Back to the Present:

How Direction of Mental Time Travel Affects Thoughts and Behavior

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WORKING PAPER

December 20, 2022

ABSTRACT

Many consumers fail to save for the future at the rate they say they want to, and the current research looks at this savings behavior problem from a persuasive messaging standpoint. With the goal of helping people to take better care of their future selves, we build on a stream of research that suggests that the way people view their identity over time dramatically affects the savings decisions they make. Past research on similarity judgments between these selves across time has always started in the present and moved forward to the future; yet similarity could theoretically be measured by starting at any point in time. Our research explores the possibility of backward time travel, which asks people to start in the future and then return to the present. Across eleven studies, we find that mentally traveling from the future to the present increases similarity judgments between the selves across time by reducing the uncertainty of the destination self. As an important outcome of this novel intervention, mentally traveling from the future to the present increases savings intentions as well as consequential savings behaviors in large-scale field settings.

Keywords: mental time travel, similarity judgments, future self, financial decision-making

Intertemporal choices – decisions that involve trade-offs at multiple points in time – are a key part of human experience. Yet, consumers struggle to identify with their selves across time (Parfit 1971). They steeply discount the value of rewards, overeating and overspending today while planning to reform tomorrow. A growing literature has found that increasing the

psychological connection between the present and future self can improve decision-making by encouraging greater allocation of resources to the future self (Parfit 1971, 1984; Urminsky 2017). Critically, an underlying premise of this literature is that the decision-maker mentally travels through time linearly, starting in the present and moving toward the future self. We turn this research on its head, asking whether the direction of mental time travel can affect the relationships of these selves across time and change the way consumers save.

CONCEPTUAL BACKGROUND

Failures to Save

Consumers live in the present, yet most spending and saving choices have a temporal component (e.g., spend on Amazon today or save for the future tomorrow). Given both the immediacy of the present and the distance of the future, consumers discount the enjoyment of their future selves, choosing to accelerate rewards to the present and delay costs to the future (O'Donoghue and Rabin 1999; Thaler 1981; Thaler and Benartzi 2004). When choosing to splurge on an Amazon Alexa today, not saving for tomorrow seems like a small price to pay (Laibson 1996; McClure et al. 2004; Shui and Ausubel 2004). Yet, different feelings arise when tomorrow comes to pass, and Mark Twain's classic question, "Why put off till tomorrow, what you can do the day after tomorrow?" may come to mind. As tomorrows turn into todays, consumers again and again eschew opportunities to pay off past purchases and save for the future, instead heading out the door to more spending in saying, "Alexa, open Uber."

Procrastination comes easily but resisting Amazon's Prime Day is difficult. Further research to help consumers save is thus needed. Notably, consumers do not currently have the savings they need to comfortably survive even small-scale disruptions in the future. Four in ten Americans cannot pay a $400 bill out of their savings, and PwC's annual Employee Financial Wellness Survey found that employees ranked financial stress as a bigger stressor than all other life stressors combined (Larrimore and Zabek 2020; PwC 2020). Disruptions are inevitable and often result in bills to pay. To pay their future rent, future mortgage, future grocery bills, and future medical bills, consumers need money; to retire tomorrow, consumers need to save today.

Despite their best efforts, consumers are often naive about future choices and overconfident in their future self-control, overestimating both their future saving and their future free time (Benartzi and Thaler 2013; DellaVigna and Malmendier 2006; Zauberman and Lynch 2005). Notably, this prior work presumes that when consumers consider tomorrow, they do so from the standpoint of today. The present research asks a novel question: Could mentally starting in the future, and traveling *backward* to the present, alter how consumers think about themselves over time and change their financial decisions? In attempting an answer to this question, we next review the literature on mental time travel (i.e., the way that consumers mentally project themselves through time), paying particular attention to personal identity over time.

Mental Time Travel

When a consumer thinks ahead to dinner tonight, the work meeting they have tomorrow, or a memory from their childhood, they engage in mental time travel. Mental time travel allows consumers to travel across personal time, remembering their past and simulating the future (Bar

2011; Corballis 2002; Suddendorf and Busby 2003; Vohs and Schmeichel 2003). Doing so is fundamental to the way consumers conceptualize their identity and pursue long-term goals (like whether to spend today or save for retirement), yet research to date has adopted an arguably limited conceptualization of how consumers mentally travel across time. Just because consumers usually start their mental time travel journeys by departing from the present moment does not mean that they cannot necessarily engage in travel that, instead, *arrives* at the present. Based on decades of research suggesting that the nature of mental time travel trips can change how consumers think and act across time, we propose that an unexamined factor – the direction of mental travel itself – may affect the financial decisions consumers make.

At either end of mental time travel trips between the present and the future are different versions of a consumer's self: the current self of today and the future self of tomorrow. A growing literature has found that relationships between these selves can impact savings decisions. If a consumer sees their future self as fundamentally similar to their present self, they are more likely to turn down smaller, sooner rewards and wait for larger, later rewards (Bartels and Urminsky 2011; 2015). This suggests that although consumers struggle to identify with the people they will become tomorrow, next year, ten years into the future, and beyond (Parfit 1984; Pronin, Olivola, and Kennedy 2008; Schelling 1984), these struggles can be overcome. More specifically, increasing the felt similarity between present and future selves reduces the intertemporal discount rate (Bartels and Urminsky 2011; 2015) and increases consumer saving (Bryan and Hershfield 2012).

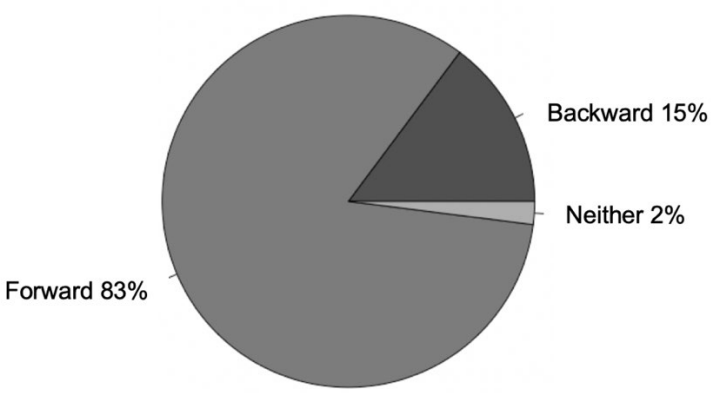
According to this research, the present self exists in one moment, "now," while the future self exists in another moment, "later" (see also Hershfield and Maglio 2020). Yet this growing stream of research often presumes only one mental pathway between these selves: from the

present *to* the future. But just as we can start in the present and move forward in our minds, we can also start in the future and rewind back. At least in the time-traveling mind of consumers, tomorrow does not solely follow today, but can, instead, precede today. In light of these descriptive discrepancies, we first wondered in what direction people mentally travel through time in their daily lives.

To do so, we conducted a pilot study in which we simply asked Amazon Mechanical Turk participants (N = 250, average age = 33.7, 53% female) how they naturally traveled through time. Participants were told, "There are two ways to think about time when we think about what sort of things are going to happen in the future. One way to think about time is to start right now in the present and mentally travel ahead to the future. Another way to think about time is to start in the future and mentally travel backward to the present." (See appendix, section A for further detail). In line with a standard linear conception of time, participants were heavily skewed toward forward time travel: 83% of respondents chose a response indicative of forward time travel as their primary mode of traveling through time (i.e., choosing a value greater than 50 on a 0-100 point scale). Nonetheless, figure 1 showcases variation in time-travel practices: Only 27% of respondents indicated that they *solely* traveled from the present to the future and never traveled from the future to the present (i.e., choosing a 100 on a 0-100 point scale).

FIGURE 1

NATURAL VARIATION IN MENTAL TIME TRAVEL DIRECTION



Note: Responses between 0 and 49 coded as "backward time travel," responses at 50 coded as "neither," and responses between 51 and 100 coded as "forward time travel."

