Budget Depreciation: When Budgeting Early Increases Spending

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While budgeting in advance is seen as a good practice to control spending, this research shows that budgeting too early for a specific purchase may increase spending. We argue that as the temporal separation between budget setting and actual purchase increases, consumers become more willing to overspend because of what we term "budget depreciation." Consumers adapt to the reference point set by the budget such that, over time, the budgeted level becomes the status-quo spending. Thus, as more time passes, pain of payment from the budgeted amount decreases, and the willingness-to-spend increases. Across a secondary dataset of real estate purchases, one field study, and three experiments, we find evidence that consumers who set a budget in the distant (vs. near) past are more likely to overspend relative to their budget. The effect emerges for single purchase occasions rather than a category of purchases over multiple occasions. It emerges because of the hypothesized pain-of-payment process (e.g., effect is stronger among tightwads, who feel greater pain from spending; effect is mitigated under budget reassessment, which prevents pain adaptation). Our work contributes to the mental budgeting literature by invoking a role for temporal separation and draws a novel connection to prior work on payment depreciation.

Keywords: mental budgets, budgeting, temporal separation, overspending, pain of payment

Budgeting is often considered as a useful tool to control spending. Many financial counseling institutions and financial literacy programs suggest that the first step to financial wellness is to set up a budget (Nagle 2019). Banks and other personal finance platforms provide services for effective budgeting (Lockert 2019), and in response, the number of consumers adopting budgeting and financial planning apps has more than tripled in the last 5 years (Hwa 2019). When budgeting for a specific upcoming purchase (e.g., purchasing a house), consumers typically do so in advance, and one might assume that budgeting further in advance helps people reduce their spending. This research explores when and why budgeting early might have the opposite effect, and instead lead to higher spending.

We examine how the amount of temporal separation that occurs between the moment that a budget is set and the moment that a purchase is made affects consumer decisions regarding how much money to spend relative to that budget. Although competing predictions can be made, our results suggest that budgeting too early tends to increase consumers' spending relative to their budgets and may result in overspending. We propose that this overspending behavior arises in part because consumers feel less pain

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when spending money for which they have budgeted in the distant past compared to money for which they have budgeted in the near past. Budgeting for a purchase involves deciding to spend money, and this *decision* to spend money on a purchase can produce a hedonic cost, or pain, for the consumer. As time passes after a decision has been made to spend money, consumers begin to adapt to that decision, and the pain associated with spending that money begins to dissipate. We refer to this process of adaptation as "budget depreciation." As a result of this process, those who budget for their purchases in the distant past may be more willing to overspend than those who budget for their purchases in the near past.

This research contributes to several streams of literature. Our findings add to the mental budgeting literature by identifying temporal separation as a factor that influences the success of budgeting in limiting spending behavior, and by elucidating the direction of the effect. Research on mental budgeting has explored factors that impact efficacy in budgeting, such as the malleability of mental accounts (Cheema and Soman 2008) and visual reminders of the budget goal (Soman and Cheema 2011). While a limited literature has begun to study the role of time in the budgeting context (Ülkümen, Thomas, and Morwitz 2008), the effect of temporal separation has not yet been explored. Prior research offers conflicting hypotheses on whether greater temporal separation will increase or decrease spending, yet no work has directly tested these predictions. We extend previous work in budgeting that examined possible pitfalls of budgeting (Cheema and Soman 2006; Kan, Fernbach, and Lynch 2018; Larson and Hamilton 2012) by showing how greater temporal separation in budgeting may backfire. In addition, prior studies in budgeting have primarily examined budgeting for categories of expenses that occur over a duration of time (e.g., dining expenses that occur over the next month; Ülkümen et al. 2008), but the current research focuses on budgeting for a single expense to occur at the end of a duration of time (e.g., a single dinner that occurs at the end of the next month). Furthermore, much of the research on budgeting observes how consumers' budget adherence is affected by changes in budgeted spending (Peetz and Buehler 2009; Ülkümen et al. 2008), but we explore how budget adherence is affected by changes in actual spending.

Second, our research contributes to the literature on pain of payment. While prior research has shown that the pain associated with making a purchase can dissipate as time passes after the purchase point (Gourville and Soman 1998), we contribute the notion that the pain associated with an earmarked-but-still-*upcoming* purchase can also dissipate with time. This adds to an emerging literature proposing that budgeting for purchases can evoke many of the same responses as actual purchases (Webb and Spiller 2014), implying that simply making the decision to spend can also evoke hedonic costs. We draw a novel connection to this prior work on payment depreciation, showing that a similar depreciation can occur with budgeting as well.

In the next section, we review literature on budgeting in general and then discuss the role of time in budgeting more specifically. We discuss how different lines of research can lead to competing predictions regarding the effect of temporal separation, before focusing on the pattern of effects that we empirically observe and a process that may underlie these effects.

THEORETICAL BACKGROUND

Budgeting

Mental budgeting is the act of coding and categorizing resource inflows and outflows into "accounts" (Thaler 1985). Through this cognitive form of bookkeeping, consumers set different mental accounts, earmark accounts, and funds for specific purposes and then track their expenses against their budgets (Heath and Soll 1996).

Funds can be earmarked for categories of multiple purchases (e.g., a $100 budget for dining expenses this week) or for single purchase (e.g., a $100 budget for a single dinner). Much of the prior research in budgeting focuses on budgeting for categories of spending, such as budgeting for weekly expenses (Peetz and Buehler 2009; Ülkümen et al. 2008), travel expenses (Fernbach, Kan, and Lynch 2015), or food and entertainment expenses (Cheema and Soman 2006). In this research, we focus on budgets set for single purchase, and, in line with Larson and Hamilton (2012), we use the term budgeting to refer to earmarking money for these purchases.

Consumers often budget with the aim of controlling their spending and saving money. A significant body of literature has explored the factors that can impact whether budgets are effective at achieving this goal (see Zhang and Sussman 2018 for a review). Budgets are often more effective when they are not too malleable (Cheema and Soman 2006), but also when not too inflexible (Heath and Soll 1996). Sometimes budgets can help people save money (Soman and Cheema 2011) and prioritize their spending (Fernbach et al. 2015), and sometimes earmarking can be unhelpful (Larson and Hamilton 2012; Sussman and O'Brien 2016).

The role of time in budgeting has been explored in various contexts, including the effect of sequence and the effect of temporal frames. Sheehan and Van Ittersum (2018) find that the sequence of purchases during a grocery store trip differs for those who do versus do not budget for their grocery shopping. Carlson et al. (2015) show that, when budget size changes in a descending (vs. ascending) sequence, people tend to prefer less variety.

The effect of different temporal frames in budgeting, such as a weekly budget versus a monthly budget, has also been explored. Longer time frames lead to higher and more

accurate budget estimates (Ülkümen et al. 2008), and default units of time also lead to higher budget estimates (e.g., setting a weekly budget when one is accustomed to setting a monthly budget; Min and Ülkümen 2014). People underestimate their spending when budgeting for a general time frame, such as the next week, more than they do when budgeting for a specific event (Peetz and Buehler 2013). The temporal frame can also impact choices; bracketing one's budget more broadly increases willingness to spend (Read, Loewenstein, and Rabin 1999), and longer time windows for future consumption increase preference for vice products over virtuous products (Siddiqui, May, and Monga 2017).

Because mental budgets are set in advance of purchase occasions (Heath and Soll 1996), there is typically some amount of temporal separation between the moment that one sets a budget and the moment that one makes a purchase. This temporal separation can vary greatly, such as when one budgets for a purchase occurring next week, next month, or even next year. However, the role of temporal separation in budgeting has yet to be explored.

The Effect of Temporal Separation on Budget Adherence

There are several possibilities for how the effect of temporal separation might impact downstream budget adherence. As a starting point, one might predict that budget adherence does not change as a function of temporal separation between setting a budget and making a purchase. However, extant research offers evidence suggesting otherwise. For example, prior research in budget estimation finds that consumers experience greater difficulty with forecasting expenses that occur over longer time frames (such as the next month) than shorter time frames (such as the next week; Ülkümen et al., 2008). As a consequence, consumers tend to give higher budget estimates when budgeting further in advance, suggesting that greater temporal separation might result in lower spending relative to their budget.

One important distinction to note is that Ülkümen et al. (2008) focus on budget setting for categories of expenses over a duration of time (e.g., all dining expenses that occur over the next week vs. the next month), whereas the present research focuses on budget setting for a single expense that will take place at the end of the budget period (e.g., a single dining expense that will occur at the end of the next week vs. the next month). When budgeting for dining expenses as a category over a duration of time, consumers need to estimate both how many dining occasions there will be and how much to spend at each occasion. Given that there are more dining occasions over the next month than the next week, consumers experience greater difficulty in estimating a budget for the next month than the next week and adjust their budget estimates upwards accordingly. When budgeting for a single dining occasion, however, consumers only need to consider how much to spend for that single occasion, regardless of whether it occurs next week or next month. This suggests that the difficulty of budget estimation may be similar for single-item budgets, irrespective of how far in advance it occurs. We explored this distinction in a pilot study (details of this study are in web appendix B). Half the participants submitted budget estimates for dining expenses as a category, budgeting for multiple dining expenses that would occur during the next week or the next 2 months. The other half of the participants submitted budget estimates for a single dining expense that would occur at the end of the next week or the next 2 months. Afterwards, all participants rated how difficult it was to estimate the budget. Replicating Ülkümen et al. (2008), we observed that budgeting for multiple purchases over a longer duration of time is more difficult ($M_{1\ \text{week}} = 3.27$, $M_{2\ \text{months}} = 3.88$; $F(1, 297) = 5.75$, $p = .017$, partial $\eta^2 = .019$) and elicits higher budget estimates on a time adjusted basis ($M_{1\ \text{week}} = \$61.69$, $M_{2\ \text{months}} = \$217.17$; $F(1, 297) = 18.52$, $p < .001$, partial $\eta^2 = .059$) than budgeting for a shorter duration of time. However, budgeting for a single purchase to occur at the end of a longer time period is just as difficult ($M_{1\text{week}} = 2.93$, $M_{2\ \text{months}} = 2.89$; $F(1, 297) = .03$, $p = .861$, partial $\eta^2 < .001$) and elicits similar budget estimates ($M_{1\ \text{week}} = \$72.61$, $M_{2\ \text{months}} = \$118.82$; $F(1, 297) = 1.58$, $p = .210$, partial $\eta^2 = .005$), as budgeting for a single purchase to occur at the end of a shorter time period. This suggests that a unique pattern of spending may arise when budgeting in advance for a single item versus a category of items.

Another possible pattern of results, and the one that we observe empirically, is that greater temporal separation increases the likelihood for people to spend more relative to their budget. This phenomenon is likely to be multiply determined, though the current research focuses primarily on the pain of payment and budget depreciation, a process that we believe applies best to the current context. In the next section, we review literature on the pain of payment and derive our hypotheses.

