

# Adversity, Time, and Well-Being: A Longitudinal Analysis of Time Perspective in Adulthood

E. Alison Holman and Roxane Cohen Silver  
University of California, Irvine

Jacqueline A. Mogle  
Pennsylvania State University

Stacey B. Scott  
Stony Brook University

Despite the prominence of time in influential aging theories and the ubiquity of stress across the life span, research addressing how time perspective (TP) and adversity are associated with well-being across adulthood is rare. Examining the role of TP in coping with life events over the life span would be best accomplished after large-scale population-based exposure to a specific event, with repeated assessments to examine within- and between-person differences over time. A national sample aged 18–91 years ( $N = 722$ ,  $M = 49.4$  years) was followed for 3 years after the September 11, 2001 (9/11) terrorist attacks. Respondents completed assessments of 9/11-related television (TV) exposure 9–21 days after the attacks, temporal disintegration 2 months post-9/11, and TP, ongoing stress, and well-being at 12, 24, and 36 months post-9/11. Results provided support for measurement invariance of TP across time and across age. Early 9/11-related TV exposure was significantly associated with greater temporal disintegration. Temporal disintegration and ongoing stress, in turn, were associated with between- and within-person variation in past TP. This effect was qualified by an age interaction that indicated a stronger relationship between ongoing stress and past TP for younger compared with older adults. Past and future TP were significantly and independently related to individual differences and within-person variation in psychological well-being, regardless of age. Future work should incorporate adversity as an important correlate of TP across adulthood.

**Keywords:** age, time perspective, life satisfaction, well-being, September 11, 2001

The window of time allows us to see our life stories unfold, build our identity, identify future ambitions, and feel proud of our successes. Our sense of time connects who we have been with who we are and who we aspire to be. Indeed, scholars have argued that our experience of time provides a foundation for the emergence of conscious thought and behavior (James, 1890; Kelly, 1955; Lewin,

1942); without time our lives would consist of isolated, incoherent moments lacking the essential consciousness that makes us human. By assigning life experiences to time frames of past, present, and future, we gain a broader perspective that helps us make sense of our lives (see Zimbardo & Boyd, 2008).

Early work addressing the importance of time drew upon the philosophical assertion that human consciousness is future-oriented (e.g., Heidegger, 1962), and that most psychological processes are guided by a future perspective. Theorists also maintained that past, present, and future time perspectives (TPs) are collectively important for health and well-being as they each play a role in sustaining morale and coping with adversity (Erikson, 1959; Lewin, 1942; Melges, 1982). Early clinical observations similarly suggested that trauma could impact TP—the degree to which we focus attention on past, present, and future periods of our life—by encouraging individuals to think about past events as a way of mentally processing them (e.g., Epstein, 1991; Melges, 1982). Although very little empirical research has directly addressed the relationship between TP and coping with adversity, evidence suggests that early psychological responses to traumatic events may impact subsequent TP, with implications for well-being over time (Holman & Silver, 1998). Given the ubiquity of stressful events across the life span and the potential impact they may have on TP, it is important to examine TP to better understand the impact of adversity on well-being as we age.

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E. Alison Holman, Program in Nursing Science, University of California, Irvine; Roxane Cohen Silver, Department of Psychology and Social Behavior, University of California, Irvine; Jacqueline A. Mogle, College of Nursing, Pennsylvania State University; Stacey B. Scott, School of Aging Studies, Stony Brook University.

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Correspondence concerning this article should be addressed to E. Alison Holman, Program in Nursing Science, University of California, 252D Berk Hall, Irvine, CA 92697. E-mail: [aholman@uci.edu](mailto:aholman@uci.edu)

### A Life Span Approach to Time Perspective

Time is implicitly addressed in nearly all developmental theories seeking to describe and explain the nature and causes of change in individuals across the life span. Many of these theories use age (i.e., distance from birth) as the proxy for time and describe or explain presumed changes by examining cross-sectional differences between people of different ages or by observing people longitudinally as they get older (Alwin, Hofer, & McCammon, 2011). In contrast, socioemotional selectivity theory (SST; Carstensen, Isaacowitz, & Charles, 1999) focuses on the distance from death or important endings as a metric of “time remaining” that impacts motivation to regulate emotions and preferences for social partners, and by these processes, well-being.

An alternative model, time perspective theory (Zimbardo & Boyd, 1999), suggests that TP is a relatively stable individual difference construct that powerfully impacts our thoughts, feelings, and behaviors. The Zimbardo Time Perspective Inventory (ZTPI) was developed as a measure of TP (see Zimbardo & Boyd, 1999) and has been used in many studies addressing the psychological and behavioral correlates of TP. For example, studies using the ZTPI have shown that TP is associated with personality constructs (e.g., conscientiousness, openness), addictive and impulsive behaviors (e.g., risky sex), and health behaviors (e.g., smoking, exercise; see Stolarski, Fieulaine, van Beek, 2015, for reviews). However, the vast majority of these studies have been conducted using convenience samples that limit the age range to young adults (e.g., undergraduates) or other specific populations (e.g., prisoners). Moreover, as the large majority of studies conducted with this measure are cross sectional, they lack prospective assessments of mental health outcomes (e.g., depression, anxiety) to rule out the possibility that associations identified between TPs and well-being are driven by preexisting mental health status rather than TP per se (see Melges, 1982). In addition, although the ZTPI is presumed to measure a relatively stable individual difference characteristic, cross-sectional comparisons cannot confirm this depiction. We know of no prospective longitudinal or population-based studies that assess past, present, or future TPs over time. Moreover, previous samples have not had sufficient age heterogeneity to examine whether TP operates similarly across different ages. That is, so far time perspective theory appears to have been applied too uniformly to explain changes in TP across the life span.

The methodological limitations of the research base seriously limit our ability to apply the available literature to questions about whether TP is associated with adversity and well-being across the life span. This is a critical gap because as we age, past experiences accumulate while future possibilities diminish (Carstensen, 2006), raising obvious questions about how TP may be related to objective experiences linked to the passage of time. Across a lifetime, is the accumulation of these past experiences associated with the degree to which we think about the past? SST argues that as endings become closer, our priorities shift to make us more focused on our goals in the immediate present or very near future, rather than a focus on past or distant future. Are such hypothesized changes supported by differences in TP between older and younger people? What role, if any, does adversity play in this equation? Understanding whether and/or how adversity may be linked to

past, present, and future TPs across age, and the proposed TP-well-being relationship over time, is an important next step in furthering our understanding of the role of time across the life course.

