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Psychological Connectedness and Intertemporal Choice

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People tend to attach less value to a good if they know a delay will occur before they obtain it. For example, people value receiving $100 tomorrow more than receiving $100 in 10 years. We explored one reason for this tendency (due to Parfit, 1984): In terms of psychological properties, such as beliefs, values, and goals, the decision maker is more closely linked to the person (his or her future self) receiving $100 tomorrow than to the person receiving $100 in 10 years. For this reason, he or she prefers his or her nearer self to have the $100 rather than his or her more remote self. Studies 1 and 2 showed that the greater the rated psychological connection between 2 parts of a participant's life, the less he or she discounted future monetary and nonmonetary benefits (e.g., good days at work) over that interval. In Studies 3–5, participants read about characters who undergo large life-changing (and connectedness-weakening) events at different points in their lives and then made decisions about the timing of benefits on behalf of these characters. All 5 studies revealed a relation between perceived psychological connectedness and intertemporal choice: Participants preferred benefits to occur before large changes in connectedness but preferred costs to occur after these changes.

Keywords: connectedness, intertemporal choice, personal identity, decision making, temporal discounting

People often choose to consume a smaller amount of some good now, rather than a larger amount later. A person might, for example, prefer to receive $150 dollars now over $500 in 25 years or to pay more in shipping to have a DVD delivered sooner rather than later. Normative accounts of this tendency—called *temporal discounting*—provide the logic by which a rational actor *should* arrive at such a preference, whereas descriptive accounts try to explain how people *actually* choose. The current studies examined how well the prescriptions of a particularly innovative normative account describe how people choose when faced with intertemporal decisions. In brief, this account predicts (and we found) that when people anticipate psychological discontinuities between their current and future selves, they feel less concern for those future selves. They therefore prefer benefits to occur before the discontinuities and burdens to occur after them.

Temporal Discounting

One might think that a person should always choose the larger benefit of two or more options, regardless of timing, as long as the outcome occurs within the person's lifetime. All else equal, choosing the larger reward confers greater utility, serving to maximize total lifetime utility. It seems reasonable for a person to want his or her life, as a whole, to go as well as possible.

However, even if rationality demands impartiality toward all parts of one's life, economists argue that temporal discounting is consistent with rationality. For example, if an option's value constantly increases over time (as does, e.g., money in a savings account), then at no point within one's lifetime is consumption more profitable than postponement. Normative theories of discounting explain why (and at what points in time) the nondeferral of consumption is rationally justified, typically by showing how the time of consumption can affect total utility over a person's life. For example, one might rationally prefer to consume sooner, rather than later, because delays entail opportunity costs. Moreover, on average, people grow wealthier over time, so an increase in one's standard of living will mean that the utility of $150 will decrease. Also, unpredictable events—changes in inflation rates, changes in tastes and preferences, uncertainty about realization of the benefit—all affect total utility. Some normative accounts specify the degree of discounting that one or more of these influences rationally require. For example, one theory (Fisher, 1930) argues that people should discount investable goods at a rate equal to the market interest rate.

People's tendency to choose early options over later, larger options often exceeds what this family of models is able to justify (for a review, see Frederick, Loewenstein, & O'Donoghue, 2002). In this light, people's choices are *impatient*. For example, market evidence suggests that people discount long-term costs (e.g., the higher energy costs associated with less expensive, lower efficiency home air conditioners) by more than what the market interest rate predicts (Thaler & Shefrin, 1981). Even psychological models, which typically describe rather than prescribe behavior, have adopted implicit normative standards. For example, situations

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in which people maximize short-term goals at the expense of long-term goals are often branded "failures" of self-control (e.g., Ainslie, 1986; Baumeister, Vohs, & Tice, 2007; Metcalfe & Mischel, 1999; Strotz, 1956).

Personal Identity and Intertemporal Choice

Most accounts of rational action and rational choice argue that rationality demands acting in a manner consistent with self-interest: acting to achieve *one's own* goals, which include not only those realizable in the present but also those one's future self will obtain. Benefits to one's future self can even compensate for burdens imposed on one's present self; this is, of course, the basis of such practices as saving money, dieting, and studying. Reconceptualizing what constitutes a person or a lifetime, therefore, could motivate very different principles for behavior and choice, perhaps justifying as rational tendencies that seem impatient and irrational by the standards of most normative accounts. *What are the future selves to which a person should direct his or her interest?*

The philosophy of personal identity attempts to answer a set of interrelated questions about which properties and relations determine identity of selves over time. One traditional view of identity comports with the traditional view of temporal discounting. Consider a person P at a particular time point t_a. If the person survives to a later time t_b, then there is some person P' at t_b who is numerically identical to P. (Numerical identity is the relation that each individual entity bears to itself, the relation symbolized by $=$; in this case, $P = P'$. Numerical identity contrasts with qualitative identity, the relation between things that have the same qualitative properties, like color or shape. Thus, two different 2009 Nissan Sentras can be qualitatively but not numerically identical.) Which properties of P and P' determine this identity are a controversial matter: For P to be identical to P', they may have to be related in certain psychological ways (e.g., Lewis, 1983; Parfit, 1984; Perry, 1972; Unger, 1991) or in certain bodily–physical ways (e.g., Williams, 1970). (See Blok, Newman, & Rips, 2005; Hall, 1998; Liittschwager, 1995; and Rips, Blok, & Newman, 2006, for empirical studies of how people judge identity over time.) In either case, the relation of P to his or her future self P' is one of identity. If P is trying to decide whether to consume some good now (at t_a) or to postpone consuming until t_b, the issue is whether P's current utility for himself or herself consuming now, $u(P, t_a)$, is greater than the current utility for P' consuming at t_b, $u(P', t_b)$. However, if $P = P'$, this choice reduces to deciding whether the current utility for his or her own consuming at t_a is greater than that for his or her own consuming at t_b—whether $u(P, t_a)$ is greater or less than $u(P, t_b)$. This in turn depends only on how utility changes as a function of time.

However, some contemporary views of personal identity call into question these assumptions about present and future selves and, thus, have direct implications for rational choice. One account that differs radically from standard economic views was offered by Parfit (1984). He described persons as a sequence of partially overlapping selves and argued that the number, strength, and quality of psychological connections, which constitute the overlap between the present self and future selves, tend to decrease over time. What matters for choice is not the identity relation between persons (e.g., $P = P'$) but the strength of these psychological connections. Although Fred today is the same person as Fred 1 year from now and Fred 20 years from now ($\text{Fred}_0 = \text{Fred}_1 = \text{Fred}_{20}$), Fred today is likely to be more closely connected psychologically to his self in 1 year than to his self in 20 years. If so, Fred_0 should care more about Fred_1 than Fred_{20}, and he should desire more positive and fewer negative outcomes for the former than for the latter. As mentioned earlier, identity may itself depend on psychological connections; nonetheless, degree of connectedness can vary even within the identical person in ways that are important for choice.

The practical import of Parfit's (1984) theory can be stated as an analogy: a person is not rationally required to care as much about most others' welfare as his or her own. So, too, if a person's future self is sufficiently different in terms of personality and values from the person's current self, the person is not rationally required to care as much about his or her future self's welfare. Thus, impatience can be justified insofar as the person anticipates changes in his or her psychological connectedness over time. The person ought to be more interested in having a closer future self consume a good than in having a more distant self consume the same good. Some evidence supporting this analogy between decisions for future selves and decisions for other people comes from a number of recent experiments (e.g., Jones & Rachlin, 2006; Pronin, Olivola, & Kennedy, 2008; Rachlin & Jones, 2008). For example, Pronin et al. (2008) asked one group of participants to decide how much of an unpleasant-tasting liquid they would drink (for scientific purposes) during the ongoing experimental session, a second group how much they would drink in a session "next semester," and a third group how much they would require "the next person in this new study" to drink. Participants allotted similar amounts for the self next semester and the next person now, but lesser amounts for the self now.

To return to the hypothetical decision maker we considered earlier, we find that his or her choice is to decide between $u(P, t_a)$ and $u(P', t_b)$, where these cannot be further reduced. Rather than thinking of P and P' as standing for a person's entire lifetime, we might more appropriately think of them as standing for *stages of a person* (so that P will not in general equal P'). Alternatively, we could suppose that the identity relation itself is a matter of degree rather than being all or none. On either conception, P's decision should depend not only on the temporal distance between events but also on the personal distance (or degree of continuity) between his or her present and future stages (or selves). From this point of view, discounted utility is a two-dimensional rather than a one-dimensional function. Although the difference between people's current and future selves normally increases with the temporal distance between them, the correlation is not perfect. Many landmark events in life—marriage or divorce, entry into college or the workforce—can change people's psychological makeup in ways that go beyond changes due to the mere passing of time (e.g., Kurbat, Shevell, & Rips, 1998; Liu & Aaker, 2007; Pillemer, Rhinehart, & White, 1986; Shum, 1998). Anticipation of such events may likewise lead to an expected change between present and future selves exceeding that due to time alone (a point to which we return in Studies 3–5).

Parfit (1984, pp. 205–206) defined psychological connectedness as "the holding of particular direct psychological connections," which include the sharing of memories (P' remembering some of the experiences of P), intentions (P' carrying out the action that P intended), and sharing of beliefs, desires, and other psychological features. If a sufficient number of such direct connections exist, P and P' are said to be *strongly connected*. Parfit then defined a weaker continuity relation that consists of "overlapping chains of strong connectedness." P and P'' can stand in such a relation, for

example, if P is strongly connected to P' who is strongly connected to P''.

While Parfit's (1984) definition is somewhat open-ended because of the open-endedness of the psychological properties that can contribute to connectedness, connectedness nevertheless seems well grounded in people's intuitions regarding changes in mental life over time. Thinking back on one's college days, for example, one is aware of continuities and changes in what one believed, remembered, and desired then and what one believes, remembers, and desires now. One therefore feels more or less connected to one's past self along this dimension. In the following studies, we explained psychological connectedness in this informal way by asking participants to think of "your personality, temperament, likes and dislikes, beliefs, values, ambitions, goals, ideals—and rate the degree of connectedness between the person you expect to be in the future compared to the person you are now."

Parfit's (1984) account has been described as "the most compelling argument supporting the logic of positive time preference" (Frederick, Loewenstein, & O'Donoghue, 2002, p. 359) and "[perhaps] the only way to justify true impatience" (Read, 2004, p. 428). Despite its logical appeal, however, no empirical data exist to support a relationship between the perceived distance between people's present and future selves and their intertemporal preferences. To our knowledge, the only direct attempt to evaluate this relation found mainly null effects (Frederick, 2003). In that study, participants rated the subjective similarity between their current self and their selves at different points in the past and future (e.g., 5, 10, or 20 years from now or 5, 10, or 20 years ago). They also indicated the amount of money they would receive at these same times that they felt was equivalent to receiving $100 tomorrow (see Study 1, below, for further details). However, Frederick (2003) found only negligible correlations between rated similarity to future selves and temporal discounting at specific times (e.g., 20 years from now).

The lack of positive evidence from this study has led to the conclusion that Parfit's (1984) theory is descriptively invalid: "Curiously, Frederick has tested whether the discount rate is correlated with how much people identify with their future selves, and has found no relationship, suggesting that the Parfitian notion of identity does not underlie discounting" (Read, 2004, p. 428). Of course, a correlation between people's level of connectedness and level of discounting cannot provide strong evidence for the descriptive status of Parfit's theory—changes in connectedness must cause impatience for the theory to be valid. Still, although insufficient, such a correlation would provide initial evidence for a link between connectedness and discounting at a minimum. Thus, the fact that no such correlation has emerged raises questions about the theory's validity. Given these findings and given the potential importance of Parfit's theory, it may be worth revisiting the theory's empirical status.