Pain of Payment

When consumers make purchases, they may experience a pain of payment, which can be defined as a "psychological burden of payment" (Prelec and Loewenstein 1998) or a "hedonic cost" (Gourville and Soman 1998). Increasing the pain of payment can reduce people's willingness to make a purchase, such as when they have fewer cognitively accessible resources (Morewedge, Holtzman, and Epley 2007), or when using a more painful form of payment (Prelec and Simester 2001; Soman 2001).

The amount of pain that people feel when thinking about a purchase can dissipate over time. Gourville and Soman

(1998, 163) suggest that when a consumer first makes a purchase, for $40 in this example, "she opens a mental account specific to this transaction and records into that account the full perceived value of the payment. . .However, as the temporal delay between the $40 payment and the pending consumption increases, this person adapts to the payment and gradually incorporates it into her status quo. As such, the potential hedonic impact of that payment decreases." This effect is termed "payment depreciation" and is found to have significant impact on sunk-cost effects; consumers are more likely to forgo the benefits associated with a purchase if the payment occurred further in the distant past.

Analogously, one may predict that consumers experience similar feelings of pain when setting a budget and making the *decision to spend money*. Prelec and Loewenstein (1998, 19–20) suggest that while mental budgets "have traditionally been interpreted as a self-control device. . .they may, however, also play the complementary role of facilitating mental prepayment." Consistent with this suggestion, Webb and Spiller (2014) find that simply earmarking money can lead to similar consequences as actually spending money, proposing that earmarking increases the feeling of financial constraint. The heightened perception of financial constraint can lead to the consideration of opportunity costs (Spiller 2011) and increased pain of paying (Pomerance, Reinholtz, and Shah 2018).

Connecting these lines of research, we propose that consumers may experience "budget depreciation" much in the same way that they experience "payment depreciation." That is, people can adapt over time to the hedonic impact associated with an upcoming payment, similar to how they can adapt over time to the pain of a payment that has already been made. After consumers set a budget for a specific purchase, the budgeted cost becomes a reference point. As time passes, they gradually incorporate that reference point into their status quo and adapt to the idea of spending that amount of money. This reduces the pain associated with spending the budgeted amount of money. When the moment of purchase finally arrives, consumers experience less pain of payment and thus become more willing to overspend. More formally, we hypothesize:

H1: As the temporal separation between budget setting and actual purchase increases, people become more willing to overspend their budgets.

H2: The change in overspending results from increases in actual spending, as opposed to decreases in budgeted spending.

H3: The change in overspending occurs through decreased pain of payment.

OVERVIEW OF STUDIES

We explore our hypotheses over a series of six studies. Study 1 investigates hypotheses 1 and 2 in the context of real estate purchases, finding that higher temporal separation between the moment of budget setting and purchase is correlated with higher spending relative to the budget. Study 2 explores the causal effect of temporal separation in a field study, investigating whether university students who are randomly assigned to budget earlier for their class ring purchases spend more than those who are randomly assigned to budget later.

Our next set of studies sought to explore the underlying process (hypothesis 3). If it is true that temporal separation between budget setting and purchase can increase people's spending relative to their budgets by reducing the pain associated with the purchase, then the effect should be stronger under conditions in which people naturally feel a high level of pain of payment, and weaker under conditions in which people naturally feel a low level of pain of payment. To test this, we employ three operationalizations of natural differences in high versus low pain of payment: individual differences (study 3), product-based differences (study 3b), and cost-based differences (study 4). The budget depreciation process also implies that adaptation to the budgeted amount of money is a necessary condition. In study 5, we explore whether inhibiting the ability to adapt to the budgeted cost mitigates the effect. These studies collectively help to provide evidence consistent with the proposed process and address alternative explanations, although we recognize that the effect is likely to be multiply determined.

STUDY 1: INCREASED TEMPORAL SEPARATION IS ASSOCIATED WITH OVERSPENDING FOR REAL ESTATE PURCHASES

The purpose of study 1 was to explore the effect of temporal separation on budget adherence in a real-world context. Buying a house is one of the largest purchases that consumers will ever make in their lives (Thakor 2010), and most consumers will need to set a budget for an expense of this size. Given the significance of home ownership to consumer financial well-being, we selected this domain to begin our examination of the relationship between temporal separation in budgeting and consumers' willingness to overspend. We collected transaction data from a real estate firm. We predicted that real estate buyers will be increasingly likely to spend more than their original budget as they experience greater temporal separation between the time they set a budget for their real estate purchase and the time they make the purchase decision.

Data

Real estate transaction data were collected from the client management software and transaction journals of a local real estate office for the period from January 2018 to September 2019. We collected the following pieces of

information for 103 transactions: (1) temporal separation between budget setting and purchase, (2) budgeted spending range, (3) actual spending amount, (4) age of the buyer, and (5) gender (web appendix C table 1 provides descriptive statistics). We did not have access to data on offers that were made prior to purchase, nor were we given data regarding clients who did not make a purchase.

Analysis

The budget depreciation process implies that temporal separation increases overspending and that this occurs via higher actual spending rather than lower budgeted spending. We ran the following regression model for transaction i, using a log–log transformation for spending and temporal separation to account for the positively skewed distribution (web appendix C table 3 provides Kolmogorov–Smirnov tests):

$$\ln(\text{Spending}_i) = \beta_0 + \beta_1 \ln(\text{Temporal Separation}_i) + \beta_2 \text{Age}_i + \beta_3 \text{Female}_i + \beta_4 \text{Male}_i + \varepsilon_i$$

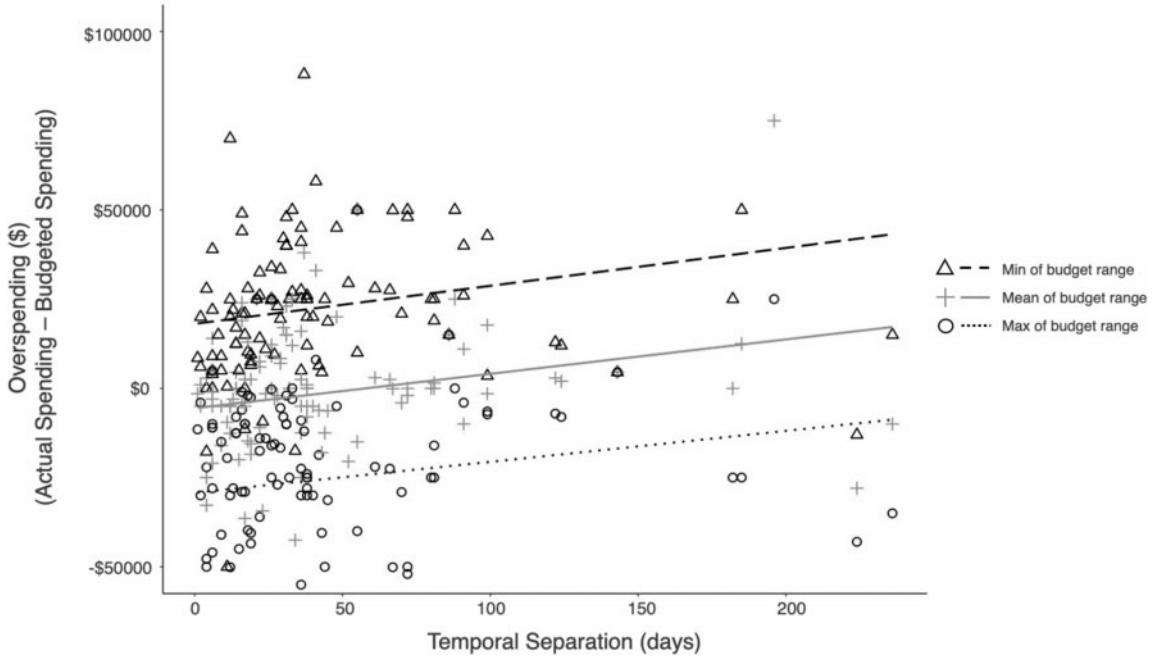
The dependent variable, Spending_i, was either overspending, actual spending, or budgeted spending. Overspending was calculated by taking the difference between ln(actual spending) and ln(budgeted spending). Because budgets were provided in a range, we used three different measures of budgeted spending (minimum, mean, and maximum). $\text{Temporal Separation}_i$ was calculated by counting the number of days between the date when buyers first contacted the real estate office to provide their budget range and the date of their purchase decision. We also included controls for Age_i (to the nearest decade) and gender (dummy variables for three categories: Female_i = single female and Male_i = single male, omitted category is both genders/couples). In web appendix C table 4, we report analyses excluding the control variables; results are directionally consistent.

Results

Overspending. Controlling for age and gender, we observe that as temporal separation increases by 1%, the amount of actual spending relative to budgeted spending increases by 0.016% if using the minimum of the budget range ($t(98) = 1.97$, $p = .052$), by 0.018% if using the mean of the budget range ($t(98) = 2.33$, $p = .022$), and by 0.019% if using the maximum of the budget range ($t(98) = 2.00$, $p = .048$). Figure 1 depicts a scatterplot of overspending in dollars and table 1 provides estimation results.

FIGURE 1

STUDY 1: OVERSPENDING INCREASES WITH TEMPORAL SEPARATION IN BUDGETING



NOTES.—Using real estate transactions, we observe that as temporal separation between the moment of budgeting and purchase increases, the willingness to spend relative to the budget also increases. Although data were analyzed using log–log transformations, they are plotted here in untransformed dollars and days for ease of interpretation.

TABLE 1

STUDY 1: THE EFFECT OF TEMPORAL SEPARATION ON OVERSPENDING, BUDGETED SPENDING, AND ACTUAL SPENDING

	Overspending (actual—budgeted)			Budgeted spending			
Budget range	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Actual spending
Temporal Separation	0.016*	0.018**	0.019**	0.068	0.067	0.066	0.085*
Age	0.000	−0.001	−0.001	0.003	0.003	0.004	0.003
Female	0.015	0.018	0.020	−0.132	−0.136	−0.138	−0.118
Male	−0.017	−0.012	−0.009	−0.717***	−0.722***	−0.725***	−0.734*
Intercept	0.035	−0.026	−0.083*	12.189***	12.250***	12.306***	12.224***

NOTES.—Table provides estimation results for the effect of temporal separation. *$p < .10$, **$p < .05$, ***$p < .01$. Detailed statistics are in web appendix C table 5.

Web appendix C figure 1 provides a scatterplot of overspending as a percentage.

Budgeted Spending. Controlling for age and gender, we find that temporal separation does not significantly predict budgeted spending, regardless of whether we use the minimum, mean, or maximum of the budget range ($ps > .12$, see table 1). This suggests that the relationship between temporal separation and overspending is not driven by lower budget estimates.

Actual Spending. Controlling for age and gender, we observe that as temporal separation increases by 1%, the amount of actual spending increases by 0.085% ($t(98) = 1.97$, $p = .052$; see table 1). These results suggest that the relationship between temporal separation and overspending may be driven by higher actual spending.