### Time Perspective, Adversity, and Well-Being

Both SST and the Time Perspective Theory suggest that TP is associated with well-being across the life span. However, as noted above, the extant literature derived from these approaches has neither directly nor robustly tested this assertion. Nonetheless, research conducted on coping with negative life events offers evidence that may shed light on the TP-well-being association. For example, age differences were found in patterns of change in posttraumatic stress and fear of future terrorism – a negative view of the future – following the September 11, 2001 (9/11) terrorist attacks (Scott, Poulin, & Silver, 2013); however, it is unknown whether age differences in TP or change in TP are associated with well-being. Life-threatening events (i.e., illness, psychological trauma) take a toll on mental health and well-being (Anda et al., 2006; Edwards, Holden, Felitti, & Anda, 2003), with some evidence that survivors’ perceptions of time play a role in this process (Holman, 2015; Holman & Silver, 1998). In fact, the impact of war-related trauma on TP—especially past TP—has been detailed in contemporary literature alongside soldiers’ accounts of their experiences following life in a war zone (Morris, 2015). Recent findings from two longitudinal studies are consistent with early research on TP demonstrating the psychological benefits of future TP versus past TP: In the aftermath of individual and collective trauma, past TP is associated with increased distress over time, while future TP predicts decreased distress years later (Holman, 2015). Importantly, both these longitudinal studies adjusted for early psychological responses to the events, so the findings reflect changes in well-being over time.

The impact of trauma on TP is also well known in the clinical literature (Janet, 1925; Melges, 1982; Terr, 1983). Recently, diagnostic criteria recognized that altered time perception contributes to peritraumatic symptomatology that, in turn, was codified in the *Diagnostic and Statistical Manual of Mental Disorders–IV* as acute stress disorder, a potential predictor of posttraumatic stress disorder (American Psychiatric Association, 1994). Indeed, traumatic events can peel away the façade of the future, urgently force people into the present moment, and expand current experience so that it fills conscious awareness. In so doing they interrupt the normal flow of experience that weaves the past, present, and future together into a fabric that anchors and supports personal identity. This disruption can also create perceptual distortions—the sense that time has stopped or slowed—rendering some people vulnerable to becoming stuck in the traumatic experience long after it passes (Holman & Silver, 1998). In fact, traumatized individuals who experience more acute symptoms of temporal disintegration—where the present moment is no longer connected with the past and future—may stay mentally focused on the past trauma over time (see Holman & Silver, 1998; Zimbardo, Sword, & Sword, 2012). They may also struggle to deal with the demands of their present circumstances and/or lose touch with their future goals, placing their emotional well-being at risk. Yet little is known about the risk factors for experiencing temporal disintegration following trauma. For example, knowing whether exposure to adversity and age

are related to these potentially detrimental responses in the early aftermath of trauma is an important step toward understanding the intersection between age, lived experience, and perceptions of time.

### Exposure to Adversity

Definitions of what constitutes “exposure” to adversity have evolved over the past several decades. Most recently, a growing body of evidence has suggested that mass media coverage can turn local disasters into national and global events by transmitting the negative impact of disasters far beyond directly exposed groups (Vasterman, Yzermans, & Dirkzwager, 2005; Wright, Ursano, Bartone, & Ingraham, 1990). For example, although tens of thousands of individuals directly witnessed 9/11, millions more viewed the attacks and their aftermath via the media, constituting an indirect form of exposure to adversity. In fact early media exposure to collective traumas is positively associated with trauma-related acute stress (Holman, Garfin, Silver, 2014; Silver et al., 2013)—a construct that includes distorted time perceptions as core symptoms. This raises the possibility that extensive trauma-related media exposure might promote temporal disintegration, with implications for TP and well-being over time. That is, perhaps trauma-related media exposure can help explain the clinically observed—but rarely studied—connection between adversity, past TP, and well-being.

Another way to conceptualize exposure to adversity is to consider the many forms of ongoing stress people experience over their lives (e.g., job loss, discrimination, divorce). These stressful events represent an ongoing form of adversity that independently predicts well-being above and beyond the impact of highly traumatic event exposures (Galea et al., 2008). Moreover, exposure to a large-scale community trauma can also trigger a series of stressors or “rapid succession disasters” that may independently contribute to well-being over time following a signal event (Garfin, Silver, Ugalde, Linn, & Inostroza, 2014).

Thus, to adequately capture the construct of adversity and its relationship with TP, studies would need to include assessments of exposure to a signal event with follow-up assessments of ongoing stress after that event. Assessments of TP would also need to be measured across time. Moreover, as TP has been conceptualized in the literature as both a stable personality construct and a construct subject to change following adversity (i.e., a malleable construct), the analyses need to test both between-person individual differences in past, present, and future TP and the link between within-person fluctuations in ongoing stress and TP over time. This approach would best capture the expected relationships among exposure to adversity, TP, and well-being over time. Unfortunately, most of the relevant research to date does not use that approach; it either assumes (but does not test) event-related change in TP, or is not longitudinal. A longitudinal study that directly assesses early responses, ongoing stress, and TP following a common, collectively experienced event would best address questions about the impact of major life events on TP and subsequent well-being.

### Age, Adversity, Time Perspective, and Well-Being

As described above, although TP is thought to be associated with well-being, conclusions supporting Time Perspective Theory have been based primarily on cross-sectional comparisons of con-

venience samples of young adults, typically decontextualized from time (measured as developmental time and time-since-event). Early work on TP employing age-heterogeneous samples suggests that the role of age is complex. For example, Fingerman and Perlmutter (1995) found that although younger and older people mostly thought about the present and very near future, younger adults considered the upcoming year and years more than did older people. Older age has also been associated with higher future TP, as well as with greater fears of the future (Holman & Silver, 2005). However, age has not been reliably associated with past TP (Holman & Silver, 1993).