This pilot study thus suggests that while beginning in the present and traveling forward is often the default, it is not the only way that most people naturally travel through time. If time is not solely viewed in a linear manner, how might different ways of traveling through time affect the relationships that exist between present and future selves? Can changing the way people travel through time alter the decisions that consumers make, especially with regard to how they save over time? To understand why this might be the case, we turn to prior research on spatial travel, which speaks to how the direction of mental time travel might matter for saving.

The Temporal Going Home Effect

Research in spatial travel suggests that features of a journey affect how long the journey seems to take. For instance, trips to a known destination, "home," seem faster than trips to a less-known destination, "away," despite both legs traversing the same objective distance (Raghubir, Morwitz, and Chakravarti 2011). Although this "Going Home Effect" focuses on trips through space, mentally traveling through time shares many of the same characteristics as traveling through space (Kim, Zauberman, and Bettman 2012; Maglio 2020; Maglio, Trope, and Liberman

2013a; 2013b). Integrating the mental time travel literature and the Going Home Effect, we reasoned that people live in the present – their temporal "home" – while the future is a less certain destination characterized as "away" from "home." As a result, the future self exists "away" from the "home" of the present self. If this theorizing holds, starting in the future and going "home" (to the present) might make the two points feel closer, expressed as increased judgments of similarity between the present and future selves: a "Temporal Going Home Effect." Thus, our theory predicts that traveling "home," toward a certain, present self, will make the future self seem more similar to the present self, and this increased similarity between present and future selves will cause consumers to save more for the future. Formally, we predict:

> **H1:** Traveling from the future to the present will lead to higher savings intentions and a higher likelihood to save than traveling from the present to the future.

Should traveling from the future to the present bolster similarity, what psychological mechanism might be at play? Past research on the Going Home Effect suggests that any extension of the Going Home Effect to time (a Temporal Going Home Effect) could be driven by uncertainty. For spatial travel, the Going Home Effect results in part from uncertainty about the "away" location relative to the "home" location. For instance, researchers had participants begin an experiment in a first room, then either did or did not tell them what they would be doing (reading a passage from the novel *My Struggle* by Karl Ove Knausgård) in a second room. After returning to the first room, participants who had been unaware of the second-room task reported a stronger experience of the Going Home Effect, suggesting that the uncertainty of (what would happen at) the destination made the trip to it feel relatively long (Maglio and Kwok 2016). Extrapolating to temporal travel, a Temporal Going Home Effect could result in part from a

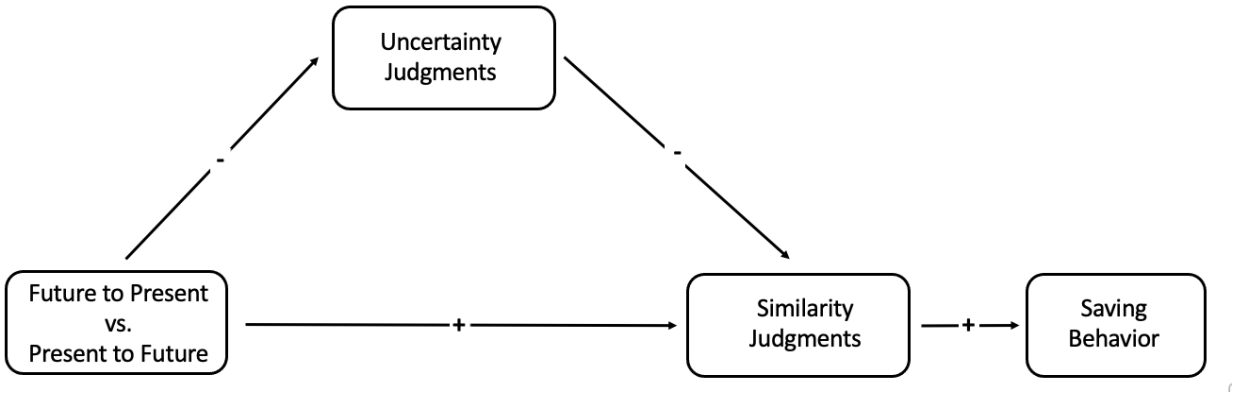
similar sense of uncertainty about the future self relative to the present self. Traveling back to the more certain destination (the present) might make the selves feel closer and more connected across time, and this closeness might be reflected in higher similarity judgments. If so, the relative uncertainty of the destination would drive our effect. Thus, we formally predict:

> **H2:** Traveling from the future to the present (rather than the present to the future) will lead to higher similarity judgments between selves across time.
>
> **H3**: The effect of mental time travel direction on similarity judgments will be mediated by uncertainty, such that when traveling from the future to the present, the destination self will feel less uncertain than when traveling from the present to the future.

Taken together, with mental travel, uncertainty, and similarity conceptualized in this way, the present investigation is well-poised to consider practical consequences (on savings behavior) of forward and reverse mental time travel. For ease of interpretation, see figure 2 for a representation of our conceptual model:

FIGURE 2

TRAVELING BACK TO THE PRESENT DECREASES
UNCERTAINTY JUDGMENTS AND INCREASES SIMILARITY OF FUTURE SELF



Note: Traveling from future to present decreases uncertainty of the destination self, which increases similarity judgments. Higher similarity judgments between the selves across time increases saving intentions and behavior.

OVERVIEW OF CURRENT RESEARCH

Our research makes two main contributions. First, in practical terms, we highlight a relatively subtle intervention that has a positive impact on saving. By changing the direction of mental time travel, we show that consumers save more, both in terms of intentions and in action. Second, from a theoretical lens, we explicate a process model that serves as a roadmap for our empirical approach. Collectively, it provides evidence that traveling from the future to the present decreases uncertainty of the destination self, which increases similarity judgments.

Across eleven experiments, spanning laboratory and field contexts, we change the way consumers mentally travel through time and, by doing so, increase (1) similarity with their future selves and (2) saving intentions and behavior. Throughout, we hypothesize that starting in the future and mentally traveling back to the present will not only increase similarity judgments between selves but will also lead to higher savings intentions and behaviors. We first examine whether changing the direction people mentally travel through time can impact perceived similarity between current and future selves (study 1a) and then replicate this effect using shorter, non-milestone time horizons (study 1b and follow-up to study 1b). We next explore uncertainty as a mechanism of the effect of mental time travel on similarity judgments through both mediation (study 2a) and moderation-of-process by manipulating uncertainty of the destination self (studies 2b and 2c). To support a distinct role for uncertainty, we examine alternative explanations including speed of time and feature matching (studies 2d and 2e) and include tests for additional alternative explanations. Pivoting to saving, we test whether mental time travel can increase intentions to save for the future self across shorter- (study 3a), and

longer-term time horizons (study 3b). Finally, to attest to the practical benefits of a mental time travel intervention, we investigate the effect of mental time travel direction on consequential savings behavior in two field studies (studies 4 and 5).

STUDY 1: SIMILARITY JUDGMENTS ACROSS TIME

In studies 1a, 1b, and a follow-up study (reported in the appendix section M), we investigated the relationship between mental time travel direction and perceived similarity of present and future selves. Specifically, we examined similarity judgments between the current self and the future self (in ten years, six years, and one year, respectively) and how this effect compares to a control condition. In both studies, the "present" is the year the study was conducted. Following prior work, we measure the psychological connection between past and future selves as a similarity judgment (Ersner-Hershfield et al. 2009). In line with H2, we predicted that participants who traveled from the future to the present would report higher levels of similarity between their present and future selves.

Method

Study 1a. Amazon Mechanical Turk (MTurk) participants (N = 1012, average age = 34.1, 53% female) were paid a nominal fee and randomly assigned to travel either from the present toward the future or from the future toward the present. Namely, participants were either asked how similar their present self was to their future self or how similar their future self was to their present self. We note that this and other early studies in our empirical package focus on

similarity with the intention to later leverage mental time travel direction to change savings behavior. Given that financial transactions are regularly completed at scale, we determined that even a smaller effect could be useful in the savings domain, and as a result, used the smallest effect size of interest (SESOI) approach to test the validity of our theory (Lakens, Scheel, and Isager 2018). This method resulted in a planned sample size of 500 participants per cell for this preliminary study and a plan to test the robustness of this effect in follow-up studies.

