THE UNIVERSITY OF CHICAGO

PREFERENCE FOR PAST PAIN: AN EMPIRICAL TEST OF THE BIAS

TOWARD THE FUTURE

A DISSERTATION SUBMITTED TO

THE FACULTY OF THE UNIVERSITY OF CHICAGO

BOOTH SCHOOL OF BUSINESS

IN CANDIDACY FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

BY

NATALIE MARGARET WHEELER

CHICAGO, ILLINOIS

JUNE 2016

To my Mom, Dad, and Meredith

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Acknowledgments

First and foremost, I would like to thank Eugene Caruso for being incredibly generous with his time, feedback, and guidance over the past five years. I would also like to thank the other members of my committee—George Wu, Dan Bartels, and Ed O'Brien—for their helpful comments and ideas along the way. Thanks to the members of PBJ Lab who provided a supportive environment in which to discuss many half-baked research ideas, and especially to Kaushal Addanki for his help with this project in particular. Thanks also to Irene Blair, Holen Hirsh, and Leaf Van Boven for fostering a love of research by providing countless opportunities and excellent mentorship during my undergrad years. I am especially grateful to my family and friends for their unwavering support—with special thanks to my parents for always encouraging intellectual curiosity, Meredith Wheeler for being a younger sister I look up to, and Daniel King for his unconditional support and encouragement.

Abstract

People are not indifferent to when experiences happen; rather they prefer to have painful experiences in their past and pleasurable experiences in their future. In this dissertation, I explore the extent to which lay people display time-biased preferences, the factors that moderate these preferences, and the implications this has for reducing bias in decision making. I demonstrate that people prefer pain to occur in the past as opposed to the future for both themselves (Study 1) and others (Study 2) and that people are willing to incur additional pain in the past to avoid future pain. When people make judgments about more distal social targets this preference for past pain is reduced (Study 3). Similarly, when people are more temporally removed from the decision, the preference for past pain is reduced (Study 4). Purposefully engaging in mental time travel (thinking forward to a future time point or backward to a past time point) causes participants to be less likely to prefer pain in the past (Study 5). Mental time travel does not impact a related behavior, judgments of the value of a painful experience (Study 6). Whereas many scholars have suggested that people should be temporally neutral in their judgments, these studies suggest that people are time biased and that taking on a more distal viewpoint can reduce this bias. The findings have implications for how we value experiences and when we choose to complete aversive tasks.

Introduction

Every time the dental hygienist reclines the chair and begins to poke around in my mouth I'm overcome with an intense desire for the experience to be over. Before any discomfort occurs (aside from trying to talk with someone's hands in my mouth), and despite the knowledge I have from many past experiences, I feel trapped. My only hope is that some magical being intervenes on my behalf to fast forward time. Many people likely feel similarly, preferring painful experiences to pass whether these are a visit to the dentist, doing taxes, or writing a dissertation. On the other hand, people prefer to have enjoyable experiences in the future. It is fun to anticipate a weekend trip, and common to feel a bit disappointed as bags are unpacked after the trip comes to an end.

Time Based Preferences

The ease with which such examples come to mind reveals a pervasive fact about human preferences: People are not indifferent to *when* experiences happen; rather they have clear time based preferences that affect many aspects of their lives. Our preferences about the timing of events reveal two temporal asymmetries. One asymmetry is a near/far asymmetry—all else being equal we prefer distant future pain to proximal future pain, and we prefer proximal future pleasure to distant future pleasure. For example, people may put off doing their taxes, preferring to complete this unpleasant task later rather than sooner. For more positive experiences, such as receiving a paycheck, it is preferable for this to occur sooner rather than later. These preferences make perfect sense when it is costless to do so. Clearly, I want to get my paycheck right now rather than wait to get the exact same amount of money a month from now. But, this phenomenon becomes much more interesting and consequential when we examine the trade-offs that people are willing to make to act on these preferences.

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Decades of research on intertemporal choice has explored these trade-offs by having participants choose between a 'smaller sooner' reward or a 'larger later' reward. Across a variety of domains people are impatient, preferring the 'smaller sooner' rewards (Ainslie, 1992; Ainslie & Haslam, 1992; Akerlof, 1991; Mischel & Staub, 1965; Soman et al., 2005; Thaler, 1981). People choose 'smaller sooner' rewards because they value future costs and benefits less than present costs and benefits (for reviews see Ainslie & Haslam, 1992; Frederick, Loewenstein, & O'Donoghue, 2003; Soman et al., 2005). Furthermore, people are inconsistent in their preferences, which suggests that they may be making an error. People prefer 'smaller sooner' rewards to 'larger later' rewards when the sooner reward will be received in the present or very near future; however when both rewards are delayed in time the majority of participants prefer the 'larger later' reward (Ainslie & Haslam, 1992; Hoch & Loewenstein, 1991; Read & van Leeuwen, 1998; Rook, 1987; Strotz, 1955). For example, when asked today a person may prefer one apple today to two apples tomorrow, and also prefer two apples in fifty-one days over one apple in fifty days (Thaler, 1981). This simple example illustrates how people fail to realize that fifty days from now, their preferences will be different. Other contextual factors can also change the extent to which people discount outcomes. For example, gains are discounted more than losses (sign effect), small outcomes are discounted more than large outcomes (magnitude effect), and people have a preference for improving sequences (Loewenstein & Prelec, 1993; Thaler, 1981).

In many situations, people choose to defer pain. However, people also recognize that it would be better to have pain occur in the past, in particular when such pain is unavoidable. Our preferences about the timing of events reveal a second asymmetry—the past/future asymmetry. People prefer painful experiences to occur in the past and prefer positive experiences to occur in

the future. An example of the past/future asymmetry might be caring very little about last week's very painful dental surgery but going to great lengths to avoid a slightly painful dental check up next week.

To illustrate the intuition for the past/future asymmetry Parfit (1984) proposed the following thought experiment, *My Past and Future Operations*:

> I am in some hospital, to have some kind of surgery. Since this is completely safe, and always successful, I have no fears about the effects. The surgery may be brief, or it may instead take a long time. Because I have to cooperate with the surgeon, I cannot have anesthetics. I have had this surgery once before, and I can remember how painful it is. Under a new policy, because the operation is so painful, patients are now afterwards made to forget it. Some drug removes their memories of the last few hours. I have just woken up. I cannot remember going to sleep. I ask my nurse if it has been decided when my operation is to be, and how long it must take. She says that she knows the facts about both me and another patient, but cannot remember which facts apply to whom. She can tell me only that the following is true. I may be the patient who had his operation yesterday. In that case, my operation was the longest ever performed, lasting ten hours. I may instead by the patient who is to have a short operation later today. It is either true that I did suffer for ten hours, or true that I shall suffer for one hour. I ask the nurse to find out which is true. While she is away, it is clear to me which I prefer to be true. If I learn that the first is true, I shall be greatly relieved. (p. 165-166)

Take a few moments to reflect on your own preference, or better yet survey a few captive friends or family members. Parfit (1984) suggests that people have an intuition for preferring past pain to future pain, even when the past pain is of greater magnitude. I suspect that your own inquiry yielded similar results. It is preferable to have already experienced a surgery in the past even if it is longer and more painful than to have to experience a shorter, less painful surgery in the future. This preference is also reflected in many economic models of human behavior. These models are "forward-looking" and often explicitly state that people should ignore the past (Friedman & Savage, 1948; Keeney & Raiffa, 1976; von Neumann & Morgenstern, 1944). For example, they

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suggest that sunk costs (past investments of time, effort, or money) should not factor into people's current decisions.

People routinely express a preference for pain in the past, and thought experiments like *My Past and Future Operations* suggest a strong intuition for this preference; however there hasn't been much empirical work that assesses the psychology of this preference. In this paper, I explore the prevalence, nature, and consequences of the past/future asymmetry. I examine the extent to which lay people display a preference for past pain over future pain, the factors that moderate this preference, and the implications this has for reducing bias in decision making. When it is costless, the preference for past pain makes perfect sense. Clearly, I would prefer to have already had a painful surgery yesterday rather than having to undergo the same painful surgery tomorrow. This question becomes much more interesting and less trivial in situations in which there are costs. Therefore, I will also explore what happens when two preferences—the desire for past pain and the desire for less pain—conflict.

Rationality of Time Based Preferences

The majority of previous work examining the past/future asymmetry has been non-empirical work by philosophers (Brink, 2011; Hare, 2006, 2008; Parfit, 1984). Among philosophers there is an ongoing debate about whether or not it is rational for people to be time biased. Some scholars argue that it is rationally permissible to prefer pain in the past. First, because it is trivially true—why wouldn't someone want to have pains in their past? Second, Parfit (1984) suggests that it is rational as part of a critique of self-interest theory. The central claim of self-interest theory is, "For each person, there is one supremely rational ultimate aim: that his life go, for him, as well as possible" (p. 4). If preferring pain in the past is rationally permissible, this poses

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a problem for self-interest theory. According to self-interest theory, you should only be concerned with how a painful experience affects how well your life goes. Whether the painful experience occurs in the past or the future should not matter. Furthermore, Parfit (1984) also suggests this preference is rational by appealing to people's intuitions in thought experiments like *My Past and Future Operations*. Finally, Heathwood (2008) argues that this preference is rational by proposing that, "[A future-biased agent] is completely reasonable in preferring that his pain be in the past. In fact, even his no longer caring at all that it occurred is perfectly fitting—not at all inappropriate. Why should he care about it now? No reason—it's over and done with" (p. 56–57).

Other philosophers argue that being time-biased is not rationally permissible. Time biased preferences are inconsistent over time, which can lead people to act counterproductively (Dougherty, 2011). Additionally, being time biased can negatively impact practical reasoning via regret—people are motivated to push off positive events in the future to avoid regret leading them to postpone positive events for no good reason (Green & Sullivan, 2015). More generally, philosophers, ethicists, and legal scholars have argued that we should be temporally neutral when making judgments (Brink, 2011; Sidgwick, 1907). In regards to the near/far asymmetry Rawls (1971) argues, "mere temporal position, or distance from the present, is not a reason for favouring one moment over another" (p. 420). In regards to the past/future asymmetry Sidgwick (1907) proposes, "equal and impartial concern for all parts of one's conscious life is perhaps the most prominent element in the common notion of the *rational...*' (p. 124). If it is not rationally permissible to be time biased, the timing of events should not impact judgments, instead each moment of a person's life should receive equal weight irrespective of its temporal location.

The debate over the rationality of time-based preferences is not one that I will resolve in this paper. People can make decisions about the timing of painful experiences using a variety of rules (e.g., choosing to minimize pain over their lifetime, always preferring pain in the past, etc.) or by maximizing different sources of utility. I'm not interested in understanding what is the normatively best or 'rational' choice. Instead, I hope to understand the psychology of lay people's intuitions about and preferences for the timing of painful experiences. In the process, I hope to highlight some situations in which being time biased leads to inconsistent preferences for the timing of painful events.

Why Prefer Pain to Pass?

There are numerous reasons why people might prefer to experience pain in the past. Three inherent differences between the past and the future affect people's psychological experience of time and may help to explain the past/future asymmetry. First, there is an asymmetry of knowledge such that the future is more uncertain than the past. Second, there is an asymmetry of influence such that the future is more controllable than the past. Third, there is an asymmetry in direction such that time moves away from the past and toward the future; future events approach whereas past events recede. This subjective experience of movement through time causes future events to feel closer than past events (Caruso, Van Boven, Chin, & Ward, 2013). Many other asymmetries result from these inherent differences, one that may be especially relevant for explaining the preference for past pain is an asymmetry in emotion. For a variety of experiences, people report experiencing more intense current emotions about future events than equivalent past events and a primary function of emotion is to prepare individuals for events that can be or need to be

successfully influenced (D'Argembeau & Van der Linden, 2004; Frijda, 1988; Okuda, Fujii, Ohtake, Tsukiura, & Tanji, 2003; Van Boven & Ashworth, 2007).

Although the somewhat uncomfortable experience of getting your teeth cleaned is typically similar from visit to visit, dental visits that will occur in the future are inherently more uncertain (Will they find yet another cavity? Or give me *two* lollipops for having flossed so well?) and controllable (I can choose to go on Tuesday or on Thursday, and request the same hygienist as last time) than visits that occurred in the past. Furthermore, a visit to the dentist two days from now feels closer (My appointment is just around the corner) and arouses more emotion (I currently feel anxious thinking about my upcoming appointment) than a visit two days ago. Taken together, these asymmetries in uncertainty, control, direction, and emotion may contribute to a preference for pain to occur in the past.