Overview

In the current studies, we tested the influence of people's intuitions about the (in)stability of personal identity over time on their (im)patience for future utility. We found evidence, in five studies, that when participants (university undergraduates) anticipated large changes in psychological connectedness, they appeared impatient—choosing to speed up consumption of monetary and nonmonetary benefits. Conversely, when they anticipated small changes, they appeared more patient. Parfit's (1984) arguments appear to justify these changes in patience: If one should care less about a distant future self than a proximal self, then one should speed up benefits so that the proximal self can enjoy them.

Studies 1 and 2 looked at the relation between patience and psychological connectedness in people's judgments about their own future selves. Participants in these studies rated the connectedness between their present state and their likely state at different times in the future. They also made judgments about the equivalence of present and future goods. Correlations between these judgments helped determine whether large decreases in connectedness are associated with a greater desire to expedite or defer benefits. Studies 3–5 employed a novel experimental approach: They described fictional characters who experience some potentially life-changing events, such as a religious conversion, that would normally decrease psychological connectedness. To separate the effect of these events from the passing of time, we balanced the life-changing events so that they happen to different characters at different points in the future. Participants chose for these characters when they would receive benefits or costs, and we used these decisions to evaluate the unique role of psychological connectedness in intertemporal choice.

Study 1: Temporal Preference and Perceived Personal Change

In this study, we investigated whether changes in patience over time correlate with changes in perceived connectedness over time. As we noted earlier, a correlation of this sort cannot provide strong evidence for a causal relation between these variables. However, if a correlation existed, then we would have obtained initial evidence for a link between these constructs—in contrast to the previously reported null results (Frederick, 2003)—and a go-ahead to seek more conclusive evidence in further studies regarding the descriptive validity of Parfit's (1984) theory.

Participants in the present study indicated the degree of anticipated change in their psychological makeup over several time delays. They also indicated their preferences between payoffs that they would receive at two given time points. For example, they decided what amount of money, to be received after 1 year, would be the equivalent of receiving $100 tomorrow—or, put differently, how much money they would have to receive a year from now to forgo $100 now. The goal of the study was to determine whether the change in psychological connectedness predicted the degree of temporal discounting.

We measured psychological connectedness in Study 1 by asking participants for similarity between present and future selves with respect to psychological properties such as personality characteristics, beliefs, and values. We had two reasons for this choice of measures. First, the philosophical theory we are testing (Parfit, 1984) takes these properties as fundamental for psychological continuity. According to the theory, these attributes serve as the mental ties between the successive stages or selves of an individual. We distinguish psychological connectedness in this sense from more general perceived similarity because, as many have argued, similarity is difficult to define without a frame of reference (Goodman, 1972; Murphy & Medin, 1985). Second, measuring psychological connectedness in this way echoes the procedure of Frederick (2003) and thus allows a closer comparison between his results and ours.

Method

Materials and design. We assessed psychological connectedness by asking participants to:

> Rate the similarity between your current self and the person you will be in the future. Please think of the characteristics that make you the person you are—your personality, temperament, likes and dislikes, beliefs, values, ambitions, goals, ideals—and rate the degree of connectedness between the person you expect to be in the future compared to the person you are now, where 0 means completely different and 100 means exactly the same.

We modeled these instructions on Frederick's (2003) but added explicit mention of the identity-comprising nature of these characteristics and of degree of connectedness. Participants first gave connectedness ratings to the self in 1 year, then for 5, 10, 20, 30, and 40 years in the future.

Next, we presented participants one of three randomized orders of the following 17 preference matching questions:

Delays

A. I would be indifferent between \$100 **tomorrow** and \$_____ in **one year**.

B. I would be indifferent between \$100 **tomorrow** and \$_____ in **5 years**.

C. I would be indifferent between \$100 **tomorrow** and \$_____ in **10 years**.

D. I would be indifferent between \$100 **tomorrow** and \$_____ in **20 years**.

E. I would be indifferent between \$100 **tomorrow** and \$_____ in **30 years**.

F. I would be indifferent between \$100 **tomorrow** and \$_____ in **40 years**.

Intervals: Postponements

A. (above)

G. I would be indifferent between \$180 in **one year** and \$_____ in **5 years**.

H. I would be indifferent between \$500 in **5 years** and \$_____ in **10 years**.

I. I would be indifferent between \$900 in **10 years** and \$_____ in **20 years**.

J. I would be indifferent between \$2000 in **20 years** and \$_____ in **30 years**.

K. I would be indifferent between \$3000 in **30 years** and \$_____ in **40 years**.

Intervals: Preponements

L. I would be indifferent between \$_____ **tomorrow** and \$180 in **one year**.

M. I would be indifferent between \$_____ in **one year** and \$500 in **5 years**.

N. I would be indifferent between \$_____ in **5 years** and \$900 in **10 years**.

O. I would be indifferent between \$_____ in **10 years** and \$2000 in **20 years**.

P. I would be indifferent between \$_____ in **20 years** and \$3000 in **30 years**.

Q. I would be indifferent between \$_____ in **30 years** and \$4500 in **40 years**.

Items G–Q use the median values supplied by 20- to 29-year-old participants in Frederick (2003) when asked for their \$100 equivalents for the designated delay. For each question, we set the value to be matched to our best guess as to the time-discounted utility of \$100 to try to make the utilities about which participants were reasoning as uniform as possible across questions. Participants received these problems in a booklet and responded by writing the equivalent amount in the blanks.

Participants. Thirty-nine Northwestern University (Evanston, IL) undergraduates participated in this study. We tested them individually, and most took fewer than 5 min to complete the task. Participants also took part in an unrelated study that filled the rest of the 30-min session. All participants received partial course credit for Introductory Psychology.

Results

Our aim was to assess the relation between judgments of connectedness and degree of temporal discounting. We first describe these two dependent measures separately and then report the correlation between them: We found that greater connectedness is associated with less discounting (more patience).

Psychological connectedness. As shown in Figure 1, perceived psychological connectedness decreased over temporal distance. Participants felt more connected to proximal future selves than to distant future selves. The shape of the function appears roughly similar to that in Frederick (2003) for comparable conditions (participants in their 20s judging similarity between future and current selves). Of course, the averaged data in Figure 1 could have come about for a variety of reasons. We explored the basis of connectedness in more detail in Studies 3–5 by manipulating events that might alter it directly.

Increasing patience over time. For each participant, we calculated the discount factor (δ) revealed by each of his or her 17 responses. This index reflects the value retained after a delay of one unit time period, in this case, a year. We calculated it as follows:

$$\delta = \left[\frac{dollars\ at\ t_1}{dollars\ at\ t_2}\right]^{\frac{1}{(t_2 - t_1)}},$$

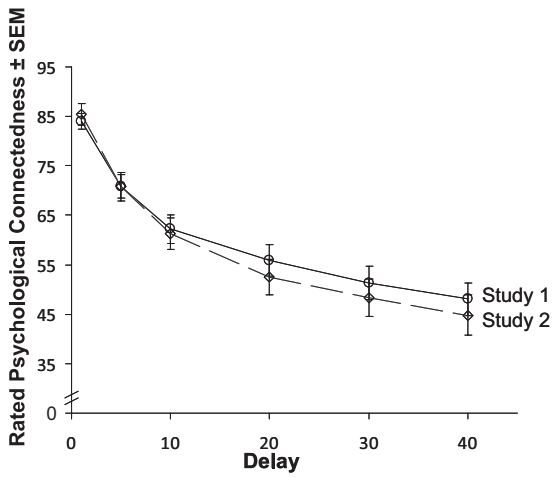

Figure 1. Decreasing psychological connectedness over time (years) in Studies 1 and 2. Error bars indicate standard error of the mean.

where *dollars at* t_1 and *dollars at* t_2 are the two amounts that participants judged equivalent, the first at the earlier time t_1 and the second at the later time t_2. For example, if a participant stated that he or she was indifferent between receiving \$180 dollars in 1 year and \$240 in 5 years (see Question G in the Method section), the discount factor would equal $(180/240)^{[1/4]}$ or .93. Discount factors greater than 1 imply negative time preference—that is, a preference for consuming goods at the more distant point t_2 in the future. There were 27 such responses (4% of the data). These values were replaced by 1.0 to reflect time indifference, or no impatience.

As δ increases from 0 to 1, patience increases since there is relatively less discounting of utility over time. The delay function in the left half of Figure 2 plots the average discount factor based on the values at 1, 5, 10, 20, 30, or 40 years that participants gave as their equivalents of \$100 tomorrow (see Questions A–F of the Method section). The graph shows that participants appeared more patient at greater temporal distances. For example, they discounted less per year over a 40-year period than over a 10-year period. The delay function in the left half of Figure 2 is also quite comparable to the data from similar questions that Frederick (2003, Table 3a) reported. In both cases, the discount factor for 20-year-old participants increases with delay but at a decreasing rate, and it reaches what appears to be an asymptotic level of about $\delta = .9$ after a delay of 40 years. (Increasing delay functions also appeared in many earlier studies, where investigators took them as evidence for *hyperbolic discounting*—i.e., changing discount rates in different time intervals; see Frederick et al., 2002.)

Read (2001) found that shorter intervals of time elicit steeper discounting, independent of the time when the more remote option occurs. For example, participants in his studies exhibited more patience when choosing between a reward now and one available in 2 years than when choosing between a reward available in 1 year and a reward available in 2. These choices varied the length of the interval between rewards (1 year vs. 2) but held constant the time of the later reward (2 years from the present). We therefore examined discounting for the constituent intervals that were subsumed by our delays. The right half of Figure 2 plots the interval data separately for responses based on postponements of rewards (Questions A and G–K in the Method section) and those based on "preponements" (Questions L–Q).These results indicate more discounting (lower δs) for the shorter intervals (1–5 and 5–10 years vs. 10–20, 20–30, and 30–40 years) but also a modest increase due to delay (from 10–20 to 20–30 to 30–40 years) when the length of the interval is constant. Change in direction (preponements vs. postponements) does not affect this pattern. (See the Discussion of Study 2 for further results on intervals.)

Relationship between psychological connectedness and discounting. Our central hypothesis is that people's patience over time depends on their perceptions of their psychological connectedness. We focus our analyses of the relationship between connectedness and preference on intervals, rather than delays. As becomes clear in Studies 3–5, below, we can test our predictions most precisely by focusing on the intervals in which people anticipate relatively large changes in psychological connectedness, where connectedness is independent of the distance of these intervals from the present time.

For each participant, we correlated the discount factor for each interval (t_n to t_{n+1}, using Questions A and G–Q of the Method section) with the corresponding drop-offs in psychological connectedness (connectedness rating for t_n minus the rating for t_{n+1}). We then compared the central tendency of these within-participant correlations against zero to test whether intuitions about connectedness relate to intertemporal preference. The results of this comparison showed that participants exhibited greater impatience (lower values of δ) over those intervals for which they anticipated relatively large drop-offs in psychological connectedness. The median of the within-participant correlations between connectedness and time preference was −.65. The results of both a Wilcoxon signed-rank test ($W = 364$, $p < .0001$) and a one-sample t test (mean Fisher-transformed r-to-$z = -.90$), $t(38) = 7.44$, $p < .0001$, confirmed that perceptions of instability (lack of connectedness) and impatience are related.