Discussion

Using a secondary dataset of real estate purchases, we observe that as temporal separation between budget setting and purchase date increases, people increasingly spend more money relative to their budgets. Furthermore, we find that more temporal separation is associated with higher actual spending, but not lower budgeted spending, which is consistent with the budget depreciation process.

There are several limitations to this dataset. First, the correlational nature of this data does not allow for causal conclusions. It may be that people who are very interested in real estate are both more likely to take more time before making a purchase decision, and to overspend their budget once they make a decision. To test for causal effects of temporal separation on increased spending, our next study is a field experiment in which we randomly assigned people to experience longer or shorter amounts of temporal separation. Second, this study does not provide conclusive evidence for the budget depreciation process. It may be that temporal separation causes higher spending because the need to close a deal becomes more urgent as time passes, and this urgency increases willingness to pay. We explore evidence for the budget depreciation process in studies 3–5.

STUDY 2: TEMPORAL SEPARATION INCREASES OVERSPENDING FOR A CLASS RING

The purpose of study 2 was to explore the causal effect of temporal separation on budget adherence in a field study using random assignment. We investigate a realistic and relatable context for the student population participating in our study: budgeting for their class ring. We contacted undergraduate students and randomly assigned them to budget for their ring either 10 weeks in advance of their purchase, or 3 weeks in advance of their purchase. Afterwards, we observe how much money they spent on their ring purchase.

The class ring field setting was beneficial for several reasons. First, at the university where this study was conducted, over 90% of the undergraduate students purchase a class ring, suggesting that this would be a relevant expense for many students. Second, the rings are a sizeable expense, suggesting that budgeting for a class ring would be a relevant activity for many students. The rings designed for female students ranged from $512 to $859, while male rings ranged from $1,013 to $1,892. Because the male rings were twice as expensive as the female rings, we report separate analyses by gender.

Design and Procedure

Participants. Study 2 was conducted during the period between November 2018 and February 2019. As students typically order their rings during their junior year, we sent out a bulk email to junior class students ($N = 10{,}438$) at a US university. This study was a three-phase field experiment. All participants were contacted in phases 1 and 2 and were randomly assigned to set a budget for their ring in phase 1 (from November 5–10, 2018) or phase 2 (from December 17–21, 2018) depending on the temporal separation manipulation. We matched the expense records of our

survey participants in phase 3 after the ring order window had closed (February 13, 2019).

Phase 1 Procedure. Among those who received the email, 1,742 participants completed phase 1 (16.7% response rate). In phase 1, participants first provided demographic information, including age and gender. All participants were then asked to report ring-specific details including whether they (1) already owned the ring at the time of taking the survey, (2) were interested in buying the ring, and (3) were eligible to buy the ring during the indicated ring order window. Students who already owned a ring, or were not interested in buying a ring, or were not eligible to purchase a ring during the upcoming order window were removed from our study ($N = 648$), leaving 1,094 participants in our study.

These participants were then randomly assigned to either set a budget 10 weeks prior to purchase (i.e., distant past condition) or 3 weeks prior to purchase (i.e., near past condition). Those in the 3-week condition were reminded to participate in phase 2 and then dismissed.

Those in the 10-week condition were asked to set a budget for their ring purchase. Participants were shown a set of ring options, including two gold options and four diamond options. After selecting their options, they set a budget for their ring purchase by entering the cost of the gold and diamond options into a text box that automatically calculated the total cost back for the participants. They were reminded to participate in phase 2 and then dismissed.

At the university where this study was conducted, the rings designed for female and male students differ in size and price. Students were shown the actual options and prices for their gender. Female rings ranged from $512 to $859, while male rings ranged from $1,013 to $1,892 (see web appendix D figure 1 for stimuli for the female students).

Phase 2 Procedure. Seven hundred eight participants returned for the second phase of the study (64.7% response rate). A binary logistic regression predicting dropout by a 1 *df* treatment effect showed no differential dropout between conditions (Wald $\chi^2(1) = .51$, $p = .48$).

Participants in the 3-week condition were asked to set a budget to purchase their ring using the same budgeting task that those in the 10-week condition did during phase 1. Participants in the 10-week condition provided demographic information and were reminded of how much they had budgeted in phase 1. This reminder was provided to minimize the possible alternative explanation that participants in the 10-week condition simply forgot how much they had budgeted and thus spent more relative to their budgets.

Phase 3 Procedure. During the designated ring order window (January 7 to February 13, 2019), 461 participants chose and paid for their class rings (81.1% female, $M_{age} = 20.49$). They also had options to join an alumni charity club for $25 and to choose shipping for $20. We obtained individual payment data from the university organization where students placed their ring orders. The number of participants who paid for a class ring did not differ significantly between conditions (Wald $\chi^2(1) = .98$, $p = .32$).

Results

During the period between budget setting and the time when students placed their ring order, the price of the gold options increased. For female rings, prices increased from $512 to $522 for the 10k option and from $617 to $630 for the 14k option. For male rings, prices increased from $1,013 to $1,037 for the 10k option and from $1,373 to $1,405 for the 14k option. We added the increased price into the budget amount in our analyses to reflect this change. For example, if a participant reported budgeting $1,013 for the gold option, we replaced that number with $1,037 to reflect the new increased pricing in our analyses. Because of the large difference in price ranges for the female and male rings, we ran separate analyses by gender. We report descriptive statistics in web appendix D table 2.

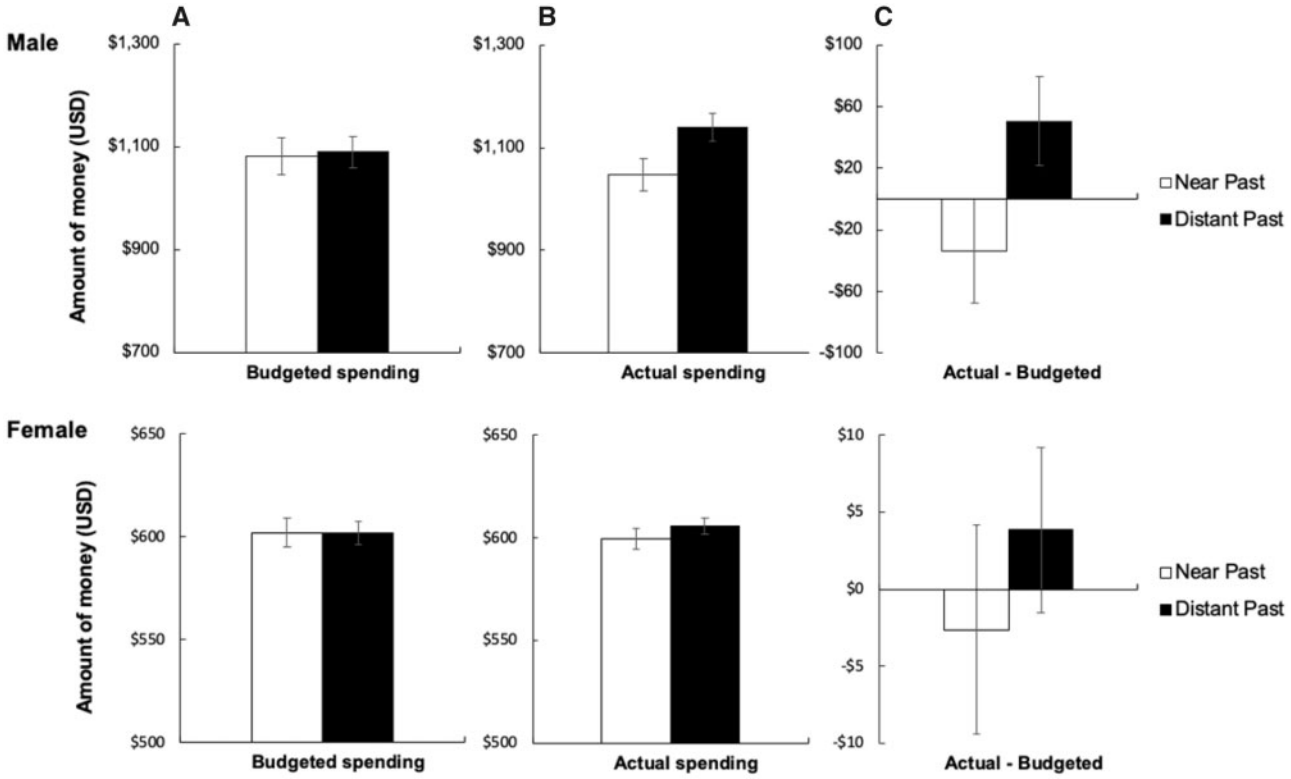
Overspending. We calculated overspending as the amount spent in phase 3 minus the amount budgeted in phase 1 or 2. Male participants who experienced the 10-week (i.e., distant past) temporal separation were more willing to overspend ($M_{10\ weeks} = \$60.03$, SD = 238.15) than those who experienced the 3-week (i.e., near past) temporal separation ($M_{3\ weeks} = -\$33.80$, SD = 204.77; $F(1, 85) = 3.87$, $p = .052$, partial $\eta^2 = .044$). Female participants in the distant past condition were directionally more willing to overspend than those in the near past condition, but the difference was not statistically significant ($M_{10\ weeks} = \$4.35$, SD = 50.32 vs. $M_{3\ weeks} = -\$2.64$, SD = 61.28; $F(1, 372) = 1.47$, $p = .226$, partial $\eta^2 < .001$, see figure 2). Web appendix D table 3 reports the proportion of participants who overspent their budgets by condition.

Budgeted Spending. To explore the possibility that people who started budgeting early overspent because their budgets were lower, we compared the budget amounts by temporal separation condition. The amount budgeted did not differ based on temporal separation for both males ($M_{10\ weeks} = \$1,127.31$, SD = 187.98 vs. $M_{3\ weeks} = \$1,080.78$, SD = 124.27; $F(1, 85) = 1.93$, $p = .168$, partial $\eta^2 = .022$) and females ($M_{10\ weeks} = \$609.67$, SD = 72.35 vs. $M_{3\ weeks} = \$602.04$, SD = 72.21; $F(1, 372) = 1.03$, $p = .310$, partial $\eta^2 = .003$).

Actual Spending. Next, we compared the actual expense amount between conditions. Male participants who experienced a 10-week separation spent significantly more than those who experienced a 3-week separation ($M_{10\ weeks} = \$1,187.33$, SD = 271.20 vs. $M_{3\ weeks} = \$1,046.98$, SD =

FIGURE 2

STUDY 2: BUDGETED SPENDING, ACTUAL SPENDING, AND THEIR DIFFERENCES BY TEMPORAL SEPARATION



NOTES.—Compared to people who were randomly assigned to experience a 3-week separation (i.e., near past) between budgeting and purchasing, people who experience a 10-week separation (i.e., distant past) budgeted for a similar amount of money (A) but spent more money (B). Consequently, those in the distant past condition spent more relative to their budget than those in the near past condition (C).