The experiment employed a between-subjects design. Participants in the "present-to-future" condition were asked to mentally travel from the present to the future while those in the "future-to-present" condition were asked to mentally travel from the future to the present. Participants in the present-to-future condition saw the prompt, "The year is 2018," while participants in the future-to-present condition saw the prompt, "The year is 2028." Next, all participants were asked to make a similarity judgment. Participants in the present-to-future condition started in the year 2018 and moved forward in time, in that they were asked, "How similar is 2018 you to 2028 you?" By contrast, participants in the future-to-present condition started in the year 2028, moved backward in time, and were asked, "How similar is 2028 you to 2018 you?" All participants rated similarity on a 7-point Likert scale (1 = not at all, 7 = very much). Finally, participants provided their age, gender, and income. This study's methods and analysis plan were pre-registered at http://aspredicted.org/blind.php?x=mn4nv9 and study materials are available at https://researchbox.org/620&PEER_REVIEW_passcode=OHPGEY.

Study 1b. Cloud Research Approved MTurk participants (N = 923, average age = 37.9, 61% female) were paid a nominal fee and were randomly assigned participants to one of three conditions: a control condition, a present-to-future condition, or a future-to-present condition

(Littman, Robinson, and Abberbock 2017). To determine the sample size needed for each cell in this study, we first reviewed data from all studies run earlier in our research process (as we conducted study 1b after having completed study 1a and other studies reported in this paper). Using the simcomp and multcomp packages, we simulated these data in R (Lakens et al. 2018). Based on this simulation and the data from studies run earlier, we determined that a predicted effect size of d = .25 would be appropriate to test. To provide a test of our theory with 80% power and an alpha of .05, a power analysis indicated a required sample size of 301 per cell. Accordingly, we requested 903 participants in three batches, and we received 923 participants. Two of these participants reported ages beyond the human lifespan, and their ages were replaced with the mean age. Results are reported with all participants included but are robust to a) inclusion of only the first 903 participants and b) exclusion of participants who misreported their age at the time of study.

The future-to-present and present-to-future conditions replicated the design of study 1a with one exception: participants evaluated the similarity of their present and future selves using a shorter (non-milestone) six-year time horizon (comparing 2021 and 2027 selves). Participants in the control condition also compared their 2021 and 2027 selves by answering the question, "How similar are your 2021 and 2027 selves?" and completed the same rating task on a 7-point Likert scale (1 = not at all, 7 = very much). Finally, we asked all participants to provide their demographic data. This study's methods and analysis plan were pre-registered at https://aspredicted.org/V1T_TPD.

Results

Study 1a. In line with H2, we identified a significant positive relationship between mental time travel direction and similarity. Specifically, participants in the future-to-present condition indicated higher similarity between their selves across a ten-year time horizon (M = 3.56, SD = 1.65) than participants in the present-to-future condition (M = 3.17, SD = 1.65, F(1, 1010) = 14.08, $p < .001$, $d = .24$). While age and income were significant predictors of similarity judgments (B = .01, $p = .034$; B = .03, $p = .003$), condition was still a significant predictor of similarity when demographics were included. There was no interaction between condition and any demographic factors.

As an alternative explanation for these findings, it is possible that traveling from the future to the present is simply more disfluent than traveling from the present to the future (Chae and Hoegg 2013). The difficulty of moving in a non-normal future-to-present direction could make it difficult to perceive differences between present and destination selves, which would increase similarity judgments. To examine this possibility, we assessed the amount of time spent as a function of condition but found no differences between them on this dimension ($p = .612$).

Study 1b. Replicating study 1a and in line with H2, a simple t-test found a significant positive relationship between mental time travel direction and similarity in two pairwise comparisons. Consistent with the findings in study 1a, a pairwise comparison from an overall ANOVA with dummy coding for control and present-to-future conditions indicated that participants in the future-to-present condition reported higher similarity between their selves across a six-year time horizon ($M = 3.75$; SD = 1.65) than those in the present-to-future condition ($M = 3.15$; SD = 1.70; $p < .001$, $d = .36$), and higher than those in the control condition

(M = 3.33; SD = 1.73; p = .002, d = 25). We also re-ran the ANOVA to test present-to-future vs. control conditions and found there were no significant differences (p = 0.191).

The addition of demographic variables did not change the significance of our results. There was a small interaction between condition and age such that the difference between participants in the future-to-present condition and participants in both the control (B = -.03; SD = .01; p = .023) and present-to-future conditions (B = -.02; SD = .01; p = .038) was largest for younger participants. This slightly reduced effect of our intervention on older consumers is consistent with prior research that has shown that older consumers already report higher levels of perceived similarity between present and future selves (Lockenhoff and Rutt 2017). The main effect of future-to-present vs. control (B = .40; SD = .14; p = .003) and future-to-present vs. present-to-future (B = .62; SD = .13; p < .001) held in a model that included demographic variables and the interaction term. There was no difference in time spent between conditions (p = .654). For details of the full model see the appendix, sections B-C.

Discussion

In studies 1a and 1b, we presented evidence that traveling from the future to the present could also affect similarity judgments across a ten-year and six-year time horizon. Moreover, we showed that the effects of traveling from the future to the present impacted judgments of similarity relative to a control condition as well. We also note that in a follow-up study (reported in the appendix, section M), we further replicate these effects on a one-year time frame. Although we found robust support for our main effect in study 1, the mechanism underlying it is still unknown. This is the question we turn to in study 2.

STUDY 2: UNCERTAINTY

After finding support for a main effect of mental time travel direction on similarity judgments in study 1, we address the underlying mechanism in study 2. Based on past research into the Going Home Effect – where a journey to a location characterized by uncertainty feels longer than to a more certain location (Maglio and Kwok 2016) – we hypothesized that traveling to the more known, present self might increase similarity judgments relative to traveling from the present to a more uncertain, future self. We examine uncertainty as a potential driver of our main effect on similarity judgments by testing for mediation via uncertainty (study 2a) and by manipulating uncertainty (studies 2b and 2c).

Further, we investigate whether uncertainty accounts for changes in similarity judgments over and above two compelling alternative explanations (studies 2d and 2e). First, past work in the spatial domain has shown that the felt distance between one place and another varies as a function of direction of travel (Raghubir et al. 2011) because the same trip seems to take longer when traveling away from home than when going home. We examine how traveling back to the present (a temporal "home") affects how quickly time seems to move, and whether a faster perceived trip can explain the difference in similarity judgments between conditions. Second, we also build on theories of "feature matching" (Tversky 1977) to test whether the difference in similarity judgments between conditions can be explained by the number of features considered in each condition. Specifically, this research suggests that starting with a lesser-known concept and comparing it to a more well-known concept (rather than starting with the better-known concept and comparing it to the lesser-known) can increase the perceived similarity between the

two concepts. In all studies, the "present" is the year the study was conducted. We examine whether these alternative explanations (speed of time and feature matching) can explain the effect of going back to the present on similarity judgments (study 2d) and whether speed of time or uncertainty is a better predictor of the effect in a competitive test (study 2e).

Method

Study 2a. Cloud Research Approved MTurk participants (N = 604, average age = 37.9, 57% female) were randomly assigned to travel either from the present to the future or from the future to the present and were paid a nominal fee.