It may seem odd at first that patience increases with delay—see the left half of Figure 2—if (as we hypothesize) lack of connectedness decreases patience. Shouldn't people feel less connected with their more remote future selves and therefore be *less* patient over longer delays? Recall, however, that the measure of patience on which we focus (δ) is a rate: the proportion of a good's initial value it retains per year over a given delay. In general, the total

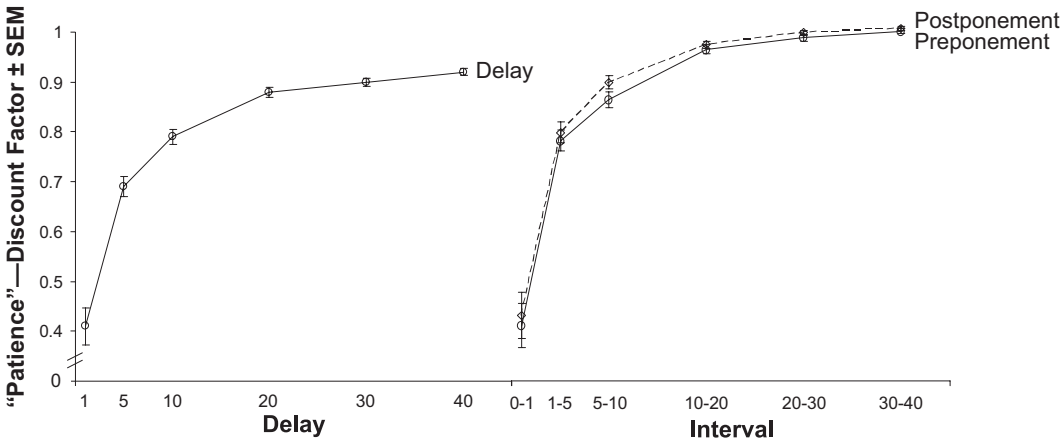

Figure 2. Increasing patience over time (years) in Study 1. Error bars indicate standard error of the mean.

value retained (i.e., \$100 tomorrow/equivalent dollars at t_n) will indeed decrease, as will the total drop-off (connectedness rating for tomorrow minus the connectedness rating for t_n), over a multiyear period, and these correlations are also significant in our data (median within-participant correlation computed over delays = −.85, $W = 390$, mean r-to-$z = -1.32$), $t(38) = 16.01$, $p < .0001$.

Discussion

Recall that the only preexisting test of the relationship between connectedness and patience found null results (Frederick, 2003) and that these null results have been interpreted as evidence against Parfit's (1984) theory (Read, 2004). We found that perceived psychological connectedness is, in fact, related to patience for the consumption of monetary benefits. Why did we find the relationship for which Frederick (2003) found no evidence? As we have noted, the shape of the connectedness functions and that of the discounting functions are very similar across the two studies. Both studies show that the discount factor increases with time, whereas connectedness decreases with time.

The difference between the two studies is primarily due to the fact that we used correlations across time points, whereas Frederick (2003) used correlations within time points. To understand Frederick's method, consider a delay of 20 years. Suppose Fran gives a rating of 70 (on a 0–100 scale) to the similarity between her current state and her predicted self after 20 years and also produces a discount rate of .18 for a 20-year delay. Calvin might likewise give a similarity rating of 60 between his current state and his predicted self after 20 years and produce a discount rate of .15, and so on. Frederick's method tested whether a participant who rates herself as highly similar in 20 years is more patient over that delay than one who rates himself as less similar in 20 years. This is a perfectly reasonable question to ask of the data, and this method has the virtue of holding constant variables, such as inflation rate, that change as a function of delay. Frederick reported the correlations between similarity ratings and discount rates within each delay, and they were negligible for most delays.[1] When we analyzed our data as Frederick did, we found similarly unimpressive correlations between similarity ratings and discount rates computed for each interval (rs = .14, .34, .13, −.10, and −.10 for the 1-, 5-, 10-, 20-, 30-, and 40-year delays, respectively; only the correlation over the 5-year delay was significant at $p < .05$).

We explored a different method of investigating the relationship between identity and discounting for a few reasons. First, any differences between participants in the use of the similarity scale would add noise to the test. A measure of connectedness may be subject to idiosyncratic interpretations by participants. For example, one participant may register a large change in identity with a reduction of 20 points on the scale and another register the same magnitude of change with an 8-point reduction. The within-delay correlation across participants would expect the latter to be more patient than the former over a 20-year delay. Our test predicts impatience using the profile of connectedness ratings for each participant, lessening the noise attributable to differences in interpreting the scale. Second, lack of meaningful variability among participants in their judged connectedness or discount rates at a particular time point would make it impossible to find a correlation between them, and this would understate the relationship between these variables. Third, the within-delay method ignores within-participant consistencies in relating discounting to predictions about his or her future self.

We would argue that the key prediction of Parfit's (1984) theory is that when an individual anticipates changes in his or her life, he or she should exhibit relative impatience during those intervals. Using a correlation across intervals to test exactly this interpretation, we found highly significant correlations in our data and in Frederick's (2003). When we analyzed Frederick's data in the same way we analyze ours, the comparable median correlation between total drop-off in connectedness and total monetary value retained over delays was −.91.[2]

This initial study provides evidence of two parallel patterns—the discount factor increased over the intervals we used (0–1 year, 1–5 years, 5–10 years, etc.), whereas connectedness drop-offs decreased over the same intervals. However, the fact that drop-offs in connectedness correlate negatively with levels of patience is not conclusive evidence for the connectedness framework. Any variable that is negatively accelerated or decelerated over these intervals would probably correlate with patience, including the perception of time itself (Zauberman, Kim, Malkoc, & Bettman, 2009). For this reason, and because different correlations (within-delay vs. between-delay) yield different inferences, Studies 3–5 took a more experimental approach to these issues. Before moving on, a generalization test of Study 1's result would be instructive because discount factors can vary widely across domains (i.e., different kinds of outcomes) and across elicitation procedures (Frederick, 2003). To test the generality of these results, Study 2 measured discounting over a new nonmonetary domain. It also offered a test of the relationship between patience and an alternative index of psychological connectedness, one that is perhaps more direct and face valid.

Study 2: Choice, Matching, Monetary and Nonmonetary Outcomes

Study 1 found, as predicted, an inverse relationship between psychological connectedness and patience. If this relationship is a general one, it should appear under different ways of assessing these two underlying variables. In Study 2, we used patience for nonmonetary benefits of a specific sort—the number of good days during a particular year on one's job—to provide a more stringent test of temporal discounting. By definition, one has to enjoy the number of good days in the year 2010 during 2010—one cannot hoard them for later use in 2011 or 2012. Thus, these options have a built-in time of consumption, and any preference to have good days during an earlier rather than a later year is a preference for enjoying these days at the earlier time. By contrast, one can save or invest the money one receives in 2010 for later use: Receiving the money earlier does not entail spending it earlier. This means that a tendency toward impatience for

[1] Frederick (2003) reported discount rates rather than discount factors, but the two measures are simple transformations of each other. In this context, $r = \frac{1}{\delta} - 1$, where r is the discount rate and δ the discount factor (Read, 2004, p. 430). We transformed the discount rates to discount factors to assess the similarities between the results of the two studies in the comparison described here.

[2] We thank Shane Frederick for providing his data set and an anonymous reviewer for suggesting this analysis.

money can be exaggerated because receiving the money sooner enables one to spend it (or save it) over a longer time interval. We would therefore expect greater impatience for monetary than for nonmonetary goods. Nevertheless, if differences in psychological connectedness between present and future selves influence impatience, we should find impatience even for nonmonetary, less temporally fungible items.

Method

Materials and design. A computer administered the stimuli to participants in this study (unlike the other studies reported here, which were paper based). After reading instructions about how to rate psychological connectedness that were similar to those of Study 1, participants took part in a modified version of the Inclusion of Other in Self Scale (Aron, Aron, & Smollan, 1992). In this task, they saw pairs of Euler circles on the computer screen and rated "the degree of 'connectedness' between your current self and the person you will be in the future" by manipulating the overlap between the circles (with respect to the important psychological features that determine continuity, or degree of connectedness, as described to participants). Figure 3 shows an example of the display.

After the connectedness ratings, participants received a matching task analogous to the interval-preference matching in Study 1. Participants indicated the monetary amount that would make them indifferent between receiving a given amount sooner (e.g., $100 in a year) and some to-be-specified amount later (e.g., $____ in 5 years) for each of the same intervals we had employed in Study 1.

In the third part of the study, participants received a preference-titration choice task. For each interval, we multiplied the dollar amounts participants had supplied for the earlier and later times by a constant (1.1) and asked participants for their preference. For example, if a participant indicated she would be indifferent between $100 in a year and $200 in 5 years, she was asked to indicate which of the two options she would prefer: $110 in a year or $220 in 5 years. The unchosen alternative was then multiplied by 1.1 until the participant's preference switched from the smaller, sooner reward to the larger, later reward or vice versa. We used the averages of the last two values associated with each alternative to determine the discount factor for each interval and each participant.

The experiment also included a measure of discounting for nonmonetary goods. Borrowing again from Frederick (2003), we asked participants to match and choose between the number of good days they would experience on the job during a specific calendar year. The instructions read:

> Imagine that you will have the same job for the rest of your life. At this job, you get to spend about half of the days doing something that you love (good days). The other half of the days, you must spend doing something that you hate (bad days). Suppose that you were given a chance to choose between having some extra good days (and, thus, fewer bad days) this year, or in a future year.

Participants indicated a value that would make them indifferent between receiving a given number of good days in an earlier calendar year and ____ good days in a later year. For example, they had to supply the number of extra good days in 5 years that would be the equivalent to them of 10 extra good days next year.

After completing this part of the study, participants were presented with a titration choice framework, following the same the same procedure we used for monetary outcomes. Half the participants completed the monetary matching and choice tasks before

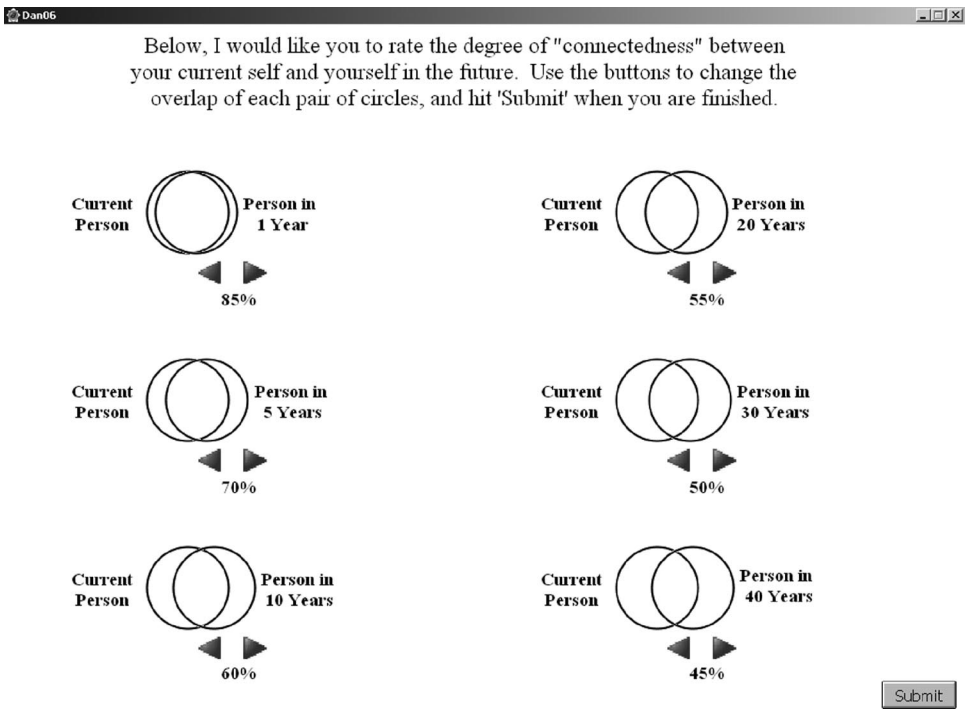

Figure 3. Psychological connectedness rating task presented to participants in Study 2.

the nonmonetary matching and choice tasks; the other half completed the nonmonetary tasks before the monetary tasks.

Participants. Twenty-eight Northwestern University undergraduates were tested individually. Another unrelated study was also run during these sessions. All participants received partial course credit.

Results

Results from the present experiment are consistent with Study 1 in finding reliable correlations between patience and connectedness. The greater the predicted difference between present and future selves, the smaller the discount factor (the less patience) participants displayed. Both methods for assessing discount factors (matching of equivalent values and preference titration) and both kinds of outcomes (money payoffs or good days at work) produced evidence for this relation.

