, $p = .09$).

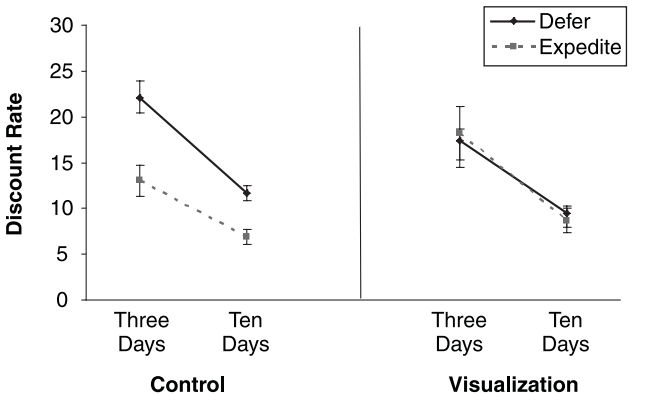
Internal analysis of the concreteness manipulation check. To provide further support for H_2, we performed several internal analyses. The first analysis used a regression with the continuous measure of concreteness as an independent variable and the difference between discount rates at the two times as the dependent variable, indicating the degree of present bias. This analysis (N = 192) showed a significant main effect for concreteness (standardized β = .20, t = 2.81, $p < .01$), demonstrating greater present bias for higher levels of concreteness. We replicated these results when we used only the participants in the control condition (N = 96; standardized β = .26, t = 2.55, $p < .05$).

To test H_2 directly and to address a possible issue with the concreteness manipulation, we performed the second internal analysis. Specifically, the visualization instructions explicitly referred to time, possibly increasing its saliency and causing the differences observed. To rule out this possibility as an alternative explanation, we created a variable, "concreteness similarity," by grouping participants on their similarity of self-reported concreteness on the manipulation check. For this analysis, we used only the 96 participants in the control (no visualization) condition (for a graphical illustration, see Figure 4).[6] We created two groups, dissimilar and similar concreteness. In the dissimilar group, we included participants who reported above-median concreteness for defer (highest on concreteness) and below-median concreteness for expedite (lowest on concreteness). In the similar group, we included those who reported below-median concreteness for defer and above-median concreteness for expedite. Therefore, participants in the similar group should be relatively more equal in terms of their concreteness level between the two frames than those in the dissimilar group. Following H_2, we expect a greater difference in present bias between defer and expedite frames when concreteness is dissimilar than when it is similar.

The analysis supports this prediction. A 2 (similarity) × 2 (framing) × 3 (time horizon) mixed ANOVA, using discount rates as the dependent measure, showed a significant three-way interaction (F(1, 92) = 6.31, $p < .02$; see Figure 5). The results indicate that when participants have dissimilar levels of concreteness, the results replicate the moderating effect of temporal framing on the degree of present bias (F(1, 54) = 15.80, $p < .01$). However, when participants have more similar levels of concreteness, the moderating effect of temporal framing on present bias is eliminated (F(1, 38) < 1).

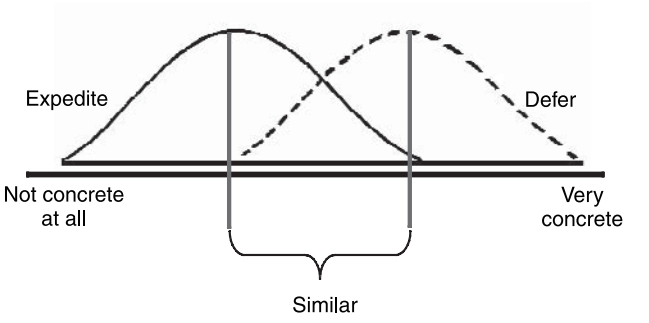
[6]The results also hold when we include data from the visualization condition; there is a significant interaction between framing and similarity (F(1, 188) = 9.80, $p = .002$).

Figure 3
EXPERIMENT 3 RESULTS: THE TIME HORIZON × TEMPORAL FRAME INTERACTION FOR THE CONTROL AND VISUALIZATION CONDITIONS



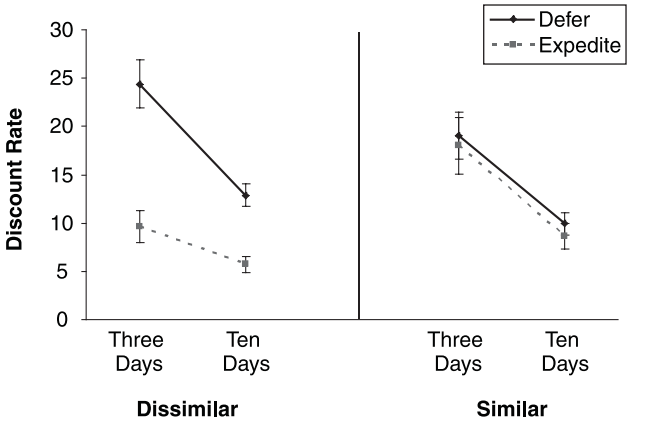
Notes: Error bars reflect standard error of the mean.

