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Getting Older, Feeling Less? A Cross-Sectional and Longitudinal Investigation of Developmental Patterns in Experiential Well-Being

Nathan W. Hudson and Richard E. Lucas
Michigan State University

M. Brent Donnellan
Texas A&M University

A large body of previous research suggests that people's global evaluations of their well-being tend to increase as a function of age. Fewer studies, however, have examined the extent to which people's in vivo experiences of well-being (e.g., felt emotions) vary as a function of age—and the existing findings are mixed. The present study used an approximately nationally representative sample of more than 2,500 Germans to evaluate developmental patterns in both experiential and global well-being using cross-sectional and longitudinal analyses. The cross-sectional and longitudinal findings converged on the idea that affect—whether positive or negative, global or experiential—decreases as a function of age and time. In contrast, life satisfaction appears to remain consistent, or perhaps decline across midlife before rebounding in old age. These findings suggest that affective well-being may develop in a nuanced way across adulthood: Negative affect appears to ebb with age—but so does positive affect.

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Which is more accurate: Is middle adulthood the "prime" of one's life and everything is downhill thereafter? Or does the more optimistic sentiment that "the best is always yet to come" better capture most people's lived experience of aging? The preponderance of scientific evidence to-date seems to suggest the latter (for an overview, see Charles & Piazza, 2009): as compared with younger individuals, older adults report fewer negative emotions (e.g., Levenson, Carstensen, & Gottman, 1994), greater emotional stability (e.g., Roberts, Walton, & Viechtbauer, 2006), and perhaps even greater life satisfaction (e.g., Prenda & Lachman, 2001).

Recently, however, scholars have emphasized that people's global evaluations of their well-being do not necessarily match the positivity of their actual lived experiences (Kahneman, Krueger, Schkade, Schwarz, & Stone, 2004; Lucas, Diener, & Suh, 1996). For example, individuals' assessments of how frequently they globally experience various emotions have only small-to-moderate correlations with measures of their actual daily affect (e.g., Anusic, Lucas, & Donnellan, 2016). This raises an important question: Do older adults *actually experience* greater well-being than younger individuals—or does age merely bias people's *beliefs* about and *evaluations* of their well-being (e.g., Charles et al., 2015)? The purpose of the present study was to investigate this question by evaluating developmental patterns in people's experiential affect, alongside their evaluations of their global well-being.

Nathan W. Hudson and Richard E. Lucas, Department of Psychology, Michigan State University; M. Brent Donnellan, Department of Psychology, Texas A&M University.

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Correspondence concerning this article should be addressed to Nathan W. Hudson, Department of Psychology, Michigan State University, 316 Physics Road, East Lansing, MI 48824. E-mail: nwhudson@msu.edu

Developmental Patterns in Global Well-Being

Subjective well-being is a broad construct that encompasses both people's global evaluations of the overall positivity of their lives (e.g., life satisfaction), as well as the balance of positive and negative emotions they routinely experience (Diener, 1984). A large body of research has been devoted to understanding how well-being develops across the life span. Early theorists believed that subjective well-being might follow a similar trajectory to physical prowess: peaking in young adulthood, and declining thereafter (Banham, 1951; Bühler, 1935). Although a few studies have supported the notion that well-being declines with age (e.g., Freund & Baltes, 1998), the majority of research suggests that well-being does *not*, in fact, decay across the life span. Rather, it appears to either remain consistent across adulthood (e.g., Diener & Diener, 1996; Diener & Suh, 1998; Hamarat, Thompson, Steele, Matheny, & Simons, 2002; Lucas & Gohm, 2000; Malatesta & Kalnok, 1984; Neugarten, Havighurst, & Tobin, 1961) or even increase with age (e.g., Carstensen, Graff, Levenson, & Gottman, 1996; Diener, Sandvik, & Larsen, 1985; Gross et al., 1997; Levenson et al., 1994; Mroczek & Spiro, 2005; Prenda & Lachman, 2001). For example, as compared with younger individuals, older adults report less anxiety and greater contentment (Lawton, Kleban, & Dean, 1993), and a greater ratio of positive to negative emotions (Ryff, 1989).

