Back to the Present: How Direction of Mental Time Travel Affects Similarity and Saving

KATHERINE L. CHRISTENSEN
HAL E. HERSHFIELD
SAM J. MAGLIO

Many consumers say they want to save for the future yet struggle to do so. This research examines this saving behavior problem from a persuasive messaging standpoint. With the goal of helping people take better care of their future selves, we build on a stream of research that has found that the way people view their identities over time affects the saving decisions they make. Although past research on similarity judgments across time almost exclusively starts with the present self and moves forward to the future self, such judgments could theoretically start at any point in time. Here, we explore the possibility of backward mental time travel, by asking people to start in the future and return to the present. A series of studies shows that mentally traveling from the future to the present—rather than the present to the future—increases perceived similarity between selves across time by reducing the uncertainty of the destination self. Lab studies and two large-scale experiments indicate that, as an important outcome of this novel intervention, mentally traveling from the future to the present has a small but positive impact, systematically increasing savings intentions and savings behavior.

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

Intertemporal choices that involve trade-offs at multiple points in time are inevitable, yet consumers often struggle to identify with different versions of their selves across time (Parfit 1971). For example, they steeply discount the value of rewards by overeating or overspending today while planning to reform tomorrow. Altering the psychological connection between the present self and the future self improves decision-making by encouraging greater allocation of resources to the future self (Parfit 1971, 1984; Urminsky 2017). A key premise of existing research is that

Katherine L. Christensen (kachris@iu.edu) is assistant professor of marketing at the Indiana University Kelley School of Business, Bloomington, IN 47405, USA. Hal E. Hershfield (hal.hershfield@anderson.ucla.edu) is professor of marketing, behavioral decision making, and psychology at the University of California Los Angeles, Anderson School of Management, Los Angeles, CA 90095, USA. Sam J. Maglio (Sam.Maglio@rotman.utoronto.ca) is professor of marketing and psychology at the University of Toronto, Toronto, ON, Canada. Please address correspondence to Katherine L. Christensen. This article is based on the lead author's dissertation completed under the supervision of the second author. The authors thank participants in seminars at the University of Houston Doctoral Symposium, Schulich School of Business, York University, HEC Paris, The Ohio State University, American University, the Wharton School of the University of Pennsylvania, the Emotion and Cognition lab at the University of Southern California, conference participants at the Association of Consumer Research, Society for Consumer Psychology, and Social Personality and Social Psychology conferences, and Stephen Spiller, Suzanne Shu, Eugene Caruso, and Keith Holyoak for their excellent comments. They also thank the ISCC and UCLA Statistical Consulting Group for their advice. Funding was provided by the Morrison Center for Marketing and Data Analytics. Sam J. Maglio is supported in part by funding from the Social Sciences and Humanities Research Council. Supplementary materials are included in the web appendix accompanying the online version of this article.

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decision makers mentally travel through time in a linear fashion, starting in the present and moving toward the future. The current research challenges this notion. We ask whether changing the direction of mental time travel might affect the relationships of present and future selves across time—and thereby change the way consumers save.

CONCEPTUAL BACKGROUND

Although consumers live in the present, most of their spending and saving choices have temporal components (e.g., buy something today or save for the future). Because the present is immediate and the future is distant, consumers discount the enjoyment their future selves will experience, 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 today, not saving for tomorrow seems like a small price to pay (Laibson 1996; McClure et al. 2004; Shui and Ausubel 2004). However, different feelings arise when tomorrow comes to pass, prompting Mark Twain's classic question, "Why put off till tomorrow, what you can do the day after tomorrow?" As tomorrow turns into today, consumers repeatedly forgo opportunities to pay off past purchases and save for the future; instead, they continue to spend more.

Because procrastination comes easily but resisting spending inducements is difficult, more research is needed to find ways to help consumers save. Many consumers do not have sufficient savings to survive even small-scale, inevitable disruptions; for example, 37% of U.S. consumers would not be able to pay for an unexpected $400 expense with their savings (Federal Reserve 2023). According to PwC's annual Employee Financial Wellness Survey, employees rank financial stress as a bigger stressor than all other life stressors combined (Larrimore and Zabek 2020; PwC 2020). Furthermore, despite their best efforts, consumers are often naive about their future choices and overconfident about their future self-control; they tend to overestimate both their future savings and their future free time (Benartzi and Thaler 2013; DellaVigna and Malmendier 2006; Zauberman and Lynch 2005). To address such tendencies, we ask a novel question: Could mentally starting in the future, and traveling *back* to the present, alter how consumers think about themselves over time, thereby changing their financial decisions? To answer it, we review research into mental time travel (i.e., how consumers mentally project themselves through time) and its links to perceptions of personal identity over time.

Mental Time Travel

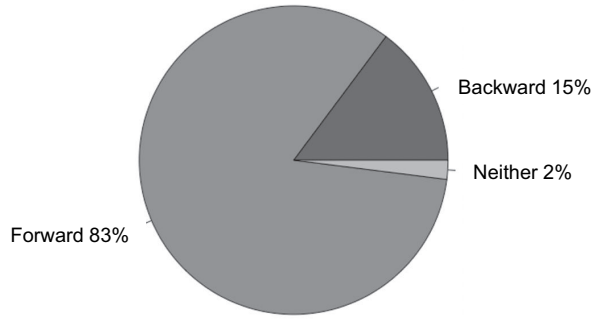
When consumers think ahead to evening dinners and next-day work meetings, or think back to childhood memories, they engage in mental time travel. Mental time travel allows people to travel across personal time, remembering the past and simulating the future (Bar 2011; Corballis 2002; Suddendorf and Busby 2003; Vohs and Schmeichel 2003). Although it is fundamental to identity conceptualizations and the pursuit of long-term goals, research into mental time travel is limited. Notably, consumers usually start their mental time-travel journeys by departing from the present moment, but they may be able to engage in mental travel that *arrives* at the present. Following decades of research that suggests that the nature of mental time-travel trips changes how consumers think and act across time (Bar 2011; Suddendorf and Busby 2003; Vohs and Schmeichel 2003), we propose that the direction of that travel represents an unexamined factor that affects financial decisions.