When faced with a choice between experiencing pain in the past or experiencing pain in the future I expect that people will be time biased, they will prefer pain in the past. Because people experience the self as moving through time, people are typically consumed with the present and the near future—they care about what is happening to them right now and what is about to happen to them (Caruso et al., 2013; Frederick, Loewenstein, & O'Donoghue, 2003; Soman et al., 2005). In addition, the inherent differences between the past and the future lead people to care about the future more than the past. Because of this, I expect people to prefer that a painful experience occurs in their past rather than their future. This preference is not very surprising when the pain in the past and the future is of identical magnitude, such that it is costless to have pain in the past rather than the future. However, when the pain in the past and the pain in the future are of unequal magnitude, as in Parfit's thought experiment, people are faced with a much harder

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decision because they must tradeoff between one preference (to have pain in the past) and another (to have less pain rather than more pain). This trade-off aligns with an important distinction between two different perspectives: one's current predicament and one's life as a whole. Hare (2008), describes these two perspectives as, "Think of a life as a way for things to go for a person, from her coming into existence to her leaving it…Think of a predicament as a position for a person to be in, with a certain past behind her and a certain future ahead of her" (p. 270).

When making a decision between a four-hour dental procedure yesterday or a two-hour dental procedure tomorrow, I am faced with a trade-off between having a better life or having a better predicament. Having undergone a four-hour dental procedure yesterday is a better predicament but a worse life (because I experience more pain). Having to experience a two-hour dental procedure tomorrow is a worse predicament, but a better life. In this case, it is less clear which painful experience I will choose as it depends on if I prefer a better life or a better predicament. Because people are myopically focused on their own present experience, I predict that when making judgments about themselves people will be more likely to prefer greater pain in the past to lesser pain in the future. This preference is a better current predicament at the cost of experiencing more total pain.

For situations in which people are required to think beyond their own present experience, they will be less likely to prefer greater pain in the past to lesser pain in the future. Evaluating psychologically distal targets is one manipulation that may move people beyond their present experience. There are four dimensions of psychological distance: spatial, temporal, social, and hypothetical. Psychologically distal targets are judged in terms of abstract and primary features (high-level construals), whereas psychologically proximal targets are judged in terms of concrete

and secondary features (low-level construals; Trope & Liberman, 2003). Previous research has demonstrated that having a more abstract mindset reduces temporal discounting (Malkoc, Zauberman, & Bettman, 2010; Rogers & Bazerman, 2008). For example, when consumer products were described in a more abstract manner as opposed to a more concrete manner, people were more likely to choose to wait a few days longer to avoid paying a delivery fee (Malkoc et al., 2010). In this paper, I will explore if thinking about psychological distal targets, specifically distal social and temporal targets, reduces the preference for past pain.

There are several reasons why understanding time-based preferences are important. First, this preference is part of a broader tendency to value future events more extremely than equivalent past events (Caruso, Gilbert, & Wilson, 2008). To the extent that a person values their future experiences more than past experiences, they may also prefer painful experiences to occur in the past. This temporal value asymmetry has important implications across a variety of domains in which valuation is critical. For example, this asymmetry may lead accident victims to receive less compensation within the legal system when they have already recovered from their injuries. Additionally, increased valuation of the future may amplify other related biases such as the preference for potential over achievement when evaluating others (Tormala, Jia, & Norton, 2012). Parfit (1984) also suggests that if we were not time biased, we would not be relieved when bad things were in the past but would also not be sad when good things are in the past and that the gains from this would outweigh the losses. Perhaps most importantly, a person who was not time biased would feel less negative about death and dying because people do not often feel anxiety about their non-existence in the past (Parfit, 1984). Understanding the extent to which and the

reasons why people are biased toward the future may improve our understanding of the temporal value asymmetry and when we choose to complete aversive tasks.

In this paper I suggest that people are biased toward the future—they prefer painful experiences to occur in the past and pleasurable experiences to occur in the future. Furthermore, people are willing to experience a greater amount of pain in the past to avoid experiencing a smaller amount of pain in the future. I predict that the extent to which people express this form of time bias may be reduced when considering psychological distal targets. People should be less likely to prefer pain in the past when making decisions about another person, especially one they don't feel very connected to. People should also be less likely to be biased toward the future when they are more temporally distant from the situation. Finally, purposefully engaging in distancing via mental simulation may be an effective intervention to reduce time bias.

Overview of Studies

The following studies have three objectives. The first objective is to empirically test the intuition proposed by Parfit (1984) that, "Even if we do not believe that we could...cause our pain to be in the past, we would strongly prefer it to be in the past, even at the cost of it lasting many times as long" (p. 56). In Study 1, I test the preference for past pain using a simplified version of Parfit's (1984) thought experiment. The second objective is to investigate if psychological distance moderates this effect. In Study 2, I test if the preference for past pain is also found for socially distal targets by modifying the scenario to describe a stranger's painful experience. In Study 3, I test the preference for past pain across three targets that vary in social distance—the self, a friend, or a stranger. In Study 4, I test if the preference for past pain is found for temporally distal targets. This study compares three temporal locations—both surgeries in the future, both surgeries in the

past, one surgery is in the past, and the other surgery is in the future. The final objective is to test distancing as an intervention by having people purposefully engage in mental distancing to attempt to reduce the bias toward the future. In Study 5, I test if instructing individuals to engage in mental time travel (thinking about a time point in the future or the past) reduces the bias toward the future in a hypothetical scenario. In Study 6, I test if engaging in mental time travel impacts a consequence of time bias, judgments of the valuation of a painful experience.

Study 1: Pain Preferences for the Self

Study 1 tested the prediction that people would prefer pain to be in the past instead of the future by creating a simplified version of Parfit's (1984) thought experiment. As in the original version, participants were asked to make a choice about their own preferences. I predicted that participants would prefer to have had a 2-hour painful surgery in the past compared to a 2-hour painful surgery in the future.

Method

Participants. 151 workers (M_{age} = 30.59, SD_{age} = 9.83, 63% male) on Amazon Mechanical Turk consented to take the survey in exchange for $0.25.

Procedure. Participants read a hypothetical scenario in which they needed to undergo a 2-hour surgery that would be safe, successful, and only somewhat painful. Participants were told that the surgery could have already happened yesterday or that it will happen tomorrow. Participants indicated if they preferred the past surgery, the future surgery, or if they were indifferent between the two options. Participants were also asked to explain the reason for their choice. To test if participants were thinking of the past and future surgery as the same event, participants indicated

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whether they thought the surgery would be longer, more painful, or more successful in the past or future.

Participants completed a series of questions to determine how much past pain they would be willing to experience to avoid a 2-hour surgery in the future. The choices varied how long the past surgery was from 2 hours to 16 hours in increments of two hours. To the extent that participants care less about past pain, they should be more willing to undergo a longer and more painful surgery pain in the past to avoid a 2-hour surgery in the future. Participants were also asked if they agreed with the following statement, "I would prefer having already had a surgery in the past, no matter how painful or long it was, compared to having a 2-hour surgery in the future". If participants truly don't care about past pain, they should be willing to incur any amount of past pain to avoid any amount of future pain. Finally, participants filled out demographic information and were asked an attention check question about the historical rate of success described in the scenario.

Results and Discussion

The majority of participants (89%) preferred the past surgery to the future surgery, X^2(1, N =139) = 119.72, p < .0001 (see Figure 1). Among participants who preferred the past surgery and who expressed a past surgery length at which they would prefer a future surgery, the average trade off point was 5.65 hours of past pain[1] (see Figure 2). Furthermore, 39% of participants who preferred the past surgery agreed that they would prefer any surgery in the past no matter how long

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[1] Some participants expressed a preference for a 16-hour surgery in the past over a 2-hour future surgery which was the maximum trade-off presented to participants. Including these participants in the trade-off calculation and conservatively estimating their trade-off point to be 16 hours yields a trade off point of 8.82 hours of past pain.

or painful it was compared to a 2-hour surgery in the future.
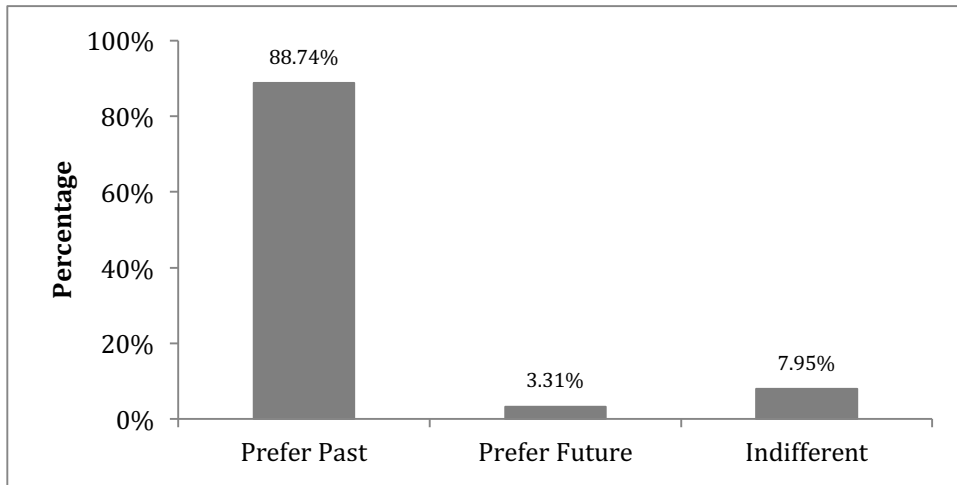
Figure 1. Preference for the timing of a 2-hour surgery for the self (Study 1).
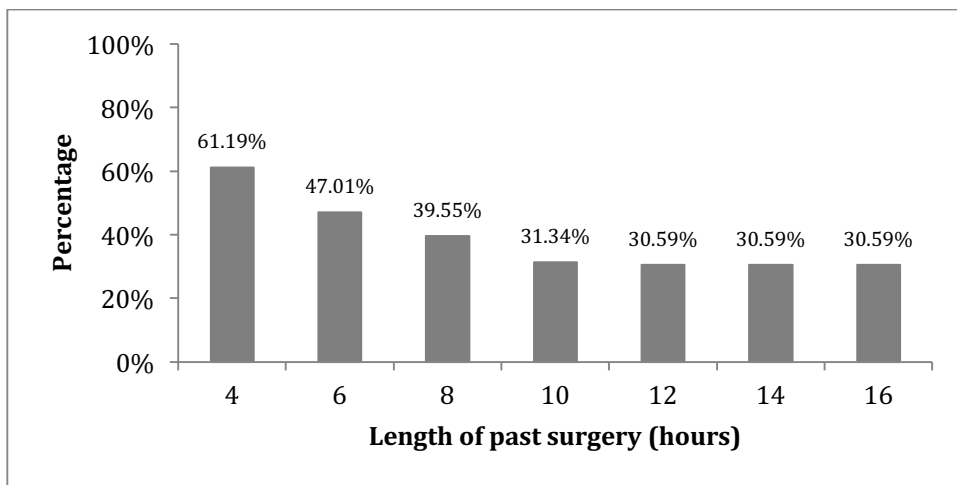
Figure 2. Percentage of participants preferring a past surgery of X hours to a 2-hour future surgery for the self (Study 1).

A research assistant coded the open-ended explanations for content. Participants gave a variety of reasons for preferring the past surgery, the majority of explanations (93%) were related to wanting to have the surgery completed or over with. For example, one participant simply stated, "Because it would already be over" as their explanation for preferring the past surgery.

Additionally, many explanations cited concerns about pain (46%) or anxiety (36%) related to the surgery.

Most participants thought the past and future surgeries were equal in length (94%), equally painful (87%) and would be equally successful (97%). This suggests that the majority of participants were paying attention to the details of our scenario and that they viewed the past and future surgeries similarly. Twenty participants failed the attention check; however removing them from the analysis does not significantly alter the results.

The results of Study 1 empirically support Parfit's (1984) intuition that people prefer past pain to future pain even when the past pain is greater in length. After reading a hypothetical scenario about a painful surgery, the majority of participants preferred the surgery to occur in the past. This preference for past pain persisted even when the length of the surgery was greater in the past than in the future. This suggests that the temporal location of a negative experience is important when making judgments for the self. To investigate if this preference extends to judgments about others, Study 2 examined preferences for another person.