The experiment employed the same between-subjects design as earlier studies. Participants were randomly assigned to the present-to-future or to the future-to-present condition. Participants in the present-to-future condition read, "The year is 2021. How similar is 2021 you to 2031 you?" while participants in the future-to-present condition read, "The year is 2031. How similar is 2031 you to 2021 you?" and this item was measured on a 7-point Likert scale (1 = not at all, 7 = very much). Then, participants read, "As you decided how similar 2021 (2031) you was to 2031 (2021) you, we would like to know what you thought about." To examine uncertainty judgments, participants were asked, "How certain did you feel when you arrived at 2021 (2031) you?," "How sure were you of what 2021 (2031) you was like?," and "How confident did you feel in your understanding of 2021 (2031) you?" These three items were measured on a 7-point Likert scale (1 = not certain / sure / confident, 7 = very certain / sure / confident; $\alpha = .956$). For ease of interpretation, we reverse-coded these items such that higher

numbers were equated to higher uncertainty. This study's methods and analysis plan were pre-registered at https://aspredicted.org/ZYN_BBR.

Study 2b. Cloud Research approved MTurk participants (N = 1,205, average age = 39.7, 51% female), participated in a short study in exchange for a nominal payment in a 2(direction: future-to-present, present-to-future) x 2(certainty of the destination self: certain, uncertain) between-subjects design. Participants in the present-to-future conditions traveled from 2022 to 2032 and participants in the future-to-present conditions traveled from 2032 to 2022. In addition, participants in the certain destination conditions were asked to "list two things that are certain about 2022 (2032) you," while participants in the uncertain destination conditions were asked to "list two things that are uncertain about 2022 (2032) you." All participants assessed the similarity between their selves (on a 7-point scale) across a ten-year time horizon using the same measure used in earlier studies, "How similar is 2022 (2032) you to 2032 (2022) you?" Participants then responded to the same uncertainty questions from study 2a (α = .946). Finally, we participants provided their demographic data. This study's methods and analysis plan were pre-registered at https://aspredicted.org/WR5_86X.

Study 2c. Cloud Research approved MTurk participants (N = 903, average age = 39.7, 51% female) travel from the present to the future, and certainty of the destination self is manipulated across three conditions (certain, uncertain, control). The manipulation matched study 2b with one exception: Participants in the control condition were not asked to list two un(certain) things about their destination self. This study's methods and analysis plan were pre-registered at https://aspredicted.org/9PT_M2S.

Study 2d. Cloud Research approved MTurk participants (N = 1,099, average age = 34.1, 58% female) were randomly assigned to travel either from the present to the future or from the future to the present. The experiment employed the same between-subjects design as earlier studies, and participants traveled across a ten-year time horizon (between the years 2019 and 2029). After making a similarity judgment, participants answered two questions. To examine speed of time as an alternative explanation, participants were asked, "When you moved from 2019 (2029) you to 2029 (2019) you, how did time seem to move?" We measured the speed of time on a 7-point Likert scale (1 = time moves slowly, 7 = time moves fast). To examine feature-matching as an alternative explanation, participants were asked, "When you thought about similarity, did you think about how any of the following would change?" and provided all participants with a list of possible changes to key elements of life (e.g., relationships, happiness, career, money) or to the self (e.g., identity). It seemed possible that some participants might never have thought of any of the listed options while other participants might have thought of all the listed options. Thus, the study did not force or limit responses to this question, and order of feature-matching and speed of time questions was randomized. This study's methods and analysis plan were pre-registered (https://aspredicted.org/XUH_MJK) and further analysis of alternative explanations can be found in a pre-test to this study and in two follow-up studies (see the appendix, sections O-Q).

Study 2e. In a competitive test, we examined whether uncertainty of the destination self or speed of time was the stronger mediator of the relationship between mental time travel direction and similarity judgments. To do so, we asked Cloud Research approved MTurk

participants (N = 903, average age = 39.7, 51% female) to start in the present (future) and assess the similarity of their 2021 (2031) and 2031 (2021) selves, and then measured both uncertainty and perceived speed of time in a manner consistent with prior studies. This study's methods and analysis plan were pre-registered at https://aspredicted.org/CR3_NQF.

Results

Study 2a. Study 2a aimed to examine the role of uncertainty in our conceptual model. Replicating earlier findings, participants in the future-to-present condition reported higher levels of similarity (M = 3.26, SD = 1.55) compared to those in the present-to-future condition (M = 2.87, SD = 1.60), $F(1, 602) = 8.93$, $p = .003$, $d = .24$; there was no effect of demographic variables (age, gender, income) on similarity judgments. More important, in line with our theorizing, participants in the future-to-present condition also perceived less uncertainty when traveling to the present (M = 2.35, SD = 1.32) than did participants in the present-to-future condition traveling to the future (M = 4.62, SD = 1.69), $F(1, 602) = 340.3$, $p < .001$, $d = 1.50$). Put differently, traveling to the present was more certain than traveling to the future. All results hold when uncertainty is analyzed as three separate, single-item measures. To check for multicollinearity in our dataset, we tested for Pearson's correlation between similarity and uncertainty judgments and found a negative correlation ($r(602) = -.20$, $p < .001$) that was substantially less than the benchmark of r = .7 that indicates multicollinearity. There was no difference in time spent between conditions ($p = .187$).

Finally, to examine whether uncertainty mediated the effect of mental time travel direction on similarity judgments (H3), we conducted a mediation analysis to test if traveling

from the future to the present would increase similarity judgments by decreasing uncertainty in the destination self. Using 10,000 bootstrapped samples of the data, results indicated that uncertainty mediated the effect of mental travel direction on similarity judgments, with an estimate of *ab* = .39 and a confidence interval that did not cross zero (95% CI = [.19, .61]; Hayes 2018; Zhao, Lynch, and Chen 2010), and the direct effect is *ns* (95% CI = [-.36, .33]) providing support for H3. As a robustness check, we reversed the pathway and re-ran our mediation analysis to see if the effect improved (mental time travel direction -> similarity -> uncertainty) and found a weaker mediation (*ab* = -.06, 95% CI = [-.12, -.02]; Hayes 2018; Zhao et al. 2010) and a significant direct effect (95% CI = [1.97, 2.45]), indicating stronger support for uncertainty as the mediator of the effect of condition on similarity judgments than for the reverse pathway.

Study 2b. To further examine the explanatory role of uncertainty, study 2b employed a moderation design in which we manipulated uncertainty of the destination self. First, we found that across mental time travel directions, participants traveling to a certain destination indicated higher similarity between their selves (M = 3.87; SD = 1.79) than participants traveling to an uncertain destination (M = 3.28; SD = 1.60; F(1, 1203) = 36.57, $p < .001$, d = .35). We also observed a small effect of direction such that participants in the future to present condition had higher similarity judgments on average than participants in the present to future conditions (M = 3.70; SD = 1.72; M = 3.44; SD = 1.71; F(1, 1203) = 7.16, p = .008, d = .15). Notably, we also found an interaction between time travel direction and uncertainty such that the effect of traveling to a certain (vs. uncertain) destination self was highest in the future to present condition (B = .50, p = .010). Adding this interaction coefficient to the model did not change the pattern of results, and the effect of traveling to a certain destination self on similarity judgments held (B =

.59, $p < .001$) in a model including the interaction coefficient, and we did not find this interaction in an earlier pilot (see the appendix, section N). Thus, we find further support for uncertainty as a driver of the relationship between time travel direction and similarity judgments.

In a robustness check, we found that higher age predicted higher similarity judgments ($F(1, 897) = 26.35$, $p < .001$) and income was marginally predicted higher similarity judgments ($p = .051$), but the addition of demographic variables did not change the significance of the similarity judgment results. There was no interaction between age ($p = .433$) and travel direction or between age and travel to a certain (uncertain) destination self ($p = .771$). As a further robustness check, we tested for differences in uncertainty judgments across time periods and found a significant difference between future certainty vs. future uncertainty, and a significant difference between present certainty vs. present uncertainty ($p < .001$, $p = .003$). To check for multicollinearity, we tested for Pearson's correlation between similarity and uncertainty judgments and found a negative correlation ($r(1203) = -.30$, $p < .001$), substantially less than the benchmark of r = .7 that indicates multicollinearity. Time spent on the study was not significantly different between certain and uncertain conditions ($p = .702$) or between present-to-future and future-to-present conditions ($p = .942$), and time spent on the study had no effect on either similarity judgments ($p = .875$) or uncertainty judgments ($p = .543$). Please see the appendix, section G for details of the full model and section N for details on our pilot study.