Decreasing psychological connectedness over time. Figure 1 plots the mean percentage of overlap between the two Euler circles that participants used to indicate degree of psychological connectedness. The graph shows that, as expected, participants believed connectedness would decrease over time. A comparison between these results and those of Study 1 (also in Figure 1) suggests that the change in data-collection mode (paper-and-pencil, quantitative ratings in Study 1 vs. computer-based, visual, interactive task here) did not appreciably alter ratings of psychological connectedness. Because we found no difference and because of the relative convenience in administering the task, we used the paper-based approach for the rest of the studies.

Increasing patience over time. There were 32 discount factors greater than 1.0 (5% of the data), implying negative time preference. As in Study 1, we replaced these values with 1.0 to reflect time indifference, or zero impatience. Also, a programming error made it possible for people to demand more than 365 additional good days in a year, and these values carried over to the titration task. All trials involving these impossible responses were dropped from the analyses (18% of the nonmonetary preference data). We examine the effects of omitting these responses in what follows.

Participants in Study 2 demonstrated greater patience (discount factors closer to 1.0) for longer temporal intervals, replicating the results of Study 1. The left half of Figure 4 shows that the shape of the discount function for monetary outcomes is not greatly changed by the preference elicitation procedures (matching vs. choice), except in the first interval. These results are quite similar to those we obtained in Study 1 for analogous intervals (see the right half of Figure 2). Likewise, the right half of Figure 4 shows that the shape of the discount function for nonmonetary outcomes does not differ for matching versus titration. As we noted earlier, the dated character of the nonmonetary benefit makes it less susceptible to influences from saving or investing, influences that can increase impatience for money. Accordingly, the discount function for nonmonetary goods displays higher δ values overall and a smaller range than that for monetary goods, in agreement with a similar difference reported in Frederick (2003, Tables 2.3–2.4). Still, evidence for impatience appears in the earlier intervals even for number of good days. Greater patience for nonmonetary goods could also be due to range restrictions on choices (no more than 365 good days per year are possible), although, in Study 5, we show similar findings where ceiling effects are less likely.

Relationship between psychological connectedness and discounting. We computed the correlations between the decrease in psychological connectedness over the intervals and the discount factor observed over the same intervals. Because we measured discount factors for both monetary and nonmonetary goods and for matching and titration procedures, there are four correlations of this type. For monetary matching, the median of these within-participant correlations was −.36; for monetary titration, the median was −.45. Both values indicate that greater drop-offs in connectedness are associated with less patience. (As in Study 1, the sign is negative because less patience—a lower value of δ—is associated with larger differences in connectedness between time

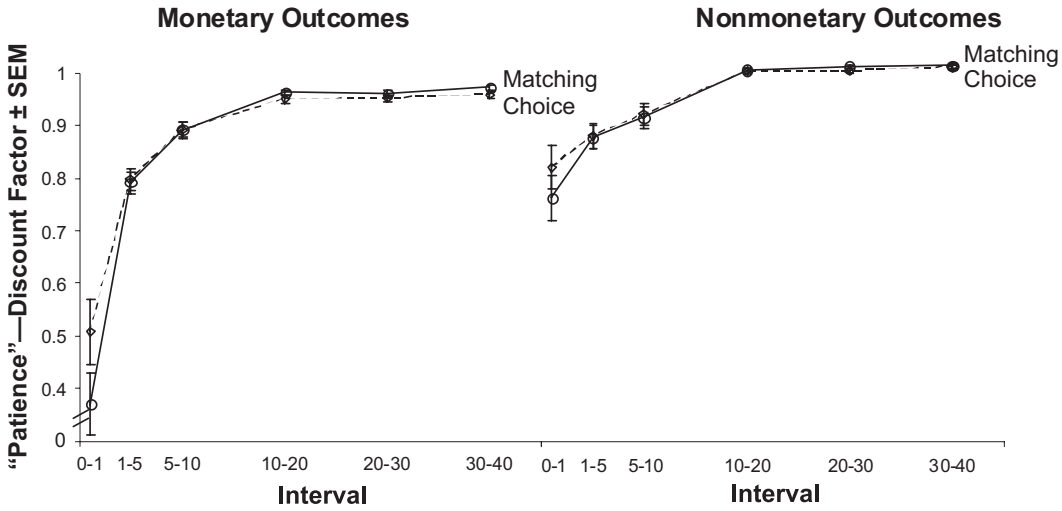

Figure 4. Increasing patience for monetary and nonmonetary outcomes in Study 2. Error bars indicate standard error of the mean.

t_1 and a later time t_2.) Wilcoxon signed-rank tests (Ws = 117.5 and 150, both ps $< .01$) and one-sample t tests—for matching, mean r-to-z = −.59, $t(24) = 3.75$, and for titration, $z = -.57$, $t(27) = 4.14$, both ps $< .01$—replicated the finding from Study 1.

This relationship also obtains for nonmonetary goods (number of extra good days at work). For the matching procedure, the median of the correlations between connectedness drop-off and discount factors is −.43, and for the titration procedure, −.38. (Ws = 100.5 and 87.5, both ps $< .05$; mean r-to-zs = −.49 and −.54), $t(25) = 2.53$ and 2.30, both ps $< .05$.[3]

In Study 1, we found reduced correlations between connectedness and discounting when we computed the correlations within each time interval as opposed to across intervals. Much the same is true of the present data. Of the 24 possible within-interval correlations between connectedness drop-offs and discount rates, only 2 approached significance: the 5- to 10-year interval for matching money ($r = .41$, $p < .05$) and for matching days ($r = .33$, $p = .09$). Frederick (2003) also examined the relation between connectedness and discount rates for the number of extra good days at work during a given year, and he again obtained mainly null results for within-interval correlations. However, when we used his data to calculate correlations between total drop-off and total value retained over delays, the median correlation was −.88.

Discussion

Studies 1 and 2 thus provide additional evidence for a relationship between patience and perceptions of psychological connectedness. In these first two studies, we measured connectedness between now and each of a series of later dates, and we showed that the connectedness drop-offs from one date to the next predicted discount factors over the same intervals. Different ways of eliciting connectedness judgments (direct ratings vs. Euler circle overlap) produced quite similar results. Likewise, different kinds of outcomes (dollars vs. good days at work) resulted in comparable correlations.

We note, however, that the later time intervals in Studies 1 and 2 also tended to be longer than the earlier ones (see Figures 2 and 4). Others have shown that shorter intervals of time elicit steeper discounting (Read, 2001; Read & Roelofsma, 2003), although this pattern does not always obtain (Scholten & Read, 2006). This raises the question of whether we would have obtained connectedness-discounting correlations had we controlled interval length. Also, we computed discount factors directly by asking participants for matching or titration responses for each interval (e.g., the interval between 10 and 20 years from now), whereas we obtained the connectedness drop-offs indirectly (e.g., by subtracting rated connectedness between now and 20 years hence from rated connectedness between now and 10 years hence). One might wonder whether this indirect method adequately assesses people's beliefs about changes in connectedness over these intervals.

To address these issues, we conducted a follow-up study quite similar to Study 1, but with two changes. First, we used only intervals of equal size, which were 0–7, 7–14, 14–21, 21–28, and 28–35 years from the present. Second, we added a new type of connectedness task (in addition to the delay-based ratings of Study 1). This interval-based task asked participants to rate the connectedness between the persons they would be at the beginning and end of each of the intervals. For example, they rated the connectedness of their self in 14 years to their self in 21 years. They made these ratings by circling one of eight pairs of Euler circles, which varied in amount of overlap. Twenty-five participants gave delay-based connectedness ratings, as in Study 1, then matching responses, and then the interval-based connectedness choices with the Euler diagrams, and 28 completed these tasks in the reverse order. (We discarded data from 4 participants because they gave psychological connectedness ratings that were not monotonically decreasing.)

The average discount factors for the five equally long intervals were .84, .91, .92, .93, and .91, respectively. This replicates our earlier finding (in Figures 2 and 4) that participants appeared relatively impatient early on but that this impatience quickly leveled off (cf. Laibson, 1997). Despite equality in the length of the intervals, discounting correlated reliably with the delay-based connectedness ratings. The median correlation was −.34 ($W = 269.5$, $p < .05$; mean r-to-$z = -.35$), $t(52) = 2.91$, $p < .01$. This implies that the relation between discounting and connectedness in Studies 1 and 2 was not an artifact of the differences in interval length. The correlation between discounting and rated interval-by-interval connectedness showed the same trend, but it was smaller in absolute size and not significant (the median correlation was −.11; $W = 92.5$, $p = .32$; mean r-to- $z = .13$), $t(46) = 1.21$, $p = .23$. The reason for this reduction is uncertain, but one possibility is that people may find it more difficult to assess connectedness between two future selves than connectedness between their current and future selves. For example, participants' intuitions about the psychological connectedness between their self in 21 years and their self in 28 years may be less reliable than their intuitions about the connectedness between their self now and their self in 21 (or 28) years. The interval-based task asked for the former judgment, the delay-based task for the latter.

The relationship between perceived decreases in psychological connectedness and impatience for benefits holds across preference-elicitation procedures, equal-length and varied-length intervals, and monetary and nonmonetary domains. However, although the results of these studies were consistent with our predictions, these correlational findings could not provide conclusive evidence for the connectedness framework's predictions for the reasons noted in the discussion of Study 1's results. To determine whether these changes in connectedness cause impatience, Studies 3–5 experimentally manipulated impressions of personal connectedness and measure resulting degrees of patience.

Study 3: Third Parties, Monetary Outcomes

In each of the remaining studies, participants read vignettes about 20-year-old characters whom we described as having life

[3] As we noted earlier, we omitted discounting data for nonmonetary trials if the participants chose more than 365 good days per year. To gauge the effect of omitting these impossible responses, we computed correlations after setting δ to 1.0 for these trials for one test and after imputing the column mean (average δ for each interval) for another. Both imputation methods boosted the magnitude of the observed median correlation from −.43 to −.50 (for both δ = 1.0 and δ = column mean) for the matching procedure and from −.38 to −.63 and −.61 (for δ = 1.0 and δ = column mean, respectively) for the titration procedure. Relative to these alternatives, then, omitting the responses provides a conservative measure of the correlation between connectedness and discounting.

experiences that might introduce relatively small or large changes to their identity. Each vignette stated that the character would graduate from college in a year and then described three events that would happen to her or him in 10, 20, and 30 years.

We intended one of these events to signal a large change in identity (i.e., a religious conversion, a return home after private contracting work in a war zone, a return home after having been kidnapped). The other two events implied a smaller change (i.e., moving to the Southwest to avoid an allergen, changing to a very similar job, developing an affinity for rice-based dishes). We refer to the former as *large-change* events and to the latter as *small-change* events. (Ratings from participants, described below, verified that the large-change events produced greater perceived decreases in psychological connectedness than the small-change events.) We balanced the descriptions so that each large change happened to two characters and so that two characters experienced their large change at each time point (10, 20, or 30 years from now). To keep participants' concern for the family of a character from affecting their assessment of the character's self-interest, the instructions asked participants to "assume that although none of these people will live an especially lonely existence, each person will choose not to marry and not to raise a family." The Appendix lists the life experiences for each of the characters.

In Study 3, participants assessed psychological connectedness for each of the six characters by rating the connectedness of the person now to the person 5, 15, 25, and 35 years from now. In addition, participants received a series of pairs for which they chose between a sooner outcome and a larger, later outcome "as if you were the person who would be receiving the outcomes at various points in time." For example, a participant in the present study had to decide whether the character would receive $1,650 in 5 years or $4,740 in 15 years.