Study 2: Pain Preferences for a Stranger

Study 2 tested if people displayed a preference for past pain when making choices for another person. I predicted that participants would prefer that another person have a painful 2-hour surgery in the past compared to a 2-hour painful surgery in the future, but that the magnitude of this preference would be reduced relative to preferences for one's own pain.

Method

Participants. 150 workers (M_{age} = 30.83, SD_{age} = 9.01, 71% male) on Amazon Mechanical Turk consented to take the survey in exchange for $0.25.

Procedure. Participants read an adapted version of the hypothetical scenario in Study 1. Although the surgery had the same features as in Study 1, in this study participants had to make a decision on behalf of a woman named Alice. Participants were given no additional information about Alice besides her name and gender. Like in Study 1, participants were told that the surgery could have already happened yesterday or that it will happen tomorrow. Participants indicated if they preferred that Alice have the surgery in the past, future, or if they were indifferent. Participants were also asked to explain the reason for their choice. Next, participants were asked if they thought that the surgery would be longer, more painful, or more successful in the past or the future.

Participants were asked to make a series of choices to indicate how many hours of past surgery they were willing to have Alice experience to avoid a 2-hour surgery in the future. The choices varied how long the past surgery was from 2 hours to 16 hours in increments of two hours. Participants were also asked if they agreed that any surgery in the past no matter how long or painful it was preferable to a 2-hour future surgery for Alice. Participants indicated how close they felt to Alice on a scale from 1 (not at all close) to 7 (extremely close). Finally, participants filled out demographic information and were asked an attention check question about the surgery's historical rate of success described in the scenario.

Results and Discussion

As predicted, the majority of participants preferred that Alice undergo the past surgery (65%) compared to the future surgery, $X^2(1, N = 104) = 81.39, p < .0001$ (see Figure 3). Participants who preferred the past surgery were willing to trade off an average of 4.93 hours of

past pain[2] for a 2-hour future surgery for Alice (see Figure 4). Additionally, 21% of participants who preferred the past surgery agreed that they would prefer any surgery for Alice in the past no matter how long or painful it was compared to a 2-hour surgery in the future. Participants' average ratings of closeness were around the midpoint of the scale, (M_{close} = 3.39, SD_{close} = 1.73) suggesting that they felt somewhat close to Alice. Participants who preferred that Alice undergo the surgery in the past felt significantly closer to Alice ($M_{prefer\ past}$ = 3.93, $SD_{prefer\ past}$ = 1.61) than participants who were indifferent to when Alice had the surgery ($M_{indifferent}$ = 2.26, $SD_{indifferent}$ = 1.44), $t(142)$ = 5.98, $p <$ .0001 (see Figure 5).
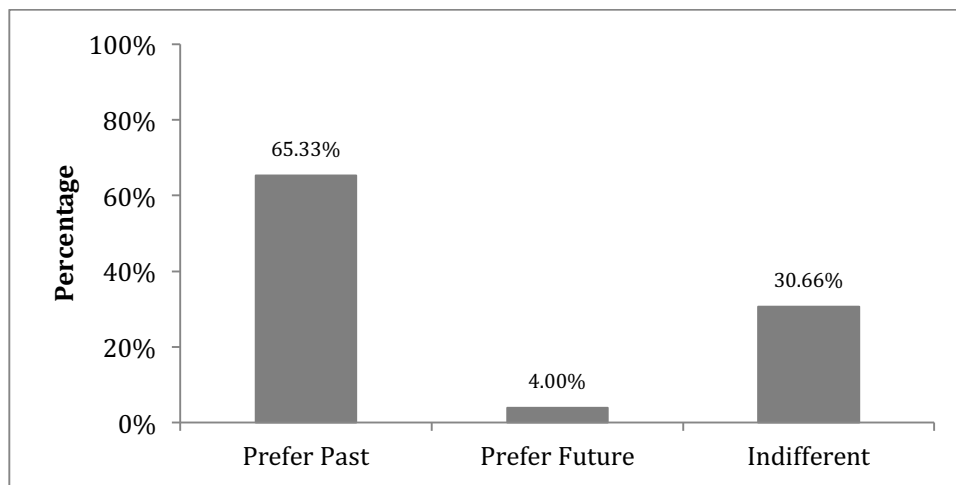
Figure 3. Preference for the timing of a 2-hour surgery for a stranger (Study 2).

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[2] Again, some participants expressed a preference for Alice to experience a 16-hour surgery in the past instead of a 2-hour future survey which was the maximum trade-off presented to participants. Including these participants in the trade-off calculation and conservatively estimating their trade-off point to be 16 hours yields a trade-off point of 6.29 hours of past pain.
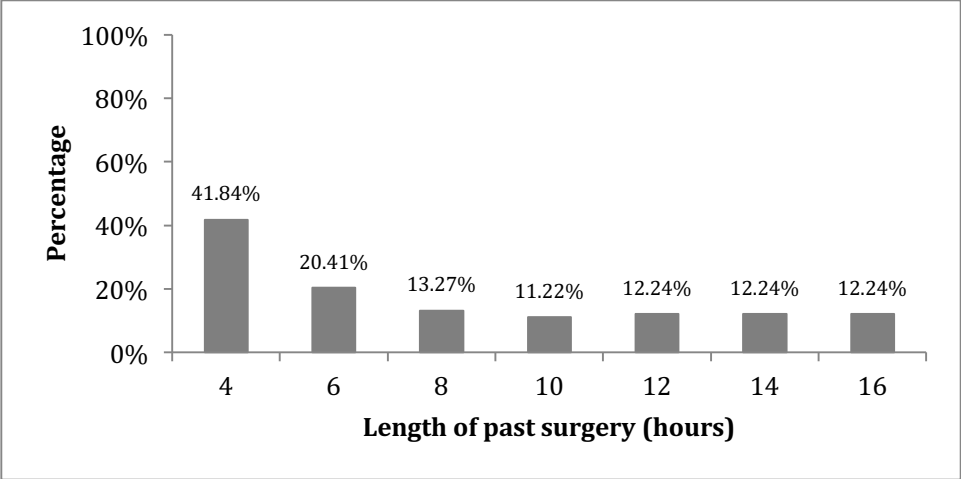
Figure 4. Percentage of participants preferring a past surgery of X hours to a 2-hour future surgery for a stranger (Study 2).
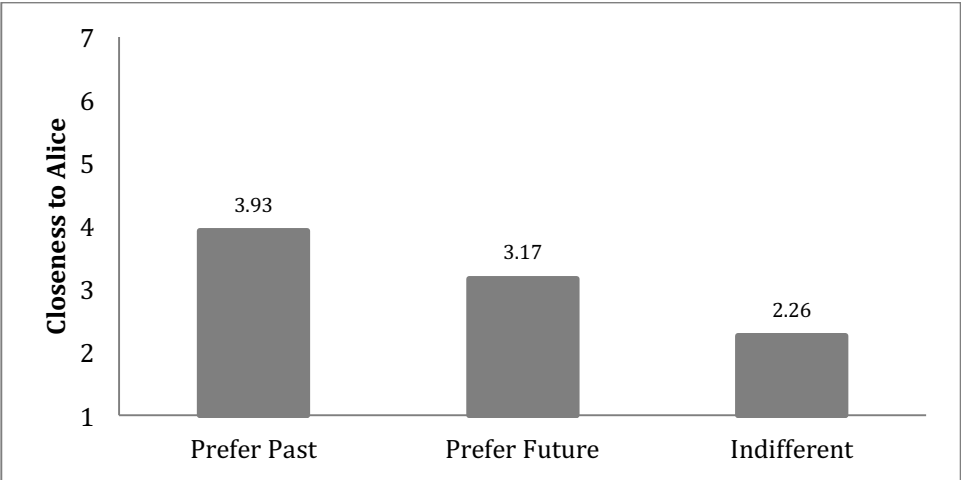
Figure 5. Ratings of closeness to Alice by surgery preferences (Study 2).

A research assistant coded participants' explanations, in which they explained their preference, for content. As in Study 1, the most prevalent content in the explanations was related to the surgery being completed, over with, or in the past (86% of explanations). Participants also referenced concerns about pain (50%), anxiety (22%), and recovery (26%) in their explanation of their choice.

Most participants thought the past and future surgeries were equal in length (95%), equally painful (91%), and would be equally successful (95%). Seventeen participants failed the attention check; however removing these participants from the analysis does not significantly alter the results.

The results of Study 2 provide further empirical support for the intuition laid out by Parfit (1984) by demonstrating that this preference extends to judgments about another person. The majority of participants preferred that Alice's surgery occurred in the past. This preference for past pain for Alice persisted even when the length of the surgery was greater in the past than in the future. Additionally, participants who felt closer to Alice were more likely to prefer her pain to be in the past. This final result fits with research demonstrating that connectedness can impact one's regard for the outcomes of another individual, whether it be a stranger or one's future self (Bartels & Rips, 2010). While the majority of participants preferred that Alice's surgery occurred in the past, the magnitude of this preference appears to be smaller that the preference for past pain for the self in Study 1. It is potentially problematic to compare these results across studies, so Study 3 directly manipulates the target of judgment within the same experiment to better understand the impact that social distance has on the preference for past pain.

Study 3: Pain Preferences Across Targets

Study 3 tests if preferences for the timing of a painful experience are impacted by social distance. Participants were randomly assigned to make a choice about a surgery for themselves, a friend, or a stranger. Participants made a choice between two surgeries of unequal length—a 4-hour surgery yesterday or a 2-hour surgery tomorrow. When making judgments for themselves, I predicted that participants would prefer that they have a painful 4-hour surgery in the past

compared to a 2-hour painful surgery in the future. When making judgments about more distal targets, their friend and especially a stranger, I predicted that participants would be less likely to prefer the painful 4-hour surgery in the past compared to the 2-hour surgery in the future.

Method

Participants. 449 workers (M_{age} = 32.99, SD_{age} = 10.32, 55% male) on Amazon Mechanical Turk consented to take the survey in exchange for $0.25.

Procedure. Participants were randomly assigned to the self-condition, friend condition, or the stranger condition. Participants who were assigned to the friend condition were first asked to think of a friend who lives in the same town as them and write out their friend's name or initials. Then, all participants were given instructions about who the target of their judgment would be. Participants in the self-condition were told that they would be making a decision for themselves. Participants in the friend condition learned that this other person would be the friend they just described. Participants in the stranger condition were told that their target was Alice, a stranger who lives in the same town as them. All participants read a hypothetical scenario that described a minor surgery. This surgery was described as safe, successful, and only somewhat painful. Participants were told that although the surgery is painful, patients report feeling back to normal by the end of the day, regardless of the length of the surgery. Participants indicated if they preferred a 4-hour surgery yesterday or a 2-hour surgery tomorrow. Participants were also able to indicate if they had no preference. Participants selected from a list of 8 reasons to explain their choice and indicated how connected they felt to the person having the surgery using a measure

adapted from Bartels & Urminsky (2011)[3]. Participants were instructed to "think about the important characteristics that make you the person you are now—your personality, temperament, major likes and dislikes, beliefs, values, ambitions, life goals, and ideals—and indicate your opinion about the degree of connectedness or overlap between the person you are now and the person having the surgery by using the slider bar to mark on the line below." The slider bar was anchored by the labels 'completely disconnected' and 'completely connected' with the midpoint labeled as 'somewhat connected', and also included Euler circles to illustrate connectedness (see Figure 6). Finally, participants answered a manipulation check question (the length of the surgery yesterday) and answered a few demographic questions.
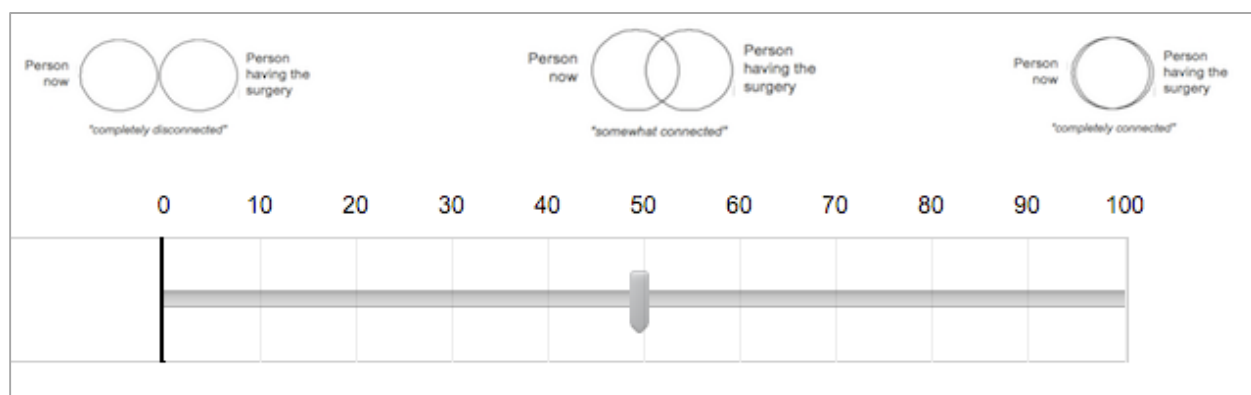
Figure 6. Measure of Connectedness (Study 3)

Results and Discussion

The majority of participants in the self-condition preferred that they have a 4-hour surgery yesterday (61%) compared to a 2-hour surgery tomorrow (28%), $X^2(1, N = 135) = 19.27, p < .0001$

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[3] These responses were created from free-response explanations collected in a previous study. Participants indicated which of the following choices best explained their choice—"To get the operation over with", "To experience less time in pain", "To experience less intense pain", "The length of the surgery is shorter", "To feel better sooner", "Don't want to worry about the surgery", "To reduce anxiety", or "Other". Participants were able to select multiple responses.