212.69; $F(1, 85) = 7.31$, $p = .008$, partial $\eta^2 = .079$). Similarly, female participants in the distant past condition spent more than those in the near past condition ($M_{10\ \text{weeks}}$ = \$614.02, SD = 78.05 vs. $M_{3\ \text{weeks}}$ = \$599.40, SD = 63.10; $F(1, 372) = 3.87$, $p = .050$, partial $\eta^2 = .010$).

We also compared actual spending within each budgeting condition to those who were not in our study ($N = 6{,}293$). For males, untreated students spent directionally more money ($M_{\text{untreated}}$ = \$1,094.22, SD = 240.52) than near past budgeters ($M_{3\ \text{weeks}}$ = \$1,046.98, SD = 212.69; $F(1, 3051) = 1.94$, $p = .164$, partial $\eta^2 = .001$), and significantly less than distant past budgeters ($M_{10\ \text{weeks}}$ = \$1,187.33, SD = 271.20; $F(1, 3051) = 5.33$, $p = .021$, partial $\eta^2 = .002$). The results for females were directionally similar. Although each pairwise comparison was not statistically significant, untreated students spent directionally more money ($M_{\text{untreated}}$ = \$605.05, SD = 89.14) than near past budgeters ($M_{3\ \text{weeks}}$ = \$599.40, SD = 63.10, $F(1, 3697) = .68$, $p = .411$, partial $\eta^2 < .001$), and directionally less money than distant past budgeters ($M_{10\ \text{weeks}}$ = \$614.02, SD = 78.05, $F(1, 3697) = 2.01$, $p = .156$, partial $\eta^2 = .001$).

Discussion

We observed that male students who were randomly assigned to experience greater temporal separation between budget setting and purchase for a class ring were more willing to overspend their budgets. Consistent with study 1, the difference in overspending was driven by differences in actual spending, and not by differences in budgeted spending. For female students, we also observe that greater temporal separation leads to higher actual spending, but not higher budgeted spending. We find that the effect of temporal separation on the overspending measure is directionally consistent with our hypotheses, although not statistically significant.

In contrast to study 1, study 2 provides causal support for the effect of temporal separation via random assignment. Study 2 also addresses concerns about some

plausible alternative explanations. First, budgeting further in advance may lead to overspending because people simply forget about the budgeted amount. To mitigate this concern, we provided a reminder of the budgeted amount. Second, greater temporal separation in budgeting can cause overspending because product prices usually increase over time. In this study however, we were able to exactly account for the size of price inflation in the budget estimates, allowing us to address concerns about price inflation driving the effect. Third, greater temporal separation in budgeting may produce greater variance in budget adherence because budgets set in the distant past are less relevant to current conditions than budgets set more recently. However, this obsolescence would not predict a particular direction of spending, as budgets may be obsolete because they were set too low or too high.

Study 2 also allows for comparison with untreated students. Untreated students spent directionally more than those who budgeted 3 weeks in advance and directionally less than those who budgeted 10 weeks in advance (though not always statistically significant). We surmise there may be several explanations for this result. One possibility is that untreated students engaged in budget setting of their own accord, at a time interval between 3 weeks and 10 weeks prior to purchase. This could cause spending to lie in the middle of the two budgeting conditions. Another possibility is that untreated students did not budget at all. In this case, there may be two competing forces at play. One is that not budgeting at all decreases spending relative to any budgeting because non-budgeters do not have the opportunity to adapt to the upcoming expense and hence feel the highest pain of payment. The other prediction is that not budgeting at all increases spending relative to any budgeting because having no budget allows people to spend without limitation. It may be that both forces are active in this study, leading non-budgeters' spending to be in between that of the distant and near past budgeters.

There are several limitations to note in this study. One limitation is the low response rate; only 16.7% of the people we initially contacted responded to our bulk email, and only 26.5% of those who responded actually completed all phases of the study. We attribute this low response rate to the longitudinal, multi-phase nature of our experiment.

Another important caveat is that the effect of temporal separation on overspending was statistically significant for males, but not for females. We speculate that this may be due to female participants experiencing less pain of payment than male participants. There are two reasons why this might occur. One reason is that the price of the male rings ($1,013–1,892) was approximately twice as high as the price of the female rings ($512–859). Purchasing the male rings may thus elicit greater pain of payment than the female rings. We explore the role of price in budget depreciation in study 4.

A second reason is that there are gender-based differences in the tendency to experience pain of payment. Prior research on tightwads and spendthrifts (Rick, Cryder, and Loewenstein 2008) has shown that females tend to report higher levels of spendthriftiness than males. Given that spendthrifts generally feel less pain of payment, female participants in our study may have experienced less pain of payment than male participants. Because there is less pain to be mitigated, the impact of temporal separation on overspending may have been muted for females as compared to males. Our next study explicitly explores how individual differences in pain of payment moderate the effect of temporal separation.

STUDY 3: TEMPORAL SEPARATION INCREASES OVERSPENDING AMONG TIGHTWADS BUT NOT SPENDTHRIFTS

The goal of study 3 was to provide evidence for the underlying budget depreciation mechanism through mediation and moderation of process. There are chronic differences in the extent to which consumers experience pain of paying; tightwads experience more pain of paying, while spendthrifts experience less (Tightwads-Spendthrifts (TW-ST) scale, Rick et al. 2008). If decreases in pain of paying are truly driving the overspending behavior, then people who naturally experience higher pain of paying (i.e., tightwads) should find that temporal separation has a strong effect on pain and subsequent overspending. In contrast, people who do not typically experience much pain of paying (i.e., spendthrifts) should find that temporal separation does not have a strong effect on pain and, subsequently, will not change their willingness to overspend. Thus, we predict an interaction of temporal separation by TW-ST such that the effect of temporal separation on pain and overspending is stronger for tightwads and weaker for spendthrifts.

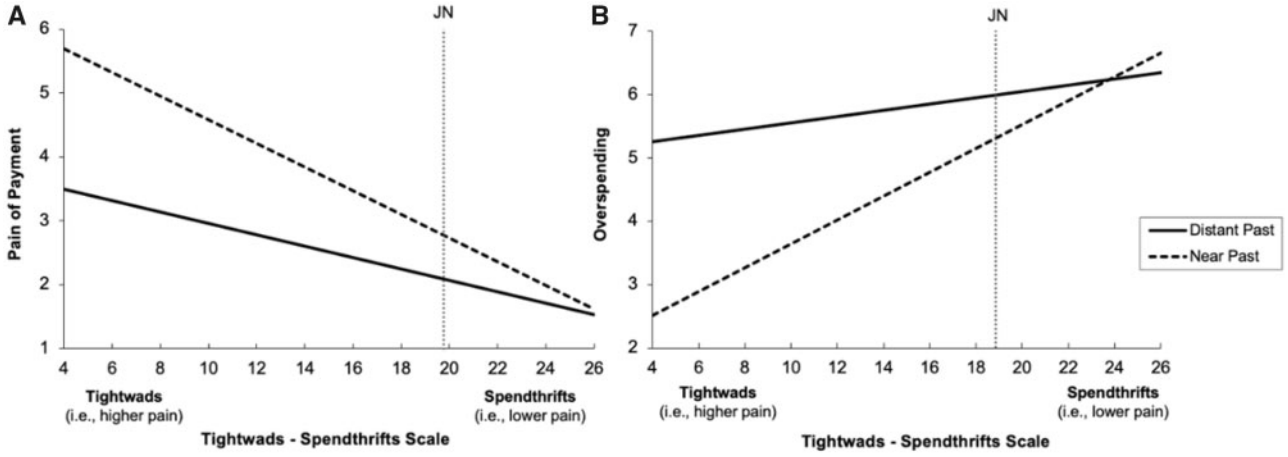
Design and Procedure

We recruited 169 participants from people who came to a university football game (47.6% female, $M_{age} = 39.0$, SD = 13.6). No response was removed prior to analysis.

Participants were asked to imagine that they budgeted $300 either 2 months ago (distant past) or 1-week ago (near past) to purchase a tablet PC. Participants then indicated how painful it would be to spend the $300 that were set aside to buy the tablet PC (1 = not painful at all, 7 = extremely painful). Next, they indicated their willingness to purchase a premium version of the tablet PC with additional storage space and longer battery life at $330 (1 = very unlikely, 7 = very likely) as a measure for overspending. Based on our observation in studies 1 and 2 that greater temporal separation generally increases spending, study 3 specifically focuses on overspending as the

FIGURE 3

STUDY 3: INTERACTION BETWEEN TW-ST AND TEMPORAL SEPARATION



NOTES.—Greater temporal separation leads to lower pain of payment (A) and more overspending (B) for tightwads but not for spendthrifts.

dependent variable. Afterwards, we assessed the tendency to experience pain of paying using the TW-ST scale (ranges from 4 to 26) from Rick et al. (2008): 21.3% were tightwads, 56.2% were unconflicted, and 22.5% were spendthrifts. Participants also reported demographic information.

Results

Overspending. We ran a regression with temporal separation (0 = near past or 1 week, 1 = distant past or 2 months), TW-ST score ($M = 15.14$, SD = 4.68), and their interaction term as predictors, and overspending as the dependent variable. We observe a significant interaction between temporal separation and TW-ST score on overspending ($b = -0.14$, SE = 0.06, $t(165) = -2.41$, $p = .017$; figure 3B). A floodlight analysis (Spiller et al. 2013) revealed that for all TW-ST scores below the Johnson–Neyman point of 18.85, greater temporal separation significantly increases willingness to overspend. Thus, the effect of temporal separation on increasing overspending is significant for tightwads (scores of 4–11) and unconflicted consumers (scores of 12–18), but not spendthrifts (scores of 19–26).

Pain of Payment. A regression with temporal separation, TW-ST score, and their interaction term as predictors, and pain of payment as the dependent variable, revealed a marginally significant interaction ($b = 0.10$, SE = 0.05, $t(165) = 1.81$, $p = .072$; figure 3A). A floodlight analysis revealed that the simple effect of temporal separation on pain of payment was significant for all TW-ST scores below the Johnson–Neyman point of 19.74. Thus, the effect of temporal separation on reducing pain of payment is significant for tightwads (scores of 4–11) and unconflicted consumers (scores of 12–18), but not for spendthrifts (scores of 19–26).

Mediation. To further test the role of pain of payment in the relationship between temporal separation and overspending, a moderated mediation analysis was conducted; temporal separation (0 = near past or 1 week, 1 = distant past or 2 months) was the independent variable, mean-centered TW-ST score was the moderator, pain of payment was the mediator, and overspending was the dependent variable. The analysis (model 8; Hayes 2017) suggests moderated mediation ($b = -0.04$, SE = 0.02, 95% CI: [−0.10, −0.0010]; see web appendix E table 2 for full results). Decreased pain of payment mediated the effect of greater temporal separation on increasing overspending for people with TW-ST scores 1 SD below the mean ($b = 0.68$, SE = 0.21, 95% CI: [.33, 1.11]) and at the mean ($b = 0.51$, SE = 0.15, 95% CI: [0.24, 0.82]), but not for people with TW-ST scores 1SD above the mean ($b = 0.30$, SE = 0.16, 95% CI: [−0.02, 0.64]).