In mental time travel, trips between the present and the future reveal different versions of a consumer's self: the current self of today and the future self of tomorrow. Relationships between such selves can affect savings decisions. If consumers see their future selves as fundamentally similar and connected to their present selves, they are more likely to turn down smaller, earlier rewards and wait for larger, later rewards (Bartels and Urminsky 2011, 2015). Even if people struggle to identify with the people they will become tomorrow or 10 years in the future (Parfit 1984; Pronin, Olivola, and Kennedy 2008; Schelling 1984), these struggles can be overcome. Specifically, increased perceived similarity between present and future selves reduces the intertemporal discount rate (Bartels and Urminsky 2011, 2015) and increases consumer saving (Bryan and Hershfield 2012). However, extant research tends to focus on only one mental pathway between these selves: *from* the present *to* the future. But just as people can start in the present and move forward in their minds, they can also start in the future and go back. At least in the time-traveling minds of consumers, tomorrow does not solely follow today but also could precede today. Considering these descriptive discrepancies, we ask: In which direction do people mentally travel through time in their daily lives?

In a pilot study, we simply asked Amazon Mechanical Turk (MTurk) participants ($N = 250$, average age = 33.7 years, 53% women) how they naturally traveled through time, with the following prompt: "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." In line with the 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 mentally traveling through time (i.e., a value greater than 50 on a 0–100 scale). Nonetheless, figure 1 showcases variation in mental

FIGURE 1

NATURAL VARIATION IN MENTAL TIME-TRAVEL DIRECTION



NOTE.– Responses from 0 to 49 are coded as backward time travel, responses at 50 are coded as neither, and responses from 51 to 100 are coded as forward time travel.

time-travel practices: Only 27% of respondents indicated they solely traveled from the present to the future and never traveled from the future to the present (i.e., 100 on a 0–100 scale; see web appendix section A for further details).

This pilot study suggests that although beginning in the present and traveling forward is often the default, it is not the only way that people naturally travel through time. If time is not viewed solely in a linear manner, different ways of traveling through time might affect the relationship between present and future selves, and this changed relationship between present and future selves might alter the decisions people make, especially regarding how they save over time. Prior research on spatial travel suggests how direction of mental time travel matters to saving, as outlined in the next section.

Temporal Going-Home Effect

Research in spatial travel suggests that features of a journey affect how long the journey seems to take. Trips to a known destination (e.g., home) seem faster than trips to an unknown destination, even if both legs involve the same objective distance (Raghubir, Morwitz, and Chakravarti 2011). Although this going-home effect relates to trips through space, mental travel through time shares many of the same characteristics (Kim, Zauberman, and Bettman 2012; Maglio 2020; Maglio, Trope, and Liberman 2013a, 2013b). By integrating findings from the mental time travel literature with the going-home effect, we reason that because people live in the present, the present self represents a temporal version of home. By contrast, the future is a less certain destination; 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, which could induce a sense that the present and future selves are similar—that is, a temporal going-home effect. Traveling home in time, toward a certain, present self might make the future self seem more similar to the present self; this increased similarity between present and future selves may cause consumers to save more for the future. We hypothesize:

> **H1:** Mentally traveling from the future to the present (rather than from the present to the future) leads to higher similarity judgments between selves across time.
>
> **H2:** Compared with mentally traveling from the present to the future, mentally traveling from the future to the present leads to greater savings intentions and greater likelihood of saving.

This extension of the going-home effect to time (i.e., temporal going-home effect) could result from uncertainty. That is, with spatial travel, the going-home effect results in part from uncertainty about the away location relative to the home location. As previous research has shown, when participants do not know what they will be doing later in a different room (i.e., reading a passage from a specific novel), they report stronger experiences of the going-home effect after they return to the initial room (Maglio and Kwok 2016). The uncertainty of what would happen made the trip to reach it feel relatively longer. Extrapolating to temporal travel, we posit that a temporal going-home effect could result from a similar sense of uncertainty about the future self, relative to the present self. Traveling back to a more certain destination (the present) might make someone feel closer and more connected to their selves across time, such that they appear more similar. Then the relative uncertainty of the destination would drive the predicted effect, as follows:

> **H3**: The effect of mental time-travel direction on similarity judgments is mediated by uncertainty, such that compared with traveling from the present to the future, traveling from the future to the present makes the destination self feel less uncertain.

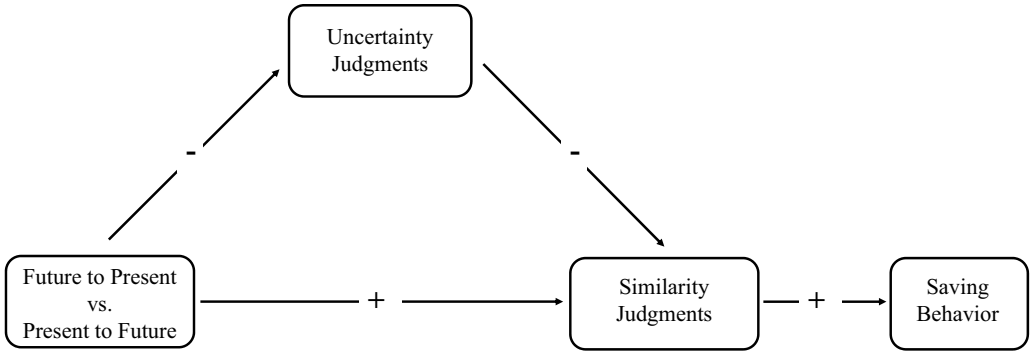
Combining these mental travel, uncertainty, and similarity literatures, we investigate the potential consequences of savings behavior linked to forward and reverse mental time travel. Figure 2 depicts our conceptual model.

OVERVIEW OF CURRENT RESEARCH

Across 20 studies, including both lab studies and field experiments, we manipulate the way consumers travel mentally through time, in an attempt to increase both feelings of similarity with future selves and saving intentions and behavior. We hypothesize that mentally starting in the future and traveling back to the present will make people judge their selves as more similar across time, and building

FIGURE 2

TRAVELING BACK TO THE PRESENT DECREASES UNCERTAINTY AND INCREASES PERCEIVED SIMILARITY WITH FUTURE SELF



on past research will also increase their savings intentions and behavior (Bartels and Urminsky 2011, 2015).