(see Figure 7). However, in the friend condition participants were evenly split between the 4-hour surgery yesterday (35%) and the 2-hour surgery tomorrow (45%), X^2(1, N =123) = 1.83, p = .176. Participants in the stranger condition were similarly split with 34% preferring the past surgery and 44% preferring the future surgery, X^2(1, N =112) = 1.75, p = .186.
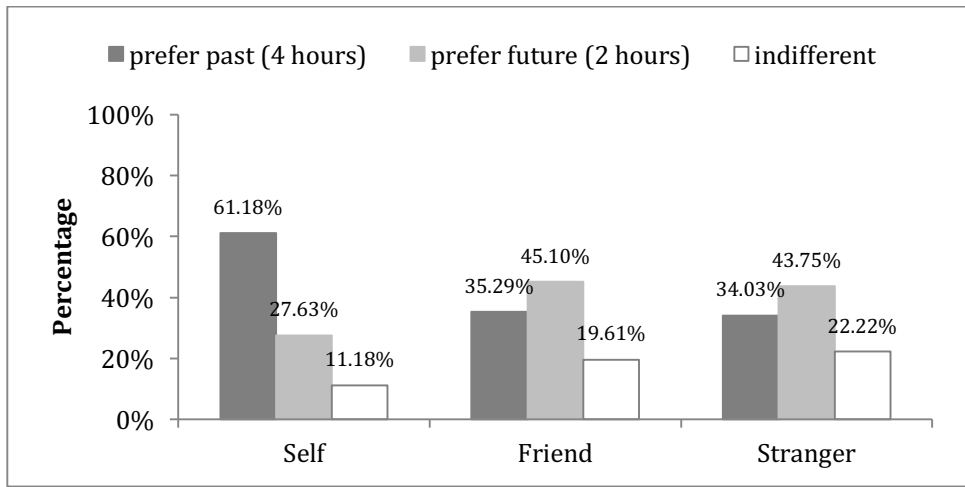
Figure 7. Preference for a 4-hour surgery yesterday or a 2-hour surgery tomorrow across three targets (Study 3).

A logistic regression analysis was conducted to predict surgery preference using target condition as a predictor. A test of the full model against a constant-only model was statistically significant, indicating that target condition reliably distinguished surgery preference, X^2(4, N = 449) = 29.27, p < .0001. The odds ratio of 2.83 with a 95% confidence interval of [1.70, 4.70] suggests that participants in the self condition were about 3 times more likely to choose the past surgery compared to the future surgery than individuals in the friend condition. A similar odds ratio of 2.85, 95% confidence interval of [1.69, 4.79], suggests that participants in the self condition were about 3 times more likely to choose the past surgery compared to the future surgery than individuals in the stranger condition.

Participants reported feeling more connected to themselves (M_{self} = 64.20, SD_{self} = 26.85) than to a friend (M_{friend} = 61.33, SD_{friend} = 20.74) or a stranger ($M_{stranger}$ = 42.26, $SD_{stranger}$ = 28.94), $F(2, 440)$ = 31.32, p <.0001. A post hoc Tukey test showed that connection ratings for the self and for a friend differed significantly from the ratings for a stranger at p < .05; the self-condition was not significantly different from the friend condition. The interaction between target condition and surgery preference was not significant, $F(4, 440)$ = 1.84, p = .12 (see Figure 8). A mediation model in which target condition predicted surgery choice, with connectedness as a mediator, was constructed using the bootstrap model of Preacher and Hayes (2004) to estimate the indirect effect of connectedness based on 10000 bootstrap samples. The 95% confidence interval for the estimation of the indirect effect contained 0, indicating that this mediation was not significant, β = –0.01, 95% CI: [–.03, .02]. The lack of mediation was also supported by the results of a Sobel test, Z = –0.35, p = .7285.
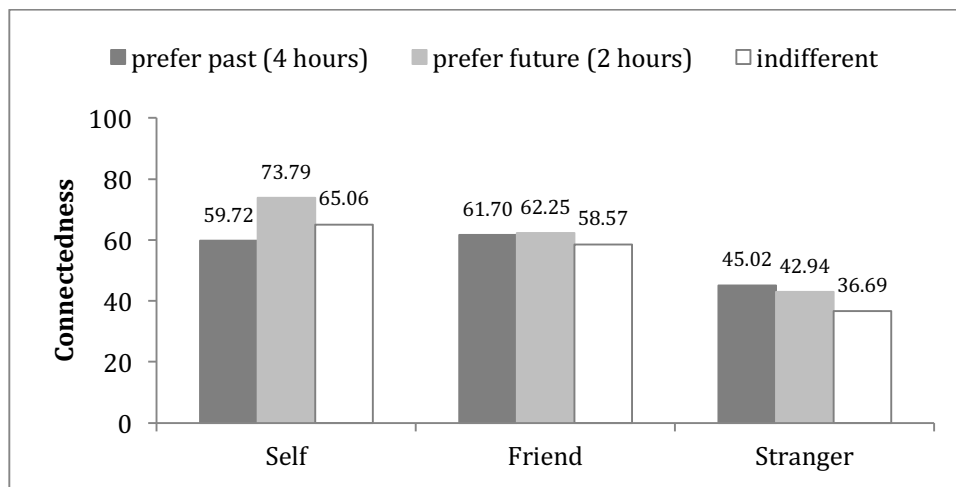

Figure 8. Connectedness ratings for three targets by surgery preference (Study 3).

Eight questions related to explanations for their choice of surgery were factor analyzed using principal component analysis with Varimax (orthogonal) rotation (see Table 1). This analysis

yielded two factors which explained 55% of the variance. The first factor was labeled 'No Worries,

Get It Over With' due to high loadings by the following items: to reduce anxiety; don't want to

worry about the surgery; to get the operation over with; to feel better sooner. This first factor

explained 35% of the variance. The second factor was labeled 'Experience Less' due to high

loadings by the following items: the length of the surgery is shorter, to experience less time in pain,

to experience less intense pain. The second factor explained 20% of the variance. The final item,

other responses, did not load onto either factor.

Table 1: *Summary of factor analysis for participant explanations (Study 3)*

	Loadings		
	Factor 1: No worries, get it over with	Factor 2: Experience less	Communality
To reduce anxiety	**.733**	–.142	.558
Don't want to worry about the surgery	**.721**	–.220	.569
To get the operation over with	**.700**	–.321	.593
To feel better sooner	**.641**	.040	.412
The length of the surgery is shorter	–.319	**.777**	.705
To experience less time in pain	–.224	**.769**	.642
To experience less intense pain	.006	**.604**	.365
Other	–.542	–.517	.561
Eigenvalue	2.84	1.57	
% of Total Variance	35.44	19.63	
Total Variance		55.07%	

The communalities of the variables included are rather low overall, one variable (to

experience less intense pain) has only a small amount of variance (36%) in common with the other

variables in the analysis. Although this may indicate that the variables are only weakly related to

each other, KMO and Bartlett's Test of Sphericity both indicate that the set of variables is

adequately related for factor analysis. This suggests that this factor analysis has identified two clear patterns of explanations among participants—one pattern of explanation focused on avoiding anxiety and getting it over with reasons and a second pattern of explanation focused on experiencing less pain.

Participants who prefer the 4-hour surgery yesterday were more likely to endorse 'No Worries, Get It Over With' reasons, $F(2, 440) = 154.22$, p < .0001, whereas participants who prefer the 2-hour surgery tomorrow were more likely to endorse 'Experience Less' reasons, $F(2, 440) = 274.82$, $p < .0001$ (See Figure 9). Additionally, participants who made judgments about themselves were more likely to endorse 'No Worries, Get It Over With' reasons, $F(2, 440) = 4.09$, $p < .017$ than participants who chose for a friend or stranger (See Figure 10).
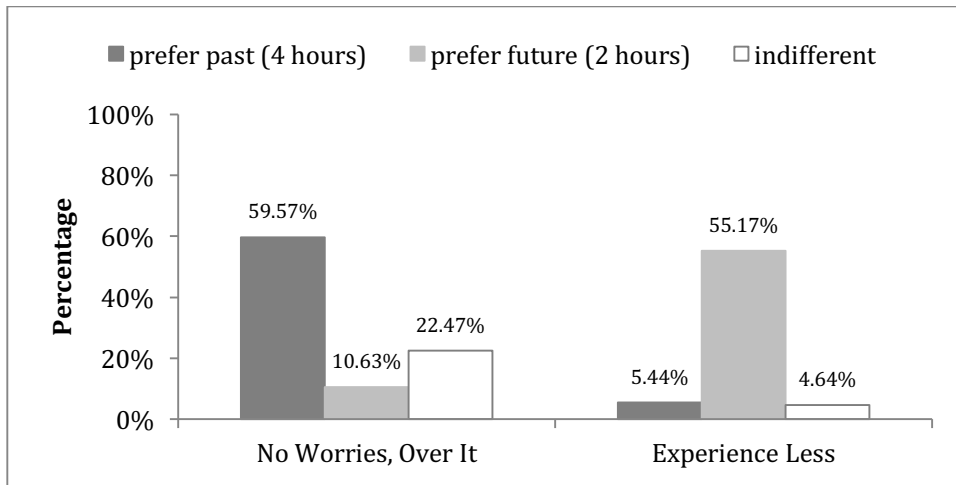

Figure 9. Percentage of participant explanations endorsing each explanatory factor by surgery preference (Study 3).

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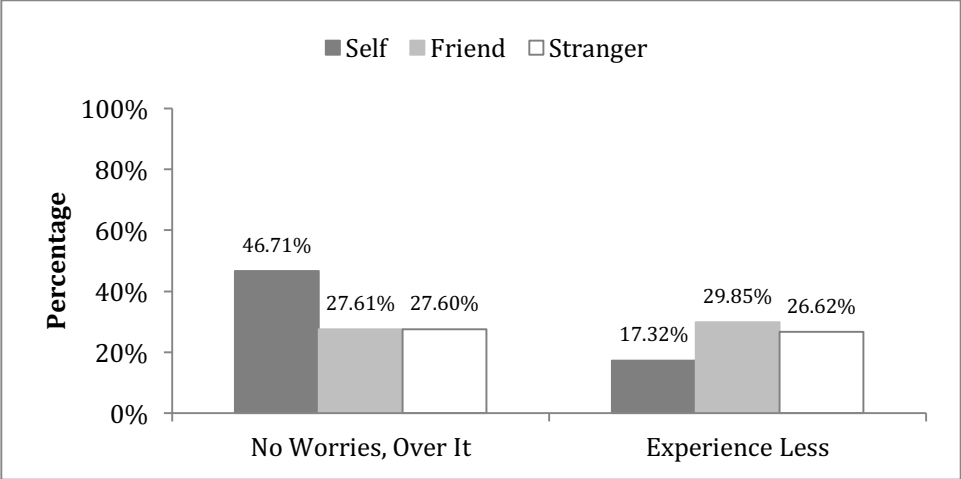
Figure 10. Percentage of participant explanations endorsing each explanatory factor by target condition (Study 3).