Study 2c. Study 2c went beyond studies 2a-b by including in a control condition. In line with H3, participants in the future certainty condition indicated higher similarity between their selves (M = 3.85; SD = 1.59) compared to participants in the control condition (M = 3.26; SD = 1.60; $p < .001$, d = .37) and future uncertainty condition (M = 3.29; SD = 1.65; $p < .001$, d = .35),

providing further support for uncertainty as a driver of the effect of condition on similarity judgments. A pairwise comparison revealed no difference between control and future uncertainty conditions (p = .818). Although higher age predicted higher similarity judgments (B = .02, p < .001), there was no interaction between age and condition in a one-way ANOVA (p = .293). This test for an interaction between age and condition also included controls for gender and income (these two demographic variables were *ns* in all models) but is robust to excluding these variables. There was a significant difference in time spent between control condition and the future certainty (uncertainty) conditions (B = 36.50, p < .001, B = 30.72, p = .001), but there was no difference in time spent between future certainty and future uncertainty (p = .114), and time spent did not predict similarity judgments (p = .349). As a further robustness check, we tested for differences in uncertainty judgments with a pairwise t-test and found a directional difference between future certainty and control in this study, and a significant difference between future certainty and future uncertainty (p = .123, p < .001). To check for multicollinearity in our dataset, we tested for Pearson's correlation between similarity and uncertainty judgments and found a negative correlation (r(901) = -.37, p < .001) that was substantially less than the benchmark of r = .7 that indicates multicollinearity. See the appendix, section H for details of the full model.

Study 2d. The aim of study 2d was to examine two candidate alternative mechanisms: speed of time and feature matching. First, replicating previous findings, participants in the future-to-present condition (M = 3.46, SD = 1.69) reported higher levels of similarity compared to those in the present-to-future condition (M = 3.11, SD = 1.69), F(1, 1097) = 11.99, p < .001, d = .21. In a robustness check, we found that higher age predicted higher similarity judgments (B =

.01, p = .003), but the addition of demographic variables did not change the significance of the similarity judgment results. In a model controlling for demographics, there was no interaction between age (p = .700) and travel direction. Time spent on the study was slightly different between conditions (B = 7.43, p = .041), but time spent on the study had no effect on either similarity judgments (p = .919).

Additionally, we found initial evidence for the role of the speed of time: Participants in the future-to-present condition perceived that time moved faster (M = 5.32, SD = 1.58) compared to those in the present-to-future condition (M = 4.89, SD = 1.83; F(1, 1097) = 17.59, p < .001, d = .25). To examine whether speed of time mediated the effect of mental time travel direction on similarity judgments, we conducted a mediation analysis to test if traveling from the future to the present would increase similarity judgments by increasing speed of time. Using 10,000 bootstrapped samples of the data, results indicated that speed of time partially mediated the relationship between mental travel direction on similarity judgments, with an estimate of ab = .03 and a confidence interval that did not cross zero (95% CI = [.01, .07]; Hayes 2018; Zhao, Lynch, and Chen 2010), providing at least weak support for speed of time as an alternative mechanism. Time spent on study had no effect on perceived speed of time (p = .276). Regarding feature matching, participants in the future-to-present and present-to-future conditions did not reveal a difference in the number of features that they considered (M = 4.30, SD = 2.13, M = 4.15, SD = 2.23; F(1, 1097) = 1.31, p = .253, d = .07, indicating that, at least as we measured it in this study, feature matching does not play a role in the link between mental time travel direction and similarity judgments. In a robustness check, we found that higher age predicted higher similarity judgments (F(1, 1095) = 9.13, p = .003), but the addition of demographic variables did not change the significance of the similarity judgment results. In a model

controlling for demographics, there was no interaction between age (p = .700) and travel direction. Time spent on the study was slightly different between conditions (B = 7.43, p = .041), but time spent on the study had no effect on either similarity judgments (p = .919) or perceived speed of time (p = .276). See the appendix, section G, for details of the full model, and details on our pretest and two follow-up studies (sections O-Q).

Study 2e. Finally, the purpose of study 2e was to pit uncertainty against speed of time and test both in the same model. First, we found a significant main effect of uncertainty, $F(1, 600) = 216.8$, $p < .001$, $d = 1.20$, with higher uncertainty in the present to future condition, and a significant indirect effect of time travel direction on similarity judgments through uncertainty, $ab = 0.42$, 95% CI [.25, .60].

Second, we found a directional, but nonsignificant effect of speed of time, $F(1, 600) = 1.94$, $p = .164$, $d = .11$. A model testing the mediating role of speed of time was non-significant, and a model that simultaneously tests the role of both uncertainty and speed of time found that the effect of uncertainty on similarity holds after controlling for speed, B = -.24, $p < .001$, $\eta^2 = .07$. Thus, uncertainty proved to be a stronger mediator than speed of time. Thus, we expand on the Going Home Effect by demonstrating that, while differences in perceived speed did emerge in some of our studies, speed does not fully or most parsimoniously explain our findings. We present evidence of uncertainty as a mediator that explains both the Going Home Effect and the Temporal Going Home Effect. As in earlier studies, age predicted similarity judgments (B = .01, p = .030), but there was no interaction between condition and age (p = .271), and in a model including uncertainty and condition as predictors of similarity judgments, adding demographic variables did not provide better goodness of fit. Time spent on the study was marginally different

between conditions (B = 7.03, p = .078), but did not have a significant effect on judgments of similarity, uncertainty, or speed of time (p = .821, p = .114, p = .337). For full details, please see the pre-registration (https://aspredicted.org/CR3_NQF) and the appendix, section H.

Discussion

In study 2, we found that uncertainty of the destination self accounted for the relationship between mental time travel direction and similarity judgments (study 2a). Further, we presented evidence that reducing uncertainty of the destination self increases similarity judgments across a ten-year time horizon (studies 2b-c), and that uncertainty was a stronger mediator of the effect of mental time travel direction on similarity judgments than speed of time (study 2e). While we did not observe any effect of condition on the number of features considered (study 2d), it is possible that feature-matching occurs very quickly and may not be a conscious process (and thus, our methods would not have picked up on such a difference), a possibility that is consistent with our finding of mediation by uncertainty, and one we return to in the General Discussion.

STUDY 3: SAVINGS INTENTIONS

The primary aim of study 3 was to examine an application of our reverse-mental-travel intervention: helping consumers save more. Past research on financial decision-making has found that similarity judgments affect how people discount the future, such that consumers who feel a greater sense of similarity value the future more (i.e., by discounting it less; Bartels and

Rips 2010). Given this past research, moving from the future to the present by way of increasing similarity may also increase intentions to save for that future self.

In study 3a, we tested the effect of mental time travel direction on savings intentions across a 10-year period. Here, participants were asked the report the likelihood that they would put money into an investment account.

In study 3b, we aimed to move beyond these 10-year horizon savings intentions in two ways. First, given that participants across our prior studies had an average age in their mid to late thirties, testing a longer time horizon might more accurately reflect the savings timeframe that participants need to keep in mind to save for their retirement needs. Thus, in study 3b, we wanted to verify that our intervention is effective across longer time horizons and tested a 20-year time horizon. Second, in study 3b, we asked participants to move through time without making a similarity judgment to assess whether this element in the design of our prior studies is necessary to produce the effect of mental travel direction on saving.

Method

Study 3a. MTurk workers (N = 1,025, average age = 33.1; 57% female) were randomly assigned to begin in the present and travel forward to the future or to begin in the future and travel back to the present, where the "present" is the year the study was conducted.