Discussion

Study 3 examines individual differences in experiencing pain of payment, represented as tightwads versus spendthrifts, as a boundary condition to the effect of temporal separation on spending decisions. We replicated the effect that, among tightwads and unconflicted consumers, setting a budget in the distant past (i.e., 2 months) compared to the near past (i.e., 1 week) increases willingness to overspend. This effect was mediated by a reduction in the pain

associated with spending money. The effect did not occur for spendthrifts, who generally feel little pain upon spending money. Together, these findings lend support for the mediating role of pain of payment on the effect of temporal separation.

These results also help to provide insight on our study 2 finding that the effect of temporal separation on overspending was significant for males but not for females. It is possible that, consistent with prior research (Rick et al. 2008), the female students in study 2 tended more toward spendthriftiness than male students and generally felt less pain associated with spending.

In study 3, we examined how individual differences in pain of payment moderate the effect of temporal separation. There are also product differences that can impact pain of payment. Hedonic products are often more difficult to justify than utilitarian ones (Okada 2005) and elicit more guilt and negative self-attributions (Khan and Dhar 2006). This suggests that the pain associated with hedonic products may be higher than the pain associated with utilitarian products and that the effect of temporal separation may thus be stronger for hedonic than utilitarian products. Study 3b (reported in web appendix F), using a similar experimental paradigm, confirms that consumers are more willing to overspend when budgeting in the near versus distant past for hedonically framed products, but not for utilitarian framed products.

The results from studies 3 and 3b imply that the majority of our participants have been tightwads or unconflicted consumers and that the stimuli used in our other studies are perceived to be hedonic. In two separate surveys conducted with students and MTurk workers, we observe that 90% of the undergraduate students and 85% of the MTurk workers sampled are indeed tightwads or unconflicted (see web appendix E). In a survey with MTurk workers, we find that the stimuli used in other studies are perceived as hedonic in nature (see web appendix F table 2).

Findings in studies 3 and 3b help address several alternative process accounts. One alternative explanation is that temporal separation in budgeting increases spending because greater temporal distance encourages a focus on desirability (i.e., high construal level), which leads to increased willingness to spend extra money for a desirable product (Trope and Liberman 2010). A second explanation is that when people have spent a long time waiting and saving up their money for a purchase, they feel proud and feel that they deserve to reward themselves by purchasing a premium product (Kivetz and Simonson 2002; May and Irmak 2014). A third potential process is that people who have begun budgeting for a product further in the distant past feel more attached to the product, and perhaps even feel that they have owned the product (Shu and Peck 2011) for a longer period of time. This increased perception of ownership over time may increase valuation of the product (Strahilevitz and Loewenstein 1998) and, thus, increase willingness to spend. A fourth alternative suggests consumers infer that purchases that have been budgeted for further in advance are more important and thus are more deserving of being upgraded. Finally, one might also predict that anticipation of the purchase increases over time (Loewenstein 1987; Nowlis, Mandel, and McCabe 2004) and drives those who have experienced greater temporal separation to spend more.

While the effect of temporal separation is likely a multiply determined phenomenon, and each of the aforementioned alternative processes may very well occur in real life, it appears that the budget depreciation process is most consistent with the results observed in this study. Each of the aforementioned alternative explanations would predict that greater temporal separation increases overspending for all participants equally. However, we observed overspending only among tightwads and unconflicted consumers, and not among spendthrifts. Furthermore, the effect of temporal separation is mediated by pain of payment. That we observe overspending for hedonic products but not for utilitarian products in study 3b is also consistent with the budget depreciation account.

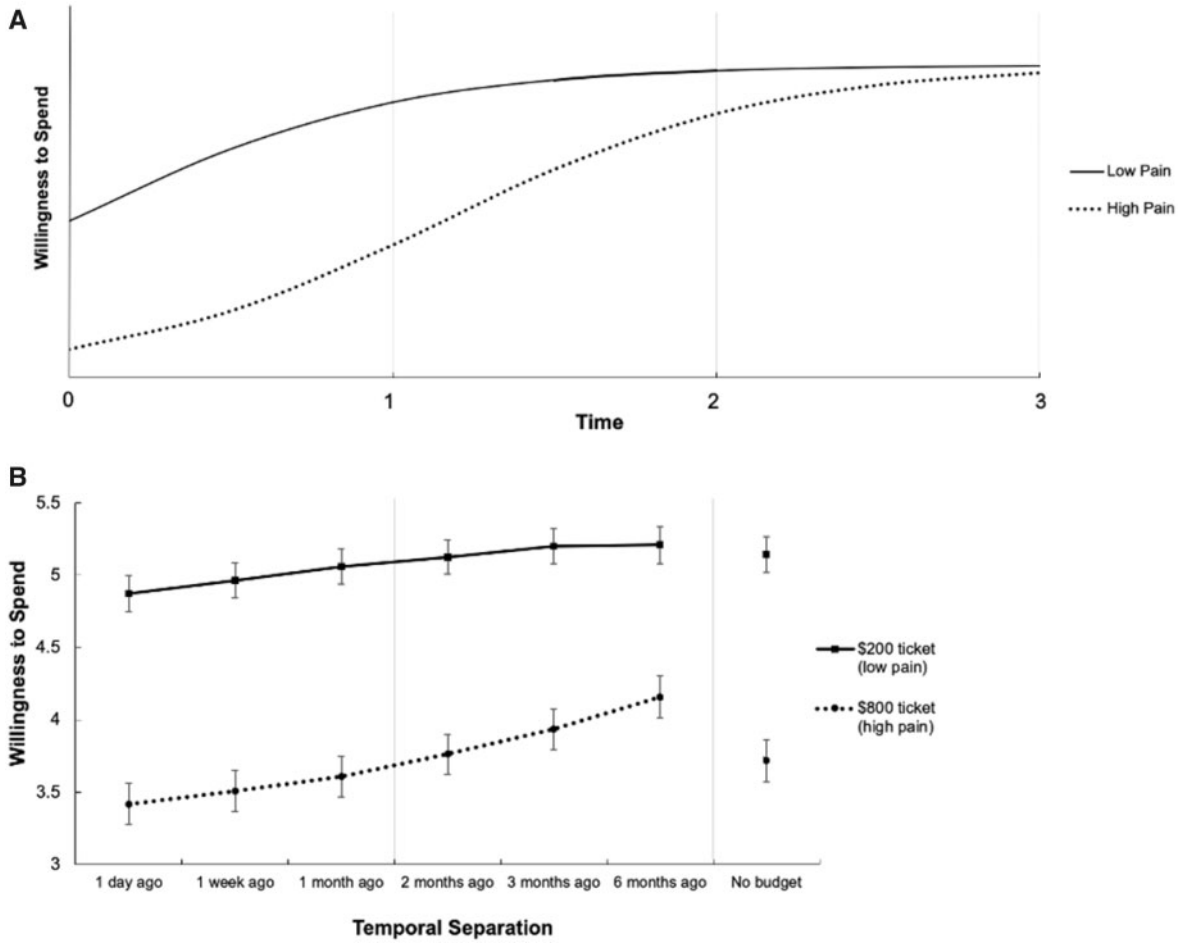
Thus far, we have operationalized the near versus distant past using various time frames: a continuous range from 1 to 236 days (study 1), 3 weeks versus 10 weeks (study 2), and 1 week versus 2 months (pilot study, study 3, study 3b). Given these differences, one might wonder how much time is needed to constitute the near versus distant past. We explore this, and the role of price, in our next study.

STUDY 4: BUDGET DEPRECIATION TAKES LONGER FOR HIGHER PRICE PURCHASES

The budget depreciation process suggests that willingness to overspend increases over time because pain of payment dissipates over time. After enough time has passed, pain of payment should reach a floor level and willingness to spend should reach a ceiling level. We propose that the amount of time this takes depends on the amount of pain that one initially feels. Figure 4A illustrates the shape of the proposed function for a low pain, and a high pain purchase. For the low pain purchase, as time initially passes (from t_0 to t_1), pain of payment decreases and willingness to spend increases. As more time passes (from t_1 to t_2 to t_3), pain reaches a floor level and willingness to spend reaches a ceiling level. For purchases that elicit high pain, the depreciation process is longer; pain decreases, and willingness to spend increases over the span of time from t_0 to t_2. It is not until after t_2 that pain begins to bottom and willingness to spend begins to plateau for the high pain purchase. The amount of temporal separation that results in differential willingness to overspend is thus longer for high pain purchases (t_0 to t_2) than for low pain purchases (t_0 to

FIGURE 4

STUDY 4: THE EFFECT OF TEMPORAL SEPARATION AS A FUNCTION OF PURCHASE PRICE



NOTES.—Willingness to spend initially increases with greater temporal separation, and eventually plateaus. The time it takes for this to occur is longer for high pain expenses than low pain expenses. (A) The proposed shape of the function over time. (B) The data points from study 4.

t_1), resulting in different manifestations of "near" versus "distant" past.

In our prior studies, we measured high and low pain via individual differences (tightwad vs. spendthrift in study 3) and manipulated it via product differences (hedonic vs. utilitariation products in study 3b). Our operationalizations of temporal separation were calibrated to coincide conceptually with t_1 and t_2 in figure 4A, amounts of temporal separation that would elicit an increase in willingness to spend for the high pain situation, but where willingness to spend will have already plateaued for the low pain situation. Pain of payment should also be influenced by the price of a product, in terms of both absolute price, and price relative to one's reference price. For example, spending $1,000 on a ring feels more painful than spending $500 on a ring. However, spending $100,000 for a house might not feel extremely painful if one expects that houses typically cost at least $100,000.

In this study, we explore the time course of budget depreciation for a high and low pain product. We manipulate pain using a high versus low price and explore how willingness to spend changes over six points in time ranging from 1 day to 6 months. These amounts of temporal separation were chosen to correspond conceptually with t_0 to t_2 in figure 4A, and with the operationalizations of temporal separation used in the prior studies.

Design and Procedure

We recruited 243 participants from Amazon Mechanical Turk (49.0% female, M_{age} = 39.26, SD = 12.49) and removed 13 participants who failed the reading check.

TABLE 2

STUDY 4: WILLINGNESS TO SPEND AS A FUNCTION OF TEMPORAL SEPARATION AND PRICE

Temporal separation	1 day	1 week	1 month	2 months	3 months	6 months	No budgeting
$200 ticket	4.86[a] (1.98)	4.95[b] (1.89)	5.04[b,c] (1.89)	5.12[c] (1.88)	5.19[c] (1.88)	5.20[c] (1.99)	5.13[c] (1.94)
$800 ticket	3.38[d] (2.23)	3.45[e] (2.18)	3.56[f] (2.18)	3.73[g] (2.18)	3.90[h] (2.19)	4.14[i] (2.28)	3.69[g] (2.23)

NOTES.—Mean willingness to spend by temporal separation and price. Standard deviation is given in parentheses. Means that do not share a common letter are significantly different ($p < .05$).