We first examine whether changing the direction people travel mentally through time affects the similarity they perceive between their current and future selves (pilot, study 1, and supplementary studies 1A and B). Next, we manipulate the uncertainty of the destination self to explore uncertainty as a mechanism of the effect of mental time travel on similarity judgments through both mediation (study 2a) and moderation-of-process (pilot, study 2b, and supplementary studies 2C–I). Regarding savings, we investigate whether mental time travel increases intentions to save for the future self across shorter-term (study 3a) and longer-term time horizons (study 3b and supplementary studies 3C and D). Finally, to test the practical benefits of mental time-travel interventions, we conduct two field studies (studies 4 and 5) that examine the effect of mental time-travel direction on saving behavior.

Our research thus makes two main contributions. First, in practical terms, it highlights a relatively subtle intervention that can have positive impacts on saving. By changing the direction of mental time travel, we find that consumers *intend* to save more and actually *do* save more. Second, from a theoretical lens, we develop a process model and roadmap for our empirical approach. It provides strong evidence that traveling from the future to the present decreases uncertainty of the destination self, making present and future selves seem more similar.

STUDY 1: SIMILARITY JUDGMENTS ACROSS TIME

In a pilot, study 1, and two supplementary studies (reported in web appendix, sections B–E), we investigate the relationship between mental time-travel direction and perceived similarity of selves across time. Specifically, we examine similarity judgments related to the current self and the future self (in 6 years in the main study and in 1, 5, and 10 years in the web appendix), and determine how this effect compares with a control condition. In these studies, we designate the present as the year the study was conducted. Following past research, we measure similarity judgments according to the psychological connection between past and future selves (Ersner-Hershfield et al. 2009). In line with hypothesis 1, we predict that participants who travel from the future to the present perceive higher levels of similarity between their present and future selves.

Method

We paid CloudResearch-approved MTurk participants ($N = 923$; average age = 37.9 years; 61% female) a nominal fee and randomly assigned them to one of three conditions: control, present-to-future, or future-to-present (Litman, Robinson, and Abberbock 2017).

To assess sample size for study 1, we first reviewed previously collected pilot data. We piloted our study design using the smallest effect size of interest approach to test the validity of our theory (Lakens, Scheel, and Isager 2018). Given that financial transactions are regularly completed at scale, this method indicated a sample size of 500 participants per cell, which we used for our pilot study (please see web appendix for pilot, supplementary studies 1A and B, and additional replications). To determine sample size for study 1 using SimComp and multcomp packages, we simulated the data in R (Lakens et al. 2018). According to this simulation and our existing data, we determined that a predicted effect size of $d = 0.25$ would be appropriate for testing. To establish a test with 80% power and an alpha equal to 0.05, the power analysis indicated a required sample size of 301 per cell. Accordingly, we requested 903 participants in three batches and obtained 923 responses. Two participants reported ages beyond the human lifespan; we

replaced those reported ages with the mean age. The reported results included all the participants; they also are robust to (1) inclusion of the first 903 participants and (2) exclusion of participants who misreported their age.

Participants evaluated the similarities of their present and future selves using a (non-milestone) 6-year time horizon (comparing 2021–2027 selves in the present-to-future condition or 2027 selves to 2021 selves in the future-to-present condition). We used a between-subjects design. Participants in the present-to-future condition had to travel mentally from the present to the future, following the prompt, "The year is 2021," whereas participants in the future-to-present condition mentally traveled from the future to the present, starting with the prompt, "The year is 2027." Each participant then made a similarity judgment—"How similar is 2021 you to 2027 you?" or "How similar is 2027 you to 2021 you?"—on a 7-point Likert scale (1 = "not at all," 7 = "very much"). Finally, participants provided their age, gender, and income, see https://aspredicted.org/2mu4u.pdf and study materials are available at https://osf.io/utcax/. The future-to-present and present-to-future conditions replicated the design of the pilot and supplementary studies 1A and B with one exception: the pilot tested similarity judgments across a 10-year time horizon, while supplementary studies 1A and B tested judgments across 1- and 5-year time horizons (web appendix, sections B–E).

This study also included a control condition. Participants in the control condition compared their 2021 and 2027 selves by answering, "How similar are your 2021 and 2027 selves?" on the same 7-point Likert scale (1 = "not at all," 7 = "very much"). We note that the present-to-future condition is very similar to the control condition as people tend to move forward in time more often than they move backward. Finally, we asked all participants to provide demographic data (see web appendix, sections B–E, for more details and replications).

Results

In line with hypothesis 1, we conducted a simple *t* test of two pairwise comparisons that showed a significant positive relationship between mental time-travel direction and similarity. A pairwise comparison from an overall analysis of variance (ANOVA) with dummy coding for the control and present-to-future conditions indicated that participants in the future-to-present condition reported greater similarity between their selves across a 6-year time horizon ($M = 3.75$; SD = 1.65) than those in the present-to-future ($M = 3.15$; SD = 1.70; $p < .001$; $d = 0.36$) or control ($M = 3.33$; SD = 1.73; $p = .002$; $d = 0.25$) conditions. We also re-ran the ANOVA to test present-to-future versus control condition and found no significant differences ($p = .191$).

The addition of demographic variables did not change the significance of our results. There was a minor interaction between condition and age, such that the difference between participants in the future-to-present condition and participants in both the control ($B = –0.03$; $p = .023$; $\eta^2 = 0.002$) and present-to-future ($B = –0.02$; $p = .038$; $\eta^2 = 0.005$) conditions was greater for younger participants. This slightly reduced effect of our intervention among older consumers is consistent with prior research that shows that older consumers report higher levels of perceived similarity between present and future selves (Löckenhoff and Rutt 2017). The main effect of future-to-present versus control ($B = 0.40$; $p = .003$; $\eta^2 = 0.001$) and future-to-present versus present-to-future ($B = 0.62$; $p < .001$; $\eta^2 = 0.02$) conditions persisted in a model that included demographic variables and the interaction terms. Finally, we note that the difficulty of moving in an abnormal future-to-present direction could make it difficult for people to perceive differences between their present and future selves, which would increase feelings of similarity. To examine this possibility, we assessed the amount of time spent as a function of condition, but we found no differences on this dimension ($p = .654$).