The results of Study 3 suggest that with some amount of social distance, participants are less likely to a choose a longer, more painful surgery in the past. However, participant's ratings of how connected they felt to the person having the surgery somewhat conflict with this result. Participants felt similarly connected to themselves and to a friend, but expressed different preferences for themselves (preferring a longer, more painful past pain experience) than for a friend (being indifferent between the two surgeries). It is somewhat surprising that ratings of connectedness for the self are not higher, which suggests that participants may have interpreted the connectedness question in a strange way. Asking participants how connected they felt to the person having the surgery when that person was themselves may have been a confusing question for participants to answer. A different measure or more clearly explained measure of connectedness or a measure of closeness (as in Study 2) may have yielded different results.

For relatively distant others, participants show less of a preference for past pain which suggests that they are treating others more objectively. When evaluating others participants may be

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more likely to think beyond the specific predicament of undergoing a painful surgery. Past research has demonstrated that moving away from one's own egocentric present perspective is a form of distancing and that people tend to treat future selves like others (Buckner & Carroll, 2007; Pronin & Ross, 2006). In addition to evaluating more distal social targets, making decisions when you are more temporally distanced from the situation may also lead people to act more objectively. Study 4 investigates the effect of making judgments about the timing of a painful experience from a more distal temporal location.

Study 4: Pain Preferences Across Time

Research on intertemporal choice has demonstrated that a temporal delay can reverse the preference for 'smaller sooner rewards' over 'larger later rewards'. One apple today is preferable to two apples tomorrow. When people move beyond their current predicament by making a choice fifty days in advance, the same person may prefer two apples in fifty-one days over one apple in fifty days. With temporal distance, people seem to maximize the overall value choosing two apples instead of one apple.

Study 4 investigated if people's preferences for the timing of a painful event are consistent over time. Participants made a choice between two surgeries of unequal length—a 4-hour surgery on Tuesday or a 2-hour surgery on Thursday. Participants made their choice on one of three days— Monday, Wednesday or Friday. I predicted that participants would be more likely to prefer the 2-hour surgery on Monday or Friday and more likely to prefer the 4-hour surgery on Wednesday.

Method

Participants. 454 workers (M_{age} = 32.68, SD_{age} = 9.48, 61% male) on Amazon Mechanical Turk consented to take the survey in exchange for $0.25. Participants were recruited via the same

Mechanical Turk HIT on three separate days. Steps were taken to ensure that participants were only able to complete the survey once.

    Procedure. Participants completed this study on one of three days—Monday, December 7, Wednesday, December 9, or Friday, December 11 (see Figure 11). Participants read a hypothetical scenario in which they needed to undergo a surgery that would be safe, successful, and only somewhat painful. Participants were told that although the surgery is painful, patients report feeling back to normal by the end of the day regardless of the length of the surgery. Participants were reminded of the date and told that they have a choice between two surgeries—a 4-hour surgery on Tuesday, December 8 or a 2-hour surgery on Thursday, December 10. Participants indicated if they preferred the Tuesday surgery, the Thursday surgery or if they had no preference between the two surgeries. Participants were also asked to explain the reason for their choice. Participants then answered two manipulation check questions (about todays date and the length of the surgery on Tuesday) and answered a few demographic questions.

Monday Condition (both surgeries in the future):

7	8	9	10	11
Completed Study	*4 hour surgery*		*2 hour surgery*	
Monday	Tuesday	Wednesday	Thursday	Friday

Wednesday Condition (4-hour surgery in past, 2-hour surgery in future):

7	8	9	10	11
	4 hour surgery	**Completed Study**	*2 hour surgery*	
Monday	Tuesday	Wednesday	Thursday	Friday

Friday Condition (both surgeries in the past):

7	8	9	10	11
	4 hour surgery		*2 hour surgery*	**Completed Study**
Monday	Tuesday	Wednesday	Thursday	Friday

Figure 11. Explanation of conditions (Study 4)

Results and Discussion

The majority of participants who completed the study on Monday preferred the 2-hour Thursday surgery (82%) to the 4-hour Tuesday surgery (10%), X^2(1, N =139) = 85.48, p < .0001 (see Figure 12). Similarly, the majority of participants who completed the study on Friday preferred the 2-hour Thursday surgery (65%) to the 4-hour Tuesday surgery (20%), X^2(1, N = 129) = 36.91, p < .0001. However, on Wednesday participants marginally preferred the 4-hour Tuesday surgery (53%) to the 2-hour Thursday surgery (40%), X^2(1, N =140) = 2.86, p = .091.
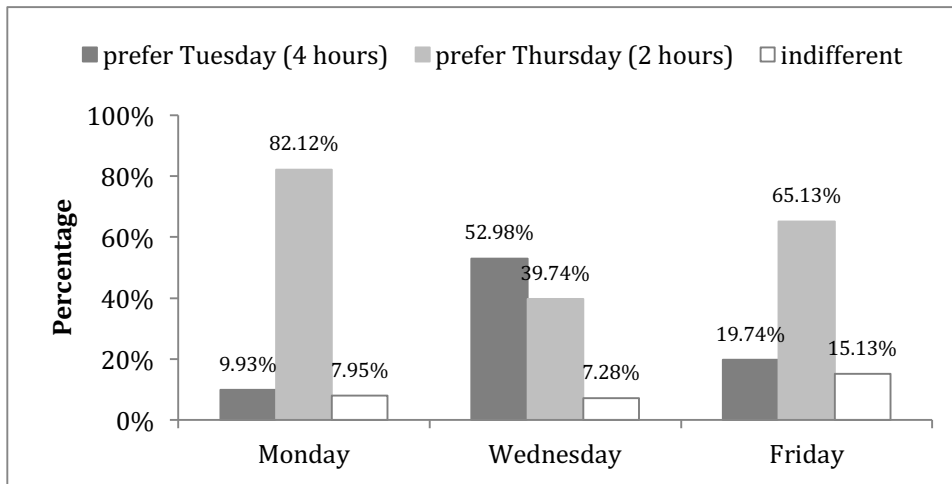
Figure 12. Preference for a 4-hour surgery on Tuesday or a 2-hour surgery on Thursday across three time points (Study 4).

Because the dependent variable is a nominal variable with more than two levels, a multinomial logistic regression model was used. A test of the full model against a constant-only model was statistically significant, indicating that day of the week reliably distinguished surgery preference, X^2(4, N = 454) = 82.46, p < .0001. The odds ratio of 11.02 with a 95% confidence interval of [5.86, 20.73] suggests that participants in the Monday condition were eleven times more likely to choose the 2-hour Thursday surgery compared to the 4-hour Tuesday surgery than individuals in the Wednesday condition. The odds ratio of 4.40, 95% confidence interval of [2.59,

7.46], suggests that participants in the Friday condition were four times more likely to choose the 2-hour Thursday surgery compared to the 4-hour Tuesday surgery than individuals in the Wednesday condition.

The results of Study 4 replicates the earlier results—when participants are making choices between a past and future surgery participants prefer the past surgery even when it is longer in length. However, with temporal distance when the surgeries are both in the future or both in the past, participants prefer the shorter surgery. Importantly, this study demonstrates how people's preferences are inconsistent over time. Whereas on Monday and Friday participants preferred the shorter surgery, on Wednesday participants preferred the longer surgery. This suggests that when both surgeries are in either the past or the future participants may be more focused on their life as a whole, but when one surgery is in the past, and the other is in the future, they may be more narrowly focused on their current predicament. The results of this study suggest that having people simulate how they may feel in the future or the past may impact preferences. Study 5 was designed to test if simulating future or past feelings would moderate the preference for past pain.

Study 5: Mental Time Travel

Study 5 investigated if having people engage in mental time travel—mentally simulating how they would feel in the future or the past—would moderate the bias toward the future. Participants made a choice between two surgeries of unequal length—a 4-hour surgery on Tuesday or a 2-hour surgery on Thursday. Before making their choice, some participants were instructed to consider how they would feel in the future or in the past. I predicted that participants who engaged in mental time travel would be less likely to prefer the 4-hour surgery on Tuesday.

Method

   Participants. 353 workers (M_{age} = 34.49, SD_{age} = 11.22, 53% male) on Amazon Mechanical Turk consented to take the survey in exchange for $0.25.

   Procedure. All participants completed the study on Wednesday, February 3. Participants were randomly assigned to one of three conditions—no instructions, Imagine Friday, or Imagine Monday. All participants read a hypothetical scenario in which they needed to undergo a surgery that would be safe, successful, and only somewhat painful. Participants were told that although the surgery is painful, patients report feeling back to normal by the end of the day regardless of the length of the surgery. Participants were reminded of the date and told that they have a choice between two surgeries—a 4-hour surgery on Tuesday, February 2 or a 2-hour surgery on Thursday, February 4. Before indicating their preference, participants in the Imagine Monday and Imagine Friday conditions received additional instructions. These participants were instructed, "Before you make your choice, take a moment to think about how you will feel on Friday, February 5 when you have experienced one of the surgeries [would have felt on Monday, February 1 when you hadn't experienced either surgery]. Think about how you will feel on Friday if you choose [would have felt on Monday if you chose] the 4-hour operation on Tuesday. Now, think about how you will feel on Friday if you choose [would have felt on Monday if you chose] the 2-hour operation on Thursday. Spend some time thinking about both options, and consider which outcome you would prefer on Friday [would have preferred on Monday] before you make your choice". Participants in the imagine Monday and imagine Friday conditions also saw a graphic depicting days of the week to help them mentally simulate. Finally, all participants indicated if they preferred the Tuesday surgery, the Thursday surgery, or if they had no preference between the two surgeries. Participants

selected from a list of eight reasons to explain their choice and indicated how connected they felt to the person having the surgery. Participants answered two manipulation check questions (what day it was and the length of the surgery on Tuesday) and answered a few demographic questions.

Results and Discussion

As in previous studies, when participants were given no instructions, the majority of participants preferred the 4-hour Tuesday surgery (54%) to the 2-hour Thursday surgery (35%), X^2(1, N = 109) = 4.85, p < .028 (see Figure 13). However, participants who were instructed to engage in mental time travel were equally likely to prefer the Tuesday or Thursday surgery. In the imagine Friday condition 43% of participants preferred the past surgery and 45% preferred the future surgery, X^2(1, N = 100) = 0.04, p = .841. Similarly, among participants in the imagine Monday condition 40% preferred the past surgery and 49% preferred the future surgery, X^2(1, N = 104) = 0.96, p = .327.
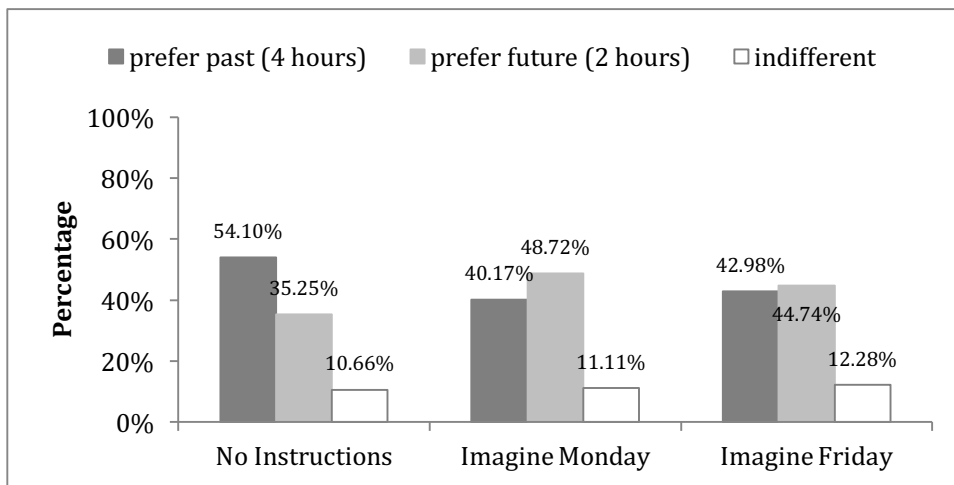

Figure 13. Preference for a 4-hour surgery yesterday or a 2-hour surgery tomorrow by mental time travel condition (Study 5).