TABLE 3

STUDY 4: THE EFFECT OF TEMPORAL SEPARATION AS A FUNCTION OF PURCHASE PRICE

Temporal separation		Mean difference in willingness to spend for distant versus near past			
Near past	Distant past	$200 ticket	$800 ticket	Interaction *F*	Interaction *p*
1 day ago	1 week ago	0.096**	0.070**	0.26	.608
1 week ago	1 month ago	0.091*	0.109***	0.12	.729
1 month ago	2 months ago	0.078	0.174***	1.94	.165
2 months ago	3 months ago	0.065	0.165***	3.59	.059
3 months ago	6 months ago	0.009	0.239***	14.36	<.001

NOTES.—Mean difference in willingness to spend for distant versus near past is calculated as: willingness to spend in distant past minus willingness to spend in near past. Interaction statistics indicate whether this difference differs significantly for the $200 ticket versus the $800 ticket. *$p < .10$, **$p < .05$, ***$p < .001$.

This study used a 2 (purchase size: $200 vs. $800) × 7 (temporal separation levels: 1 day vs. 1 week vs. 1 month vs. 2 months vs. 3 months vs. 6 months vs. no-budget control) within-subject design. In the six temporal separation scenarios, participants were asked to imagine that they had budgeted $200 for a ticket to a post-season Major League Baseball (MLB) game or $800 for a ticket to a World Series MLB game 1 day, 1 week, 1 month, 2 months, 3 months, or 6 months ago. No budget information was provided for the no-budget control. Participants indicated their willingness to upgrade their ticket by adding $20 for the $200 purchase or $80 for the $800 purchase (1 = very unlikely to upgrade, 7 = very likely to upgrade).

Results

The data were analyzed in a repeated-measures ANOVA with ticket price ($200 vs. $800) as one factor, and temporal separation (1 day vs. 1 week vs. 1 month vs. 2 months vs. 3 months vs. 6 months vs. no-budget as control) as another factor. Table 2 reports willingness to spend for each amount of temporal separation separated by price.

The six different amounts of temporal separation in this study were chosen to align conceptually with t_0 to t_2 in figure 4A, and we plot the data from this study below it in figure 4B. We predicted that during the earlier time periods (i.e., t_0 to t_1), increases in temporal separation would result in higher willingness to spend for both the $200 ticket (i.e., low pain) and the $800 ticket (i.e., high pain). For the later time periods (i.e., t_1 to t_2), increases in temporal separation would result in higher willingness to spend for the $800 ticket (i.e., high pain) only, as willingness to spend for the $200 ticket (i.e., low pain) will have already plateaued. To explore this pattern, we ran a set of planned contrasts comparing willingness to spend in the "near" versus "distant" past for each incremental amount of temporal separation. Table 3 reports the mean difference in willingness to spend for each operationalization of "near" versus "distant" past separately for the $200 ticket and the $800 ticket. The interaction statistics indicate whether the difference in willingness to spend between "near" versus "distant" past is significantly different for the $200 ticket versus the $800 ticket. For example, the first row represents the difference in willingness to spend when budgeting 1 day ago versus 1 week ago. For the $200 ticket, willingness to spend is higher in the distant past scenario ($M_{1\ \text{week ago}} = 4.95$, SD = 1.89) than in the near past scenario ($M_{1\ \text{day ago}} = 4.86$, SD = 1.98; $F(1, 229) = 3.95$, $p = .048$, partial $\eta^2 = .017$). For the $800 ticket, willingness to spend is also higher in the distant past scenario ($M_{1\ \text{week ago}} = 3.45$, SD = 2.23) than in the near past scenario ($M_{1\ \text{day ago}} = 3.38$, SD = 2.18; $F(1, 229) = 4.64$, $p = .032$, partial $\eta^2 = .020$). The difference in willingness to spend between the near and distant past scenario does not differ significantly between the $200 ticket ($M_{\text{difference}} = 0.096$) and the $800 ticket ($M_{\text{difference}} = 0.070$; $F(1, 229) = 0.26$, $p = .608$, partial $\eta^2 = .001$).

During the earlier time periods (t_0 to t_1 in figure 4A; 1 day ago, 1 week ago, and 1 month ago in figure 4B), people are more willing to spend as temporal separation increases from one time point to the next, for both the $200

ticket (i.e., low pain) and the $800 ticket (i.e., high pain). These increases in willingness to spend do not differ significantly between the two ticket prices (interaction $ps > .60$). For the later time periods (t_1 to t_2 in figure 4A; 1 month ago, 2 months ago, 3 months ago, 6 months ago in figure 4B), people are more willing to spend with increasing temporal separation for the $800 ticket (i.e., high pain), but not for the $200 ticket (i.e., low pain) as the willingness to spend for the $200 ticket (i.e., low pain) has already begun to plateau. The interaction of temporal separation by ticket price becomes statistically significant beginning at the 2-month time point (interaction $ps < .06$).

We also compare the effect of temporal separation in budgeting to not budgeting at all (see table 2 for means). For the $200 ticket (i.e., low pain), people were more willing to spend when not budgeting at all ($M = 5.13$) compared to budgeting 1 day ago ($M = 4.86$) or 1 week ago ($M = 4.95$; $ps < .01$ for both pairwise comparisons) and equally willing to spend compared to all the other time periods ($ps > .30$ for all pairwise comparison). For the $800 ticket, people were more willing to spend when not budgeting at all ($M = 3.69$) compared to budgeting 1 day ago ($M = 3.38$), 1 week ago ($M = 3.45$), or 1 month ago ($M = 3.56$; $ps < .05$ for all pairwise comparisons), equally willing to spend compared to budgeting 2 months ago ($M = 3.73$, $p = .55$) and less willing to spend compared to budgeting 3 months ago ($M = 3.90$) or 6 months ago ($M = 4.14$, $ps < .05$). Web appendix G table 1 provides further detail on these comparisons.

Discussion

Results from study 4 support the idea that budget depreciation takes longer for higher cost purchases. We observe that for an $800 purchase (i.e., high pain), willingness to spend increases as temporal separation increases from one time point to the next, starting from 1 day ago to 6 month ago. For a $200 purchase (i.e., low pain), however, willingness to spend increases from 1 day ago to 1 month ago, but reaches a plateau after that.

This is consistent with the pattern of results observed across our prior studies and helps to explain why, for a given instantiation of "near" versus "distant" past, a high pain purchase might show a difference in willingness to spend, while a low pain purchase might not. It also helps to shed light on our finding in study 2 that the effect of temporal separation on overspending was significant for males but not for females. It may be that budget depreciation takes longer for the higher priced male rings ($1,013–1,892) and that willingness to overspend for the lower priced female rings ($512–859) had already begun to plateau. Web appendix G provides further discussion on comparisons of temporal separation lengths across studies.

Study 4 also offers a comparison with not budgeting at all. We observe that willingness to upgrade when not budgeting is directionally higher than budgeting 1 day, 1 week, or 1 month ago, similar to budgeting 2 months ago, and directionally lower than budgeting 3 or 6 months ago. We speculate that, consistent with study 2, this may be a result of two countervailing forces. Not budgeting implies that the budget depreciation process cannot occur, which should decrease spending relative to any budgeting. On the other hand, not budgeting may imply an ability to spend without limitation, which should increase spending relative to any budgeting. The two processes may have combined such that willingness to upgrade for the no-budgeting scenario lies in between the "near" and "distant" past.

One limitation of this study is that, due to the scenario-based nature of this experiment, we are only able to assess people's lay beliefs about how pain of payment and willingness to spend would change, rather than capture people's actual feelings and purchase decisions. While studies 1 and 2 capture changes in actual purchase decisions, they did not assess pain of payment. To overcome this limitation, study 5 adopts an incentive-compatible experimental design to measure actual pain of payment and actual purchases.

While study 4 explored budgeting time frames spanning from 1 day to 6 months, we would expect this general pattern to occur even in very short time periods if the purchase cost is very low. We thus designed study 5 to manipulate temporal separation during a very short time period (1-hour-long laboratory session), using a very low cost purchase (in-laboratory credits for films).

STUDY 5: THE EFFECT OF TEMPORAL SEPARATION IS MITIGATED WHEN PEOPLE REPEATEDLY REASSESS THEIR BUDGETS

The goal of study 5 was to provide additional evidence for the underlying process with a consequential outcome variable, while addressing the limitations associated with scenario studies. Adopting a microcosmic and minimalistic simulation (Hsee et al. 2013; Shah, Mullainathan, and Shafir 2012), we simulate an individual's budgeting and purchasing process within the confines of the laboratory. Participants earn in-laboratory credits, budget for films they watch in the laboratory, and experience either a short or long wait period before making a consequential purchase.

The budget depreciation process implies that the ability to adapt to the budgeted amount of money is a necessary condition and that inhibiting the adaptation process should mitigate the effect of temporal separation on spending. One way to inhibit the adaptation process is to encourage people to repeatedly deliberate on and reconsider their budgeted spending.

In our prior studies, we assumed that the budgeting decision is closed after the budget is set; after people set their budget, they feel that they have made a decision to spend that amount of money. However, people do not always experience choice closure and may not consider the decision phase complete, even after making a choice (Gu, Botti, and Faro 2013, 2018). People may revisit a decision and engage in further comparisons with forgone alternatives (Carmon, Wertenbroch, and Zeelenberg 2003). For those who constantly reevaluate their budget decision, completion of the decision phase is postponed until they stop reevaluating that decision.

In study 5, we randomly assign participants to repeatedly deliberate on their budget after the budget has already been set. This deliberation prolongs the budgeting decision, reducing the amount of temporal separation between the final budget and actual purchase, and suppressing hedonic cost adaptation. If budget depreciation is the underlying process, then those experiencing a long wait who are made to repeatedly deliberate on their budget should behave similarly to those who experience a short wait.

Design and Procedure

A total of 226 undergraduate students participated in this study. Fifteen participants were removed from the study due to a technical glitch causing the laboratory computers to crash, leaving 211 participants for analysis (37.4% female, $M_{age} = 20.80$, SD = 2.27). Participants were tested individually while seated in front of a computer screen wearing a headset (see figure A1 for a diagram of the experiment phases and web appendix H for the experimental design with visuals). Before starting the study, participants were told what to expect in each phase so that they could plan accordingly.

In phase 1 (i.e., earning credits), participants engaged in a credit-earning task. Participants were told they could earn 50, 100, or 150 credits based on the number of e's they could count in an article within 1 minute. In actuality, all participants received 100 credits.