Discussion

In study 1, we establish that, in comparison to mentally traveling from the present to the future, mentally traveling from the future to the present can affect similarity judgments across a 6-year time horizon. Moreover, the effect of traveling from the future to the present affects judgments of similarity relative to a control condition. In three additional studies (web appendix, sections B–E), we replicate this effect across 1-, 5-, and 10-year time frames. Building on this robust support for our main effect, we seek to identify the underlying mechanism in study 2.

STUDY 2: UNCERTAINTY

We examine uncertainty as a potential driver of the main effect on similarity judgments by testing for mediation via uncertainty (study 2a) and by manipulating uncertainty (study 2b). In additional follow-up studies, we investigate whether uncertainty can better explain changes in similarity judgments than two compelling, alternative explanations: feature-matching and the speed of time. Throughout study 2, we define the present as the year in which the study was conducted.

Method

Study 2a. In return for a nominal fee, we randomly assigned CloudResearch-approved MTurk participants ($N = 604$; average age = 37.9 years; 57% women) to travel either from the present to the future or from the future to the present. The between-subjects design matched that

used in study 1 except this study used a 10-year time horizon. We randomly assigned participants to conditions, such that they read, "The year is 2021. How similar is 2021 you to 2031 you?" (present-to-future condition) or "The year is 2031. How similar is 2031 you to 2021 you?" (future-to-present condition). They answered on the same 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 gauge uncertainty judgments, we 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?," using different 7-point Likert scales (1 = "not certain/not sure/not confident," 7 = "very certain/very sure/very confident"; α = 0.956). For ease of interpretation, we reverse-coded these items such that higher numbers represented higher uncertainty. We preregistered this study at https://aspredicted.org/j8sv8.pdf.

Study 2b. CloudResearch-approved MTurk participants (N = 1,205; average age = 39.4 years, 54% female) completed a short study in exchange for a nominal payment in a 2 (direction: future-to-present, present-to-future) × 2 (certainty of the destination self: certain, uncertain) between-subjects design. Participants in the present-to-future conditions mentally traveled from 2022 to 2032, and participants in the future-to-present conditions mentally traveled from 2032 to 2022. In addition, we asked participants in the certain-destination conditions to "list two things about your life today (in ten years) that are relatively certain," and asked participants in the uncertain destination conditions to "list two things about your life today (in ten years) that are relatively uncertain." All participants assessed the similarity between their selves (7-point scale) across a 10-year time horizon using the previously noted measure, "How similar is 2022 [2032] you to 2032 [2022] you?" Participants then responded to the uncertainty questions from study 2a (reverse-coded, α = 0.946). Finally, participants provided their demographic data. We preregistered this study at https://aspredicted.org/pb8kn.pdf.

Results

Study 2a. Replicating our previous findings, participants in the future-to-present condition reported higher levels of similarity (M = 3.26; SD = 1.55) than those in the present-to-future condition (M = 2.87; SD = 1.60; F(1, 602) = 8.93; p = .003; d = 0.24), and there was no effect of demographic variables (age, gender, income). In line with our theorizing, participants in the future-to-present condition perceived less uncertainty when traveling to the present (M = 2.35; SD = 1.32) than did participants in the present-to-future condition when traveling to the future (M = 4.62; SD = 1.69; F(1, 602) = 340.3; p < .001; d = –1.50; web appendix, section F). That is, traveling to the present seemed more certain than traveling to the future. All results held when we analyzed uncertainty as three separate, single item measures. To check for multicollinearity in our data set, we tested for Pearson's correlations between similarity and uncertainty judgments; the negative correlation (r(602) = –0.20; p < .001) was substantially less than the benchmark of r = 0.7 that indicates multicollinearity. We found no difference in time spent between conditions (p = .187).

To test hypothesis 3, we also conducted a mediation analysis of whether mentally traveling from the future to the present increased perceived similarity by decreasing uncertainty surrounding the destination self. According to 10,000 bootstrapped samples, uncertainty mediated the effect of mental travel direction on similarity judgments, with an estimate of ab = 0.39 and a confidence interval (CI) that did not include 0 (95% CI = [0.19, 0.61]; Hayes 2018; Zhao, Lynch, and Chen 2010). The direct effect was not significant (95% CI = [–0.36, 0.33]), in support of hypothesis 3. As a robustness check, we reversed the path and re-ran the mediation analysis to determine if the effect improved with similarity as the mediator and uncertainty as the dependent variable (mental time-travel direction → similarity → uncertainty). Instead, we found weaker mediation (ab = –0.06; 95% CI = [–0.11, –0.02]; Hayes 2018; Zhao et al. 2010) and a significant direct effect (95% CI = [–2.46, –1.97]). Relative to the reversed path, we thus found stronger support for uncertainty as a mediator of the effect of the condition on similarity judgments.

Study 2b. To clarify the explanatory role of uncertainty, we employed a moderation design. Specifically, we manipulated the uncertainty of the destination self in order to test if higher uncertainty would attenuate the effect of time travel direction on similarity judgments. 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 = 0.35). A small effect of direction implied that participants in the future-to-present condition sensed greater similarity on average than participants in the present-to-future conditions (M = 3.71; SD = 1.72; M = 3.43; SD = 1.71; F(1, 1203) = 7.74; p = .005; d = 0.16). 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 higher in the future-to-present condition (B = 0.52; p = .007; η^2 = 0.006). 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 = 0.33; p = .016; η^2 = 0.03) in a model that included the interaction coefficient. This interaction did not appear in an earlier pilot study (web appendix, section G). Overall, we

find further support for uncertainty as a driver of the relationship between time travel direction and similarity judgments, although it is important to note that the effect is multiply determined.

In a robustness check of the full model, higher age predicted ($B = 0.01$; $p < .001$; $\eta^2 = 0.01$) and higher income marginally predicted ($B = 0.02$, $p = .064$; $\eta^2 = 0.003$) greater similarity judgments but adding demographic variables did not change the significance of the similarity judgment results. We found no interaction between age ($p = .343$) and travel direction or between age and travel to a certain [uncertain] destination self ($p = .739$). As a further robustness check, we tested for differences in uncertainty judgments across time periods, which revealed a significant difference between future certainty versus future uncertainty ($p < .001$), as well as a significant difference between present certainty versus present uncertainty ($p = .004$). To check for multicollinearity, we tested Pearson's correlation between similarity and uncertainty judgments and found a negative correlation ($r(1203) = –0.30$; $p < .001$), substantially less than the benchmark of $r = 0.7$. 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 ($p = .983$) and had no effect on similarity ($p = .875$) or uncertainty ($p = .543$) judgments (web appendix section H includes the full model, section I includes a replication across a 5-year time horizon, section J includes a control condition, and sections K–O report follow-up studies that test alternative mechanisms including speed of time, feature matching, and concreteness).