Notably, research indicates that negative affect, in particular, wanes with age (e.g., Charles et al., 2015; Charles, Reynolds, & Gatz, 2001)—although emerging evidence suggests that certain discrete negative emotions (e.g., sadness) may defy this trend (e.g., Kunzmann, Kappes, & Wrosch, 2014; Kunzmann, Richter, & Schmukle, 2013). Evidence is far more mixed with respect to developmental changes in positive affect and life satisfaction. For example, some studies suggest that people's global positive affect

increases with age (e.g., Carstensen et al., 2011; Gross et al., 1997; Mroczek & Kolarz, 1998; Ryff, 1989), whereas other studies have found that positive affect either remains stable (e.g., Kunzmann et al., 2013; Vaux & Meddin, 1987), or that it *abates* across the life span (e.g., Diener & Suh, 1998; Lucas & Gohm, 2000). Similarly, life satisfaction may remain relatively constant with age, or it may follow complex curvilinear patterns, such as decreasing in early adulthood and rebounding in late life (Baird, Lucas, & Donnellan, 2010; Blanchflower & Oswald, 2008).

Despite these nuances, why might well-being generally increase with age? There are several potential explanations. For one, biologically predetermined maturation—analogous to physical maturation—may cause people to increase in emotional stability as they age, leading to less frequent or intense negative affect and greater positive emotions (Carstensen et al., 2011; Roberts & Mroczek, 2008; Roberts et al., 2006). Beyond maturation, common, age-graded social experiences, such as committing to and investing in enduring romantic relationships, may instill security and assuage negative emotions (e.g., Hudson, Fraley, Chopik, & Heffernan, 2015; Lehnart, Neyer, & Eccles, 2010). Finally, differences in mental perspective (e.g., ever-increasing awareness of limited time left to live) may cause older adults to prioritize and select into situations that facilitate positive emotions and diminish negative ones—and when such selection is not possible, older adults may use emotion regulation strategies to effectively mitigate unpleasant feelings (e.g., Charles & Carstensen, 2008; Charles & Piazza, 2009; Charles, Piazza, Luong, & Almeida, 2009). In summary, a variety of processes may explain why older adults generally report greater global well-being—particularly less negative affect—as compared with their younger counterparts.

Distinctions Between Global and Experiential Well-Being

Recently, researchers have emphasized that people's *global* assessments of their well-being are not isomorphic with their *experiences* of well-being (Kahneman et al., 2004; Lucas et al., 1996). For example, individuals' self-reported patterns of global affect only weakly correlate with reports of their momentary emotions (Anusic et al., 2016). This phenomenon may reflect that people's assessments of their global well-being (e.g., overall patterns of affect) are based more upon their top-down beliefs and expectations regarding their well-being, rather than a bottom-up aggregation of their actual, lived experiences (Robinson & Clore, 2002a, 2002b). Thus, for instance, it may be possible for an individual to predominantly experience negative emotions in vivo (e.g., while spending most of his or her waking time working hard to serve others), yet nevertheless construe his or her life positively and therefore, report relatively little global negative affect, and high levels of global positive affect and life satisfaction.