Figure 4
GRAPHICAL ILLUSTRATION OF THE METHOD FOR CREATING THE SIMILARITY CONDITIONS USING THE CONCRETENESS MEASURE



Notes: The figure illustrates the similar and dissimilar regions of concreteness in the Defer and Expedite frames.

Figure 5
EXPERIMENT 3 RESULTS: THE TIME HORIZON × TEMPORAL FRAME INTERACTION FOR SIMILAR AND DISSIMILAR MENTAL REPRESENTATIONS



Notes: Error bars reflect standard error of the mean.

Discussion

To test the moderating role of concreteness on the interaction between time horizon and framing (H_2), Experiment 3 introduced a manipulation of mental representations using a visualization task. Across multiple analyses, we show that concreteness of mental representation of an outcome is one mechanism that drives this interactive effect. We found that delay frames trigger more concrete representations, leading to present bias, whereas expedite frames trigger relatively less concrete representations, thus attenuating this effect. We further demonstrated that visualization manipulation increases concreteness and thus eliminates the different patterns of discounting between the two frames. These results demonstrate that if consumers have similar mental representations, the framing of the task (defer versus expedite) no longer leads to differential impatience over time. In addition, this experiment employed even shorter time horizons (days) than previous experiments, further demonstrating the robustness of this effect.

Note that in the delay condition, the visualization manipulation actually decreased the extent of present bias, which we did not expect. To understand the reason for this effect, we examined participants' written responses, which we collected as part of the visualization manipulation. Our examination of these written responses indicated that in addition to describing the outcome in detail, participants reported possible schedule conflicts for watching the DVD and other feasibility-related issues. Thinking about the feasibility of the consumption episode might have affected their discount rates in a manner consistent with our results (e.g., Liberman and Trope 1998). To address this issue directly, we conducted a simple posttest (N = 53), manipulating visualization in a way that focuses on the outcome and using only the delay frame. As expected, we found a significant two-way interaction ($F(1, 52) = 5.53$, $p < .05$), indicating that the present bias was more pronounced in the outcome visualization ($M_{3d} = 25.48$, $M_{10d} = 13.36$; difference = 12.12) than in the no-visualization ($M_{3d} = 20.29$, $M_{10d} = 12.83$; difference = 7.46) condition. Taken together, our results establish concreteness as an important moderator of present-biased preferences.

GENERAL DISCUSSION

A better understanding of the psychological mechanisms that drive intertemporal preferences is critical to the study of consumer behavior. In this article, we examined the implications of temporal framing for consumers' decisions involving different time horizons. We demonstrated that sensitivity of consumers' discounting to different time horizons (i.e., degree of present bias) is significantly more pronounced in deferral decisions than in expedite decisions. We identified one psychological driver of this effect: concreteness of mental representations.

Our empirical work showed that the way that intertemporal consumption decisions are framed has a systematic and robust effect on how consumers value changes in consumption timings. Three experiments demonstrated that when a decision is framed as a deferral, consumers display present-biased preferences, which manifest in high discount rates that decline sharply with time. However, this pattern of discounting is significantly attenuated when the same decision is framed as a decision to expedite. We consistently found support for our predictions in different domains, using within-subjects and between-subjects designs, monetary and nonmonetary outcomes, long and short prospective time horizons, and undergraduate and MBA students.

Experiment 3 provides direct evidence for a psychological mechanism by demonstrating that the concreteness of outcome representations moderates the interaction between temporal framing and time horizon. We show that the two frames are associated with different levels of concreteness. Deferral frames, which describe a departure from current consumption, are associated with relatively more concrete representations and therefore result in present-biased preferences. Conversely, expedite frames anchor expected consumption in the future, leading to relatively more abstract representations that do not induce the same degree of present bias. We show that when the concreteness of mental representations is similar between defer and expedite frames, there are similar levels of present bias in the two frames. In summary, three experiments support H_1 and H_2 and provide evidence for a mechanism that can help explain temporal framing, sensitivity to time horizon, and their interaction.