Discussion

Study 2 shows that uncertainty linked to the destination self accounts for the relationship between mental time-travel direction and similarity judgments (study 2a). It also provides evidence that reducing the uncertainty of the destination self increases perceived similarity across a 10-year time horizon (study 2b), and additional studies do not find support for alternative explanations such as speed of time and feature-matching (web appendix, sections K–O); we return to these considerations in the General Discussion.

STUDY 3: SAVINGS INTENTIONS

Our primary aim in study 3 was to test if a reverse mental-travel intervention might help consumers save more in a laboratory context. Past research 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, by discounting it less (Bartels and Rips 2010). Therefore, moving from the future to the present by increasing similarity may 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 in a controlled context, an online study on MTurk. We asked participants to report the likelihood that they would put money into an investment account. Then in study 3b, we addressed two additional considerations. First, because participants across our prior studies had an average age in their mid-to-late 30s, testing a longer time horizon might reflect their necessary savings timeframes more accurately, in terms of saving for their retirement needs. To examine the effectiveness of our intervention across a longer time horizon, we tested a 20-year time horizon with a participant pool from Prolific Academic. Second, we asked participants to move through time without making similarity judgments to assess whether this design element of our prior studies was necessary to produce the effect of the mental travel direction on saving.

Method

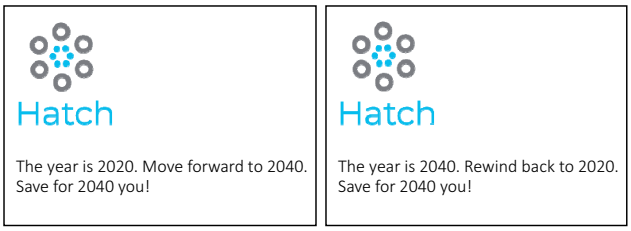
Study 3a. We randomly assigned MTurk workers ($N = 1{,}025$; average age = 33.1 years; 56% women) to begin in the present and mentally travel forward to the future or to begin in the future and travel back to the present, where the present was the year the study was conducted. In this between-subjects design, participants in both conditions made similarity judgments and answered questions about saving intentions. As in prior studies, participants began by completing a similarity judgment task, after which they responded to a savings promotion.

In the savings scenario, participants read that their bank was offering a special promotion. Multiple banks were offering a 5% introductory rate to attract new customers when we conducted this study, so we similarly offered study participants a 5% interest rate as a savings promotion (Financial Panther 2018; Gillman 2020). Participants read, "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 2018 you will be helping out 2028 you." Participants then rated their likelihoods of using this savings account on a 7-point Likert scale (1 = "not at all," 7 = "very much"). This study received slightly more respondents than requested (1,025 vs. 1,000). We preregistered the study at https://aspredicted.org/9f8n3.pdf (web appendix, section P).

Study 3b. We randomly assigned Prolific Academic workers based in the United States ($N = 1{,}005$; average age = 32.7 years; 56% women) to begin in the present and mentally travel forward to the future or to begin in the future and travel back to the present (the year the study was conducted). Two participants did not indicate their age and their age was replaced with the mean. All participants made savings choices in response to the prompt: "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

FIGURE 3

PROMPTS FOR SAVINGS AD (STUDY 3B)



NOTE.– Future-to-present condition is on the left; present-to-future condition is on the right.

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 showed them an ad that asked them to start in the year 2040 and go back to 2020 (the future-to-present condition) or start in the year 2020 and move forward to 2040 (the present-to-future condition, see figure 3). Participants had to imagine they had received $1000 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 (receive either double the money or no money at all). For completeness, we report the results of the tests of the effect of condition on this unrelated gamble outcome in the web appendix (section Q), but we do not discuss them further here. We tested if participants in the future-to-present condition would be more likely than participants in the present-to-future condition to save for the future by buying a Treasury bill. Please see https://aspredicted.org/8gb6s.pdf. Given that this study was conducted prior to the start of the coronavirus disease 2019 pandemic and there have been many macroeconomic changes since then, we conducted two follow-up studies, which we discuss in the web appendix (sections R and S).

Results

Study 3a. As in prior studies, participants in the future-to-present condition reported greater perceived similarity ($M = 3.48$; SD = 1.70) than participants in the present-to-future condition ($M = 3.14$; SD = 1.79; $F(1, 1023) = 10.00$; $p = .002$; $d = 0.20$). In line with hypothesis 2, participants in the future-to-present condition reported higher likelihood of using the savings account ($M = 4.69$; $SD = 1.90$) than participants in the present-to-future condition ($M = 4.45$; SD = 1.89; $F(1, 1023) = 4.35$; $p = .037$; $d = 0.13$).

To test the relationship of mental time-travel direction, perceived similarity, and savings intentions, we conducted a preregistered mediation analysis with 10,000 bootstrapped samples. In this model, similarity judgments mediated the effect of mental time-travel direction on likelihood of saving. The bootstrapped unstandardized indirect effect was 0.02, and the 95% CI ranged from 0.00 to 0.06 ($p = .064$). After we added 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 0.25 (95% CI = [0.01, 0.48]). As a robustness check, we tested whether these effects held when we included demographics (age, gender, income). Age predicted similarity judgments ($B = 0.02$; $p < .001$; $\eta^2 = 0.01$) and savings intentions ($B = –0.04$; $p < .001$; $\eta^2 = 0.05$), but in both cases, the effects held after controlling for them, and we found no interaction between condition and age on either similarity judgments ($p = .512$) or savings intentions ($p = .795$). Furthermore, there was no difference across conditions in time spent on the study ($p = .568$).