The fact that global and experiential well-being are potentially distinct raises the possibility that they may develop differently across adulthood. For example, the finding that global negative affect ebbs with age (e.g., Charles et al., 2015, 2001) may primarily reflect greater maturity and emotional stability influencing people's top-down assessments of their lives. In other words, it is possible that older individuals do not necessarily report lesser negative emotions in the moment; they may simply retrospectively recall (relative to younger persons) experiencing fewer negative emotions. Tentatively supporting this line of reasoning, studies have found that, when asked to summarize their emotions over increasingly long intervals (which forces people to rely more upon top-down processes rather than bottom-up ones; Robinson & Clore, 2002a, 2002b), older individuals exhibit increasingly greater biases in reporting less negative affect, as compared with younger persons (Charles et al., 2015). Stated differently, when mentally aggregating their emotions across short time intervals (e.g., 1 day) older individuals report marginally less negative affect than do younger persons. However, when summarizing across longer time intervals (e.g., 1 month) older people report substantially less negative affect than do their younger counterparts. This opens the possibility that the age-graded increases in well-being observed in prior studies may reflect changes in people's top-down beliefs and expectations regarding their well-being, rather than changes in their actual momentary affective experiences. Supporting this possibility, at least one study has found no association between age and emotions measured with experience sampling techniques (Charles & Pasupathi, 2003).

Of course, it may also be the case that global and experiential well-being have similar associations with age across adulthood (e.g., Carstensen et al., 2011; Charles et al., 2010; Riediger, Schmiedek, Wagner, & Lindenberger, 2009). Indeed, scholars have argued that global and experiential well-being represent different points in a unified psychological process; and thus, changes in one may propagate and eventually be reflected in the other (Kim-Prieto, Diener, Tamir, Scollon, & Diener, 2005). If true, this would suggest that global and experiential well-being should exhibit more-or-less similar developmental patterns.

In summary, global and experiential well-being are potentially distinct (Kahneman et al., 2004; Lucas et al., 1996) and may or may not develop similarly across adulthood. However, relatively few studies have explicitly explored associations between age and experiential well-being—and the few existing studies on the topic have produced somewhat mixed findings (Carstensen et al., 2011; Charles et al., 2010; Charles & Pasupathi, 2003; Riediger et al., 2009). Thus, further research is needed with respect to how experiential well-being develops across adulthood. The purpose of the present study was to clarify the developmental patterns in experiential well-being, as directly compared with those in global well-being.

Overview of the Present Study

The present study was designed to examine developmental patterns in both experiential and global well-being across adulthood. To do so, we used an approximately nationally representative sample of Germans, with ages ranging from 17 to 95. Participants reported their experiential and global well-being up to three times over the course of 2 years. These data were used to examine both the cross-sectional associations between age and well-being, and also longitudinal changes in well-being across 2 years for individuals of differing ages.

In our specific sample, participants' experiential well-being was measured via the *day reconstruction method* (DRM; Kahneman et al., 2004). In contrast to *experience sampling methods* (ESM; Shiffman, Stone, & Hufford, 2008) that require the use of costly technology and can be intrusive for participants, DRM can be administered in standard survey format, and some versions can be

completed in as few as 10–15 minutes (e.g., Anusic et al., 2016). In DRM measures, participants are first asked to systematically reconstruct their prior day in terms of "episodes" that occurred. Subsequently, participants provide ratings of the emotions that they experienced during those episodes. Despite entailing retrospective reporting, preliminary evidence suggests that DRM produces similar patterns of findings to ESM (Anusic et al., 2016; Kahneman et al., 2004). For example, one recent study found that daily aggregates of DRM and ESM measures of the same emotions correlate $r = .76–.89$ with one another (Tweten, Anusic, Lucas, & Donnellan, 2016). Importantly, the DRM is increasingly being used in large-scale survey work, such as the American Time Use Study and the German Socioeconomic Panel (GSOEP; Wagner, Frick, & Schupp, 2007). Thus, our study not only helps to clarify the associations between age and experiential well-being; it also provides critical insight into the properties of an instrument that is increasingly being used in the social sciences, and even to guide policy decisions.