Theoretical Contribution

Prior research on intertemporal choice has consistently demonstrated that scenarios that are framed as deferral lead to higher overall discount rates than expedite frames (e.g., Loewenstein 1988). We extend these findings by showing that the implications of temporal framing go beyond overall higher rates of discounting and affect the pattern of discounting over time. Our results also indicate that the commonly reported phenomenon of hyperbolic discounting (e.g., Benzion, Rapoport, and Yagil 1989; Thaler 1981) might seem so robust, at least partially, because of the deferral framing that has been employed in these studies. This could be important to researchers who design and measure intertemporal trade-offs.

The results we report in this article provide further evidence that cognitive factors, such as concreteness, moderate the rate and pattern of intertemporal discounting. As we noted previously, most existing accounts of hyperbolic discounting focus on affective and visceral reactions (Ainslie

1975; Loewenstein 1996; Rachlin and Raineri 1992). Recent exceptions include a similarity-based account (Rubinstein 2003) and resource slack theory (Zauberman and Lynch 2005). Our research builds on and extends these more cognitive explanations by providing direct empirical evidence for concreteness as one of the psychological drivers behind present-biased preferences. Our perspective is distinct in that it suggests that temporal frames are associated with different levels of outcome concreteness. We demonstrate that consumers with more concrete representations show more present bias, regardless of the contextual factors (i.e., framing). Taken together, our results suggest that a cognitive account—namely, concreteness of representations—might help explain not only present-biased preferences (i.e., hyperbolic discounting) but also temporal reference point effects (i.e., delay–expedite asymmetry).[7]

Our theory and the results also extend the current scope of the construal-level theory (Trope and Liberman 2003). Until now, construal-level theory has examined only the effects of differences in mental representations, but it has not considered the situations in which multiple competing representations are activated. Thus, little is known about how the order of representations would effect the subsequent representations and resulting changes in preferences. To our knowledge, the current research is the first to demonstrate that the order in which the representations are evoked has an important effect, in which the initial representation inhibits the activation of latter ones.

Finally, on a more speculative note, we suggest that to understand present bias better, it is important to consider the links between affective and cognitive systems. Our proposed cognitive mechanism focuses on changes in levels of concreteness. However, we conjecture that an important link might exist between the level of representation and the extent of situational impulsivity. That is, we suggest that consumers might not be impulsive when they think abstractly, and a more concrete representation might be necessary to observe impulsiveness.

Implications and Conclusions

Although the main goal of this article is to advance current theory of intertemporal processes, our results also have more applied implications. Our results suggest that it is important to understand the implications of temporal frames when presenting consumers with timing decisions. Specifically, when considering multiple time horizons, consumers who are anchored in the present would be more willing to spend relatively more money to avoid a shorter delay than they would to avoid a longer delay in consuming a product than would those who expedite the consumption of a product. For example, consider the implications of this effect for shipment options that companies provide. As Experiment 3 demonstrated, if the default option given to customers is to have immediate delivery, they not only will pay more to avoid delaying receipt of their items but also will disproportionately value shorter delays. That is, in such situations, a four-day delay might not be twice as bad as a two-day delay but rather will be only slightly more aversive. Alternatively, if the default shipment option is scheduled for the future and consumers evaluate a decision frame as expedite, they will be more proportional in their valuation of different waiting periods, and linear pricing might be more effective.

It is also important for companies to understand the psychological effects of the temporal framing of options on consumers. Using delay frames might increase consumers' willingness to incur costs to avoid very short delays, even when the companies would prefer that consumers be patient. For example, in the case of possible stockouts, companies often want consumers not to rush the orders and try to avoid dissatisfaction due to the delay. Our results indicate that under such circumstances, it might be more beneficial to use expedite frames in outlining delivery options. Our results further suggest that the different effects under the two temporal frames are related to the level of mental representation, which can be under the influence of firms, at least to some extent. For example, by providing consumers with vivid pictures or concrete definitions of immediate benefits, companies can alter consumers' levels of impatience.

In conclusion, this research has demonstrated that temporal frames (defer versus expedite) lead to different degrees of bias toward the present. We show that the extent to which consumers are sensitive to the time horizon in a given consumption situation depends on the temporal framing of the task. We also show that the reason we observe this effect is related to the level of mental representation associated with each temporal frame.

[7]We do not claim that cognitive processes can account for all prior results that show hyperbolic discounting. It is a multiply determined phenomenon (for a discussion, see Zauberman and Lynch 2005).

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