The task we gave to our participants is not in itself an unusual one, inasmuch as people are often in the position of having to make financial decisions for others that involve the timing of outcomes. Investment counselors do so for clients, parents for children, and financial officers for companies and institutions. Nor is it unusual for such third parties to anticipate large changes in the lives of others. Investment counselors, for example, must take into account predictable large changes to their clients, such as marriage, births of children, entry into the labor force, and retirement. Participants in these studies, however, had an atypically omniscient view of the characters' lives, since individuals (and their advisors) would not usually be able to envision large-change events, such as a religious conversion. We used these events precisely because their unpredictability makes it plausible that the characters could undergo them at very different points in their lives and without extensive interactions with other events. This contrasts with an event like retirement, for example, which typically occurs relatively late in life and cannot occur prior to entry into the labor force. We assume that participants in Studies 1 and 2 anticipated a mixture of small and large changes in their own lives (though perhaps not as large as the ones used here) and that their ratings of future connectedness reflected these events. However, the time-bound nature of these personal events keeps us from isolating their effects on connectedness. The large-change events used here permit a clearer test of connectedness that is independent of the usual time course of life history.

We assessed discounting over the intervals 5–15, 15–25, and 25–35 years from the present. We predicted that participants' preferences for the timing of benefits would appear more impatient over intervals during which large changes occurred, relative to those in which small changes occurred. For example, suppose an individual experiences a large change in 20 years. This change should create a lack of connectedness prior to the 25-year point, and we would expect to see discounting within the 15–25 year interval: The individual should prefer benefits to occur to the +15-year self than to the +25-year self, since the individual now is more closely connected to the former than the latter. By contrast, if the individual experiences only a small change in 20 years, connectedness to the +15-year self and to the +25-year self is more nearly equal. Hence, less discounting should occur within the same interval. In short, we expected preferences for benefits over intervals with large changes to appear relatively impatient, regardless of exactly when the interval occurred.

Method

Materials and design. In the first block of the study, participants read descriptions of the six hypothetical characters, one at a time in one of three randomized orders. Each description consisted of a list of life events (see the Appendix) and an accompanying time line. Participants rated the psychological connectedness between each character now and the same character 5, 15, 25, and 35 years from now, using a numerical scale from 0 to 100, as in Study 1.

In the second part of the study, participants reread the list of events and accompanying time line for each character and completed a preference assessment task for her or him. The following set of choices is the assessment for one of the characters; the remaining assessments were nearly identical except for the character's name. (The dollar values differed very slightly across characters, and the order of the three choices in each block appeared in a different random sequence for each character to prevent formulaic responding.)

For each of the following nine annuities, please CIRCLE the payout (dollar amount) you would take if you were Jenn.

1. $1,650 in **5 years** – OR – $4,740 in **15 years**
2. $1,440 in **5 years** – OR – $7,290 in **15 years**
3. $2,060 in **5 years** – OR – $3,430 in **15 years**
4. $3,400 in **15 years** – OR – $5,800 in **25 years**
5. $2,800 in **15 years** – OR – $7,900 in **25 years**
6. $2,200 in **15 years** – OR – $11,300 in **25 years**
7. $4,800 in **25 years** – OR – $24,200 in **35 years**
8. $7,700 in **25 years** – OR – $12,900 in **35 years**
9. $5,800 in **25 years** – OR – $16,700 in **35 years**

For each interval (e.g., 5–15 years), participants faced tradeoffs between smaller, sooner benefits and larger, later benefits, corresponding to discount factors of .85 (for Choices 2, 6, and 7 above), .90 (for Choices 1, 5, and 9), and .95 (for Choices 3, 4, and 8). This design allowed the dependent variable (patience) to take one of four values for each interval. If participants circled all three

smaller, sooner rewards in an interval, they were assigned a score of 1. If they circled all the smaller, sooner rewards except the one posed by $\delta = .85$, they were assigned a score of 2. If they circled all the larger, later rewards except the $\delta = .95$ tradeoff, they were assigned a score of 3. If they circled all three larger, later rewards, they were assigned a score of 4. Thus, higher scores indicate more patience. There were 12 inconsistent sets of responses (less than 2% of the data). These values were replaced by the middle value of our scale (2.5). Omitting these responses does not affect the results.

Participants. Thirty-nine Northwestern University undergraduates participated under the same conditions as in Studies 1–2. We discarded data from 3 participants because they gave incomplete preferences.

Results and Discussion

Each of the six characters experiences one large-change event, and this event occurs to Ashley and Jenn in 10 years, to Jill and Jon in 20 years, and to Matt and Mike in 30 years (see the Appendix). We calculated average connectedness ratings and intertemporal preferences for each of these pairs of characters. We first inspected the connectedness ratings to verify that the largest decrease in connectedness did in fact occur at the time of the large-change events. Then, we analyzed the discount factors from the preference data to see whether participants were more impatient over intervals containing large changes than ones containing small changes.

Larger perceived decreases in psychological connectedness over large-change intervals. Table 1 presents the average perceived psychological connectedness ratings for our fictional characters. The rows in the table correspond to the characters who experience their large-change event at 10, 20, or 30 years. Participants rated psychological connectedness between the characters' current condition and their condition in 5, 15, 25, and 35 years, and the columns of the table present the mean ratings for each of these time points. Ratings for years bracketing the large changes appear in bold typeface. For example, the ratings for 5 and 15 years are bolded in the first row for the two characters (Ashley and Jenn) whose large change happens in 10 years. We anticipated larger decreases in connectedness during these key intervals, and the data in Table 1 bear out this prediction. Drop-offs in psychological connectedness (difference scores $t_n - t_{n+1}$) for the intervals appearing in bold type were significantly larger ($M = 35$) than the drop-offs perceived for the other intervals ($M = 8$). The test statistics appear in Table 2.

Table 1
Rated Psychological Connectedness Over Time in Studies 3–5 (0–100 Scale)

Study	In 5 years	In 15 years	In 25 years	In 35 years
3				
Large change at 10 years	**87.3**	**50.8**	44.2	37.7
Large change at 20 years	87.4	**77.4**	**40.1**	31.9
Large change at 30 years	87.6	79.0	**71.0**	**37.9**
4				
Large change at 10 years	**85.7**	**65.1**	55.5	47.2
Large change at 20 years	84.5	**72.9**	**51.6**	44.1
Large change at 30 years	86.3	74.9	**65.4**	**44.4**
5a				
Large change at 10 years	**82.6**	**47.9**	45.1	42.5
Large change at 20 years	83.7	**73.3**	**54.9**	39.0
Large change at 30 years	83.7	75.7	**59.8**	**41.1**
5b				
Large change at 10 years	**87.4**	**51.7**	48.5	42.8
Large change at 20 years	87.1	**77.6**	**57.4**	39.2
Large change at 30 years	86.8	78.7	**60.8**	**40.9**

Note. Ratings for years bracketing the large changes appear in bold.

Relationship between psychological connectedness and discounting. Results from the preference task confirm that participants were more patient for intervals containing small changes than for those containing large ones. For each participant, we computed correlations between drop-offs in connectedness and patience scores observed over each interval. The median of the within-participants correlations between drop-offs in connectedness and patience scores was $-.21$ ($W = 198$, $p < .0001$; mean r-to-$z = -.32$), $t(35) = 4.01$, $p < .001$, indicating that participants were less patient over the intervals for which they perceived large drop-offs in psychological connectedness.

Table 3 shows the average level of patience (on the 1–4 scale, with 4 indicating most patience) for characters having their large change in 10, 20, or 30 years. For each interval (the columns), the least patience appears for those characters who experience their large change in that interval. For example, the first column contains patience scores for the interval between 5 and 15 years from now and shows that participants were less patient on behalf of characters whose large change occurs in 10 years than for characters whose large change occurs in 20 or 30 years. (The comparisons across the rows of the table are less meaningful since they are confounded by the tendency of participants to be more patient for more remote intervals, a trend we observed in Studies 1 and 2.) Overall, the mean patience score was 2.86 for the large-change intervals and significantly larger, 3.18, for the small-change intervals. The test statistics appear in Table 2. This difference supports the prediction that participants would be more likely to speed up monetary benefits when they anticipated large changes in identity.

Study 3 demonstrates that manipulations of psychological connectedness can influence preference for the timing of monetary outcomes. One objection might be that our participants' perspective was not the same as the characters' and thus that the procedure did not provide a direct test of the connectedness proposal. However, in taking the characters' part, the participants' task was not greatly different from what is required in most studies of decision making. Participants in such studies pretend for the sake of the experiment that they are choosing between two options (e.g., $650 for sure vs. a .50 chance of winning $1,000), which they know they will never in fact receive. In those experiments, as in ours, participants must place themselves in a hypothetical situation and respond on this basis. Assuming this kind of projection is legitimate, we can interpret the results as support for the connectedness framework.

Study 4: Utility Discounting Without Probability Discounting

Participants in Study 3 believed that the large-change events, such as serving in a war zone, disrupted psychological connectedness more than did the small-change events, and their discounting of outcomes seemed to reflect this difference. Large-change

Table 2
Differences Between Large-Change and Small-Change Intervals for Connectedness and Patience in Studies 3–5

	Drop-offs in connectedness				Patience scores			
Study	Large-change intervals	Small-change intervals	Paired *t*	η_p^2	Large-change intervals	Small-change intervals	Paired *t*	η_p^2
3	35.45	7.99	12.23**	.79	2.86	3.18	−3.61**	.27
4	20.96	9.68	10.04**	.66	2.96	3.11	−3.24*	.17
5a	22.59	12.02	8.29**	.62	2.53	2.74	−2.91*	.16
5b	23.42	11.58	7.49**	.61	2.63	2.52	1.37	.05

* $p < .01$. ** $p < .001$.

events, however, can bring other consequences in their train. For one thing, people may believe that such events not only introduce changes in the characters' psychological makeup but also reduce the likelihood that they will ever receive the outcome. To endure delay for a reward, people must trust that they will receive the reward as promised (as Mischel, Ayduk, & Mendoza-Denton, 2003, pointed out). Yet large changes may reflect or alter social conditions, making it difficult for people to collect benefits (e.g., perhaps the financial system is in disarray). If so, they may prefer to receive those benefits before the change occurs. The same reasoning suggests postponing negative outcomes in the hope that large changes will make these outcomes less likely to materialize. This type of *probability discounting* is an alternative to utility discounting in explaining people's impatience for rewards, and probability discounting over time stands as a possible explanation for the results of our earlier studies.

Our large changes might have had another unintended effect. We have been assuming that large changes make the postchange selves less like the decision maker; hence, the decision maker has less interest in providing for them. Another possibility, however, is that large changes directly reduce the characters' need for the goods on offer. Perhaps serving in a war zone or undergoing a religious conversion makes the character less likely to want money. Although differences in goals and values are among the psychological characteristics that make for connectedness, Parfit's (1984) theory allows for discounting of a particular outcome over time even though a person's need for the outcome is stable or increases over the same period. What makes for discounting of an item is the overall (lack of) connectedness to future selves, not change in the need for that particular item.

Table 3
Patience Scores Over Temporal Intervals in Studies 3–5

Study	5–15 years	15–25 years	25–35 years
3			
Large change at 10 years	**2.63**	3.32	3.40
Large change at 20 years	2.82	**2.97**	3.35
Large change at 30 years	2.82	3.35	**2.99**
4			
Large change at 10 years	**2.61**	3.11	3.32
Large change at 20 years	2.75	**3.10**	3.43
Large change at 30 years	2.78	3.27	**3.18**
5a			
Large change at 10 years	**2.45**	2.80	2.86
Large change at 20 years	2.73	**2.48**	2.81
Large change at 30 years	2.68	2.52	**2.67**
5b			
Large change at 10 years	**2.49**	2.68	2.63
Large change at 20 years	2.37	**2.71**	2.45
Large change at 30 years	2.43	2.50	**2.70**

Note. Patience scores for the large-change intervals appear in bold typeface.

If the connectedness account is correct, we should continue to see effects of large-change events on discounting even if these events produce no decrement in the likelihood of receiving or desiring the outcomes. The connectedness idea *does* predict that the decision maker (now) will find it less valuable to have his or her postchange self consume the outcome, but this is not necessarily because the postchange self no longer wants the outcome or is no longer able to obtain it. We should continue to see discounting, then, if these latter variables are controlled, and the present study examined this possibility.