What should we expect to find? Numerous previous studies suggest that global well-being tends to increase with age—and this effect appears to be predominantly driven by declines in negative affect (e.g., Carstensen et al., 2011, 1996; Diener et al., 1985; Gross et al., 1997; Levenson et al., 1994). Thus, we expected to observe both cross-sectional and longitudinal declines in negative affect in our study. It is less clear what to expect with regard to positive affect and life satisfaction. Indeed, some studies suggest these variables increase with age (e.g., Carstensen et al., 2011), whereas others have found that these variables remain constant (e.g., Diener & Diener, 1996; Kunzmann et al., 2013) or even decline across adulthood (e.g., Charles et al., 2001; Freund & Baltes, 1998). Other studies yet have found complex curvilinear associations between age and life satisfaction, such as declines in early adulthood, followed by gains across late life (Baird et al., 2010; Blanchflower & Oswald, 2008). Particularly relevant to the present study, Kunzmann and colleagues (2013) analyzed data from the 2007–2011 waves of the GSOEP and found that global negative affect remained stable or decreased across adulthood (specifically, anger decreased, whereas sadness remained stable before increasing in old age), whereas global positive affect remained stable across midlife before declining in old age. In the present study, we analyzed data from the 2012–2014 waves of the GSOEP—and so might expect to replicate Kunzmann and colleagues' (2013) findings with respect to global well-being.

In contrast to global well-being, fewer studies have examined the associations between age and experiential well-being. Several studies have found positive associations between age and experiential well-being, such that older adults report greater positive affect and lesser negative affect, as compared with younger persons (Carstensen et al., 2011; Charles et al., 2010; Riediger et al., 2009). Other research, in contrast, has found no significant associations between age and experiential positive or negative affect (e.g., Charles & Pasupathi, 2003). Other studies yet suggest that different discrete emotions may exhibit different associations with age. For example, low-arousal positive emotions (e.g., relaxation) may increase as a function of age, whereas high-arousal positive affect (e.g., excitement) may remain stable (Scheibe, English, Tsai, & Carstensen, 2013). Similarly, older adults may experience greater fear and sadness—but not anger or disgust—in response to emotionally evocative stimuli (Haase, Seider, Shiota, & Levenson, 2012). Thus, the developmental patterns in experiential well-being remain somewhat poorly understood—and it is therefore unclear what to expect in the present study.

Finally, in our study, we also examined whether age might predict differences in daily time usage, and whether such differences might explain any age-graded variation in well-being. Specifically, to the extent that younger and older adults vary with respect to experienced emotions, these affective differences may be driven by variation in how they spend their time. For example, older people may experience less negative affect simply because they spend less time working or caring for children—activities that may (on occasion) generate frustrations (Kahneman et al., 2004). To evaluate this and similar possibilities, we tested whether age-graded differences in daily time usage might explain any developmental patterns observed in well-being.

Method

Participants

We analyzed data from participants in the 2012–2014 waves of the Innovation Sample of the German Socioeconomic Panel (GSOEP; Richter & Schupp, 2015; Wagner et al., 2007). This sample is an approximately nationally representative subsample of the larger GSOEP study, in which new and innovative questions are administered. Participants completed DRM measures once annually in 2012–2014. In total, 2,504 unique participants (52% female; ages ranged from 17–95, $M = 51.78$, $SD = 18.00$)[1] provided at least one wave of data. The respective individual sample sizes for 2012, 2013, and 2014 were 2,303, 1,920, and 1,763.

On average, participants provided 2.39 waves of data ($SD = 0.85$)—with 1,898 participants (76%) providing at least two waves of data. Attrition analyses revealed that people tended to provide fewer waves of data if they were younger ($r = .06$, 95% confidence interval [CI] [.02, .10]), or if, collapsing across waves, they reported greater levels of global positive affect ($r = -.09$, 95% CI [−0.12, −0.05]). No other study variables were statistically significantly associated with total waves of data provided.

Measures

Experiential positive and negative affect. At each time point, participants completed DRM measures in which they systematically reconstructed their prior day by reporting all activities that had occurred. Specifically, participants were first asked what time they awoke. Afterward, they were queried, "What did you do next?" Participants selected a general activity from a predetermined list (e.g., personal care, commuting, preparing food, watching TV, meeting with friends) and indicated what time the episode began and ended. This procedure was repeated (i.e., participants were asked, "What did you do next?") until participants had accounted for their entire day—ending with either their bedtime or midnight.