Study 3b. As predicted, participants in the future-to-present condition reported a higher likelihood of investing in a low-risk 20-year Treasury bill (52% vs. 45%, χ^2 (1) = 4.74; $p = 0.030$; $V = 0.07$), in further support of hypothesis 2. This effect held after adding age, gender, and income into the model ($B = 0.27$; SE = 0.13; z(1000) = 2.13; $p = .033$), and age was not a significant predictor in this study ($p = .190$). There was no difference in time spent across conditions ($p = .490$). As a further robustness check, we found that the effect size is similar after including this study and two additional studies ($V = 0.06$; please see web appendix for details, sections Q–S).

Discussion

Our primary aim in study 3 was to examine whether mentally traveling from the future to the present could increase saving intentions. In this study, we found support for the effect of our invention on saving intentions. That is, participants who traveled from the future to the present reported a higher intention of saving when offered an introductory 5% savings rate (study 3a), were more likely to invest windfall gains by buying a Treasury bill, and were less likely to plan to spend all the money now (study 3b). The effect of mental time-travel direction on financial decision-making was not limited to 10-year savings goals. Therefore, in study 4, we examine whether starting in the future and mentally traveling back to the present affects consequential saving behavior.

STUDY 4: CONSEQUENTIAL SAVING BEHAVIOR

In an initial test to evaluate the potential effectiveness of our intervention in the field, we partnered with a Swedish financial technology company, Dreams, to run a

large-scale, exploratory field study. At the beginning of the study period, the field partner provided us with access to 6,732 customers who had relatively low savings balances in their app-based mobile savings accounts (M = \$1,011; Mdn = \$470).[1] The company offers customers four primary options to save money. We hypothesized that an intervention designed to encourage customers to travel from the future to the present (vs. from the present to the future) might increase deposits in savings products.

Method

We randomly assigned the savers ($N = 6,732$; average age = 30.8 years; 79% women) to start in the present and mentally travel forward to the future ($n = 3,404$) or to start in the future and travel back to the present, that is, the year the study was conducted ($n = 3,328$). In the experiment, we examined savers' choices to save (or not to save) across four savings plans: a 1-year savings plan, a one-time deposit from an external account to an investment account that would help users save, a funds transfer from an internal account to an investment account to help users save, or a follow-the-market automatic savings plan, in which saving increases when the stock market rises. Because all Dreams savers had access to these four savings options, we analyzed each of them in our main analysis. Dreams also offered two additional savings options that were unusual, risky, and specific to the Dreams fintech app. We do not address these savings options in the main article (for more details, please see web appendix, section T).

In the field experiment, we sent 6,732 investors one of two push messages, translated into Swedish, to ensure that all participants could easily understand it. Participants in the present-to-future condition received a message that asked them to move forward ("The year is 2019. Move forward to 2029. Save for 2029 you!"); participants in the future-to-present condition received a message that asked them to move backward ("The year is 2029. Rewind back to 2019. Save for 2029 you!"). After sending investors these push messages, we observed saving behavior on the Dreams platform over the ensuing 1-week period. Because we could not observe open rates on the push messages themselves, we analyzed all data 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 using one of the four savings products, versus 413 (12.13%) participants in the present-to-future condition. This difference was statistically significant (χ^2 (1) = 6.55; p = .010, V = 0.03). Participants in the future-to-present condition were more likely to save in the 1-year savings plan (16 savers, 0.48% vs. 5 savers, 0.15%; $\chi^2(1) = 6.03$; p = .014; V = 0.03), directionally more likely to make a one-time deposit (365 savers, 10.93% vs. 332 savers, 9.75%; $\chi^2(1) = 2.67$; p = .102; $V = 0.02$), more likely to transfer funds from an internal account to an investment account (112 savers, 3.36% vs. 82 savers, 2.41%; $\chi^2(1) = 5.50$; p = .019; V = 0.03), and more likely to invest in a follow-the-market plan (30 savers, 0.90% vs. 14 savers, 0.41%; χ^2 (1) = 6.23; p = .013, $V = 0.03$). There were no differences in age or gender across conditions.

Discussion

Our aim in study 4 was to pilot test the effect of mental time-travel direction in a consequential context. These findings in the field provide preliminary evidence that traveling from the future to the present increased the likelihood that consumers would deposit real money in long-term savings products. This exploratory field study was not preregistered, so to replicate and extend the findings, we conducted study 5.

STUDY 5: LIKELIHOOD OF INPUTTING PERSONAL DATA AND SIGNING UP FOR COLLEGE SAVINGS ACCOUNTS

In study 5, we had four key aims. First, we sought to test the impact of mental time travel direction on savings behavior in a large-scale field study in the U.S. market, to generalize the study 4 findings that involved a large-scale population of millennial savers in Sweden. Second, study 4 was not preregistered, so to validate the findings, we preregistered the analysis plan in advance of the data collection for study 5. Third, we previously targeted a population of current savers, whereas in study 5, we tested whether the intervention could encourage consumers to begin saving for the future. Fourth, we have explored the impact of mental time-travel direction on self-related decisions (perceived similarity, savings), but in study 5, we also investigate whether such effects extend to others, such as those included closely in self-concepts. Thus, in study 5, we examined a consequential savings outcome focused on others, in the form of college savings plans.

We partnered with UNest, a college savings app and registered investment advisor with the U.S. Securities and Exchange Commission, which seeks to help parents and families save for important events such as college education. To begin investing with UNest, investors complete a sign-up process and receive an automatic \$10 deposit in their accounts. Crucially, signing up has a high barrier to entry: Parents must input their private family data. In turn, UNest maintains contact information for tens of thousands of users on a potential customer list, who may have contacted UNest about its products or begun the sign-up

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

process but who have not completed the onboarding process or received their first deposit. Therefore, the crucial outcome of interest is the likelihood of investing.

Method

Consumers who had contacted UNest or one of its subsidiaries but had not yet finished the sign-up process ($N = 24{,}517$, average age = 31 years) 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 ($n = 12{,}265$). We preregistered the sample size in advance. As in prior studies, the present was the year in which the study was conducted. We measured participant response over a 1-week study period. Depending on participants' contact preferences, we contacted participants by email or an email and a push message on their mobile devices, with a message that read: "The year is 2031 [2021]. Rewind back [Move forward] to 2021 [2031]. Save now for college and get $10 on us." In line with hypothesis 2, we predicted that compared with participants in the present-to-future condition, 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 investing in the savings app. Because we could not observe whether participants received 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 the effect of the condition (future-to-present vs. present-to-future) on users' likelihood of completing UNest's investor sign-up process and receiving $10 investments in their accounts, see https://aspredicted.org/fd8qu.pdf. Because of the field study partner's preference when sending the message, the subset of participants who received push messages also received emails, and all participants received an additional reminder within the 1-week timeframe (duplicate message). There was no difference in number of emails or push messages sent across conditions.