Method

Pretest. We first carried out a pretest to select the large-change and small-change events for the main experiment. Our purpose was to equate the two sets in terms of their likelihood of affecting the desirability and probability of the outcome (payout from an annuity in this experiment). To this end, we presented 23 participants with 17 life events (e.g., finding out that one has been adopted). For each event, we asked them to rate three characteristics. First, they judged the extent of the psychological change the event would produce: "how much of an impact each event would have on the important characteristics that define a person." These characteristics were listed as in the previous studies (personality, temperament, etc.). Second, they rated the degree to which each event might change a person's desire for money. Finally, they rated the extent to which each event happening in 5 years would reduce the likelihood of receiving a payout from an annuity that matures in 10 years.

On the basis of this set of ratings, we selected three events for which the average rating for psychological change was small ($M = 3.07$, $SD = 1.81$) and three for which the average change rating was large ($M = 5.09$, $SD = 1.64$) on a scale bounded by 0 (*no change at all*) and 7 (*a very large change*). We chose these groups of events such that the change in desire for money induced by the small-change events did not differ from that induced by the large-change events (Ms = 0.84 and 0.36, SDs = 1.29 and 1.51) on a scale bounded by −4 (*much less desire for money*) and 4 (*much more desire for money*). Thus, any differences in discounting across small-change and large-change intervals in this study

were unlikely to be due to differing inferences about how the events altered our characters' desire for money.

Overall, participants rated the six events unlikely to affect whether a promised payment would be received ($M = 0.87$, $SD = 1.62$) on a scale bounded by 0 (*would have absolutely no effect on whether the payout is received*) and 7 (*would greatly decrease the likelihood that the payout is received*). Furthermore, they judged our small-change events more likely to eliminate payment ($M = 1.12$, $SD = 2.05$) than would our large-change events ($M = 0.45$, $SD = 0.93$). If participants' ideas about likelihood of payment were to determine when to consume monetary benefits, we would expect our small-change intervals to produce greater impatience than our large-change intervals. This is the opposite of the connectedness prediction that larger changes will produce greater impatience.

Main study. All aspects of the study proper were identical to Study 3, except that we supplanted the three large-change events with three new events: "[Character's name] will be buried by an avalanche during a skiing trip but will be rescued by the ski patrol and remain totally unharmed," "[Character's name] will receive a diagnosis of pancreatic cancer but, soon after, will be completely symptom-free and learn that the initial test results were incorrect," and "[Character's name] will find out that he was adopted, a fact hidden from him when he was a child." Also, we replaced two of our small-change events (moving to the Southwest to avoid an allergen and developing an affinity for rice-based dishes) with the following two: "[Character's name] will ask a question that elicits an unusual and comically bad response from a presidential candidate; video of the event will be viewed thousands of times online" and "[Character's name] will be examined by police as a possible accomplice in a series of robberies, but is completely exonerated—is found to be innocent of any wrongdoing."

Participants. Fifty-nine University of Chicago (Chicago, IL) undergraduates participated in the main study. They were tested individually in a small-group setting (typically, 1–3 participants per session) and were paid $2 for their time. Data from 3 participants were discarded because these participants gave psychological connectedness ratings that were not monotonically decreasing for all characters. Data from another 4 participants were discarded because they did not complete the questionnaire (circling only three preferred payouts presented in each block of nine annuities), leaving us with 52 usable sets of responses.

Results and Discussion

Although the events were equated for how much they affected the characters' desire for money and although pretest participants rated small-change events more likely to interfere with payoffs than large-change events, the results for the main study nevertheless followed those of Study 3 in finding more discounting over large changes than over small ones.

Larger perceived decreases in psychological connectedness over large-change intervals. Table 1 presents the average connectedness ratings for the characters having significant life experiences at 10, 20, and 30 years. As in Study 3, participants perceived significantly larger drop-offs in psychological connectedness for large-change intervals than for small-change intervals (see Table 2 for test statistics).

Relationship between psychological connectedness and discounting. We analyzed these data using the same scoring procedure as described in Study 3—larger numbers correspond to greater patience. There were 21 inconsistent sets of responses, just over 2% of the data, which we replaced with the middle value of our scale (2.5), as we had in Study 3. Omitting these responses does not affect the results. Replicating the earlier results, large changes made participants want to expedite the consumption of benefits. The median of the within-participant correlations between drop-offs in psychological connectedness and patience for monetary benefits was $-.12$ ($W = 288$, $p < .01$; mean r-to-$z = -.13$), $t(49) = 3.26$, $p < .01$.[4] The patience scores in Table 3 provide further evidence for the hypothesis. Within each column of the table, the smallest scores appear in the large-change interval. Overall, the mean patience score was 2.96 for the large-change intervals and significantly larger, 3.11, for the small-change intervals. The test statistics appear in Table 2.

These results strengthen the case for thinking that life events produce impatience by decreasing psychological connectedness. Variations in the character's desire for money or the likelihood that he or she will receive the designated payout may have had some effect on impatience, since the difference between large-change and small-change intervals was slightly smaller than in Study 3. Neither factor, however, overrode the positive relation between connectedness and patience.

In Studies 3 and 4, we found results consistent with Parfit's (1984) view of personal identity: Discounting depends on how close the person who receives those outcomes is to the person's current self. Concern for the future may be scaled by the degree of connectedness between current and future versions. However, concern for the future presumably encompasses more than just the preferred timing of payoffs from annuities, and decisions involving discounting represent only a small subset of future-oriented preferences and behaviors (which may or may not cohere with each other; Fuchs, 1982). We thus thought it important to test whether the causal relationship established in Studies 3 and 4 extends beyond the temporal discounting of money to time preference more generally. Our final study therefore examined other, nonmonetary domains and preferences for negative, as well as positive, outcomes.

Studies 5a–5b: Third Parties, Extra Vacation and Workdays

In this study, participants read about the same six characters and life events as in Study 3 (and described in the Appendix), but this time the participants made choices about the timing of extra vacation days (Study 5a) and extra workdays (Study 5b). For example, participants in Study 5a decided whether a character should choose 5 extra vacation days in 5 years and 15 extra vacation days in 15 years versus 15 extra vacation days in 5 years

[4] Two participants responded formulaically, circling all of the sooner, smaller rewards for all six blocks of nine annuities. The correlation for these participants cannot be defined due to the lack of response variance on the dependent measure.

and only 5 extra vacation days in 15 years. Choosing the latter indicates a preference to expedite, rather than to defer, benefits. Choosing to consume all 20 extra vacation days in 5 years indicates even greater impatience. Similarly, participants in Study 5b decided how to allocate extra workdays.

Including both vacation days and extra workdays allowed us to test whether perceptions of personal connectedness predict preferences for the timing of both positive and negative outcomes. We might expect the opposite pattern of results for negative outcomes relative to positive ones: People may prefer to postpone negative outcomes if their psychological connectedness to the future self receiving those outcomes is slight. Pushing a burden into the future might be akin to pushing the burden onto another person. Although such a choice might be judged inappropriate for other reasons ("We ought not do to our future selves what it would be wrong to do to other people"; Parfit, 1984, p. 320), it may accord with some accounts of self-interest.

In examining how people distribute a fixed number of benefits and burdens over time, Study 5 offered a test of whether we could extend the connectedness account to predict preference in situations that do not involve the usual measures of discounting. In standard discounting paradigms, participants indicate how much more of a benefit is required to compensate for a delay. In the first four studies, we used this paradigm to test the relationship between drop-offs in connectedness and discounting, both of which increased with length of delay. Study 5 entailed a different kind of temporal tradeoff, where a better near future (larger benefits) explicitly means a worse distant future (smaller benefits). Many decisions involving patience (e.g., saving for future retirement) are based on the idea that benefits to a later self can compensate for burdens imposed on earlier selves. Study 5 offered a straightforward test of whether large disruptions in connectedness can alter the preferred balance between present and future costs and benefits.

Method

Materials and design. Participants in both Studies 5a and 5b rated the psychological connectedness of the six characters, following the procedure used in Study 3. In Study 5a, we then re-presented the list of events and accompanying time line for each character and asked participants to register their preferences for the timing of extra vacation days. For example, after reading about the events in Mike's life (see the Appendix), participants read a scenario about Mike's job (in Study 5a):

> After graduation, Mike takes a job in an industry that will employ him until he retires. Because his job is so important, he gets vacation days and holidays off, plus some extra days off in designated years, and he has to make decisions about extra off-days well in advance—years, in fact. He has a choice about when to take his extra off-days, but he has to use extra off-days in the years (12-month periods) designated below.
>
> *Please circle what you would choose if you were Mike (A, B, C, D, or E)*
>
> A) 20 extra off-days in **5 years** – and – 0 extra off-days in **15 years**
>
> B) 15 extra off-days in **5 years** – and – 5 extra off-days in **15 years**
>
> C) 10 extra off-days in **5 years** – and – 10 extra off-days in **15 years**
>
> D) 5 extra off-days in **5 years** – and – 15 extra off-days in **15 years**
>
> E) 0 extra off-days in **5 years** – and – 20 extra off-days in **15 years**
>
> *Please circle what you would choose if you were Mike (A, B, C, D, or E)*
>
> A) 20 extra off-days in **16 years** – and – 0 extra off-days in **25 years**
>
> B) 15 extra off-days in **16 years** – and – 5 extra off-days in **25 years**
>
> C) 10 extra off-days in **16 years** – and – 10 extra off-days in **25 years**
>
> D) 5 extra off-days in **16 years** – and – 15 extra off-days in **25 years**
>
> E) 0 extra off-days in **16 years** – and – 20 extra off-days in **25 years**
>
> *Please circle what you would choose if you were Mike (A, B, C, D, or E)*
>
> A) 20 extra off-days in **26 years** – and – 0 extra off-days in **35 years**
>
> B) 15 extra off-days in **26 years** – and – 5 extra off-days in **35 years**
>
> C) 10 extra off-days in **26 years** – and – 10 extra off-days in **35 years**
>
> D) 5 extra off-days in **26 years** – and – 15 extra off-days in **35 years**
>
> E) 0 extra off-days in **26 years** – and – 20 extra off-days in **35 years**

The problems were identical for the remaining characters, except for the change in name (e.g., from Mike to Jenn).

Participants in Study 5b saw the same character descriptions; however, they read:

> Because his job is so important, he gets vacation days and holidays off, but has to work some extra days in designated years, and he has to make decisions about extra workdays well in advance—years, in fact. He has a choice about when to serve his extra workdays, but he has to work those extra days in the years (12-month periods) designated below.

The participants then made choices about the timing of extra workdays, which were analogous to those for vacation days. For example, Choice Option A in the first block read, "20 extra workdays in **5 years** – and – 0 extra workdays in **15 years**."

Note that we described the second and third intervals in the list of options above as beginning in 16 and 26 years, rather than in 15 and 25 years, as in Study 3. We made this change to mitigate effects of a possible tendency to spread outcomes over time, rather than to saturate a given time period (in this case, a year; see Linville & Fischer, 1991; Read & Loewenstein, 1995). For example, participants might hesitate to assign additional days off to the same year 15 years hence in the second set of choices if they had just assigned extra days off to the same year in the first set. Making the intervals nonoverlapping should help reduce this tendency.

Participants. Forty-four University of Chicago undergraduates participated in Study 5a and 38 in Study 5b. We tested them individually and paid them $3 for their time. Data from 2 participants in each study were discarded because these participants gave psychological connectedness ratings that were not monotonically decreasing for all characters.

Results

Larger perceived decreases in psychological connectedness over large-change intervals. As in Studies 3 and 4, large changes produced larger decreases in connectedness than did small

changes. Table 1 presents the average connectedness ratings from Study 5a for characters having significant life experiences in 10, 20, and 30 years. The table also contains the comparable data for Study 5b. The means show that participants generally perceived larger decreases in psychological connectedness for the large-change intervals than for the small-change intervals. Table 2 displays the mean differences in connectedness over the large- and small-change intervals, and it shows that tests of these differences are significant in both studies. The data for Studies 5a and 5b are quite similar to each other and to those of Studies 3 and 4, as can be seen by comparing the four parts of Table 1.