[1] The sample sizes per decade of life were: 17-19: $n = 74$; 20-29: $n = 278$; 30-39: $n = 243$; 40-49: $n = 406$; 50-59: $n = 440$; 60-69: $n = 420$; 70-79: $n = 344$; 80-89: $n = 90$; 90-95: $n = 8$.

After providing a basic account of all of their activities during the previous day, three episodes were randomly selected for each participant. For each of these three episodes, participants rated the extent to which they felt several emotions *during the episode*: happy, enthusiastic, satisfied, angry, frustrated, sad, worried, and stressed. Each emotion was rated on a scale from 1 (*not at all*) to 7 (*very much*). Having participants rate three randomly selected episodes—rather than every episode (e.g., Kahneman et al., 2004)—dramatically reduces the time required to complete the measure, yet nevertheless appears to produce similar patterns of findings to full length DRM assessments (Anusic et al., 2016).

We formed daily composites for each of the eight emotions by averaging the ratings from the three episodes together with equal weighting. For example, we computed a single "daily happiness" composite for each participant at each wave—which was an average of their reported happiness during each of the three episodes they had rated. Subsequently, we formed composites at each time point for *daily positive affect* and *daily negative affect*. Daily positive affect was an average of daily happiness, enthusiasm, and satisfaction (2012: $\alpha = .85$). Daily negative affect was an average of daily anger, frustration, sadness, worry, and stress (2012: $\alpha = .87$).

Global positive and negative affect. At each time point, participants rated the frequency with which they had generally felt happiness, anger, sadness, and worry over the prior 4 weeks (notably, this is a divergence from the experiential measures, in which participants rated the momentary *intensity* of each emotion). Each emotion was rated on a scale running from 1 (*very seldom*) to 5 (*very often*). Because previous research suggests positive and negative affect are independent (e.g., Watson, Clark, & Tellegen, 1988), we created separate composites for positive and negative affect. We used the happiness question as a single-item indicator of participants' *global positive affect* at each wave. We averaged together the anger, sadness, and worry items to obtain a measure of participants' *global negative affect* at each wave (2012: $\alpha = .61$).

Life satisfaction. Participants' global life satisfaction was assessed at each wave using a single item that read, "How satisfied are you with your life, all things considered?" This item was rated on a scale that ran from 0 (*completely dissatisfied*) to 10 (*completely satisfied*). Research suggests that single-item measures of life satisfaction have comparable validities to multi-item measures (Cheung & Lucas, 2014; Lucas & Donnellan, 2012).

Results

Descriptive statistics and correlations between all study variables at 2012 are presented in Table 1.[2] Supporting the notion that global and experiential well-being are separable (Kahneman et al., 2004; Lucas et al., 1996), global and experiential affect were only moderately correlated (average $r = .27$). On a zero-order level, age was negatively associated with all well-being variables (rs ranged from $r = -.13$, 95% CI [−.17, −.09] [global positive affect] to $r = -.04$, 95% CI [−.08, −.00] [life satisfaction]) except daily positive affect ($r = -.02$, 95% CI [−.06, .02]). Thus, in 2012, older individuals reported less daily negative emotions, global positive emotions, global negative emotions, and life satisfaction.

Overview of Analyses

We evaluated the developmental patterns in well-being using two separate methods. First, we modeled the cross-sectional associations between age and each well-being variable. These analyses capture the extent to which older individuals report lesser or greater well-being, as compared with their younger counterparts. Because researchers have frequently found curvilinear associations between age and well-being (e.g., Baird et al., 2010; Blanchflower & Oswald, 2008; Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Diener & Suh, 1998; Kessler, Foster, Webster, & House, 1992), we modeled quadratic associations between age and each well-being variable in these cross-sectional analyses.