Importantly, both the coping perspective (Holman & Silver, 1998) and SST propose that TP should be sensitive to adversity. If stressful events alter individuals’ perceptions of time, then normative age differences in TP that are typically observed should be disrupted when events occur, and they should reemerge as time passes from the event. Some data support this proposition. To test SST’s assumption that age differences in future TP drive preferences in social partners, Fung and Carstensen (2006) examined preferences for familiar and novel social partners cross-sectionally among Hong Kong adults 3 years prior to, 1 week after, and 4 months after 9/11. The expected cross-sectional age differences in social preferences were observed prior to and four months after 9/11 (i.e., younger people were less likely to prefer spending time with a familiar social partner), but no age differences were observed one week after 9/11 (i.e., all age groups preferred to spend time with a familiar social partner). In a second study, Fung and Carstensen (2006) used a repeated measures design to test whether age differences in social preferences depended on recency to another large-scale event, the severe acute respiratory syndrome (SARS) epidemic in Hong Kong. During the peak period of the SARS outbreak, no age differences were observed in preference for familiar social partners. However, several months later, when the Hong Kong travel advisory had been lifted indicating the threat of SARS had passed, younger individuals were significantly less likely to prefer spending time with familiar social partners than were older individuals.

Unfortunately, in both naturalistic and laboratory settings, changes in TP are typically assumed, rather than assessed. In both studies reviewed above, Fung and Carstensen (2006) concluded that the collective events under study (9/11, SARS) altered individuals’ perceptions of time remaining and produced differences in social preferences. This interpretation is consistent with findings from laboratory studies that manipulated time remaining prior to an important ending (Carstensen et al., 1999). In Fung and Carstensen’s (2006) study during and after the SARS outbreak, future TP was assessed only at the second wave. Those individuals who were more future oriented were less likely to choose a familiar social partner, and after including TP in the model, age was no longer a significant predictor of post-SARS social preferences. To our knowledge, the only longitudinal examination of TP across a collective event is an unpublished study in which Cheung, Cheung, and Hui assessed future TP in college students three times across the period of the SARS outbreak and found that “[future] time perspective became increasingly limited during this period” (as cited in Fung & Carstensen, 2006, p. 261).

In sum, research that has considered the role of age in the association between TP, adversity, and well-being across adulthood is scant and has a number of methodological deficiencies.

Much of the work on this topic involves inferred—but not measured—constructs in predominantly cross-sectional studies with limited samples. To address these limitations, a longitudinal study with repeated assessments of TP, adversity, and well-being in a sample with a large age range is needed.

### The Present Study

The 9/11 terrorist attacks—the first national collective trauma experienced on U.S. soil in several decades—provided an ideal opportunity to examine these issues. The American population was predominantly exposed to the attacks indirectly through massive media coverage—two thirds of the population reported witnessing the attacks on live TV (Silver, Holman, McIntosh, Poulin, & Gil-Rivas, 2002), suggesting widespread, indirect, national exposure to a common collective trauma. The scale of these attacks made them an ideal signal event to use for studying how changes in TP might be associated with well-being over time.

Four key questions arise from the literature. First, is indirect media-based exposure to collective trauma associated with peritraumatic changes in time perception? Second, are peritraumatic time perceptions associated with individual differences in the average levels of past, present, and future TP? Specifically, does the amount of 9/11-related TV exposure, 9/11-related temporal disintegration, or age predict TP? Third, is ongoing stress associated with fluctuations in TP over time? Finally, how are fluctuations in TP associated with individual differences and within-person change in well-being over time?

We explore these questions in a 3-year longitudinal study conducted with a large national U.S. sample following the 9/11 terrorist attacks that had completed a pre-9/11 assessment of physician-diagnosed mental health. To test whether potential changes in TP were associated with the 9/11 attacks, early 9/11-related TV exposure and 9/11-related temporal disintegration were included as predictors of between-person and within-person variation in TP. Subsequently, TP (past, present, future), ongoing stress, and well-being (positive affect, life satisfaction) were assessed at 12, 24, and 36 months post-9/11. This design allowed us to examine our research questions prospectively over time following a national collective trauma.

### Hypotheses

Given the limitations of the extant literature on age, TP, adversity, and well-being, it is not clear what role age plays in the associations among adversity, TP, and well-being. The following hypotheses reflect expectations stemming from a coping perspective on TP, adversity, and well-being (Holman & Silver, 1998). Age was tested as a moderator of the hypothesized associations to explore possible age-related differences in the link between adversity, TP, and well-being.

*Hypothesis 1:* 9/11-related TV exposure shortly after the attacks will be positively associated with reports of early post-9/11 temporal disintegration. This effect is not expected to vary by age.

*Hypothesis 2:* 9/11-related TV exposure, temporal disintegration, and age will each be associated with individual differences in TP levels. Specifically, we expect higher 9/11-related TV exposure and temporal disintegration will be associated

with higher past TP on average. Given the data suggesting that older people tend to pay less attention to negative emotional stimuli (Isaacowitz, Wadlinger, Goren, & Wilson, 2006a, 2006b), we would expect age to be negatively associated with past TP following collective trauma.

*Hypothesis 3:* Ongoing stress experienced following 9/11 will be associated with higher past TP over time.

*Hypothesis 4:* Past TP will be associated with lower well-being (as measured by life satisfaction and positive affect), whereas present and future TP will be associated with higher well-being in both between-person and within-person analyses.

### Method

#### Design and Procedure

The present study involves secondary analysis of data from a 3-year prospective longitudinal study on mental and physical health following 9/11 conducted in collaboration with Knowledge Networks, Inc. (KN) among a national sample of American adults (Silver et al., 2006). At the time of data collection, KN was a survey research company that used stratified random digit dial telephone sampling (circa 2000, when landlines were dominant) to maintain a nationally representative panel of potential respondents for web-based surveys. To ensure that individuals without personal computers or Internet access could participate, KN provided the necessary equipment and services (i.e., WebTV and Internet access) to all panel households. When a survey was available, a random sample of KN panel members received a notification in password-protected email accounts. Respondents could access the self-administered survey at any time for a designated period but could only complete the survey once. Panel participants completed KN surveys three to four times per month; provision of WebTV and Internet access were not contingent on completing any particular survey. Consistent with the sampling methods, the KN panel followed the distribution of census counts for the U.S. population on age, race, Hispanic ethnicity, region, employment, income, and education at the time of data collection (Silver et al., 2006).

The original sample used in the present study completed six surveys: one conducted by KN 9–23 days following 9/11 to assess 9/11-related media exposure and other constructs, one assessing temporal disintegration approximately 2 months following 9/11, and four that subsequently assessed well-being (i.e., positive affect and life satisfaction), among other constructs, across 3 years post-9/11. Different subsets of individuals completed different waves over time, depending on research goals and funding availability. Each participant was assigned a unique identification code by KN that was used to link their data across waves. Respondents needed to have completed all relevant waves and provided data on all relevant constructs to be used in the analyses reported here. In prior work with this dataset, older respondents were found to be less likely to drop out across time; gender, ethnicity, income, marital status, household size, education, employment status, mental and physical health history, and degree of exposure to the 9/11 attacks did not predict attrition (Seery, Holman, & Silver, 2010). More detail, including specific dates in which surveys were fielded, is provided in Silver et al. (2006).