Relationship between psychological connectedness and time preference. In scoring patience for a participant's choices, we assigned a value of 1 if the participant chose 20 days in the earlier year and 0 days in the later, 2 if the participant chose 15 days in the earlier year and 5 in the later, and so on. In terms of the choices listed in the Method section, participants received a score of 1 for choosing Alternative A, 2 for Alternative B, and so on, up to 5 for Alternative E. Thus, larger numbers correspond as usual to greater patience (willingness to postpone benefits).

We expected less patience for extra vacation days during those intervals in which the characters experienced larger changes in connectedness. Vacations are benefits that the characters should want for their closer rather than their more distant selves. This is the pattern we found. The median of the within-participant correlations between drop-offs in psychological connectedness and patience for extra vacation days was $-.09$ ($W = 135$, $p < .05$; mean r-to-$z = -.14$), $t(41) = 2.10$, $p < .05$. The patience scores in Table 3 provide further support for this prediction. Within each column of the table, smaller scores (indicating less patience) appear during the large-change interval than during the small-change intervals. The third row of Table 2 gives the means for the two interval types and shows that the difference between them is a reliable one. The effect of change on impatience, however, appears to be smaller than the one we observed for monetary outcomes in Study 3, which used the same small-change and large-change events as Study 5. This may be due to the dated nature of the vacation days, as we discussed in connection with the second study. Vacation days for a particular year have to be taken during that year, whereas money received in a particular year can be spent at any later time, and this fact may limit the amount of impatience for vacations versus money.

This study posed the question of how a preference to expedite or defer negative outcomes compares to that for positive ones. On the one hand, people might prefer to have inevitable negative events over as quickly as possible. On the other hand, a preference for delaying negative events is a preference for having a more remote self experience them rather than a closer self, according to the approach we are pursuing here. The results in Table 3 show a blend of these two tendencies. Notice, first, that all the means in the table are less than 3.0, the midpoint of the patience scale. Values less than 3.0 indicate a preference for allotting more extra workdays to the earlier year (see the preference list in the Method section). In this respect, the data for extra workdays agree with those for extra vacation days, for which the means also exhibited a positive time preference—a desire to expedite extra vacation days.

A comparison of the diagonal to the off-diagonal cells in Table 3, however, reveals a striking difference between positive and negative outcomes. Whereas participants in Study 5a exhibited a greater preference to *expedite* outcomes over the large-change rather than the small-change intervals, participants in Study 5b preferred to *postpone* outcomes. For extra workdays, the mean patience scores for large-change intervals are 2.63 but for small-change intervals are 2.52. Thus, although participants wanted to be done with the extra workdays, this tendency was reduced over periods of large changes. The blend of these two tendencies resulted in correlations between anticipated change and preferences for extra workdays that are weaker than for extra vacation days, and they follow the opposite trend (median $r = .10$; $W = 91$, $p = .089$; mean r-to-$z = .07$), $t(35) = 1.15$, $p > .10$. Likewise, the difference in patience for large-change and small-change intervals is nonsignificant (see the fourth row of Table 2).

An analysis of patience for the large-change and small-change intervals in both studies, in the form of a 2 (large change, small change) $\times$ 2 (vacation days, workdays) analysis of variance (ANOVA), found only the predicted interaction—large changes inducing an unwillingness to postpone vacation days and relative willingness to postpone workdays, $F(1, 80) = 8.98$, $p < .01$, $\eta_p^2 = .10$. No significant main effects appeared in the analysis.

Discussion

The results of this study and Studies 3–4 show that changes in personal identity influence preferences for the timing of both monetary and nonmonetary outcomes. Each of these studies varied degree of connectedness for fictional characters, and the results exhibited concomitant changes in patience. We balanced the events that caused the large changes, so that these events occurred equally often at the 10-, 20-, and 30-year time points across the fictional characters. Thus, the observed differences in patience cannot be due to mere passing of time, to length of intervals, or to factors, such as inflation rates or greater uncertainty about more remote events, that are confounded with time. In this respect, these results go beyond the correlations between connectedness and patience in Studies 1 and 2. Participants in the earlier studies made judgments about connectedness and timing of benefits in their own lives, where we could not control the confounding factors.

Study 5 demonstrates that intuitions about psychological connectedness can influence preference for the timing of nonmonetary benefits (extra vacation days) and burdens (extra workdays) in a manner consistent with what we have been proposing even in circumstances that do not entail the overall reduction in total amounts (e.g., total vacation days) posed in standard discounting paradigms. Before drawing conclusions about timing preferences for nonmonetary outcomes, however, we thought we should consider some paradigmatic examples of cases for which the standard pattern of intertemporal choice (impatience for benefits, patience for burdens) does not obtain—those where anticipation of the outcome may be as important as the experienced utility (Loewenstein, 1987). People often enjoy savoring the expectation of an upcoming, short-lived positive experience: Thinking about a kiss from the movie star of one's choice might be better than the actual experience or, at least, pleasant enough to warrant postponing the kiss to a later date. Conversely, people sometimes prefer to bite the bullet and speed up some short-lived negative experiences: The dread of being subjected to a short but painful electric shock may be worse than the actual experience.

In our pilot study, half the participants read that the characters used in Studies 3 and 5 performed well on a TV game show and won a number of kisses from the movie stars of their choice at various points in the future. The other half read that the characters had performed poorly and would be subjected to a number of short, painful shocks. Participants indicated their preferences for the timing of kisses or shocks (over the same intervals as those used in Study 5), and a similar pattern to that identified in Study 5 obtained. A 2 (large change, small change) $\times$ 2 (kisses, shocks) ANOVA found only the predicted interaction: Large changes induced a strong willingness to expedite benefits (i.e., kisses) and a slight preference to postpone burdens (i.e., shocks) relative to the preferences for the small-change intervals, $F(1, 89) = 7.76$, $p < .01$, $\eta_p^2 = .07$. As was the case for vacation days, the results for kisses were significant, $t(44) = -2.36$, $p < .01$, but the results for shocks were weaker. As was the case for extra workdays, participants in this pilot study wished to expedite shocks, but this tendency was reduced over periods of large change.

In general, we found that participants tended to speed up consumption of both nonmonetary benefits and burdens but that changes in identity produced different trends on these two types of outcomes. Although participants were significantly more willing to speed benefits over large-change rather than small-change intervals, they were somewhat more willing to defer burdens (though not significantly so) over large changes rather than smaller ones. Although anticipation may sometimes cause people to postpone benefits (and dread may cause them to expedite burdens), such effects did not seem to alter the relations we found here between patience and degree of psychological connectedness.

General Discussion

When people anticipate an important change that might weaken the psychological bonds between their present and future selves, they want upcoming desirable events to happen before the change occurs. The earlier these desirable events, the more likely the present self or a very similar future self will enjoy them. Evidence for this relation comes from Studies 1 and 2, in which participants judged the psychological connectedness of their current self to later selves and decided about the equivalence of earlier and later benefits. Both studies found that the larger the expected change in connectedness, the sooner participants wanted the benefits to occur. Similar evidence appeared in Studies 3–5, in which we manipulated connectedness in fictional characters and had participants distribute benefits over time on behalf of the characters.

Acceleration of benefits occurred for monetary gains (Studies 1–4) and for nonmonetary positive outcomes, such as good days at work (Study 2) and vacation days (Study 5). The same result also occurred for different ways of measuring psychological connectedness and different ways of measuring preference over time (Study 2). The results for negative outcomes were more complex, possibly because of a conflict between wanting these outcomes over with and wanting distant selves to take on the burden. In general, participants wanted negative events to happen earlier rather than later, but they preferred to delay these events until after big psychological changes had occurred (Study 5). Similar results appeared for extra workdays and for events—painful electric shocks—that people regard with fear or dread.

The pattern that emerges from all five studies is that large changes in psychological connectedness make people want to place benefits before the change but to delay burdens until after the change. Of course, this pattern does not mean that psychological connectedness is the only factor responsible for discounting. Inflation rates, increased uncertainty about whether a promised reward will be delivered, appetitive urges, and other factors no doubt contribute to discounting. The present claim is simply that connectedness is an important element in the desired timing of costs and benefits. In terms of the utility functions with which we started, the evidence suggests that decisions depend on both arguments in $u(P, t)$, where P is a person stage (or some other component of a person less enduring than the whole person) and t summarizes time-bound aspects of choice.

A related caveat is that discounting due to connectedness does not necessarily overrule caution about later phases of one's life. Those distant future episodes will happen to oneself after all (though a distant future self). We do not mean to overstate the analogy of thinking about one's future self as one would think of another distinct person. We are not making the claim that people conceive of intrapersonal connectedness on the model of interpersonal connectedness. Within-person connectedness may be sufficiently obvious or important in its own right that people recognize its influence without the need to think of it in social terms. Furthermore, a decrease in connectedness between a current and a remote self does not imply that there is no connection between them. A person may still see his or her distant future self as related enough to want to provide it with benefits and shield it from harm by putting money in savings accounts, training for future jobs, exercising regularly, and dieting sensibly. The future benefits themselves may be important enough to overcome discounting from lack of psychological connections.

We have been approaching the issue of temporal discounting by taking seriously the idea that people project changes between their self at an earlier time point (possibly the moment of decision) and their self at a later one (as the recipient of the decision's outcome). Because these selves increasingly diverge as new events intervene between them, the decision maker has a motive to adjust the timing of outcomes so that better things happen to the nearer selves and worse things to the more remote ones. However, this idea is in the near vicinity of some prior theories of discounting and some prior theories of predicted changes in one's self image. In the rest of this discussion, we consider three such views and their relation to the present approach. The first of these theories interprets the timing of outcomes as a reaction to the merits of future selves rather than to their psychological connectedness to the present self. The second, related theory views timing as the result of ignorance about future selves. The third sees the timing of outcomes as the result of a conflict between selves, but selves existing simultaneously in the mind of the decision maker: vertically existing selves rather than horizontally existing ones.

Discounting as Reward, Punishment, or Coping

We have been assuming that the large changes in Studies 3–5 motivated the timing of costs and benefits because participants wanted the protagonists' closer selves rather than their later selves to enjoy benefits and to avoid costs. Perhaps we could also view participants as arranging these outcomes as a response to changes

in the protagonist's moral character. If the protagonists in these studies appear praiseworthy prior to their large change and appear blameworthy after the change, then this may have motivated participants to reward them before the change and punish them after. Impatience for benefits and patience for costs would ensure this distribution of rewards and punishments, potentially explaining the pattern of results that we observed (see Brink, 1997, who mentioned a similar possibility).

This reward theory seems to agree with the connectedness framework in supposing that psychological change underlies temporal discounting. If so, there is a common element in the two explanations. The reward theory, however, explains discounting in terms of the moral worthiness of the protagonists at different times rather than in terms of connectedness per se. Connectedness predicts that prechange selves should get more benefits and fewer burdens than postchange selves, but reward theory predicts that better selves should get more benefits and fewer burdens no matter when these selves exist. The reward theory, however, seems more likely to apply to third-person cases, in which one individual makes decisions for another (e.g., Studies 3–5), than for first-person decisions (e.g., Studies 1–2). People tend to believe that they have changed for the better and that they will be better still in the future (Wilson & Ross, 2000, 2001). Haslam and Bain (2007, Study 3) found that people rated their selves in 5 years to possess more desirable traits than their current selves did. If most individuals view themselves as improving morally over time, reward theory would predict delay of benefits and speed-up of costs for first-person preferences. The results on first-person decisions in Studies 1 and 2, however, are consistent with the third-person decisions in Studies 3–5 in showing that people prefer to expedite benefits more than costs. Indeed, impatience for benefits is the norm in most prior studies of temporal discounting.