The experiment used a between-subjects design with participants in both the present-to-future conditions and future-to-present conditions making a similarity judgment, and then answering a question about saving intentions. As in prior studies, participants began the study by

completing a similarity judgment task. Immediately following the similarity judgment task, participants were asked to respond to a savings promotion.

In the savings scenario, participants read that their bank was offering a special savings promotion. Given that multiple banks were offering a 5% introductory rate to attract new customers as we conducted this study, we chose to offer participants in our study a 5% interest rate as their bank's savings promotion (Financial Panther 2018; Gillman 2020). Participants read that, "This savings account returns 5% a year. After you deposit funds into the account, the money will be locked and unavailable until the year 2028, meaning that 2018 you will be helping out 2028 you." Participants then rated their likelihood to use this savings account on a 7-point Likert scale (1 = not at all, 7 = very much). We note here that this study received slightly more workers than requested (1,025 instead of 1,000). This study's methods and analysis plan were pre-registered at https://aspredicted.org/JBT_KKI, please see the appendix, section I.

Study 3b. Prolific Academic workers based in the US (N = 1,005, average age = 32.7; 56% female) were randomly assigned to begin in the present and travel forward to the future or to begin in the future and travel back to the present (the year the study was conducted).

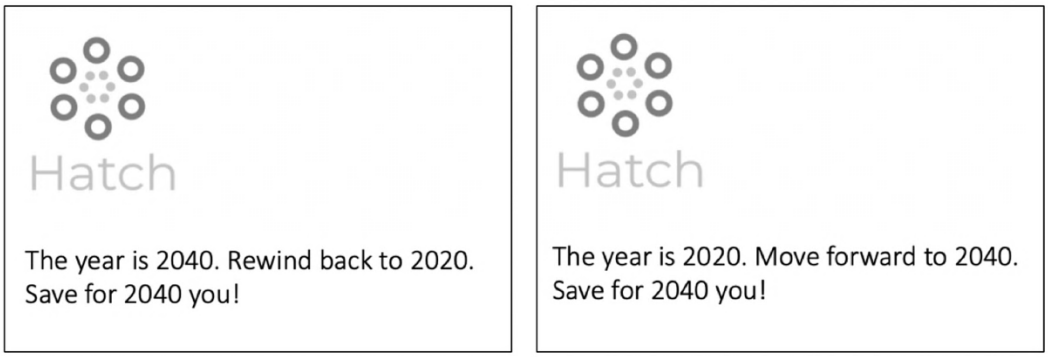
As in prior studies, we assigned participants to either a present-to-future condition or a future-to-present condition. In this study, all participants were asked to make a choice about saving and read, "Hatch Bank is a new bank focused on helping customers. As part of a promotion, they are planning to give one customer $1000. Before this happens, they want to know what customers would like to do with this money. First, you will see Hatch's ad. Then, you will be asked about saving. You will only see the ad once." We then showed them an ad that asked them to start in the year 2040 and rewind back to 2020 or start in the year 2020 and move

forward to 2040 (see figure 3). Participants were then asked to imagine they had received $1000 from Hatch Bank and had three options regarding what to do with that money: save (guaranteed investment in a Treasury bill, in which all money would be invested and would increase in value over a 20-year time horizon); spend ($1000 to spend now); or gamble (participants get either double the money or no money at all). We note here that this final option was included as part of earlier theorizing. Although we report the results of the gamble outcome in the appendix (section J), for the sake of completeness, we do not discuss them further here.

We hypothesized that participants in the future-to-present condition would be more likely to save for the future by buying a Treasury bill than would participants in the present-to-future condition. This study's methods and analysis plan were pre-registered at https://aspredicted.org/SPC_EQQ.

FIGURE 3

PROMPTS FOR SAVINGS AD (STUDY 3B)



Note: future-to-present condition on left and present-to-future condition on right.

Results

Study 3a. As in prior studies, participants in the future-to-present condition reported higher similarity judgments (M = 3.48, SD = 1.70) than participants in the present-to-future condition (M = 3.14, SD = 1.79; F(1, 1023) = 10.00, p = .002, d = .20).

In line with H1, participants in the future-to-present condition reported a higher likelihood to use the savings account (M = 4.69, SD = 1.90) than participants in the present-to-future condition (M = 4.45, SD = 1.89; F(1, 1023) = 4.35, p = .037, d = .13).

To test the relationship between mental time travel direction, perceived similarity, and savings intentions, we conducted a pre-registered mediation analysis using 10,000 bootstrapped samples. This model indicated that similarity judgment mediated the effect of mental time travel direction on likelihood to save. The bootstrapped unstandardized indirect effect was .02, and the 95% confidence interval ranged from .00, .06, p = .065. After adding the indirect effect to the model, the direct effect was not significant, and the total effect of mental time travel direction on savings intentions was significant with an estimate of .25. The 95% confidence interval ranged from .03 to .48. As a robustness check, we tested whether these effects held when including demographics (i.e., age, gender, and income). Age predicted similarity judgments (B = .02, p < .001) and savings intentions (B = -.04, p < .001), but in both cases the effect of condition held after controlling for all demographic variables, and there was no interaction between condition and age on either similarity judgments of (p = .512) or savings intentions (p = .795). Further, there was no difference between conditions in time spent on study (p = .568).

Study 3b. As predicted, participants in the future-to-present condition reported a higher likelihood to invest in a low-risk 20-year Treasury bill (52% vs. 45%, χ^2 (1) = 5.20, p = .030, Φ = .16), providing further support to H1. This effect held after age, gender, and income were

added to the model (B = -.28, SE = .13, z(995) = 2.22, p = .026, d = .15). There was no difference in time spent between conditions (p = .490), and no main effect of age (p = .214).

Discussion

The primary aim of study 3 was to examine whether traveling from the future to the present could increase saving intentions. In both study 3a and 3b, we found support for the effect of our invention on saving intentions. Namely, participants who traveled from the future to the present reported a higher intention to save when offered an introductory 5% savings rate (study 3a) and were more likely to invest windfall gains by buying a Treasury bill and less likely to plan to spend all money now (studies 3b). Further, we found that the effect of mental time travel direction on financial decision making is not limited to ten-year savings goals. While these findings were encouraging, the questions we asked in studies 3a-b were purely hypothetical. As a result, in study 4, we examined whether starting in the future and mentally traveling back to the present would impact consequential savings decisions.

STUDY 4: CONSEQUENTIAL SAVINGS BEHAVIOR

Study 4 tested the impact of mental time travel direction on consequential savings behavior in a large-scale field study. To evaluate the effectiveness of our intervention in the field, we partnered with a financial technology company (Dreams) based in Sweden to run an exploratory field study. At the beginning of the study period, the field partner provided us with

access to 6,732 of their customers. The customers in this sample had relatively low savings balances in their app-based mobile savings account (M = $1,011, Mdn = $470).[1]

The field partner offers its customers four primary options to save money for the future. We hypothesized that an intervention designed to encourage customers to travel from the future to the present (versus from the present to the future) would increase deposits in savings products.

Method

Participants. Savers (N = 6,732, average age = 30.8; 79% women) were randomly assigned to start in the present and travel forward to the future (n = 3,404) or to start in the future and travel back to the "present", the year the study was conducted (n = 3,328)

Design. The experiment examined millennial savers' choice to save (or not to save) across four savings plans: a one-year savings plan; a one-time deposit from an external account to an investment account within Dreams that would help users save; a funds transfer from an internal account to an investment account within Dreams to help users save; a "follow-the-market" automatic savings plan, in which saving increases when the stock market rises. All Dreams savers had access to these four savings options, and we analyze each of these in the main analysis. Dreams also offered two additional savings options which were unusual, risky, and specific to the Dreams fintech app. We do not address these savings options in the main paper, though see the appendix (section K) for a full discussion.

[1] These account values in USD are based on a 9.59 SEK to USD exchange rate at the time of the study.