A logistic regression analysis was conducted to predict surgery preference using imagination condition as a predictor. A test of the full model against a constant-only model was not statistically significant, indicating that imagination condition did not reliably distinguish surgery preference, X^2(4, N = 353) = 5.67, p = .225. However, the odds ratio of 1.86 with a 95% confidence interval of [1.08, 3.21] suggests that participants in the imagine Monday condition were about two times more likely to choose the future surgery compared to the past surgery than individuals in the no instruction condition. An odds ratio of 1.59, 95% confidence interval of [.92, 2.77] suggests that participants in the imagine Friday condition were about one and a half times more likely to choose the future surgery compared to the past surgery than individuals in the no instruction condition.

Based on the factor analysis from Study 3, I analyzed the explanations based on two factors—'No Worries, Get It Over With' Factor and 'Experience Less'. Participants who prefer the 4-hour surgery yesterday are more likely to endorse 'No Worries, Get It Over With' reasons, F(2,344) = 124.44, p < .0001, whereas participants who prefer the 2-hour surgery tomorrow are more likely to endorse 'Experience Less' reasons, F(2, 344) = 222.62, p < .0001 (See Figure 14). There were no significant differences based on target condition (See Figure 15). Participants in the imagine Friday, imagine Monday and no instruction conditions gave similar explanations for their choice.
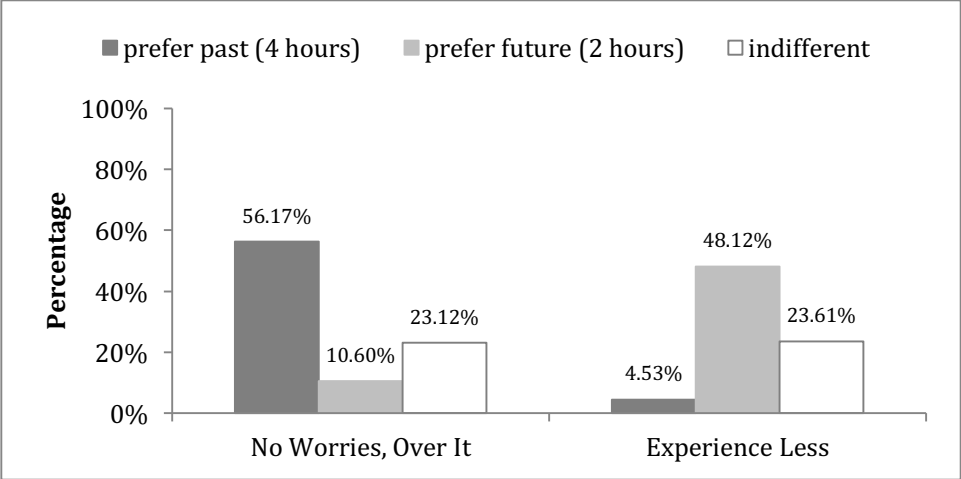
Figure 14. Percentage of participant explanations endorsing each explanatory factor by surgery preference (Study 5).
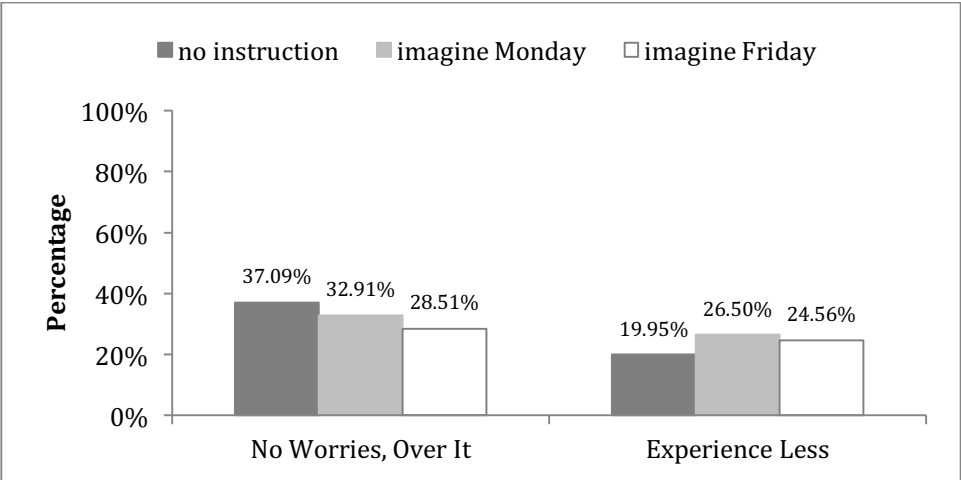
Figure 15. Percentage of participant explanations endorsing each explanatory factor by mental time travel condition (Study 5).

The results of Study 5 suggest that having people engage in mental time travel reduces the bias toward the future. This provides further evidence that distancing, both social or temporal distance, seems to moderate this effect. To understand the concrete impact of this intervention, in Study 6 I examined how engaging in mental time travel impacts actual behavior.

Study 6: Valuation of a Real Pain Experience

Previous research has demonstrated that individuals value future events more extremely than equivalent past events (Caruso et al., 2008). This temporal value asymmetry is likely closely related to the bias toward the future—to the extent that a person values their future experiences more, they are likely to want to place negative events in their past. This study capitalizes on this link by testing the extent to which engaging in mental time travel moderates valuation of a future painful event, a 90-second cold pressor test. Because having experience with a cold pressor test may be important for valuation judgments, half of participants experienced a 15-sceond sample of the cold pressor test, whereas half did not. In addition, half of participants received additional instructions asking them to engage in future mental time travel before valuing a 90-second cold pressor test. The main hypothesis was that individuals who engaged in future mental time travel would give lower value ratings than those who had been given no instructions. Also, we thought that experiencing a sample of a cold pressor test might be a necessary pre-condition for our effect.

Method

Participants. 173 participants (M_{age} = 29.90, SD_{age} = 12.77, 58% male) from the campus lab and downtown lab at the Center for Decision Research at The University of Chicago consented to take the survey in exchange for $5.

Cold Pressor Test. The equipment for this task was a large cooler filled ¾ with ice and ¼ with water. The temperature was measured before every participant and was kept at an average of 36.55°F (SD = 4.51°F). Participants were instructed to place their non-dominant hand in the ice-water for a specified period of time. While their hand was in the water, participants kept their hand moving (to prevent a heat barrier from building up). Past research has shown that the cold

pressor test causes moderate pain, which increases the longer a person's hand is kept in the water (Mitchell, MacDonald, & Brodie, 2004; Read & Loewenstein, 1999). On average, college students report that the cold pressor test becomes "too painful to continue" after about a minute (Mitchell et al., 2004).

Procedure. Participants were randomly assigned to a sample condition—15-second sample or no sample. Participants were also randomly assigned to a mental time travel condition—future mental time travel or no instructions. First, all participants read a one-page informational summary of the cold pressor test, which included text describing the procedure and a picture of a hand in ice water. Then, participants in the 15-second sample condition completed a 15-second cold pressor test. Next, all participants spent 10 minutes completing puzzles. This time allowed the hands of participants in the 15-sec sample condition to warm up. After 10 minutes, the RA informed the participant that they could attempt a 90-second cold pressor test for a bonus payment of between $1 and $6. The RA explained that the outcome of a die roll would determine the bonus payment participants would be eligible for if they successfully completed a 90-second cold pressor test (if the die landed on 1 the bonus payment would be $1, if the die landed on 2 the bonus payment would be $2, etc.). To elicit participant's valuation of the 90-second cold pressor test, we asked participants if they were willing to attempt a 90-second cold pressor test for each bonus amount. Participants circled yes or no for each option (e.g., if the die lands on one would you like to attempt a 90-second cold pressor test for a bonus of $1, if the die lands on two would you like to attempt a 90-second cold pressor test for a bonus of $2 etc.). Before answering the questions about their willingness to attempt a cold pressor test, participants in the future mental time travel condition received additional instructions prompting them to think about how they

would feel about the cold pressor test a week in the future. These instructions stated, "Before you indicate your preferences for each die roll, take a moment to think about how you will feel one week from now after you have completed this experiment. Think about how you will feel about today's 90-second cold pressor test one week from today. Spend some time thinking about this, and consider what you would prefer one week from now as you make your decision". After completing the valuation worksheet, the RA rolled a die. If the participant had circled yes for the revealed bonus amount, they attempted the 90-second cold pressor test and earned the bonus if they successfully completed it. If the participant had circled no for the revealed bonus amount, they did not have to attempt the 90-second cold pressor test. Finally, all participants completed a short set of demographic question and were debriefed.

Results and Discussion

Based on participant's yes or no responses to the six valuation questions, the lowest amount of money they were willing to accept to attempt a 90-second cold pressor test was calculated. Seven participants were unwilling to attempt a 90-second cold pressor test for all potential bonus amounts ($1–$6). These participants lowest willingness to accept was conservatively set at $7. This measure, the lowest amount of money participants were willing to accept to attempt a 90-second cold pressor test was used as a measure of how they valued this future painful experience.

Participants who were instructed to engage in mental time travel ($M_{time\ travel}$ = 2.28, $SD_{time\ travel}$ = 1.79) and participants who read no instructions ($M_{no\ instruction}$ = 2.03, $SD_{no\ instruction}$ = 1.68) valued the 90-second cold pressor test similarly, $F(1,171)$ = 0.85, p = .357 (see Figure 16). The main hypothesis was not supported, across both groups, participants on average were willing to attempt

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the 90-second cold pressor test for a minimum payment of about $2. There was a significant effect of sample condition, participants who experienced a 15-second sample of the cold pressor test gave higher valuation judgments (M_{sample} = 2.67, SD_{sample} = 1.93) than participants who did not experience a sample ($M_{no\ sample}$ = 1.66, $SD_{no\ sample}$ = 1.36), $F(1,171)$ = 15.75, p < .0001. The interaction between sample condition and mental time travel condition was not significant, $F(1,169)$ = 0.02, p = .900. There was an unexpected interaction between sample condition and study location, $F(1, 169)$ = 8.08, p < .005 (see Figure 17). Participants who completed the study on campus valued the 90-second cold pressor test more when they were in the sample condition (M_{sample} = 3.18, SD_{sample} = 1.99) compared to the no sample condition ($M_{no\ sample}$ = 1.57, $SD_{no\ sample}$ = 1.11). Participants who completed the study at the downtown lab valued a 90-second cold pressor test similarly across both sample conditions (M_{sample} = 1.94, SD_{sample} = 1.62; $M_{no\ sample}$ = 1.74, $SD_{no\ sample}$ = 1.59).
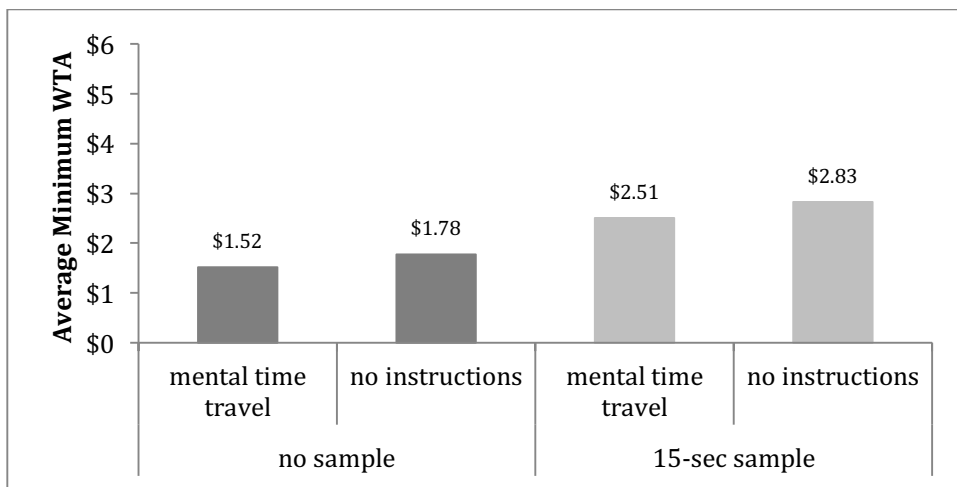

Figure 16. Valuation of 90-second Cold Pressor Test by Sample Condition and Mental Time Travel Condition (Study 6).
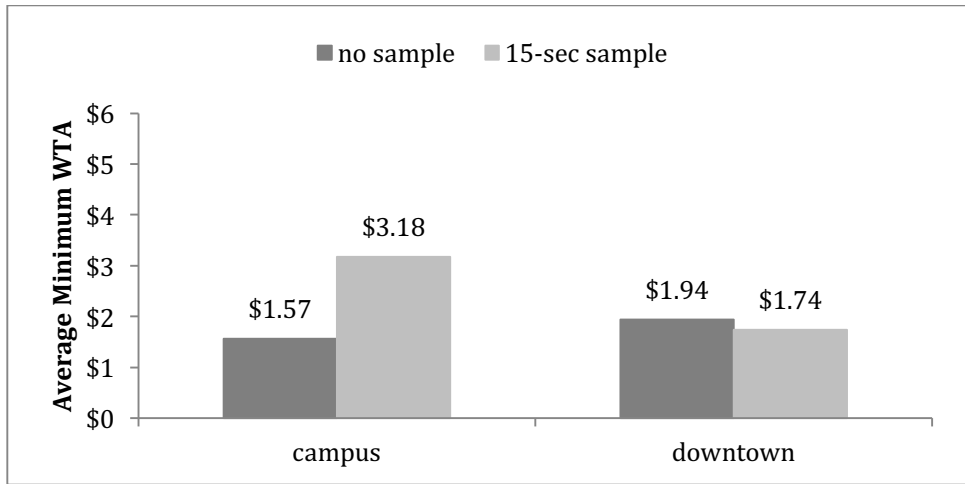
Figure 17. Valuation of a 90-second Cold Pressor Test by Sample Condition and Study Location (Study 6).