Second, given the longitudinal nature of our data, we examined the extent to which well-being *changed* over 2 years. Although we discuss the cross-sectional and longitudinal patterns separately for narrative simplicity, we estimated both effects using a single multilevel model (MLM) for each well-being variable. For example, the MLM for daily positive affect was:

$$\begin{aligned}(\text{DRM Positive Affect})_{ij} = {} & b_o + b_1\,(\text{Age}/10)_j + b_2\,(\text{Age}/10)_j^2 \\ & + b_3\,(\text{Year})_{ij} + b_4\,(\text{Age}/10)_j\,(\text{Year})_{ij} \\ & + b_5\,(\text{Age}/10)_j^2\,(\text{Year})_{ij} + U_j + \varepsilon_{ij}\end{aligned}$$

In all models, age was scaled in decades (i.e., age/10) and centered around its grand mean. Thus, the b_1(Age/10) and b_2(Age/10)^2 coefficients capture the expected normative difference in well-being per decade of life.[3] Importantly, to orthogonalize the cross-sectional and longitudinal analyses, participants' ages were held constant at their 2012 value (i.e., age in 2012 was a predictor at each wave; e.g., age for individuals born in 1986 was held constant at 26 years old across all waves in the cross-sectional analyses).

In contrast, longitudinal Time was scaled in years and grand-mean centered. Therefore, the b_3(Year) coefficient represents the expected longitudinal increase or decrease in well-being per year. We also modeled interactions between participants' age and Time

[2] Reviewers requested information on (a) the amount of within-person variance in the well-being variables, (b) the percent of people with no within-person variance in well-being, and (c) whether this within-person variance varied as a function of age.

With respect to the amount of within-person variance present in each variable, intraclass correlations for all variables were: DRM positive affect: .42; global positive affect: .45; DRM negative affect: .36; global negative affect: .52; life satisfaction: .57. The percent of individuals with no within-person variance in well-being was: DRM positive affect: 1%; global positive affect: 40%; DRM negative affect: 14%; global negative affect: 9%; life satisfaction: 21%.

To address the extent to which within-person variance varied as a function of age, we computed each person's individual standard deviation for each well-being variable—and correlated these deviation scores with age. Age was positively correlated with within-person deviations in global positive affect ($r = .05$, 95% CI [.00, .10]) and life satisfaction ($r = .05$, 95% CI [.01, .10]), and it was negatively correlated with within-person deviations in daily negative affect ($r = -.11$, 95% CI [−.15, −.07]). Age was unrelated to deviations in global negative affect ($r = -.02$, 95% CI [−.06, .03]) and daily positive affect ($r = -.03$, 95% CI [−.07, .02]).

[3] This linear transformation of the age variable does not affect the statistical significance of any parameter estimate. We used this scaling because using an untransformed age variable produced statistically significant parameter estimates that required up to five decimal places to accurately express.

Table 1
Descriptive Statistics and Inter-Correlations at 2012

Variable	*M*	*SD*	Correlations 1	2	3	4	5	6
1. Age	51.79	17.99	—					
2. DRM positive affect	3.83	1.28	−.02	—				
3. DRM negative affect	1.52	.72	**−.11**	**−.06**	—			
4. Global positive affect	3.56	.81	**−.13**	**.25**	**−.15**	—		
5. Global negative affect	2.29	.74	**−.07**	**−.10**	**.29**	**−.32**	—	
6. Life satisfaction	7.44	1.71	**−.04**	**.21**	**−.18**	**.46**	**−.40**	—

Note. Ninety-five percent confidence intervals for correlations in boldface do not include zero. DRM = day reconstruction method.

to examine whether individuals of varying ages experienced differing longitudinal changes in well-being each year.[4,5]

In terms of notation, we use b_L and b_Q to denote linear and quadratic effects, respectively. Standardized coefficients (β) were computed by standardizing all variables across the entire sample before entering them into the model (see Ackerman, Donnellan, & Kashy, 2011).[6]