## Measures

**Demographics.** KN collected demographic information on this sample prior to the initiation of this study. Specifically, panelists provided demographic information on gender, age, ethnicity, educational status, and household income. KN imputed missing values for income using the mean income score for each respondent's census block (i.e., the smallest geographic area for which the Bureau of Census collects and tabulates data, see <http://www.census.gov>).

**Pre-9/11 mental health.** Prior to the initiation of this study, between June 2000 and September 9, 2001, respondents completed an online health survey, modified from the Centers for Disease Control's National Center for Health Statistics annual National Health Interview Survey. Respondents were asked, "Has a medical doctor ever diagnosed you as suffering from any of the following ailments?" with prompts for anxiety and depressive disorders. An index (0–2) representing pre-9/11 physician-diagnosed mental health ailments (none, anxiety disorder or depression, both), was created. This variable was used as a covariate in all analyses.

**Early 9/11-related media exposure.** Media exposure to the 9/11 attacks was assessed at the first wave of data collection with the following question: "Since the terrorist attack, about how much time each day have you spent watching news footage about this on TV? Please give your best estimate for the *first 7 days* after the attack." A categorical variable was used (<1 hr per day, 1 to 3 hr/day, 4 to 6 hr/day, and 6 or more hr/day).

**Temporal disintegration.** Acute trauma-related temporal disintegration was assessed at approximately 2 months postattacks using six items modeled after those described in our prior work (Holman & Silver, 1998) that were averaged to form an index. Participants were asked questions such as, "During and immediately after the attacks of September 11th, how often did you . . ." "feel as though you were in slow motion," "feel as though time had stopped," and "feel unsure about what time or day it was." Items were scored on a 5-point scale ranging from 1 (*never*) to 5 (*all of the time*); reliability was excellent,  $\alpha = .87$ .

**Ongoing stress.** Respondents' exposure to stressful life events was assessed at 12, 24, 36 months post-9/11 using a measure of 37 events (e.g., child abuse, assault) used in prior research (Silver et al., 2013). Items were specifically designed to include, but also go beyond, the DSM criteria for event exposure to allow adherence to traditional definitions of trauma as well as fine-grained analysis of the many ways respondents may be exposed to stressful life events.

**Time perspective.** TP was assessed at 12, 24, and 36 months post-9/11 using items drawn or modified from both the Temporal Orientation Scale (Holman & Silver, 1998) and the ZTPI (Zimbardo & Boyd, 1999). Participants rated how true statements were for them using a 5-point scale ranging from 1 (*not at all true*) to 5 (*very true*). Future TP was assessed with three items (e.g., "My plans about the future are pretty well laid out," "When I want to accomplish something, I set goals and consider means for achieving them," and "I am usually certain about what I am going to do next";  $\alpha = .71$  to  $.75$ ). Present TP was assessed using two items that assessed the tendency to live in the present (e.g., "I try to live one day at a time," "It is best to live day-to-day";  $\alpha = .78$  to  $.83$ ). Past TP was assessed using three items from the past negative subscale of the ZTPI as it most closely approximated the concept of past TP in the context of a trauma exposure (e.g., "It is hard for

me to forget unpleasant images of my past"; "Painful past experiences keep being replayed in my mind"; "I think about the bad things that have happened to me in the past"). Reliability for past TP ranged from  $\alpha = .85$  to  $.87$  across the waves.<sup>1</sup>

**Well-being.** Well-being was measured at 12, 18, 24, and 36 months after 9/11 with scales assessing life satisfaction and positive affect. Life satisfaction was measured using the mean of the five items from Diener, Emmons, Larsen, and Griffin's (1985) Satisfaction With Life Scale. Participants rated their agreement with statements from 1 (*not at all*) to 7 (*strongly agree*). Reliability ranged from  $.91$  to  $.93$  across waves. Positive affect was measured using the mean of eight items used by Diener, Smith, and Fujita (1995). Participants rated how often they felt positive emotions (e.g., joy, affection, contentment) over the past week using a scale of 1 (*never*) to 5 (*all the time*). Reliability ranged from  $\alpha = .91$  to  $.93$  across waves.

## Analytic Strategy

Analyses were conducted in MPLUS (measurement invariance) and SAS 9.4 (PROC GLM and MIXED). Analysis of the data was conducted in a series of steps. First, descriptive statistics were calculated for all variables. To confirm that our measures functioned consistently across age groups and across waves of data collection, we next tested for measurement invariance (Meredith & Horn, 2001; Tisak & Meredith, 1990). For these analyses, we examined configural invariance, which constrains the structure of items to be the same across age groups or time. These analyses were followed by an assessment of metric invariance, which constrains items to load equivalently on the relevant factor regardless of age group or time. We accepted this as the highest level of invariance necessary for the current analyses. The next constraint, scalar invariance, assumes the observed means of indicators to be equivalent across age groups or time; this was not appropriate given that we expected the observed scores to differ over time and across age. For all models, the model  $\chi^2$  is reported but was not used as an indicator of model fit due to the large sample size (Kline, 2015). Model fit was assessed using the comparative fit index (CFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA). Acceptable values for these indices are CFI/TLI above  $.9$  and RMSEA below  $.08$  (Bollen, 1989). Change in model fit was also assessed using the change in these indices with change less than  $.01$  for CFI and less than  $.015$  for RMSEA, indicating evidence of invariance in large samples (Chen, 2007).

For the primary analyses, we used analysis of covariance (PROC GLM) to examine the relationship among 9/11-related TV exposure and temporal disintegration (Hypothesis 1). Post hoc contrasts with a Bonferroni correction were used to examine all possible differences among 9/11-related TV exposure groups and temporal disintegration. Covariates for this analysis were age, gender, marital status, educational attainment, ethnicity, household income, and pre-9/11 mental health.

<sup>1</sup> The ZTPI also has a past positive subscale that was not assessed in this study over time because the items were not internally consistent in early waves and space was limited.