In phase 2 (i.e., budgeting for films), participants set a budget for the number of credits they would like to allocate to film purchases during the experiment. Each film costs 30 credits for a 5 minute viewing. To ensure that participants were aware of the number of budgeted credits, the webpage showed a visual indicating how many credits they had budgeted and how many were left. To create an opportunity cost for their credit usage, participants were told that any credits not spent on films could be used to purchase computer games to play in the fifth phase of the laboratory session. After writing down their film budget, participants rated pain of payment at the moment of budgeting using a one-item measure: "when you think about the credits you have planned to spend on films, how much pain does this make you feel?" (1 = not painful at all, 7 = very painful; adapted from Morewedge et al. 2007). Pain of payment toward the budgeted money before experiencing temporal separation did not differ significantly ($M_{20\ minutes} = 2.06$, SD = 1.27 vs. $M_{5\ minutes} = 1.95$, SD = 1.33, $t(209) = -0.58$, $p = .562$).

Phase 3 (i.e., wait time period) manipulated temporal separation and budget deliberation. Participants were randomly assigned to one of the 2 (temporal separation: 20 minutes vs. 5 minutes) × 2 (budget deliberation vs. no-budget deliberation) experimental conditions. All participants were given crossword puzzles to complete on paper, while the information screen for the films was left open on the computer screen in front of them. This was designed to simulate what happens in life after a budget decision—a person can move on (by playing crossword puzzles), or they can continue to look up product information and deliberate on their decision.

To manipulate deliberation during the wait period, half of the participants were asked to reassess their budget five times during the wait period. Those waiting for 20 minutes reevaluated their budget every 4 minutes, while those waiting for 5 minutes reevaluated their budget every 1 minute. Thus, the final budget decision was made at the same time, regardless of temporal separation condition. After the final budget decision, participants reported on pain of payment.

In phase 4, participants used their credits to purchase and watch films. In phase 5, participants used their remaining credits to purchase and play games.

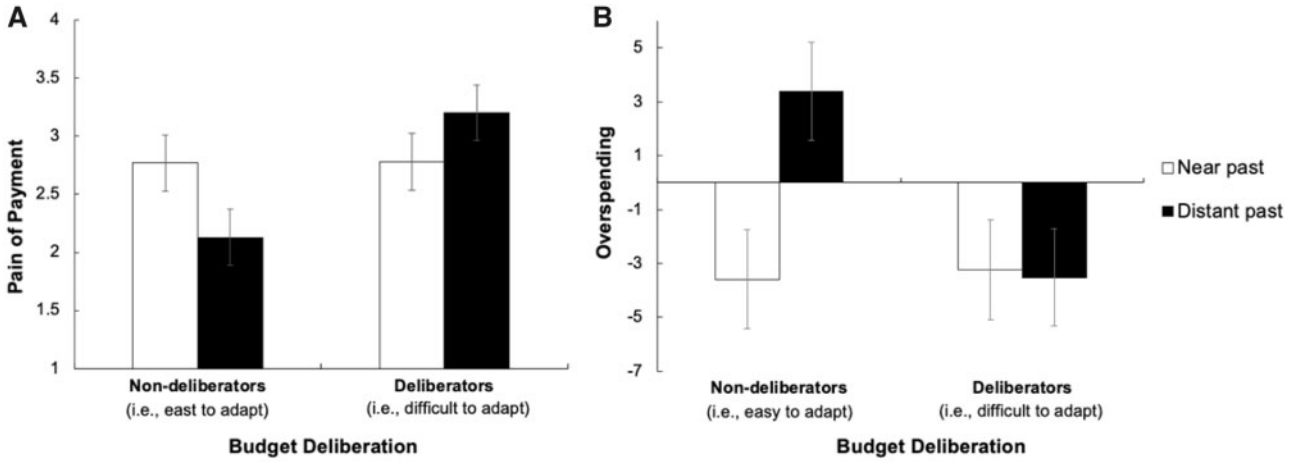
Results

Overspending. We calculated the simple difference between the final budget and the actual spending on film purchases as a measure for overspending. A two-way between-subjects ANOVA revealed a significant interaction between temporal separation and budget deliberation on willingness to overspend ($F(1, 207) = 3.94$, $p = .048$, partial $\eta^2 = .019$; figure 5B). For people who did not deliberate on their film budget during the temporal separation, greater temporal separation increased overspending ($M_{20\ minutes \times non\text{-}deliberators} = 3.40$, SD = 11.26 vs. $M_{5\ minutes \times non\text{-}deliberators} = -3.58$, SD = 9.63, $F(1, 207) = 7.25$, $p = .008$, partial $\eta^2 = .034$). However, for people who did deliberate and reassess their film budget during the temporal separation, temporal separation did not have a significant effect on overspending ($M_{20\ minutes \times deliberators} = -3.52$, SD = 13.48 vs. $M_{5\ minutes \times deliberators} = -3.24$, SD = 17.60, $F(1, 207) = .018$, $p = .893$, partial $\eta^2 < .001$). Proportions of participants spending over, on, and under budget are in web appendix H table 3.

Pain of Payment. A two-way between-subjects ANOVA revealed a significant interaction between temporal separation and budget deliberation on pain of payment ($F(1, 207) = 4.84$, $p = .029$, partial $\eta^2 = .023$; figure 5A).

FIGURE 5

STUDY 5: INTERACTION BETWEEN DELIBERATION AND TEMPORAL SEPARATION



NOTES.—Greater temporal separation leads to lower pain of payment (panel A) and higher overspending (panel B) only for those who do not deliberate on their budgets.

For people who did not deliberate on their film budget during the temporal separation, greater temporal separation marginally decreased pain of payment ($M_{20\ \text{minutes}\times\text{non-deliberators}} = 2.13$, SD = 1.44 vs. $M_{5\ \text{minutes}\times\text{non-deliberators}} = 2.77$, SD = 1.76, $F(1, 207) = 3.54$, $p = .061$, partial $\eta^2 = .017$). However, for people who deliberated on their film budget during the temporal separation, temporal separation did not have a significant effect on pain of payment ($M_{20\ \text{minutes}\times\text{deliberators}} = 3.20$, SD = 1.74 vs. $M_{5\ \text{minutes}\times\text{deliberators}} = 2.78$, SD = 2.02, $F(1, 207) = 1.50$, $p = .221$, partial $\eta_2 = .007$).

Mediation. To further test the role of pain of payment in the relationship between temporal separation and overspending, a moderated mediation analysis was conducted; temporal separation (near past or 5 minute gap = 0, distant past or 20 minute gap = 1) was the independent variable, budget deliberation (non-deliberators = 0, deliberators = 1) was the moderator, pain of payment was the mediator, and overspending was the dependent variable. The analysis (model 8; Hayes 2017) suggests moderated mediation ($b = -0.97$, SE = 0.71, 90% CI: [−2.24, −0.01], see web appendix H table 4 for full results). Greater temporal separation marginally increased willingness to overspend through lower pain of paying for people who were non-deliberators ($b_{\text{non-deliberators}} = 0.58$, SE = 0.46, 90% CI: [0.01, 1.43]), but not for people who were deliberators ($b_{\text{deliberators}} = -0.38$, SE = 0.42, 90% CI: [−1.14, 0.18]).

Budgeted Spending. We also compared the budgeted spending between conditions. A two-way between-subjects ANOVA did not find a significant interaction between temporal separation and budget deliberation conditions ($F(1, 207) = 2.41$, $p = .122$, partial $\eta^2 = .012$), nor were there any significant main effects of temporal separation ($F(1, 207) = 0.65$, $p = .422$, partial $\eta^2 = .003$) or budget deliberation ($F(1, 207) = 1.24$, $p = .268$, partial $\eta^2 = .006$; see web appendix H table 2 for additional details).

Actual Spending. Next, we compared the actual spending between conditions. A two-way between-subjects ANOVA found a marginally significant main effect of temporal separation such that, collapsing across deliberation conditions, greater temporal separation increased actual spending ($M_{20\ \text{minutes}} = 52.43$, SD = 20.23 vs. $M_{5\ \text{minutes}} = 46.44$, SD = 26.40, $F(1, 207) = 3.40$, $p = .066$, partial $\eta^2 = .016$). Unexpectedly, this main effect was not qualified by a significant interaction between temporal separation and budget deliberation conditions ($F(1, 207) = .20$, $p = .653$, partial $\eta^2 = .001$), suggesting that the effect of temporal separation on actual spending was similar across deliberation conditions. There was no main effect of deliberation condition ($p = .911$).

Discussion

Consistent with hypotheses 1 and 3, this study finds that those who experience greater temporal separation spend more relative to their budgets and that pain of payment mediates this effect, albeit at a 90% CI. For consumers who deliberate on and reassess their budget, pain of

payment remains high over time and consumers are unwilling to overspend.

We had predicted that the effect of temporal separation on overspending would be driven by changes in actual spending and not by changes in budgeted spending (hypothesis 2). While the observed results are directionally consistent with our prediction for the non-deliberators, they are inconsistent with our prediction for the deliberators. For deliberators, we hypothesized that temporal separation would have no effect on budgeted or actual spending, but we instead observe that greater temporal separation leads to a marginal increase in actual spending. To explore why this result may have occurred, we further analyzed the budgeted spending data for deliberators and find that greater temporal separation lead to a marginal increase in budgeted spending as well ($M_{20\ \text{minutes}\times\text{deliberators}} = 56.85$, SD = 22.13 vs. $M_{5\ \text{minutes}\times\text{deliberators}} = 49.12$, SD = 28.28; $p = .098$). In hindsight, we suspect that for deliberators, the increase in both budgeted and actual spending for the distant past condition may have been a result of an experimental artifact. It is possible that participants who anticipated being asked to reconsider their budget over 20 minutes felt a stronger need to justify their decisions than those who anticipated being asked to reconsider their budget over 5 minutes. This may have increased the desire to add slack to the budget, leading to higher budget estimates. It may also have increased the desire to appear consistent with the prior budget decision, leading to higher actual spending.

One may also wonder whether deliberators budgeted more in the distant past condition than the near past condition because of increased difficulty in estimation. In the pilot study, we found that when people set budgets for multiple expenses to occur over a duration of time, those who do so for the distant future set higher budgets than those who do so for the near future. Although participants in this study did indeed set a budget for multiple expenses (multiple films and multiple games), the consumption of these purchases occurred within a single consumption period for both the near and distant time conditions. As such, we do not believe that this difference was due to increased difficulty in estimation.

GENERAL DISCUSSION

Across a secondary dataset of real estate purchases, a field study, and three experiments, we explore the effect of temporal separation between the moment of budgeting setting and the moment of purchase. Contrary to popular belief that setting a budget far ahead of a purchase is most helpful, our findings reveal that when single-item budgets are set aside far in advance, consumers are more willing to overspend their budgets when it comes time to make the purchase.

Our first study explores this effect with a secondary dataset of consumer home purchases and finds that consumers spend more relative to their budgets as more time passes since they set those budgets. The difference in overspending across time is driven by differences in actual spending, and not by differences in budgeted spending.