Cross-Sectional Associations Between Age and Well-Being

The Age/10 and $(Age/10)^2$ coefficients in Table 2 represent the cross-sectional associations between age and experiential well-being. Age negatively predicted daily affect, such that, as compared with younger persons, older individuals reported feeling less intense daily emotions—both positive (b_L = −0.02, 95% CI [−0.05, 0.00], β_L = −.03) and negative (b_L = −0.05, 95% CI [−0.06, −0.03], β_L = −.12). These coefficients indicate that, for each decade of life, people of the sample mean age reported 0.02 original scale units less positive affect, and 0.05 scale units less negative affect. The negative association between age and daily positive affect was buffered by a positive curvilinear trend (b_Q = 0.01, 95% CI [0.00, 0.03], β_Q = .04). As can be seen in Figure 1, which depicts the model-predicted cross-sectional age patterns in experiential well-being, the model suggests that daily positive affect declines across adulthood—until about age 65—and subsequently rebounds in old age. In contrast, negative affect appears to decline linearly across adulthood.

The Age/10 and $(Age/10)^2$ parameters in Table 3 capture the cross-sectional associations between age and global well-being. As with daily affect, older individuals reported lower frequency of both global positive affect (b_L = −0.07, 95% CI [−0.08, −0.05], β_L = −.14) and global negative affect (b_L = −0.03, 95% CI [−0.05, −0.02], β_L = −.07; b_Q = −0.01, 95% CI [−0.02, −0.00], β_Q = −.04).[7] As can be seen in the left-hand panel of Figure 2, unlike experiential positive affect, global positive affect did not rebound in old age. Finally, there were no statistically significant linear or curvilinear associations between age and life satisfaction (b_L = −0.02, 95% CI [−0.06, 0.01], β_L = −.02; b_Q = 0.02, 95% CI [−0.00, 0.03], β_Q = .03).

To summarize our cross-sectional age analyses, as compared with their younger counterparts, older individuals tended to report lower levels of affect across the board—positive and negative, experiential and global. The only qualification to this was that, after dropping across early adulthood and middle age, experiential positive affect appeared to rebound in late life (after about 65 years of age). In contrast, age was generally unrelated to global life satisfaction (notably, however, there was a negative zero-order correlation between age and life satisfaction; see Table 1).

Longitudinal Changes in Well-Being

For our next series of analyses, we tested whether well-being longitudinally changed over the course of 2 years for individuals of varying ages. The Time parameters in Table 2 capture the extent to which average-aged individuals in the sample (M = 51.79 years) increased or decreased in experiential well-being each year. Average-aged participants reported annual declines in experiential positive affect (b = −0.08, 95% CI [−0.12, −0.03], β = −0.04), but not negative affect (b = −0.02, 95% CI [−0.04, 0.01],

[4] Because cross-sectional age and longitudinal Time were orthogonal, modeling them together—as opposed to separately—does not affect the parameter estimates. Including the interaction between age and Time does, however, shift the lower-order terms to represent the sample-mean simple slopes. That is, the age coefficients represent the simple cross-sectional associations between age and well-being at average Time; and the Time parameters capture the simple longitudinal associations at the sample average age. In our data, omitting the interaction terms (and thus shifting the parameters to represent "main effects" rather than simple slopes) did not affect any of the age parameters. Omitting the interaction terms did slightly reduce the first-order longitudinal effect for daily positive affect (from b = −0.08 to b = −0.06, 95% CI [−0.09, −0.03]) and life satisfaction (from b = −0.06 to b = −0.05, 95% CI [−0.09, −0.01]). No other longitudinal coefficients were altered (to two decimal places) by omitting the interactions.

[5] This model specification is very similar—albeit not identical—to examining the between-persons and within-persons effects of age. The only difference between our model and a typical between-/within-persons model is that we grand-mean centered Time, whereas a typical between-/within-persons model would person-center Time (which is mathematically equivalent to person-centered age).

[6] Notably, the first-order βs may represent slightly different simple slopes than the first-order bs, because in the standardized analyses, $(Age/10)^2$ is "recentered" around zero, whereas in the unstandardized analyses, it is simply the untransformed square of the centered (Age/10) variable. Nevertheless, the pattern of statistical significance was largely identical across the standardized and unstandardized coefficients.