Procedure. In the field experiment, 6,732 investors were sent one push message, which was translated into Swedish to ensure that all participants could easily understand it. Participants in the present-to-future condition were sent a message asking them to move forward ("The year is 2019. Move forward to 2029. Save for 2029 you!") while participants in the future-to-present condition were sent a message asking them to rewind back ("The year is 2029. Rewind back to 2019. Save for 2029 you!"). After sending investors the push message, we observed savings behavior on the Dreams platform over the ensuing one-week period. Given that we could not observe open rates on the push message itself, all data were analyzed using a simple χ^2 Intent-to-Treat analysis.

Results

Overall, 474 (14.24%) participants in the future-to-present condition signed up to save in at least one of four savings products, versus 413 (12.13%) participants in the present-to-future condition, and this difference in choice to save was statistically significant (χ^2 (1) = 6.55, p = .010, Φ = .08). Participants in the future-to-present condition were more likely to save in the one-year savings plan, "savings plan 1" (16 savers, .48% vs. 5 savers, .15%, χ^2 (1) = 6.03, p = .014, Φ = .07), directionally more likely to make a one-time deposit, "savings plan 2" (365 savers, 10.93% vs. 332 savers, 9.75%, χ^2 (1) = 2.67, p = .102, Φ = .03), more likely to transfer funds from an internal account to an investment account, "savings plan 3," (112 savers, 3.36% vs. 82 savers, 2.41%, χ^2 (1) = 5.50, p = .019, Φ = .07), and more likely to invest in a follow-the market plan, "savings plan 4" (30 savers, .90% vs. 14 savers, .41%, χ^2 (1) = 6.23, p = .013, Φ = .08). There were no differences in age or gender between conditions.

Discussion

Our aim in study 4 was to test the effect of mental time travel direction outside of the lab and in a consequential context. Overall, findings in the field provide further evidence to support findings in the lab. Namely, in a large-scale field study, we found that traveling from the future to the present increased consumers' likelihood to deposit their money in a long-term savings product. We note, however, that this study was an exploratory field study and was not pre-registered. To replicate and extend this work to other contexts, in study 5, we aimed to further examine the effect of mental time travel direction on saving behavior.

STUDY 5: MENTAL TIME TRAVEL DIRECTION AFFECTS LIKELIHOOD TO INPUT PERSONAL DATA AND SIGN UP FOR A COLLEGE SAVINGS ACCOUNT

Study 5 had four key aims. First, we wanted to test the impact of mental time travel direction on savings behavior in a large-scale field study in the U.S. market. Our earlier field study tested our intervention in a large-scale population of millennial savers, but those savers were in Sweden. It is possible that an intervention that works in Sweden might not work in other markets, so we conducted a second field study in the US market. Second, our earlier field study was not pre-registered. To validate our findings in the field in the present study, we pre-registered our analysis plan in advance of data collection. Third, our previous field study targeted a population of current savers. In this study, we asked whether our intervention could encourage non-savers to begin their savings journey. Fourth, although our earlier studies explore the impact

of mental time travel direction on self-related decisions (e.g., perceived similarity and savings decisions), here we investigate whether such effects extend to others as well, especially those who may be strongly included in one's self-concept. Thus, in study 5, we examine a consequential savings outcome focused on others: college savings plans.

To do so, we partnered with UNest, a college savings app and registered investment advisor (RIA) with the U.S. Securities and Exchange Commission that seeks to help parents and families save more easily for important events like college education. To begin their investment journey with UNest, investors complete the sign-up process and receive an automatic $10 deposit in their investment account. Crucially, signing up to invest has a high barrier to entry: Parents must input their private family data. As a result, UNest has contact information for tens of thousands of users on a potential customer list and who may have contacted UNest about their products or begun the sign-up process, but who have not completed the onboarding flow and received their first deposit. Our crucial outcome of interest, then, was to examine the likelihood to invest.

Method

Participants. Consumers who had contacted UNest or one of their subsidiaries, but who had not yet finished the sign-up process (N = 24,517, average age in both conditions = 31) were randomly assigned to begin in the present and travel forward to the future (n = 12,252) or to begin in the future and travel back to the present (n = 12,265). Sample size was pre-registered in advance.

Procedure. As in prior studies, we assigned participants to either a present-to-future condition or a future-to-present condition, where the "present" was the year the study was conducted. In this study, participants were contacted twice over a one-week period. Depending on their contact preferences, users received an email or an email and a push message on their mobile device with a time travel direction "The Year is 2031 (2021). Rewind back (Move forward) to 2021 (2031)." All users were then advised, "Save now for college and get $10 on us." In line with H1, we hypothesized that participants in the future-to-present condition would be more likely to input their personal data, accept a $10 sign-on bonus, and commit to invest in a new savings app than would participants in the present-to-future condition. Since we could not observe if participants receive notifications on their phones and we did not know if they saw the marketing email, we analyzed data using a χ^2 Intent-to-Treat analysis. We assessed effect of condition (future-to-present vs. present-to-future) on users' likelihood to complete UNest's investor sign-up process and receive a $10 investment in their account. Due to the field study partner's preference the subset of participants who received a push message also received an email, and all participants received a reminder within the one week timeframe (a duplicate of the earlier message). There was no difference in number of emails or push messages sent between conditions. This study's analysis plan was pre-registered in advance of data collection and can be found at https://aspredicted.org/DKF_IPG.

Results

After the one-week study period, we obtained conversion rates across conditions. Given that these conversions were from inactive users and involved inputting highly sensitive data, we

expected low conversion rates across the sample. Still, we found that participants in the future-to-present condition were more likely to complete the user flow by inputting their personal data than participants in the present-to-future condition (30 investors, .24% vs. 8 investors, .07%, χ^2 (1, N = 24,517) = 12.73, $p < .001$, $\Phi = .08$), providing further support to H1. Crucially, inputting this personal data had a financial pay-off. Participants in the future-to-present condition were more likely to complete their onboarding process and start investing in their future with a $10 investment in their UNest account.

Nine months later, we received a dataset that included parental age as well as conversions from marketing emails that had occurred outside the one-week study window. With this more complete dataset, we found no changes to the core results: participants in the future-to-present condition were more likely to complete UNest's onboarding flow than participants in the present-to-future condition (42 investors, .34% vs. 12 investors, .10%, χ^2 (1, N = 24,517) = 16.67, $p < .001$, $\Phi = .11$). See the appendix (section L) for further robustness checks.

Discussion

In study 5, we partnered with a financial technology company focused on college savings to further investigate the impact of mental time travel direction on savings behavior. We pre-registered the sample size and analysis in advance of data collection and used a simple outcome variable: completion of the onboarding user flow. As predicted, participants in the future-to-present condition were more likely to complete the onboarding user flow and receive a $10 investment in their college savings account than participants in the present-to-future condition.

GENERAL DISCUSSION

Consumers frequently fail to save for the future at the rate they say they want to, and the current work provides a novel intervention to help close this gap: alter the usual mental time travel direction by traveling back to the present from the future. Across nine laboratory experiments and two large-scale field studies, we demonstrate that mental time travel direction affects how similar consumers feel to their future selves and, in turn, the actions they take on behalf of those future selves. Namely, we provide evidence that, relative to traveling from the present forward to the future, traveling from the future back to the present increases similarity judgments between selves across time. Moreover, we reveal uncertainty as the primary mechanism underpinning this effect. On a secondary level, we find weaker evidence that traveling back to the present may increase the speed at which time seems to move. Most importantly, such backward mental time travel increases saving in both hypothetical laboratory studies and incentivized field contexts.

Theoretical Contributions

The present findings have relevance to several different literature streams. First, work on future self-continuity has found that when consumers feel psychologically similar to their future selves, they discount the future less (Bartels and Urminsky 2011; 2015; Ersner-Hershfield et al. 2009). Though present and future selves are by definition separate, theorizing in this arena documents how and why they can come to feel more connected. The current research introduces a strategy to increase perceptions of similarity between selves, which, in turn, increases saving.