Table 1  
Descriptive Statistics for Primary Variables

Variable	Mean	SD	Min	Max	Skew	BP variance	WP variance	ICC
Ongoing stress	.92	1.30	.00	20.00	5.79 <sup>a</sup>	.82	1.35	.38
Past TP	-.79	.88	-2.00	2.00	.88	.65	.34	.66
Present TP	.18	.86	-2.00	2.00	-.11	.53	.49	.52
Future TP	.17	.68	-2.00	2.00	-.26	.36	.24	.60
Positive affect	3.58	.63	1.00	5.00	-.50	.33	.20	.62
Life satisfaction	4.47	1.33	1.00	7.00	-.53	1.56	.65	.71

Note. TP = time perspective; BP = between-person; WP = within-person; ICC = intraclass correlation.

<sup>a</sup> Removing five individuals (<1% of data) led to corrected skew of 1.97 and a maximum value of 5.67 for ongoing stress.

After establishing the relationship between 9/11-related TV exposure and temporal disintegration, we used multilevel models (MLMs; PROC MIXED) to address Hypotheses 2, 3, and 4. MLM allows the examination of time-varying relationships in nested data; here, assessments were nested within individuals over the 3-year observation period. Hypothesis 2 tested the impact of 9/11-related TV exposure, temporal disintegration, and ongoing stress on the three TP scales. These models included the interaction between ongoing stress and age as a test of Hypothesis 3. Hypothesis 4 then considered how TP related to positive affect and life satisfaction over time.

Prior to conducting the full MLM, empty models were used to decompose the variability and calculate the intraclass correlation (ICC) for each of the time-varying outcomes: TP, ongoing stress, positive affect, and life satisfaction (see Table 1). The ICC is calculated as the ratio of variance due to individuals relative to total variability in an outcome. All time-varying predictors were centered at a person's average to reflect an individual's deviations from his or her typical experience. Because it was a variable of particular interest, age was standardized. All other between-person predictors were grand mean centered to provide an interpretable 0 point for the intercept. Covariates for the MLMs included the demographic variables used in the analysis of covariance, as well as time in study and the between-person averages for all within-person centered time-varying predictors. All MLMs used reduced estimation maximum likelihood.

For MLMs, we calculated pseudo- $R^2$  as a measure of the variance accounted for by the effects of interest at each level of the model. The formula for pseudo- $R^2$  used procedures recommended by Singer and Willett (2003). The difference in variance from a reduced model that included only covariates to the full model that included all effects of interest is divided by the variance from the reduced model to provide a ratio of the change in variance accounted for by the primary variables.

## Results

### Sample Description

A total of 722 individuals had complete data for the current analyses. The average age was 49.4 ( $SD = 16.14$ , range: 18–91), 49.3% female, and 75.6% Caucasian. Most individuals were married (63%,  $n = 455$ ), 30.6% of the sample reported having a bachelor's degree or higher, and the median income was \$40,000–\$49,000.

### Descriptive Statistics

Descriptive statistics and ICCs for primary variables appear in Table 1. Ongoing stress was significantly skewed. This was due to five individuals with substantially higher scores relative to the rest of the sample (<1% of sample). These individuals were removed from further analysis, which corrected the skew for this variable.

ICCs ranged from .38 (ongoing stress) to .71 (life satisfaction), indicating substantial within-person variability in the scales over observations. For the TP scales, approximately 34–48% of the variance was due to changes within individuals across the observation period. Ongoing stress varied more within-persons over time, with 62% of variability at this level compared to 38% between individuals.

### Does Measurement of Past, Present, Future TP Show Stability Over Time and Age?

We first examined whether items of the TP subscales were equivalently related to the construct of TP, regardless of age and across time. We divided the sample into tertiles by age (Tertile 1:  $M = 29.3$ ,  $SD = 5.73$ ; Tertile 2:  $M = 45.9$ ,  $SD = 4.30$ ; Tertile 3:  $M = 65.8$ ,  $SD = 8.79$ ) and tested for invariance across these groups at each wave. These models fit the data well, 12 months:  $\chi^2(61) = 144.75$ ,  $p < .0001$ , CFI = .987, TLI = .981, RMSEA = .042; 24 months:  $\chi^2(62) = 149.59$ ,  $p < .0001$ , CFI = .987, TLI = .982, RMSEA = .041; 36 months:  $\chi^2(63) = 233.06$ ,  $p < .0001$ , CFI = .969, TLI = .959, RMSEA = .065, and indicated that the measure was equivalent in structure and loadings across age groups.

Measurement invariance across time was assessed using the test for stationarity. An initial model testing configural invariance over time fit the data well,  $\chi^2(216) = 1,523.61$ ,  $p < .0001$ , CFI = .940, TLI = .924, RMSEA = .048. A model that added a constraint that assumed loadings were equivalent across time also fit the data well,  $\chi^2(226) = 1,618.88$ ,  $p < .0001$ , CFI = .936, TLI = .922, RMSEA = .049, and did not lead to a substantive change in model fit ( $\Delta CFI = .004$ ;  $\Delta TLI = .002$ ;  $\Delta RMSEA = -.001$ ).

### Does 9/11-Related TV Exposure Predict Temporal Disintegration?

Hypothesis 1 addressed whether 9/11-related TV exposure significantly predicted the degree to which individuals experienced temporal disintegration, controlling for age, gender, mar-

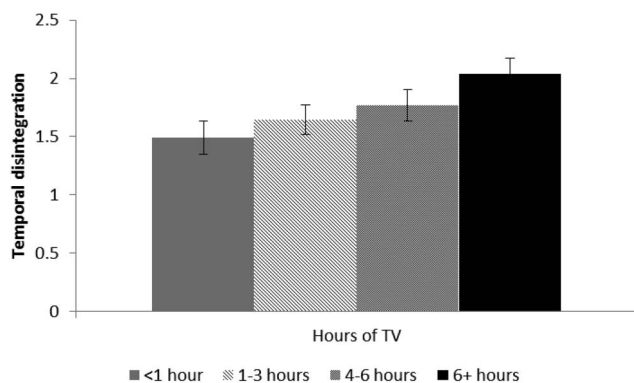


Figure 1. Model adjusted means for temporal disintegration for different levels of 9/11-related TV exposure. Errors bars represent standard errors. Means adjusted for age, gender, marital status, ethnicity, household income, education, and pre-9/11 mental health.

ital status, education, ethnicity, household income, and pre-9/11 mental health. The overall model was significant:  $F(22, 694) = 4.03, p < .01$ . Hours of early 9/11-related TV exposure significantly predicted temporal disintegration ( $p < .01$ ); however, age and the age by 9/11-related TV exposure interaction did not ( $p = .151$  and  $p = .887$ , respectively). Post hoc comparisons indicated significant differences between the highest level of 9/11-related TV exposure (i.e., 6+ hr) and all others. Further, individuals exposed to less than 1 hr of 9/11-related TV exposure also reported significantly lower temporal disintegration compared to individuals exposed to 4–6 hr of early 9/11-related TV. Model adjusted means for each group appear in Figure 1. The total  $R^2$  for this model was .113.