The results of Study 6 did not support the hypotheses. Engaging in future mental time travel did not alter how participants valued a future painful experience. The results of this study suggest a potential boundary condition for the simple strategy of engaging in mental time travel. While Study 5 demonstrated that a short set of instructions moderated preferences about hypothetical experiences, this minimal intervention did not alter judgments about a real painful experience. Future research could develop more immersive and involving interventions that may be more effective. For example, having participants write about how they might feel in the future or involving sensory cues could enhance the effectiveness of engaging in mental time travel.

It is unclear how to interpret the unexpected interaction with study location. While these two labs differ based on certain demographic characteristics (participants at the downtown lab tend to be older and more racially diverse), there is not an obvious explanation for why these participants would be less sensitive to a sample of a cold pressor test. The participants at the downtown lab may have more experience with painful experiences in general or the cold pressor

test specifically leading them to be more rigid in how they value painful experiences, but additional research would be necessary to validate this conclusion.

General Discussion

The current studies provide empirical evidence that people are time biased—they prefer that painful events occur in the past as opposed to the future for both themselves (Study 1) and others (Study 2) and are willing to experience more past pain to avoid future pain. This preference for past pain is reduced when making judgments about more distal others (Studies 2 and 3) and when making judgments from more distal time points (Study 4). Finally, engaging in mental time travel can reduce the bias toward the future in hypothetical judgments about surgery timing (Study 5) but did not have an effect on valuation judgments of a real pain experience (Study 6).

Theoretical Implications

There are several reasons that the bias toward the future is good. First, because this preference makes sense in situations in which there are no costs involved. Also, because future events can be acted upon, whereas past events cannot, it may be highly functional to be biased towards the future (Horwich, 1987). Furthermore, this bias may be evolutionarily adaptive. Suhler and Callendar (2012) suggest that emotions have evolved to organize and motivate an individual's behavior. Individuals with a tendency to experience an appropriate affective reaction upon imagining a future experience should enjoy an evolutionary advantage. To the extent that an individual was able to experience future-triggered affective states, they would be able to behave in evolutionary advantageous ways to make certain experiences more likely to occur (e.g., acquiring food, finding a mate) and other experiences less likely to occur (e.g., starving, being injured by a predator). There is less of an advantage to experiencing a past-triggered affective state because of

the asymmetry in control between the past and the future. Retrospection of past events cannot change the past so this would be less evolutionary beneficial to an individual.

Despite this potential evolutionary advantage, there are also several reasons that the bias toward the future may be problematic. When faced with a conflict between past pain and more pain, people prioritize the future the extent that they are willing to incur more pain. It is likely that most people would endorse the idea that they prefer to experience less pain, but they are willing to incur a cost (more past pain) to avoid future pain. Additionally, the bias toward the future potentially reduces overall well-being across the lifespan because it contributes to people to excessively worrying about future negative experience and because it leads people to make choices that negatively impact their well-being. There also may be a cost to retrospective memory that impacts people's current well-being. As a person looks back on their life, they may experience some negative utility in the present from the memory of experiencing more pain rather than less pain. More generally, the bias toward the future leads people to make myopic choices that they do not anticipate or plan for in prospect, that they potentially regret in retrospect and that they wouldn't endorse for other people. Under some conditions, such as when there are no costs involved it may be good for people to have this bias. However, in situations with costs such as when the preference for less pain and preference for past pain are in conflict, the bias toward the future may be detrimental. In these situations, it may be appropriate to use strategies to overcome this bias, and I have suggested one method—engaging in mental time travel—that may reduce this bias.

Previous research has documented the effects of adopting a more distant perspective. Prospective hindsight, taking a backward perspective on a future event, leads people to generate more possible reasons for why an event would occur (Mitchell, Russo, & Pennington, 1989).

Relatedly, scenario planning (creating descriptions of alternative hypothetical futures) can lead people to generate multiple possible chains of events and is often used in strategic business decisions (Jungermann, 1985; Jungermann & Thuring, 1987). Past research has also manipulated psychological distance more directly. Research on subjective temporal proximity has shown that framing events as more temporally close has a positive impact on self-appraisal. In one study, participants were less likely to derogate their past self when the past was framed as more recent or temporally close, especially on dimensions participants felt were important (Wilson & Ross, 2001). In another study, participants were motivated to evaluate the self more favorably when they felt closer to their future self in time (Wilson, Buehler, Lawford, Schmidet, Gie, & Yong, 2012).

Feeling more temporally close has also been shown to impact goal pursuit—feeling closer to graduation increases motivation for academic goals (Peetz, Wilson, & Strahan, 2009). Engaging in self-distancing, thinking about an event from a more removed and distant perspective impacts how people appraise emotions. Self-distancing facilitates the processing of negative emotions and leads to lower cardiovascular reactivity after analyzing experiences of anger (Ayduk & Kross, 2008; Kross, Ayduk, & Mischel, 2005). This has been demonstrated both when self-distancing was experimentally induced and when performed spontaneously by participants (Ayduk & Kross, 2010). The current work, specifically the effect of engaging in mental time travel, adds to past research demonstrating the wide-ranging effects that distancing can have on judgments, decisions, and behavior.

Practical Implications

This work has important implications for when people choose to complete aversive tasks. When faced with an unpleasant task, many people are inclined to push off such a task and

procrastinate. Practically, people are not able to move experiences to the past because actual time travel is currently impossible. However, the choices people make today impact the experiences that will eventually be in their past. For example, going to the dentist is an experience I find aversive, and I may delay scheduling. Until I invent a time machine, I cannot place a dental check up in my past or fast forward time to make my visit to the dentist next week happen sooner. But, it is up to me to choose when to schedule a dental check-up and the closer I schedule it to the present, the sooner it will be in my past. Engaging in mental time travel, or another activity that helps me to simulate how I will feel when the dental check up is in my past, may reduce procrastination and motivate me to schedule this aversive experience sooner. In some situations, delaying aversive experiences may have negative outcomes. Instead of just needing to get a cavity filled, delaying a visit to the dentist may result in a root canal. In addition to underestimating how good they will feel once a negative experience is over, people may fail to appreciate the extent to which they can avoid additional negative consequences by getting negative experiences over with and into their past as soon as possible (Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998). It would be especially advantageous to get an aversive task over with when the painful experience is inevitable or when it will have escalating negative consequences as time goes on (e.g., preventative medical screenings such as mammograms, colonoscopies). When an aversive task leads to some permanent negative consequence, such as having your leg amputated, the advantages of getting this task over with may be reduced.

More generally, many troubles in life are temporary (a temptation to eat food, a desire to harm oneself, a desire the spend money, etc.), yet people struggle to take on a wider view and look beyond their present moment or specific circumstances. If people are able to identify situations in

which they are facing a trade-off between a better life or a better predicament, engaging in mental time travel may also help them to choose the outcome that will lead to a better life.

Alternative Explanations and Limitations

One alternative explanation for our results is that people may prefer the past surgery because they believe the surgery will provide some benefit, and they want whatever benefit it provides sooner. Although this explanation is not explicitly ruled out in any of the experiments, I would expect this preference to persist when the pain has no benefit. A related alternative explanation is that people have a preference for earlier pain as opposed to a preference for past pain. This explanation is tested in one additional study (see Appendix). When choosing between surgeries of equal length, it is unclear if people prefer the earlier surgery or the past surgery. However, in Study 4 I demonstrate that timing matters when surgeries are of unequal length and that there are some conditions in which people prefer later surgeries. This is suggestive that the temporal placement of the surgeries is critical.

Future Directions

Although I have demonstrated that people are time biased, why people are time biased remains to be fully explained. Future research could more directly investigate possible mechanisms such as inherent differences between the past and the future or a focus on life versus predicament to illuminate why people display this bias. In addition, future research could investigate how to deploy the mental time travel intervention most effectively—investigating the types of situations for which mental time travel is best suited, the extent to which people engage in mental time travel spontaneously, and other downstream effects of this intervention. Furthermore, comparing the mental time travel intervention to other types of temporal distancing (e.g., temporal proximity)

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and social distancing (e.g., self-distancing or imagining the decision someone else would make on your behalf) would be informative for understanding the strengths of different distancing interventions. Finally, future work could target the idea of focusing on life as opposed to predicament more directly by specifically instructing participants to focus on their life as a whole or focus more narrowly on their current predicament.

Appendix: Additional Studies

For simplicity of narrative, four additional studies were not included in the main body of the dissertation. Study A tested if people preferred positive events to occur in the future as opposed to the past. Study B tested an alternative explanation if people prefer early pain to later pain as opposed to past or future pain. Study C is an earlier version of Study 3, examining preferences for the timing of a painful event for a friend or a stranger. Finally, Study D tests the impact that the preference for past pain has on well-being.

Study A: Timing of a Positive Experience for the Self

Study A investigates another prediction of the past/future asymmetry, testing preferences for the timing of positive experiences. In this study participants made choices about their own preferences. I predicted that participants would prefer to have a positive experience occur in the future compared to having the same experience occur in the past.

Method

Participants. 202 workers (M_{age} = 33.02 , SD_{age} = 11.75, 57% male) on Amazon Mechanical Turk consented to take the survey in exchange for $0.25.

Procedure. Participants read a hypothetical scenario in which they had the opportunity to have a 2-hour TV and movie night. They were told that a selection of TV and movies would be specifically curated for them that they were guaranteed to enjoy. Participants read that the TV night could have already happened yesterday or that it will happen tomorrow. Participants were asked to indicate if they preferred the past TV night, the future TV night, or if they were indifferent between the two options. Participants were also asked to explain their choice. Next,

participants were asked if they thought that the TV night would last longer or be more enjoyable in the past or the future.

Participants who expressed a preference for the future TV night were asked to make a series of choices indicating how many hours of past TV they were willing to trade-off to experience 2 hours of TV time in the future. The choices varied the length of the past TV night from 2 hours to 8 hours in increments of one hour. Participants were also asked if they agreed that a 2 hour TV night in the future was preferable to having a TV night in the past no matter how long or enjoyable the past TV night will be. Participants rated how enjoyable they thought the TV night described in the scenario was. Finally, participants filled out demographic information and were asked two attention check questions.

Results and Discussion

As predicted, most participants (62%) preferred the future TV night to the past TV night, $X^2(2, N = 202) = 89.77, p < .0001$. Participants who initially preferred the future TV night were willing to trade off an average of 4.49 hours of past TV[4] compared to 2 hours of future TV. Additionally, 69% of participants who preferred the future TV night agreed that they would prefer a 2-hour TV night in the future compared to having already had a TV night in the past no matter how long or enjoyable the past TV night was.