Could the reward theory explain the results if we confine attention to the third-person perspective of Studies 3–5? We agree that rewarding others' good selves and punishing their bad selves is a plausible strategy for some types of decisions. Parfit (1984) also acknowledged that two factors matter in assessing future selves:

> In judging the value to me of [a future self] we must know how close my relation is to the resulting person. We must also know whether this person will have features that I regard as good or bad . . . . The value to me of my relation to a person depends both (1) on my degree of connectedness to this person and (2) on the value, in my view, of this person's physical and psychological features. (Parfit, 1984, p. 299)

For the characters we invented for these studies, however, it is hard to make a convincing case that they are more blameworthy following their large change than prior to it. The large-change events that we employed—for example, witnessing traumatic events in a war zone or religious conversion—seem, on balance, more likely to elicit sympathy than blame for the postchange individual. If this is correct, then reward theory again predicts a pattern of preferences opposite the one we observed. The same pattern also rules out the idea that participants might abide by a coping principle that adjusts the timing of benefits to coincide with periods in which the characters are especially needy. Study 4 equated large- and small-change events in this respect but still found differences in patience. Of course, people are apt to adjust the timing of benefits to cope with major life crises—if a person knows he or she is about to undergo chemotherapy, for example, saving up money and vacation days to take care of a future, very sick self will be the right thing to do. However, the large-change events used in Studies 3–5 were constructed to reduce connectedness without appreciably affecting the characters' material circumstances—including their perceived need for money or other benefits—and under these circumstances, our participants preferentially allocated benefits to the prechange, more connected person at the expense of the postchange, less connected person.

Discounting as Ignorance or Uncertainty About Future Selves

Both common sense and theoretical analysis suggest that people know more about their proximal selves than about their remote ones. People's futures are subject to influences they may find difficult to predict, and as a result, people are more confident about what they will be like next week than about what they will be like next year. Study 4 casts doubt on the idea that our findings are due to uncertainty about whether an individual will receive a payoff at the designated time. Preliminary ratings guaranteed that the perceived probability of receiving the reward was no less likely for big changes than for small ones. However, ignorance about their more remote future selves and the associated uncertainty about whether their defining traits will be preserved may lead people to allocate benefits to the nearer selves that they know best.

We can interpret two recent lines of research as consistent with this view. According to construal level theory (Trope & Liberman, 2003), people conceive of temporally remote events and objects, including themselves, in more abstract, less context-sensitive terms than temporally proximal items. In particular, people paint their remote selves with a broad brush as belonging to higher level social categories (e.g., as a leftist rather than an activist leftist), having a less complex set of traits, and sharing more traits across social roles (Wakslak, Nussbaum, Liberman, & Trope, 2008). This suggests that people have less detailed information about, hence are more uncertain about, the continuity of their traits in the distant future.

Many of the phenomena that fall under the heading of *affective forecasting errors* (Wilson & Gilbert, 2003) similarly suggest that people possess only a sketchy conception of their future selves. For example, people mispredict how they will feel after a good or bad event (intensity bias; Buehler & McFarland, 2001), how long the feeling will persist (durability bias; Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998), which features will or will not affect how they feel (focalism; Schkade & Kahneman, 1998), and how current somatic states affect these predictions (visceral influences and empathy gaps; Loewenstein, 1996; Van Boven & Loewenstein, 2003). Sometimes, the difference between prediction and experience (or the influence of an irresistible impulse) may lead people to make choices that are normatively indefensible or otherwise regrettable. Studies of affective forecasting suggest that people may have little veridical information about how a future benefit or burden will seem to them when it finally arrives. To be sure, the accuracy of people's predictions about their future selves is not the same as their certainty about those selves. One could be absolutely certain at 15 that one will have a lifelong antipathy toward the Chicago Blackhawks, only to find oneself rooting for them at 30. Still, experience with such mispredictions may convince people of the uncertainty in their predictions about the stability of their traits over time.

According to the connectedness account, one reason for this lack of information about future selves is that these selves' properties and feelings, their needs and desires, may drift away from people's own current ones (see also Loewenstein, O'Donoghue, & Rabin, 2003). Thus, lack of psychological connectedness to distant selves goes along with high-level construals, since people typically know fewer low-level details about these less connected selves. Lack of connectedness is consistent with affective forecasting mistakes for the same reason.

However, both construal level theory and affective forecasting have offered their own accounts of temporal discounting. According to the former, discounting is the result of a focus on low-level details for nearer outcomes and on high-level factors for more remote ones (Liberman & Trope, 2003, p. 250). When the low-level features of an outcome are more positive than its high-level features, people will want the outcome sooner; when the reverse is true, they will want the outcome later. According to affective forecasting accounts (Kassam, Gilbert, Boston, & Wilson, 2008), people view both positive and negative outcomes as less extreme the farther in the future these outcomes occur—an effect Kassam et al. (2008) called *future anhedonia.* People therefore prefer positive outcomes sooner to boost their positive qualities, but negative outcomes later to reduce their negative ones.

The present experiments were not intended to distinguish among these theories of discounting, and construal and affective factors (among other variables) may well play a role in people's preferred timing of costs and benefits. We note, though, that the large changes to the characters in Studies 3–5 did not necessarily entail that the outcomes would seem affectively neutral. One could argue, on the one hand, that a large change, such as a religious conversion or time spent as a political hostage, could numb a character's sensibilities in such a way that later events have a dampened affective tone through future anhedonia. On the other hand, one could also imagine that large changes (once they are over) could heighten the character's appreciation for the positive and negative aspects of later outcomes. Similarly, a construal account might venture that the larger changes produce high-level descriptions that potentiate the positive (but not the negative) aspects of the positive outcomes (so people will want them sooner) and the negative (but not the positive) aspects of the negative outcomes (so people will want them later). Although this is possible, it is not clear, without further assumptions, why large changes would exert this selective influence. Moreover, we observed a connectedness effect on discounting in Study 4 even though we equated the large-change and small-change events on how they affected desirability of the outcome. We suspect that large life changes may have a more direct role to play in weakening the links to people's later selves, making them seem not only more abstract and affectively unpredictable but also less like them, less worthy of the special regard people reserve for themselves.

Discounting as Competition Among Multiple Selves

A prominent approach to discounting is the idea that impatience is the result of a conflict between multiple selves—usually a nearsighted self and a farsighted self that have opposite aims in self-control dilemmas. Schelling's (1984) multiple-self model describes commitment tactics for resolving interpersonal conflicts—between the myopic selves who act impulsively and the farsighted selves who control them by placing the alarm clock across the room. Thaler and Shefrin (1981) modeled self-control conflicts as a planner–doer problem, postulating a farsighted "planner" who coordinates with or quashes the competing desires of myopic "doers" (agents).

Multiple-self theories are well positioned to explain the results of our first two studies. If impulsive selves have the upper hand in distributing outcomes, then we would expect these selves to ensure that they enjoy the benefits (dollars or good days at work) as soon as possible, producing impatient choices. This is, in fact, one standard explanation for discounting. The more challenging test for the theory comes from the results of Studies 3–5. To account for these results, the multiple-self approach needs to explain why large changes in an individual's life would lead to more impatience for benefits than small changes do, even when other temporal factors are controlled. Large changes would somehow have to increase the impulsiveness of the nearsighted agent (or decrease the control of the farsighted planner) in a way that is not built into current versions of the theory.

Although there may be several ways to modify the theory to accommodate these results, one way to do so is consistent with the present approach. Suppose the planner considers the demands of doers who exist not only in the present but also at distinct future times. The planner could then allot control to these doers based on the psychological connectedness between planner and doer. An analogy would be to real-life planners in government agencies who award lucrative contracts to doer–contractors—brothers-in-law, golfing buddies, or contributors to their boss's reelection campaign—with whom they have closer ties. Connectedness will tend to be greater for the more temporally proximal doers than the temporally remote ones, other things being equal. Yet connectedness will also be greater over smaller life changes than over larger ones, in line with our results. In this way, multiple-self theory is compatible with the present approach, assuming that multiple selves can exist sequentially as well as simultaneously.

There is an important distinction, however, between the normative implications of multiple-self theory and the connectedness framework. On the one hand, multiple-self theory is intended to capture impulsive decisions and similar phenomena where it is comparatively easy to persuade people that they made a mistake in not acting in their own best interest. On the other hand, the connectedness framework aims to provide a normative foundation for discounting rather than branding it as impulsiveness or failure of self-control. We do not doubt that there are true cases of impulsive behavior (in addiction, e.g.), and multiple-self theory may be the correct way to explain them. For other kinds of behavior, though, including the cases we tested here, people may be less willing to agree that they are making any kind of myopic or impatient error. Even though nonconstancy of discount rates has often been criticized on normative grounds, people in our studies may be justified in expressing different levels of patience that track underlying changes to psychological makeup.

Conclusion

Philosophers' normative arguments often painstakingly introduce a logical structure that systematizes intuitions, removing contradictions among them. In some cases, this rational reconstruction means demoting the normative status of some principles and promoting the status of others. This pattern of reasoning is

especially evident in Parfit's theory of discounting, since it downplays the idea that acting in a patient, self-controlled manner maximizes utility and emphasizes the idea that degree of psychological connectedness should be the basis of self-interest. As Parfit (1984, pp. 313–314) put it:

> My concern for my future may correspond to the degree of connectedness between me now and myself in the future . . . since connectedness is nearly always weaker over long periods, I can rationally care less about my further future. This claim defends a new kind of discount rate. This is a discount rate, not with respect to time itself, but with respect to [connectedness].

In five studies, we found that participants' preferences followed this principle: When they anticipated large changes, they chose to speed up rewards. This provides the first empirical support for Parfit's radical normative theory. That connectedness to the future self is a strong moderator of people's preferences, at least in the contexts tested here, offers both a descriptive account of nonconstancy in discount rates and an invitation to reevaluate the normative status of these patterns of preferences.

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Appendix

The Six Characters Presented to Participants in Studies 3 and 5

Jenn

A) In one year, Jenn will graduate from college.

B) In 10 years, Jenn will return home after 12 months of private contracting work in a war-torn region of the Middle East, where she saw terrifying and atrocious events unfold.

C) In 20 years, Jenn will develop an acute sensitivity to pollen and will move to Arizona to avoid the allergen.

D) In 30 years, Jenn will leave her job for the same position (and salary) at another employer.

Mike

A) In one year, Mike will graduate from college.

B) In 10 years, Mike will take a short vacation in Asia and will develop an affinity for rice-based dishes.

C) In 20 years, Mike will return home after 12 months of private contracting work in a war-torn region of the Middle East, where he saw terrifying and atrocious events unfold.

D) In 30 years, Mike will leave his job for the same position (and salary) at another employer.

Ashley

A) In one year, Ashley will graduate from college.

B) In 10 years, Ashley will have a religious conversion—will be introduced into a new faith and will find spiritual fulfillment in her God.

C) In 20 years, Ashley will leave her job for the same position (and salary) at another employer.

D) In 30 years, Ashley will take a short vacation in Asia and will develop an affinity for rice-based dishes.

Jon

A) In one year, Jon will graduate from college.

B) In 10 years, Jon will develop an acute sensitivity to pollen and will move to Arizona to avoid the allergen.

C) In 20 years, Jon will leave his job for the same position (and salary) at another employer.

D) In 30 years, Jon will have a religious conversion—will be introduced into a new faith and will find spiritual fulfillment in his God.

Jill

A) In one year, Jill will graduate from college.

B) In 10 years, Jill will leave her job for the same position (and salary) at another employer.

C) In 20 years, Jill will return safely and in good health from a vacation in South America where she had been kidnapped and imprisoned as a political hostage for 6 months.

D) In 30 years, Jill will develop an acute sensitivity to pollen and will move to Arizona to avoid the allergen.

Matt

A) In one year, Matt will graduate from college.

B) In 10 years, Matt will leave his job for the same position (and salary) at another employer.

C) In 20 years, Matt will take a short vacation in Asia and will develop an affinity for rice-based dishes.

D) In 30 years, Matt will return safely and in good health from a vacation in South America where he had been kidnapped and imprisoned as a political hostage for 6 months.

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