### Do Temporal Disintegration, 9/11-Related TV Exposure, and Age Predict Subsequent TP?

Next, we examined whether age, temporal disintegration, 9/11-related TV exposure, and age were associated with an individual's TP (Hypothesis 2). Results for the MLMs appear in Table 2.

Temporal disintegration was related to greater average past TP ( $b = 0.17, SE = 0.047$ ) and greater average present TP ( $b = 0.114, SE = 0.05$ ) but not to future TP ( $b = -0.10, SE = 0.04$ ). Early 9/11-related TV exposure was significantly related to greater past TP ( $b = 0.107, SE = 0.04$ ), but not related to present ( $b = 0.005, SE = 0.042$ ) or future TP ( $b = -0.022, SE = 0.034$ ). Older age was related to lower past TP ( $b = -0.098, SE = 0.042$ ) and higher future TP ( $b = 0.139, SE = 0.035$ ) on average. Temporal disintegration and 9/11-related TV exposure did not interact with age to predict within-person variation in TP over time ( $ps > .66$ ).

### Do Ongoing Stressful Experiences Predict Within-Person Variation in TP Over Time? Does Age Moderate These Associations?

The MLM analyses also included ongoing stress and its interaction with age as predictors of within-person TP over time to determine whether any effects of ongoing stress on TP differed across individuals of different ages at baseline (Hypothesis 3). As expected, ongoing stress was a significant predictor of past TP: At observations where individuals reported more ongoing stress, they also reported greater past TP ( $b = 0.067, SE = 0.025$ ). This effect was qualified by an interaction with baseline age, and tests of simple slopes indicated that this effect was significant for younger individuals (i.e., lowest tertile, ~30 years old;  $b = 0.120, SE = 0.036, p = .001$ ) but not for older ones (i.e., highest tertile, ~65 years old;  $b = 0.014, SE = 0.033, p = .667$ ; see Figure 2). Ongoing stress was not related to present or future TP ( $p = .685$  and  $p = .175$ , respectively). Age did not moderate these associations ( $p = .614$  and  $p = .336$ , respectively).

### Does TP Predict Individual Differences in Well-Being and Within-Person Variation in Well-Being Over Time?

To address our final question, we examined MLMs that used the TP scales to predict positive affect and life satisfaction at each observation (Hypothesis 4). These models included all three TP scales simultaneously to determine whether each were indepen-

Table 2

Multilevel Models Using Ongoing Stress, Age, Temporal Disintegration, and 9/11-Related TV Exposure to Predict Within-Person Fluctuations in Time Perspective

Independent variable	Past TP		Present TP		Future TP	
	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>
Intercept	2.433	.561	4.098	.604	3.059	.477
Ongoing stress (WPC)	.067**	.025	.012	.030	-.030	.022
Age	-.098*	.042	.013	.044	.139**	.035
Ongoing stress (WPC) × Age	-.053*	.024	-.015	.029	.020	.022
Temporal disintegration	.170**	.047	.114*	.050	-.010	.040
9/11-related television exposure	.107**	.040	.005	.042	-.022	.034
Pseudo- $R^2$	.067		.00		.00	

Note. TP = time perspective; WPC = within-person centered. All estimates from models adjusted for covariates: gender, marital status, ethnicity, household income, education, pre-9/11 mental health, average ongoing stress, and time in study. Pseudo- $R^2$  was calculated comparing the full model to one that included covariates only.

\* $p < .05$ . \*\* $p < .01$ .

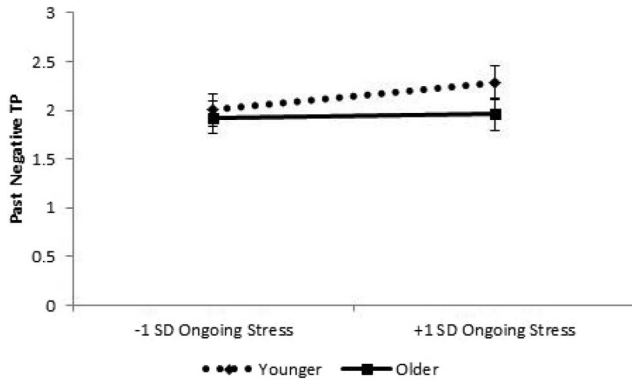


Figure 2. Plot of the within-person relationship between ongoing stress and past time perspective (TP) for younger (~30 years old, dotted line) and older adults (~65 years old, solid line). The slope for younger adults is significant ( $b = 0.120$ ,  $SE = 0.036$ ,  $p = .001$ ) and the slope for older adults is not ( $b = 0.014$ ,  $SE = 0.033$ ,  $p = .667$ ).

dently associated with well-being. The final results for these models appear in Table 3.

As hypothesized, past TP was negatively related to positive affect and life satisfaction, both between persons as well as within persons over time. That is, individuals who reported more past TP on average also reported lower positive affect ( $b = -0.183$ ,  $SE = 0.025$ ) and life satisfaction ( $b = -0.360$ ,  $SE = 0.047$ ). Further, at observations when an individual reported more past TP, they also tended to report lower positive affect ( $b = -0.108$ ,  $SE = 0.024$ ) and life satisfaction ( $b = -0.346$ ,  $SE = 0.042$ ). Future TP was also consistently related to higher positive affect and life satisfaction between persons ( $b = 0.383$ ,  $SE = 0.032$ ;  $b = 0.929$ ,  $SE = 0.061$ , respectively) and within persons ( $b = 0.124$ ,  $SE = 0.029$ ;  $b = 0.394$ ,  $SE = 0.051$ , respectively). Present TP was only related to individual differences in positive affect. Individuals higher in present TP also reported higher positive affect on average ( $b = 0.075$ ,  $SE = 0.024$ ). Age did not significantly predict positive affect or life satisfaction (all  $ps > .12$ ) and did not interact with TP to predict well-being over time (all  $ps > .06$ ).