Most participants thought that the past and future TV nights were equal in length (94%). A majority (68%) of participants felt that the two TV nights would be equally enjoyable, another

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[4] Some participants preferred a 2-hour TV night in the future over an 8-hour TV night in the past which was the maximum choice value provided. Including these participants in the trade-off calculation and conservatively estimating their trade-off value to be 8 hours yields a trade-off point of 6.91 hours of past TV.

29% of participants felt that the future TV night will be more enjoyable. Seven participants failed one or both of the attention checks, however removing them from the analysis does not significantly alter the results. There were no significant effects of gender or race.

Study A provides additional empirical support to the claim that people are time biased by demonstrating that people prefer to have positive events occur in the future compared to the past. The majority of participants preferred to have a TV night occur in the future. This preference for a future TV night persisted even when the past TV night was longer in length. In addition to preferring pain to occur in the past, people also prefer pleasure to occur in the future. This suggests that people have preferences about the temporal location of both positive and negative events.

Study B: Preference for Past Pain or Preference for Early Pain

In several studies, preferences for the past or the future were confounded with preferences for earlier or later experiences. Study B, tested if participants are expressing a temporal preference (a preference for pain in the past), or a preference for pain that occurs earlier in time. Participants were randomly assigned to read a version of the surgery scenario that took place in the past or the future and were asked to choose between an earlier or later painful surgery. I predicted that in the past, participants will be indifferent between earlier and later pain. In the future, participants may wish to "get it over with" and prefer earlier pain, or they may dread the painful surgery and wish for the later painful surgery (Hardisty, Frederick, Weber, 2012; Harris, 2010; Loewenstein, 1987).

Method

Participants. 402 workers (M_{age} = 31.99, SD_{age} = 10.11, 59% male) on Amazon Mechanical Turk consented to take the survey in exchange for $0.25. Participants were recruited via two

separate Mechanical Turk HITs, one for the past and one for the future. Steps were taken to ensure that participants were only able to complete one version of the study.

Procedure. Participants in both conditions read a hypothetical scenario in which they were told that they needed to have a 2-hour surgery that would be safe, successful, and only moderately painful. Participants in the future condition were told that the surgery will happen one day from now or three days from now. Participants in the past condition were told that the surgery had happened one day ago or three days ago. Participants indicated if they preferred the earlier surgery, the later surgery, or if they were indifferent between the two timings. After making their choice, participants were asked to explain their reasoning. Participants were also asked if they thought that the surgery would be longer, more painful, or more successful one day from now or three days from now.

Participants who expressed a preference for the earlier or later surgery were asked to make a series of choices to indicate how many hours of earlier (later) surgery they were willing to trade-off for a 2-hour surgery later (earlier). The choices varied how long the earlier (later) surgery was from 2 hours to 16 hours in increments of two hours. Participants also indicated if they preferred any earlier (later) surgery no matter how long or painful it will be compared to having a 2-hour surgery later (earlier). Finally, participants filled out demographic information and were asked an attention check question about the historical success rate described in the scenario.

Results and Discussion

Across the past and future conditions, a majority of participants preferred the earlier surgery to the later surgery (70%), $X^2(2, N = 402) = 251.78$, $p < .0001$. There were no significant differences in preference based on temporal condition. In the past condition, participants who

preferred the earlier surgery were willing to trade off an average of 5.23 hours of earlier pain[5] for 2 hours of later pain. 20% of participants in the past condition who preferred the earlier surgery agreed that they would prefer any surgery that occurred earlier no matter how long or painful it was compared to a 2-hour surgery that occurred later. In the future condition, participants who preferred the earlier surgery were willing to trade off an average of 4.81 hours of earlier pain[6] for 2 hours of later pain. Additionally, 17% of participants in the future condition who preferred the earlier surgery agreed that they would prefer any surgery that was earlier no matter how long or painful it was compared to a 2-hour surgery that occurred later.

The majority of participants thought that the earlier and later surgeries were equal in length (95%), equally painful (92%) and would be equally successful (96%). Forty-nine participants failed the attention check (22 in the future condition, 27 in the past condition), however removing them from the analysis does not significantly alter the results. There were no significant effects of gender or race.

Study 4 failed to rule out the alternative explanation that participants prefer earlier pain. When thinking about earlier and later surgeries in both the past and the future, the majority of participants preferred an earlier surgery. Also, participants were willing to experience more pain in an earlier surgery to avoid a later surgery in both the past and the future. These results do not eliminate the possibility that the preference for past pain is due to a preference for earlier pain.

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[5] As in previous studies, some participants expressed a preference for a 16-hour earlier surgery over a 2-hour later surgery which was the maximum trade-off presented to participants. Including these participants in the trade-off calculation and conservatively estimating their trade-off point to be 16 hours yields a trade off point of 6.75 hours of earlier pain.

[6] When including participants who expressed no preference and conservatively estimating their trade-off point to be 16 hours of earlier pain, the trade off point is 5.77 hours of earlier pain.

One reason for this result is because the time frame was relatively short (one day ago vs. three days ago and one day from now vs. three days from now). The inherent differences between the past and the future, especially in uncertainty, may have been dampened due to the short time horizon. The results of this study suggest that this preference may not be related to tense, and is instead a preference for earlier painful experiences. Alternatively, there may be different explanations for the patterns in the past and the future. In the past, participants may prefer to have the surgery as far in the past as possible to increase their recovery time, gain some benefit from having the surgery, or decrease the salience of the memory of the surgery. In the future, participants may dread the surgery and prefer to get it over with. Additional studies are necessary to distinguish between preferences for earlier pain and preferences for past pain.

Study C: Pain Preferences for Friends and Strangers

Study C investigated the effect of social distance on the preference for past pain. Participants were randomly assigned to make a choice about surgery for a friend or for a stranger. Participants made a choice between two surgeries of unequal length—a 4-hour surgery yesterday or a 2-hour surgery tomorrow. I predicted that participants would be more likely to prefer a 4-hour surgery yesterday for their friend than for a stranger. Because participants are likely to feel closer to their friends than to a stranger, I predict that they will be more likely to express similar preferences to those they would express for themselves (preferring greater pain in the past).

Method

Participants. 301 workers (M_{age} = 35.06, SD_{age} = 10.96, 45% male) on Amazon Mechanical Turk consented to take the survey in exchange for $0.25.

Procedure. Participants were randomly assigned to either the friend condition or the stranger condition. Participants who were assigned to the friend condition were asked to think of a friend who lives in the same town as them and write out their friend's name or initials. Then all participants were instructed that they would be asked to make judgments about another person. Participants in the friend condition learned that this other person would be the friend they just described. Participants in the stranger condition were told that their target was Alice, a stranger who lives in the same town as them. All participants read a hypothetical scenario that described a minor surgery that their friend or Alice needed to have. This surgery was described as safe, successful, and only somewhat painful. Participants were told that although the surgery is painful, patients report feeling back to normal by the end of the day, regardless of the length of the surgery. Participants indicated if they thought that a 4-hour surgery yesterday or a 2-hour surgery tomorrow was in Alice's or their friend's best interests. Participants were also able to indicate if they had no preference. All participants explained their choice, then indicated how close they felt to the target. Participants answered a manipulation check question (the length of the surgery yesterday) and answered a few demographic questions.

Results and Discussion

The majority of participants in the friend condition preferred that their friend have the 2-hour surgery tomorrow (55%) compared to the 4-hour surgery yesterday (32%), $X^2(1, N = 131) = 9.35, p < .002$. However, participants in the stranger condition were indifferent to when Alice had the surgery with 47% preferring the 2-hour surgery tomorrow and 39% preferring the 4-hour surgery yesterday, $X^2(1, N = 130) = 1.11, p = .293$. Participants marginally differed on their

preference for surgery timing for friends compared to strangers, $X^2(1, N = 261) = 2.06, p < .095$, with participants in the friends group being more likely to prefer the 2-hour surgery tomorrow.

As expected, participants in the friend condition felt more close to their friend ($M_{friend} = 5.68$, $SD_{friend} = 1.04$) than participants in the stranger condition felt to Alice ($M_{stranger} = 3.52$, $SD_{stranger} = 1.56$), $F(1, 299) = 200.84$, $p < .0001$. The interaction between target condition and surgery preference was not significant, $F(2, 295) = 1.493$, $p = .226$.

The results of Study C did not support the hypothesis. Participants were more likely to prefer a future, shorter surgery for their friend as opposed to a stranger. When prompting participants to state their preference we asked 'With your friend's [Alice's] best interests in mind which would you prefer'. In past studies, the 'best interests in mind' language was omitted. Including this language may have encouraged participants to think more about the targets life as opposed to their predicament leading them to prefer the future, shorter surgery. This may have been exacerbated by the difference in length between the past and the future surgery.

Study D: Well-Being

Study D investigated if preferences for the timing of a painful experience were related to well-being. In this exploratory study, I predicted that participants who had higher well-being scores would show a reduced bias toward the future (e.g., would be less willing to trade off past pain for future pain).

Method

Participants. 600 workers ($M_{age} = 35.77$, $SD_{age} = 11.86$, 51% male) on Amazon Mechanical Turk consented to take the surgery in exchange for $0.50.

Procedure. Participants read a hypothetical scenario in which they needed to undergo a 2-hour surgery that would be safe, successful, and only somewhat painful. Participants were told that the surgery could have already happened yesterday or that it will happen tomorrow. Participants indicated if they preferred the past surgery, the future surgery, or if they were indifferent between the two options.

Participants who expressed a preference for the past (future) surgery were asked to make a series of choices to indicate how many hours of past (future) surgery they were willing to trade-off for a 2-hour surgery in the future (past). The choices varied how long the past (future) surgery was from 2 hours to 16 hours in increments of two hours. Participants were also asked if they agreed with the following statement, "I would prefer having already had a surgery in the past [having a surgery in the future], no matter how painful or long it was, compared to having a 2-hour surgery in the future [having already had a 2-hour surgery in the past]".

Participants completed the Satisfaction with Life Scale (SWLS) (Diener, Emmons, Larsen, & Griffin, 1985) and a matching measure of monetary discounting (Hardisty, Thompson, Kranz, & Weber, 2013). Participants indicated the amount of money they would have to receive in 6 months to be equal to receiving $300 immediately. The order in which participants completed the timing preference questions, the SWLS and the monetary discount measure was randomized. Finally, participants filled out demographic information and were asked an attention check question about the historical rate of success described in the scenario.

Results and Discussion

There were no differences based on the order that participants completed the dependent measures so I ignore order in the analysis. The majority of participants (85%) preferred the past

surgery to the future surgery, $X^2(2, N = 600) = 731.77$, $p < .0001$. Among participants who

preferred the past surgery and who expressed a past surgery length at which they would prefer a

future surgery, the average trade off point was 3.83 hours of past pain[78]. Furthermore, 36% of

participants who preferred the past surgery agreed that they would prefer any surgery in the past no

matter how long or painful it was compared to a 2-hour surgery in the future.

Well-being scores were not significantly different based on participants' preferences for the

timing of the surgery, $F(2, 597) = 0.29$, $p = .745$. In addition, well-being scores did not significantly

predict participants' trade-off point between past pain and future pain, $b = -0.01$, $t(512) = -0.27$, p

$= .788$. Monetary discounting did not significantly differ based on participants' preferences for the

timing of the surgery, $F(2, 597) = 0.11$, $p = .898$. In addition, rates of monetary discounting did

not significantly predict participant's trade-off point between past and future pain, $b = -0.01$, $t(512)$

$= -0.08$, $p = .935$. One hundred and thirty four (22%) participants failed the attention check;

however removing them from the analysis does not significantly alter the results. There were no

significant effects of gender or race.

Although I hypothesized that the preference for past pain may be related to well-being, this

was not supported in this study. The results of Study D suggest that the preference for past pain

and the willingness to trade-off past pain for future pain are not related to participants' well-being.

Although the SWLS is a very commonly used measure of well-being, future studies could explore

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[7] Some participants expressed a preference for a 16-hour surgery in the past over a 2-hour future
surgery which was the maximum trade-off presented to participants. Including these participants in
the trade-off calculation and conservatively estimating their trade-off point to be 16 hours yields a
trade off point of 6.32 hours of past pain.
[8] Nine participants who preferred the past surgery gave inconsistent responses on the tradeoff
questions, however removing their responses does not significantly alter the results.

additional measures of well-being. Additionally, future studies could investigate if preference for

past pain is related to anxiety about the future or anxiety toward death and dying to further

explore this relationship.

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