Study 2 builds on the correlational evidence provided in study 1 by offering causal support in a field study setting. Students who were randomly assigned to set their class ring budget in the distant past budget a similar amount as those who set their class ring budget in the near past, but end up spending more. When analyzing the difference between actual and budgeted spending, we observe that male students are significantly more likely to overspend as temporal separation increases. Unexpectedly, this difference, while directional, is not statistically significant for female students. We speculate that this may result from males experiencing higher pain of payment than females because the price of the rings is higher for males than for females and because males tend to be higher in tightwaddism than females (Rick et al. 2008).

Our next studies provide evidence for the budget depreciation process. We demonstrate that the effect of temporal separation is most pronounced when people naturally experience high pain of payment. Study 3 shows the effect of temporal separation holds for tightwads (i.e., consumers who usually feel greater pain of paying) but not for spendthrifts (i.e., consumers who usually feel lower pain of paying) and is mediated by pain of payment. Study 3b (web appendix F) further shows that the effect of temporal separation holds for hedonic products (i.e., products that typically evoke greater pain of payment) but not for utilitarian products (i.e., products that typically evoke lower pain of payment). Study 4 explores the role of price in influencing what constitutes the "near" versus "distant" past. We propose that willingness to spend increases with time as people incorporate the budgeted purchase into their status quo and begins to plateau after enough time has passed. Results from study 4 suggest that the budget depreciation process takes longer for higher price purchases.

Study 5 provides further process evidence by manipulating the ability to adapt over time to the hedonic cost associated with payment. Using an experimental paradigm with consequential choices, we show that the effect of temporal separation on overspending is mitigated for those who repeatedly deliberate on their budgets and that this pattern of effects is mediated by pain of paying. We note a caveat in interpreting this result, the potential of an experimental artifact for those who were made to repeatedly deliberate on their budgets.

Future Directions

Comparisons to Not Budgeting At All. In study 2, untreated students spent directionally more than the near

past budgeters and directionally less than the distant past budgeters. In study 4, non-budgeters were more likely to upgrade their ticket purchase than budgeters in the near past but less likely to upgrade their tickets than budgeters in the distant past. We have speculated that there are two competing forces that drive spending in the non-budgeting conditions. Not budgeting may mean that one has not had any time at all to adapt to the upcoming expense, and hence experiences the highest pain of payment. This would lead to the lowest amount of spending. On the other hand, when not setting any budget at all, people might infer that they do not need to limit their spending, leading non-budgeters to spend the highest amount of money. The results we observe suggest a mix of these two forces. In future research, it would be interesting to explore when and why each is most dominant.

Multiply Determined Process. Throughout this article, we observe and provide evidence that greater temporal separation increases spending relative to the budget through decreased pain of payment. However, we recognize that this pattern of overspending is likely driven by multiple factors in real life, such as (1) memory decay, (2) price inflation, (3) focus on product desirability, (4) licensing effects, (5) perceived product ownership, (6) perceived importance, (7) increased anticipation, and (8) increased knowledge about the purchase. Although we observe evidence consistent with the pain of payment explanation, it would be worthwhile for future research to determine which other explanations are prevalent.

Relatedly, with the exception of study 1, we generally sought to manipulate and randomly assign the length of temporal separation between budgeting and spending to isolate the effect of temporal separation. In reality, people may endogenously select the length of temporal separation according to factors that increase the willingness to overspend. For example, consumers who have a strong preference for a product may be both more likely to start budgeting earlier for that product and to overspend their budget for that product. Future research could explore how consumers choose when to begin budgeting for an upcoming purchase.

Post-Purchase Emotions. Another interesting avenue would be to explore the affective consequences of overspending for those who budgeted further in advance. Researchers have documented post-purchase emotions such as satisfaction (Mano and Oliver 1993) and regret (Zeelenberg et al. 1998). How does temporal separation alter the type of emotions that consumers feel after overspending? One prediction might be that consumers are more satisfied with their purchases because the temporal separation they experience prior to the purchase completely removes the negative emotion attached to overspending. Exploring the impact of temporal separation on post-purchase affective consequences can contribute to our understanding of the different stages in the consumer decision process.

Alternate Patterns of Spending. In addition, future research could explore the situations under which greater temporal separation might lead to underspending. While we observe overspending with greater temporal separation, there is also reason to predict that people overestimate budgets in the distant future, leading to underspending. What factors cause one pattern of effects over the other? One might predict that underspending is more common for budgets set with explicit savings goals in mind.

Theoretical Implications

This research complements several streams of literature. First, our findings add to the mental budgeting literature by introducing the notion of temporal separation in budgeting and its impact on effective budgeting. Existing literature has examined different factors related to time that influence budget adherence, such as the temporal framing of budgets (Ülkümen et al. 2008), and general versus specific time frames (Peetz and Buehler 2013). The current research identifies temporal separation as another important factor in budgeting that influences how much people spend relative to their budgets and elucidates the direction of the effect. Furthermore, while most prior research focuses on budgeting for multiple expenses over a duration of time, we focus on budgeting for a single expense. We contrast single expense budgeting with multiple expense budgeting; while budgeting for multiple expenses over a duration of time is more difficult for longer than shorter durations (consistent with Ülkümen et al. 2008), budgeting for a single expense to occur at the end of a time period is just as difficult regardless of when it occurs. This helps to reconcile why budget discrepancies are driven through changes in budget estimates for multiple expenses but driven through changes in spending for single expenses.

We also contribute to research on pain of payment. Gourville and Soman (1998) find that greater temporal separation between payment and consumption reduces the pain associated with the payment and that this in turn reduces the sunk-cost impact of the payment on consumption behavior. Connecting the literature on payment depreciation with mental budgeting, we propose and find that the hedonic cost associated with an upcoming budgeted payment can recede with time, much like the hedonic cost associated with payments that have already been made.

This connection also offers some insights on sunk costs. Sunk costs are non-recoverable expenditures, and the sunk-cost effect refers to the tendency for people to irrationally consider sunk costs when making related future spending decisions (Arkes and Blumer 1985; Thaler 1980). Results from Gourville and Soman (1998) and from this research both suggest that greater temporal separation increases the

extent to which prior spending decisions feel more like sunk costs, costs that should not be considered when making future spending decisions. In the case of payment depreciation, treating prior non-recoverable expenses as sunk can be considered helpful, in that it increases rational decision-making. But in the current research, treating a prior budget decision as "sunk" can be considered unhelpful because these budget decisions are not actually non-recoverable expenditures, and treating it as such leads to increased spending.

In addition, this research contributes broadly to prior work on the effect of temporal separation. Prior research has investigated the role of temporal separation between payment and consumption on sunk-cost effects (Gourville and Soman 1998; Soster, Monga, and Bearden 2010), between choice and consumption on enjoyment (Nowlis et al. 2004), and between choice and consumption on product performance (Monga and Houston 2006). The current research adds to this body of work, investigating the role of temporal separation between budgeting and payment on pain of payment and overspending.

Practical Implications

In our studies, we observe that consumers are willing to spend about 5–10% more than the budgeted amount when they experience greater temporal separation. This effect might not seem substantial at first glance, but it is worth noting that consumers budget for many different items over a year, and the aggregate impact of temporal separation on overspending for all these different items can be quite substantial. Furthermore, overspending on a single large purchase like a house can have a significant impact on a consumers' overall wealth.

This research can provide actionable insights for businesses. For example, a financial advisor might recommend that a client not budget further in advance than necessary, or that a client reconsider the budget shortly before spending. Hotels and rental car agencies can strategically allocate their resources to selling upgrades to consumers who made their reservations further in advance, as these customers may be more willing to pay for upgrades. Firms that are launching a new product might consider releasing the price of the product well in advance of its release to encourage consumers to start budgeting early, allowing the budget depreciation process to unfold while waiting for the product release.

Consumers themselves can also take advantage of these findings to manage their spending, and their emotional responses to spending. The spendthrift who is planning to buy a house might do well to reconsider the budgeted amount of spending from time to time. The tightwad who knows that an expensive family vacation is coming up could begin mentally budgeting for that vacation far in advance so that it feels less painful when the time to spend finally arrives.

Conclusion

Consumers are frequently told to set budgets in advance, but budget depreciation suggests that budgeting too far in advance can be detrimental. The pain associated with spending dissipates over time and can lead to an increased willingness to spend.

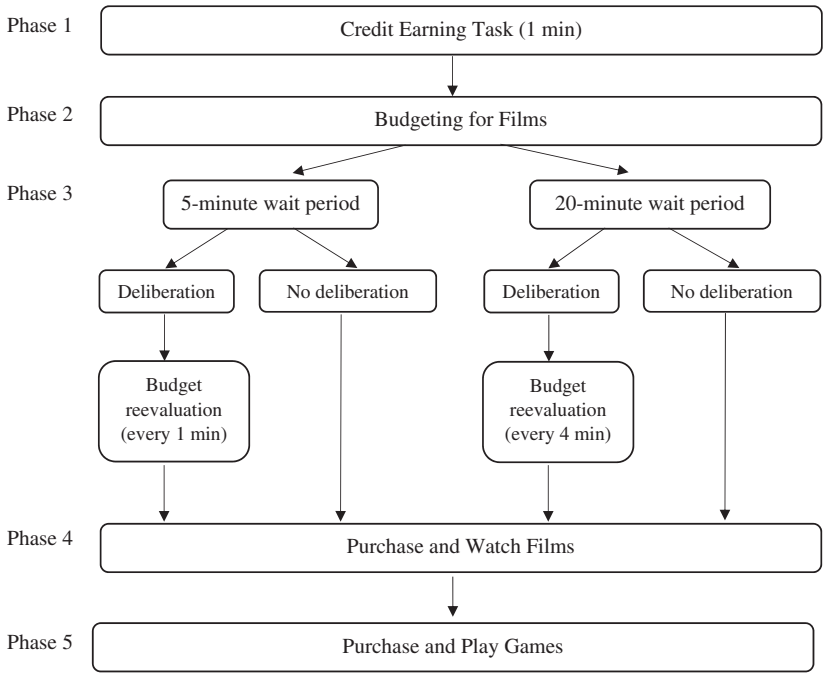
DATA COLLECTION INFORMATION

The data for study 1 were collected in fall 2019 from a local real estate office in College Station, TX, by the first author under the supervision of the second author. The data for the pilot study, web appendix study 3b, and study 4 were collected from MTurk during fall 2019 by the first author under the supervision of the second author. The data for study 2 were collected at Texas A&M University between fall 2018 and spring 2019 by the first author under the supervision of the second author. The data for study 3 was collected on the Texas A&M University campus prior to football games by the first author and a research assistant in fall 2018. The data for study 5 were collected by research assistants at the Conant Behavioral Research Lab, Mays Business School, in spring 2018. Both authors analyzed the data for all studies.

APPENDIX A

FIGURE A1

STUDY 5: MULTI-PHASE EXPERIMENT FLOW



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