## Discussion

This prospective study is, to our knowledge, the first longitudinal examination of the relationship between TP and well-being in an age-diverse, national sample. By following a group of individuals who were all exposed to the same collective trauma—most indirectly via the media—we could examine both within-person fluctuations and between-person differences in TP over time. Specifically, we conducted novel tests of predictions about associations among TV exposure, temporal disintegration, ongoing stress, TP fluctuations, and well-being after the 9/11 terrorist attacks. Age was examined as a moderator in these analyses to see whether length of time lived plays a role in shaping these associations. Our findings demonstrate that (a) early 9/11-related TV exposure is related to acute 9/11-related temporal disintegration; (b) these early experiences predict subsequent levels of past TP 12 months post-9/11; (c) ongoing stress is an important process associated with past TP (not present or future), but only for younger people and not older ones; (d) older respondents generally report lower

past TP and higher future TP; and (e) both within-person fluctuations and between-person differences in TP are associated with well-being over time. The results of this study lay a foundation for future research on the unique and combined roles that age, adversity, and perceptions of time play in shaping our sense of well-being over the life span.

These findings are consistent with previous studies suggesting that early posttrauma time perceptions can leave individuals focused on past events, with deleterious implications for well-being over time (Holman & Silver, 1998). The present study extends this prior work by demonstrating that *indirect* media-based exposure to collective trauma may serve as a stimulus contributing to early trauma-related temporal disintegration, which was subsequently linked to higher past TP several months later. In so doing, we identify media-based collective trauma exposure as a risk factor for temporal disintegration, and suggest a mechanism underlying the likelihood of becoming cognitively and emotionally “stuck” in one’s past experience.

Early 9/11-related temporal disintegration was also associated with higher present TP, but unrelated to future TP 1-year post-9/11. This may be due, in part, to the timing of the survey around the first anniversary of 9/11—a time when a great deal of media attention was once again focused on the 9/11 attacks. This more proximal media attention may have rekindled 9/11-related stress, and encouraged individuals to focus on the present moment as a way to cope. Future research might consider potential mechanisms by which media exposures to collective events may be linked to time perceptions. Finally, as our findings were not age-dependent, this pattern of response may occur at any age.

Our third hypothesis addressed one of the most important messages to take from these findings: that ongoing stress following

Table 3  
Multilevel Models Using Time Perspective to Predict Individual Differences and Within-Person Fluctuations in Well-Being

Independent variable	Positive affect		Life satisfaction	
	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>
Intercept	3.138	.090	3.474	.171
WP				
Past	-.109**	.024	-.340**	.042
Present	.034	.020	-.027	.036
Future	.124**	.029	.392**	.050
BP				
Past	-.178**	.025	-.363**	.048
Present	.076**	.024	.025	.047
Future	.381**	.032	.924**	.061
Age	-.010	.032	-.044	.061
Age moderation				
Age × WP Past	-.012	.023	.055	.041
Age × WP Present	.005	.019	.008	.034
Age × WP Future	.025	.029	-.097	.051
Age × BP Past	.047	.024	-.020	.047
Age × BP Present	.007	.025	.059	.048
Age × BP Future	.036	.033	.075	.063

Note. BP = between-person; TP = time perspective; WP = within-person. All estimates from models adjusted for covariates: age, gender, marital status, ethnicity, household income, education, pre-9/11 mental health, temporal disintegration, 9/11-related television exposure, average ongoing stress and time in study.

\*\* $p < .01$ .



collective trauma had independent ties to past TP—above and beyond the impact of collective trauma exposure—with significant implications for well-being over time. Interestingly, this association was only present for younger people, suggesting that the past TP of older people may be less sensitive to ongoing stressors. There are many possible explanations for this. These findings are largely consistent with SST in that they may reflect the tendency for older adults to focus their attention away from negative stimuli (e.g., a negative past experience; Isaacowitz et al., 2006a, 2006b), and/or experience less emotional reactivity to stressful situations (Charles, Piazza, Luong, & Almeida, 2009).

Alternatively, perhaps the accumulation of lived experience as we age builds wisdom or perspective-taking skills that make the relative salience and/or threat associated with these ongoing stressors less meaningful for our overall sense of time and well-being. The importance of these findings lies in the fact that two independent and different forms of adversity—national collective trauma and ongoing stress exposures—were each uniquely associated with individual differences in past TP. Ongoing stress also appears to be one of the mechanisms underlying within-person fluctuations in past TP over time.

Our findings also present some of the most compelling data showing that TP can be characterized as both a stable individual difference construct as well as a malleable cognitive process that responds to changes in ongoing stress. Indeed, our approach of using between- and within-person analytic strategies to examine the associations among collective trauma exposure, ongoing stress and TP allowed us to demonstrate the stable and malleable qualities of past TP in the same sample. Because early 9/11-related TV exposure predicted 12-month past TP but was not related to fluctuations in TP over time, these findings demonstrate that collective trauma exposure may increase risk for subsequent past TP. Moreover, they suggest that ongoing stress serves as a mechanism that sustains past TP (in younger people), which may fuel its association with well-being over time.

Our data also suggest that being older is associated with having a greater focus on the future, which appears inconsistent with the expectations of SST (Carstensen et al., 1999). However, this finding is likely due to different conceptualizations of, and approaches to, TP assessments. For example, setting goals and planning ahead do not necessarily preclude prioritizing temporally proximal socioemotional goals. Indeed, one could easily use a future-oriented approach to ensure that one spends time with familiar social partners. Perhaps the awareness of having less time left to live as we age encourages older people to make their futures as meaningful as possible, in part by planning and setting goals for themselves. Future research needs to tease apart how the combined contributions of these different views of TP are associated with well-being over time.

The fact that ongoing stress was only linked with past TP—but not present or future TPs—is consistent with clinical studies demonstrating the powerful impact adversity can have on the integration of past, present, and future TPs as trauma survivors cope with their experiences (e.g., Zimbardo et al., 2012). To the extent that individuals are unable to process or make sense of their experiences, they may remain cognitively engaged with past events, a tendency likely to be reinforced by ongoing stress. That is, ongoing stress following a major event may pose even greater threat to one's world views, making the need to engage in the “mental

gymnastics” of searching for meaning, undoing, and other cognitive processes that keep people focused on the past more salient (e.g., Tait & Silver, 1989). Future work should examine how the synergies between a collective trauma and different types of subsequent individual-level stressors are associated with cognitive processing, TP, and well-being over time.