Results

After the 1-week study period, we determined conversion rates across conditions. Because these conversions were from inactive users who had to provide highly sensitive data, we expected low conversion rates across the sample. However, we found that, compared with participants in the present-to-future condition, those in the future-to-present condition were more likely to register and input their personal data, in further support for hypothesis 2. These results hold when analyzing results of the first message sent (21 investors, 0.17% vs. 5 investors, 0.04%; χ^2 (1, $N = 24{,}517$) = 9.84; $p = .002$; $V = 0.02$), and when including the reminder, duplicate message also sent within the 1-week timeframe (30 investors, 0.24% vs. 8 investors, 0.07%; $\chi^2(1, N = 24{,}517) = 12.73$; $p < .001$; $V = 0.02$). Crucially, inputting these personal data had a financial payoff. Participants in the future-to-present condition were more likely to complete the onboarding process and start investing with $10 investments in their UNest accounts.

Nine months later, we obtained a data set that included parental age and conversions from marketing messages outside the 1-week study window. This more complete data set did not alter the core results: compared with participants in the present-to-future condition, participants in the future-to-present condition were more likely to complete UNest's onboarding flow (42 investors (0.34%) vs. 12 investors (0.10%); χ^2 (1, $N = 24{,}517$) = 16.67; $p < .001$; $V = 0.03$; see web appendix, section T, for further robustness checks).

Discussion

In partnership with a financial technology company focused on college savings, we further investigate the impact of mental time-travel direction on savings behavior, using a simple outcome variable: completion of the onboarding user flow. As predicted, relative to participants in the present-to-future condition, participants in the future-to-present condition were more likely to complete the onboarding user flow and receive $10 investments in their college savings accounts.

GENERAL DISCUSSION

Because consumers frequently fail to save for the future at the rates they say they desire, we investigate a novel intervention to help close this gap, namely, altering conventional mental time-travel directions, by traveling *back* to the present from the future. Across 20 experiments spanning both laboratory and field contexts, we demonstrate that mental time-travel direction affects how similar consumers perceive their current and future selves and, in turn, the actions they take on behalf of those future selves. Relative to mentally traveling from the present forward to the future, traveling from the future back to the present increases consumers' perceived similarity between selves across time. Moreover, uncertainty is a primary mechanism that underpins this effect. At the secondary level, we find weaker evidence that traveling back to the present increases the speed at which time seems to move. Ultimately, we establish that backward mental time travel increases saving—albeit with small effects—in both hypothetical laboratory studies and incentivized field contexts.

Theoretical Contributions

Our findings contribute to several literature streams. First, work on future self-continuity implies that when consumers feel psychologically similar to their future selves, they discount the future less (Bartels and Urminsky 2011, 2015). Although present and future selves are, by definition, separate, theorizing in this arena documents how and

why people might regard them as more connected. We introduce a strategy to increase perceived similarity between selves that also increases savings. Mentally traveling back to the present increases future-self similarity, and this increased sense of similarity can change financial decision-making by increasing intentions to save and driving consequential saving behavior.

We also contribute to marketing literature on the going-home effect, which to date has been restricted to the spatial domain (i.e., felt distance between one place and another varies as a function of direction of travel, Raghubir et al. 2011). Whereas trips through physical space often are measured in time ("How long does it take to get there?"), trips through time often are measured in psychological closeness ("How similar do you feel to yourself in ten years?"). We examine how traveling back to the present (i.e., temporal home) affects closeness across time and find that, like travel through space, travel through time seems closer, and the two selves feel more similar, when traveling home (to the present) than when traveling away (to the future). This effect is driven by the certainty of the destination self. We thus conceptually replicate and extend prior work that documents the role of uncertainty in the going-home effect (Maglio and Kwok 2016).

Uncertainty is fundamental not only to how consumers traverse time and space but also to how they make comparisons across different entities (Tversky 1977). Accordingly, we also advance literature on similarity judgments. Similarity judgments often compare better-known concepts (prototypes) with lesser-known concepts (variants). Research on feature matching also indicates a similarity–judgment asymmetry as a function of comparison directions (Holyoak and Gordon 1983; Tversky 1977). For example, a friend is likely to be judged as more similar to oneself than the self is to a friend (Holyoak and Gordon 1983; Tversky 1977). This asymmetry arises because when people start with more uncertain, lesser-known concepts and compare them with more well-known concepts, they know fewer features, load fewer features, and then identify a higher percentage of loaded features that match. Because more loaded and matched features produce greater similarity perceptions, when starting with lesser-known concepts and matching to more well-known concepts, perceived similarity between the concepts increases. The concepts tested in these similarity judgments—friends, nations, shapes—already exist. To our knowledge, our research is the first to test this similarity asymmetry across time, in which one component of the comparison—the future self—does not yet exist. Even though the future self exists only once the present self ceases to exist, we find this similarity asymmetry still persists.

By reversing the standard comparison—that is, by starting with the future self and comparing it with the present self—interventions can increase perceived similarity between selves across time. Among our contributions to this theoretical tradition, we also note that our supplemental study 2D does not reveal a difference in feature matching as a function of direction of mental time travel. It also seems possible that feature matching across selves over time differs in some critical ways from feature matching across people or nations. We propose that uncertainty may underlie both the effect we find and the feature-matching effect. Continued research should explore how similarity judgments related to a known present and unknown future differ from similarity judgments of more prosaic concepts, such as two nations or two shapes. There is a rich opportunity for continued research to determine how and when feature matching operates relative to the broader construct of similarity judgments.