Namely, we find that traveling back to the present increases future self-similarity and that this increased sense of similarity can change financial decision-making by increasing intentions to save and driving consequential saving behavior.

This work also makes contributions to the marketing literature on the Going Home Effect, to date restricted to the spatial domain (in that felt distance between one place and another varies as a function of direction of travel, Raghubir et al. 2011). Specifically, the same trip seems to take longer when traveling away from home than when going home. While trips through physical space are often measured in time ("How long does it take to get there?"), trips through time are often measured in psychological closeness ("How similar do you feel to yourself in ten years?"). The present work examines how traveling back to the present (a temporal "home") affects closeness across time: Like travel through space, travel through time seems closer – in that the two selves feel more similar – when traveling home (to the present) than when traveling away (to the future), and this effect is driven by the certainty of the destination self, conceptually replicating, and extending prior work documenting a role for uncertainty in the Going Home Effect (Maglio and Kwok 2016).

Uncertainty is not only a linchpin for how consumers traverse time and space; it is also foundational for how consumers make comparisons across different entities (Tversky 1977). Accordingly, the present research advances the literature on similarity judgments as well. Similarity judgments often compare a better-known concept (the prototype) to a lesser-known concept (the variant). Crucially, past research on "feature matching" has found a similarity judgment asymmetry as a function of comparison direction (Holyoak and Gordon 1983; Tversky 1977). For example, a friend is likely to be judged more similar to the self than the self is to a friend (Holyoak and Gordon 1983; Tversky 1977). This asymmetry arises because, when people

start with a more uncertain, lesser-known concept and compare it to a more well-known concept, (1) fewer features are known, (2) fewer features are loaded, and as a result, (3) a higher percentage of the loaded features match. Because more loaded and matched features makes for higher similarity, when starting with a lesser-known concept and matching to a more well-known concept, the perceived similarity between the two concepts increases. Yet, the concepts tested in these similarity judgments – friends, nations, and shapes – are all already in existence. To our knowledge, the current research is the first to test this similarity asymmetry across time, where one piece of the comparison, the future self, does not yet exist. Critically, the future self will only exist once the present self ceases to exist. Yet, we find that, even under these conditions, the similarity asymmetry holds.

The current research demonstrates that by reversing the standard comparison – by starting with the future self and comparing it to the present self – interventions can increase similarity judgments between the selves across time. To be sure, while we contribute to this theoretical tradition, we note that study 2d did not find a difference in feature matching as a function of direction of mental time travel. Nevertheless, it seems at least possible that feature-matching across selves over time may differ in some critical ways vs. feature-matching across people or nations, and that our mechanism of uncertainty may also underlie both the effect we find and the feature-matching effect. Thus, future research could explore how similarity judgments of a known present and unknown future differ from similarity judgments of more prosaic concepts such as two nations or two shapes. This suggests a rich opportunity for future research to consider how and when feature matching may operate in our effect vis-à-vis the larger construct of similarity judgments.

This research also contributes to the literature on backward planning, which finds that working backward, from a goal to the present, can lead to more realistic estimations of task completion time (Buehler et al. 1994; Buehler et al. 2010; Halkjelsvik and Jorgensen 2012). Past work in backward planning has found that when a planner starts in the future (at a goal) and moves back to the present, they arrive at a longer time estimate for project completion than when they start in the present and move forward in time (Wiese, Buehler, and Griffin 2016). Thus, a backward planner realizes that they need more time to achieve their goal – and the changes they want to make to a project – than a forward planner would predict. Crucially, the backward planning literature has looked at tasks that are already planned or in process. The current research showcases backward travel as a more general phenomenon, suggesting that traveling backward can create value even for consumers who do not already have a plan. We find that travelers who go back to the present judge their future self as more similar to their current self than a forward traveler. We explain this finding by demonstrating that traveling back to a known destination self leads to a feeling that the future self and the present self are not that different after all. Further, we find that when the future self feels psychologically closer to the current self, consumers are more likely to commit to saving and to investments to help the future self.

Managerial Implications and Avenues for Future Research

The current research has significant implications for companies, governments, and individual decision-makers looking to help reduce the savings shortfall. While we examined the potential of mental time travel direction to drive behavior change in millennial investors in Sweden and investors in a college savings plan in the United States, it is possible that a similar

intervention would impact other institutions looking to enhance investments in the future. The present research, for example, might apply to Social Security claiming in the United States, where early claiming can reduce retirees' benefits by as much as 30% over the lifespan (Epperson 2015). If changing the direction people travel through time can foster saving, perhaps our intervention would lead to postponing claiming for an additional six months or a year, making deferral an easier choice for potential retirees. The present work could also apply to consumer and student loan debt. Temporal discounting not only affects the rate at which people save – it also impacts how much they choose to borrow (Greenberg and Hershfield 2018), and research on college saving suggests that students do not aim high enough and as a result may not borrow enough or invest enough in their educations (Yoon, Yang, and Morewedge 2022).. In the case of student loans, a simple mental time travel manipulation before asking students how large a student loan they would like to borrow might change the amount borrowed. While this paper has examined the potential of mental time travel direction to drive behavior change in the domain of saving, traveling back to the present could also affect change in non-financial domains that benefit from higher future self-similarity, including healthy eating, education, healthcare, and exercise.

Nonetheless, we offer these future directions alongside a note of caution: We conducted many of these studies when the then-present macroeconomic environment could be characterized as more certain. Given the role of uncertainty in our conceptual model, it could be the case that the effects of mental time travel direction on saving and other potential behaviors could be weakened in times of great uncertainty, a possibility that we hope future researchers examine. Specifically, while the current work builds on the established connection between similarity and saving, future work could examine whether market upswings and downswings moderate the link

between similarity judgments and savings. For example, if inflation rates are high and investing in the future feels very expensive (e.g., rate of inflation is higher than interest rates) while the present feels very uncertain (e.g., will interest rates rise, fall, or stay stead?), does increasing future similarity have an equivalent effect on saving as it would in a time when investing in the future seems like a better proposition? Or does reverse mental time travel only boost saving when people see that (or any) action as truly beneficial for the future self? Future research could also test if increasing the connection between the present self and future self shifts as a function of time within a year. For example, are January 2022, April 2022, and New Year's Eve 2022 equally prototypical of the 2022 self, or does the ease of connecting back to the present self from the future self vary across the year (e.g., the New Year's Eve 2022 self feeling less like a present self and more like an imminent past self with a major temporal landmark a few hours away)? And might such seasonal variation have implications for similarity across time?

Future research could also explore the role of fluency and the ease of processing temporal information. Prior work on time and conceptual metaphors (e.g., Chae and Hoegg 2013) suggests that fluency may be critical, especially when one is considering a temporal movement or orientation that is not the norm for participants (such as traveling from the future to the present). As noted earlier, a fluency perspective might argue that the difficulty of moving in a non-normal future-to-present direction could make it harder to notice differences between present and destination selves, thereby increasing similarity judgments. While the items used to measure uncertainty do not rule out the possibility that uncertainty is capturing ease of processing, fluency would likely be reflected in differences in time spent on task between conditions. Yet, we do not find evidence of such a process. Time on task was equivalent in nearly all studies, and

all effects hold after controlling for time spent. Nonetheless, future research could investigate the role of fluency more fully.

Conclusion

This research started with an observational study that asked consumers how they travel through time. We found natural variability in the way people conceptualize time: While most people usually travel forward in time, most also travel backward at least occasionally. The rest of this paper induced changes in the way consumers travel through time, asking an experimental condition to travel back to the present. Across eleven studies, we find that mental time travel direction alters how similar consumers feel to their future selves and how they choose to save for the future. While the mind might tend to start in the present before moving away, it appears capable of more elaborate maneuvers. We offer reverse mental time travel both as evidence for the adeptness of consumers' time-traveling minds and as a promising intervention by which traveling back home to the present changes how consumers relate to and decide for the selves they are today and the selves they one day will become.

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