Our final prediction was that past TP would be associated with lower life satisfaction and positive affect in both between- and within-person models. Analogously, we expected future and present TP would be associated with higher life satisfaction and positive affect in both between- and within-person models. These predictions were mostly confirmed. Individuals who were more past oriented at 12 months post-9/11 had lower life satisfaction and positive affect on average. Similarly, increases in past TP were associated with lower positive affect and life satisfaction within-persons over time. On the other hand, respondents who were more future oriented at 12 months post-9/11 reported greater well-being on average (i.e., the between person effect), and increases in future TP were associated with increases in positive affect and life satisfaction within-persons over time. However, present TP was only associated with between-person individual differences in positive affect. This pattern of findings was similar across all ages, suggesting that TP appears to have both dispositional and situational qualities that may play a role in well-being for individuals across adulthood.

Together these findings raise two critical issues for future work in this area. First, the analyses reported in this article included assessments of pre-9/11 mental health—as measured *before* the 9/11 attacks. In so doing we were able to examine whether TP had an association with well-being that was *independent* of preexisting mental health status. Second, to better understand the shifts in TP over time and their associations with well-being, we believe it is important for future studies to examine how *cognitive and emotional responses* to ongoing stress following an event like 9/11 may contribute to TP change and well-being over time. That is, major life events are often accompanied by secondary stressors that may negatively impact one's ability to cope with the original event (Garfin et al., 2014). Knowing how people think and feel about these ongoing stressors would inform our understanding of the mechanisms underlying the trauma-TP association. Ideally, future studies will include baseline mental health and TP assessments, ongoing stress, and responses to stress that can be reassessed over time as respondents age and cope with life's challenges. This approach would help tease apart the relationships among adversity, cognitive and emotional processing, time perceptions, and well-being as we age.

Our findings provide needed groundwork for future studies to examine TP and well-being across adulthood. Older age was associated with greater future and lower past TP at 12 months post-9/11, and older individuals' past TP was less sensitive to ongoing stress. Although the definition of TP employed in this study is different from that offered by Carstensen and colleagues, SST brought critical attention to how individuals' perspective on time may be related to where they are in their own lifetime. SST's reference event is often an event in the near or distant future, whereas the clinical literature highlights the importance of major events in the past. The present study integrates contributions from both SST and the clinical perspective by studying individuals spanning adulthood and anchoring our examination of TP and well-being after a major collective event. Finally, unlike research

derived from the SST that focuses on “time remaining” and its presumed impact on an expansive future TP (Carstensen et al., 1999), we were able to provide preliminary findings about a more comprehensive range of TPs by assessing past, present, and future TP in our sample over time.

## Limitations

In addition to the contributions described above, we acknowledge several limitations. Our sample spans a wide range of adulthood: 18–91 years old. From a life span perspective, however, it lacks representation from critical early years when adversity is known to have a powerful influence on children’s developing identities and world views that undergird TP formation. Thus, the findings we report must be viewed with the understanding that a *life span* approach to these questions would need to begin in childhood. Second, although this study included repeated observations of TP, ongoing stress, and well-being following 9/11, the 12 month TP baseline may not have been assessed early enough to capture potentially larger effects of collective trauma on TP over time. Also, we did not have pre-9/11 assessments of TP or general time perceptions that would have allowed us to examine *changes* in TP after collective trauma exposure. Our measure of TP was also somewhat limited in that we used two to three items per subscale and the past TP subscale was negatively valenced (in keeping with our focus on a post-9/11 context), whereas the present and future TP measures were neutral. It is likely that items tapping into a more positive view of the past might produce a different pattern of past TP in older adults, as suggested by recent cross-sectional work on aging and well-being (Webster, Bohlmeijer, & Westerhof, 2014). Future studies should include a more robust set of assessments over time to better evaluate the role of adversity in TP shifts over the life span and its implications for well-being. Measures that include both positive and negative aspects of all TPs would be essential to tease apart the role played by emotions versus TP in well-being over time. That said, because our results remained robust when controlling for pre-9/11 mental health, our findings do not appear to be confounded with preexisting emotional states. Finally, when addressing the valences of TP dimensions in future studies, it would be important to include measures of optimism to rule out confounding between trait optimism and having a more positively valenced TP linked to greater well-being.

As with other theories that make predictions about age patterns in well-being related to events (Charles, 2010), the exact time frame over which these patterns will be observed has not yet been established (see Scott, Sliwinski, & Blanchard-Fields, 2013). To fully test TP predictions, future studies should incorporate more frequent assessments necessary for examining lagged effects that would allow testing whether increases in TP precede changes in well-being over time.

Although these findings provide a starting point for understanding patterns of TP in adulthood, there are several dimensions of time that need further study at the individual and population levels. For example, studies addressing the role of TP in coping with trauma need to address the role of what has been called “pretraumatic stress” (Berntsen & Rubin, 2015). Although posttraumatic stress disorder is a disorder based on past experience, it has fear—an inherently future-oriented emotion—at its core (see Hol-

man & Silver, 2005). Fear represents the projection of prior experience onto anticipated, future negative experiences. To the extent that people have been exposed to fear-inducing experiences, they may become more vulnerable to engaging in this kind of negative future orientation. TP scales currently in use do not address this domain adequately. Given the impact of media exposure on acute stress symptoms following collective trauma (Holman et al., 2014), one area for exploration in this work would be to examine whether media-based indirect exposures prime people for a more negative future TP. Given experimental findings that older adults direct attention away from negative emotional stimuli (Isaacowitz et al., 2006a, 2006b) and older adults remember relatively fewer negative images compared to positive or neutral images (Charles, Mather, & Carstensen, 2003), these effects may also differ across age, making them a prime target for future research on time and aging. Finally, additional work is needed to examine how past, present, and future TP relate to each other cross-sectionally and covary in their change across time. With more comprehensive measures and more frequent assessments, future research could use techniques such as dual change score models to examine balanced TP and possible shifts in TP balance across time.

## Conclusion

This study provides evidence that TP has both dispositional and situational qualities that may be associated with well-being over time, while simultaneously demonstrating the critical link between ongoing stress and past TP following collective trauma. Our findings add to a growing literature demonstrating the contribution time perceptions make to overall well-being. It is our hope that we can expand this knowledge and use it to identify developmental associations that inform innovative approaches to helping people of all ages stay grounded in the past, keenly aware of the present, and motivated toward the future despite the challenges they may face.

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