Finally, our research contributes to the literature on backward planning, which indicates that working backward, from a goal to the present, can lead to more realistic estimations of task completion time (Buehler, Griffin, and Peetz 2010, Buehler, Griffin, and Ross 1994, Halkjelsvik and Jørgensen 2012). When planners start in the future (with their goals) and move back to the present, they arrive at longer time estimates for project completion than when they start in the present and move forward in time (Wiese, Buehler, and Griffin 2016). Thus, compared with forward planners, backward planners are more likely to realize they need more time to achieve their goals and make the changes they want. Prior backward-planning literature has investigated tasks that already are planned or in process (Buehler et al. 1994; Wiese et al. 2016); in contrast, we feature backward travel as a more general phenomenon, suggesting that traveling backward can create value even for consumers who do not already have plans. Compared with forward travelers, travelers who mentally go back to the present judge their future selves as more similar to their current selves, seemingly because traveling back to this known destination self leads to a sense that the future and present selves are not very different. Furthermore, when consumers' future selves feel psychologically closer to their current selves, they are more likely to commit to saving and making investments to help their future selves.

Managerial Implications and Avenues for Research

Our research has implications for companies, governments, and individual decision makers seeking to reduce savings shortfalls. The field studies indicate the potential of mental time-travel directions to drive behavioral changes among millennial investors in Sweden and investors in a college savings plan in the United States; similar interventions might assist other institutions that seek to enhance future-oriented investments. For example, early claims of U.S. Social Security benefits can reduce retirees' benefits by as much as 30% over their lifespans (Epperson 2015). If changing the direction people travel mentally

through time can foster their saving, perhaps a similar intervention would help convince them to postpone such claims and make deferral an easier choice for potential retirees.

The time at which this intervention takes place may be critical, and future research could examine both timing and age effects. For example, in a retirement context, an intervention 6 months before beginning retirement may be too late to shift judgments, while 30 years before retirement may be too soon. Our findings also might apply to consumer and student loan debt. Temporal discounting not only affects the rates at which people save but also how much they choose to borrow and repay (Meier and Sprenger 2012); research suggests students do not aim high enough and as a result may not borrow enough or invest enough in their education (Yoon, Yang, and Morewedge 2022). A simple mental time-travel manipulation, before asking students how much they want to borrow, might change loan amounts. Finally, traveling back to the present might exert effects in non-financial domains that benefit from greater perceived future similarity too, such as healthy eating, education, healthcare, or exercise.

We offer these research directions along with a note of caution: we conducted many of these studies in a macroeconomic environment that could be characterized as more certain. Noting the role of uncertainty in our conceptual model, we acknowledge that the effects of mental time-travel direction on saving and other behaviors might be weakened in times of greater uncertainty, and we hope researchers will examine this possibility. Specifically, continued studies could examine whether market upswings and downswings moderate the link between similarity judgments and savings. If inflation rates are very high, investing in the future likely feels very expensive (i.e., the rate of inflation is higher than interest rates), and the present feels very uncertain (will interest rates rise, fall, or stay the same?), so increasing similarity across time might not have an equivalent effect on saving as it would if investing in the future seemed more stable. Alternatively, if the future looks very bright (e.g., if large income raises are expected), consumers may see less of a need to save. Reverse mental time-travel interventions arguably might boost savings only if people see saving (or other future-oriented) actions as truly beneficial for the future self, and if they have the financial capacity to save.

We further note that although the effect sizes of mental time travel direction on future self-similarity can best be characterized as small to moderate, the effect sizes of mental time travel direction on savings intentions in online studies and savings behaviors in the field are small at best. In our model, saving intentions and behaviors represent downstream consequences of mental time travel direction, so perhaps it is not surprising that the impact of mental time travel direction is considerably lessened at this step. In a similar vein, savings intentions and behaviors are determined by multiple factors, only one of which is the relationship a consumer has with their future self. Nonetheless, we raise these points to set appropriate expectations for both future researchers and practitioners wishing to implement the types of interventions we explored in this project.

Another direction for future research is to test whether increasing perceived similarity of present and future selves shifts as a function of the time of year. Are January 2024, April 2024, and New Year's Eve 2024 equally prototypical of a 2024 self, or does the ease of connecting the present self with a future self vary across the year (e.g., at a major temporal landmark like New Year's Eve 2024)? Such seasonal variations could have implications for both similarity across time and for saving depending on temporal landmarks (e.g., tax refunds) and even day of the week (De La Rosa, Turner, and Aaker 2020).

The role of fluency and the ease of processing temporal information also might be relevant to these topics. Prior work on time and conceptual metaphors (Chae and Hoegg 2013) suggests fluency informs perceptions of temporal movements or orientations that are not normative for participants (e.g., traveling from the future to the present). The difficulty of moving in a non-normal, future-to-present direction thus might make it harder to notice differences between present and destination selves, which would increase perceived similarity. While the items we use to measure uncertainty cannot fully capture this ease of processing, fluency might be manifest in differences in the time spent on tasks across conditions. We do not find evidence of any such process; the time spent on the task was equivalent in nearly all our studies, and all effects held after controlling for this time spent. Nonetheless, further research could investigate the role of fluency in more detail.

Conclusion

Across 20 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. Although human minds may tend to start in the present before moving to the future, they appear capable of more elaborate maneuvers. We offer reverse mental time travel as evidence of consumers' time-traveling minds and as a promising intervention that alters how consumers relate to and make decisions for their present selves and the selves they one day will become.

DATA COLLECTION STATEMENT

The first, second, and third authors designed all studies together. The first field study (study 4) was conducted by the field study partner, Dreams, in spring 2019 and the second field study (study 5) was conducted by the field study partner, UNest, in winter 2021 with all three authors

supervising. Laboratory studies were conducted on Amazon Mechanical Turk with the exception of study 3b, which was conducted on Prolific. Pilot 2 and the savings intentions study (study 3a) were conducted in the spring of 2018. Pilot 1 was conducted in spring 2019, study 2e was conducted in winter 2019, and studies 2f and 2g were conducted in summer 2019. The long-term savings intentions study (3b) was conducted in winter 2020. Two similarity studies (studies 1 and 1a) and two process studies (studies 2a and i) were conducted in summer 2021 while an additional similarity study (study 1a) was conducted in fall 2021. Additional process studies were conducted in the spring of 2022 (study 2h), the summer of 2022 (study 2d), the fall of 2022 (pilot 3 and study 2b), and the summer of 2023 (studies 1b, 2c, and two follow-up studies, 3c–d). The first author collected data for all online studies on MTurk and Prolific with the second and third authors supervising data collection. The first and second authors jointly analyzed the data. Project files and data are available at https://osf.io/utcax/.

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