[7] As compared with women, men tended to have lesser age-graded declines in global positive affect (Male × [Age/10] b = 0.04, 95% CI [0.01, 0.08]), and sharper declines in global negative affect (Male × $[Age/10]^2$ b = −0.04, 95% CI [−0.05, −0.03]). Gender did not moderate any other age or Time associations.

Table 2
Age and Time Predicting Experiential Well-Being

	DRM positive affect				DRM negative affect			
		95% CI				95% CI		
Predictor	*b*	LB	UB	β	*b*	LB	UB	β
Intercept	3.70	3.65	3.76	—	1.51	1.47	1.54	—
Age/10	−.02	−.05	.00	−.03	**−.05**	−.06	−.03	**−.12**
$(Age/10)^2$	**.01**	.00	.03	**.04**	.00	−.01	.00	−.02
Time	**−.08**	−.12	−.03	**−.04**	−.02	−.04	.01	−.03
(Age/10) × Time	−.01	−.03	.00	−.02	.00	−.01	.01	.00
$(Age/10)^2$ × Time	.00	−.01	.01	.01	.00	−.01	.00	−.01

Note. DRM = day reconstruction method; CI = confidence interval; LB = lower bound; UB = upper bound; 95% CIs for parameter estimates in boldface do not include zero.

β = −.03). In terms of interpretation, these coefficients suggest that people reported 0.08 scale units less daily positive affect with each passing year. Age did not moderate these longitudinal changes (all interaction $|b|$s ≤ 0.01), suggesting that adults of all ages showed similar changes in experiential well-being over the course of 2 years.

In contrast to the longitudinal trends in experiential affect, individuals in their 50s (i.e., the average age in the sample) reported no longitudinal changes in global positive affect (b = −0.01, 95% CI [−0.04, 0.01], β = −.01) and declines in global negative affect (b = −0.04, 95% CI [−0.06, −0.01], β = −.04; see Table 3). People also tended to decrease in life satisfaction each year (b = −0.07, 95% CI [−0.12, −0.02], β = −.02). Notably, age moderated the longitudinal changes in only global positive affect (b_L = −0.02, 95% CI [−0.03, −0.00], β_L = −.03), such that older individuals reported sharper declines in global positive affect than did younger persons. Decomposing this interaction, simple slope analyses revealed that people between the ages of 61 and 78 were predicted to experience statistically significant decreases in global positive affect each year (simple b_{61} = −0.03, 95% CI [−0.05, −0.00]; simple b_{78} = −0.08, 95% CI [−0.09, −0.00]). Individuals younger than 61 or older than 78 were not predicted to statistically significantly change in global positive affect. Although people younger than approximately 43 years of age were predicted to increase in global positive affect, these gains were not statistically significant at any age (the greatest simple slope was at age 17, b_{17} = 0.06, 95% CI [−0.01, 0.12]; the tightest CI was at age 25, b_{25} = 0.04, 95% CI [−0.00, 0.08]).

Figure 3 depicts the model-predicted 2-year longitudinal trajectories in each well-being variable for adults of varying ages. The solid black curve in each panel is the model-predicted cross-sectional associations between age and well-being (see Figures 1 and 2). The short, lighter gray lines represent the model-predicted longitudinal change in well-being over the course of the study for adults of varying ages. For example, as can be seen in the lower-left panel of Figure 3, the cross-sectional analyses suggested that global positive affect tends to universally decrease as a function of age across adulthood. In contrast, the longitudinal analyses suggested that global positive affect (nonstatistically significantly) increases across time for individuals younger than approximately 40, and it remains constant or decreases for individuals 40 or older. Similarly, as can be seen in the lower-right panel of Figure 3, although the effect did not cross the threshold for statistical significance, global life satisfaction may longitudinally decrease across adulthood before longitudinally rebounding in the latter-

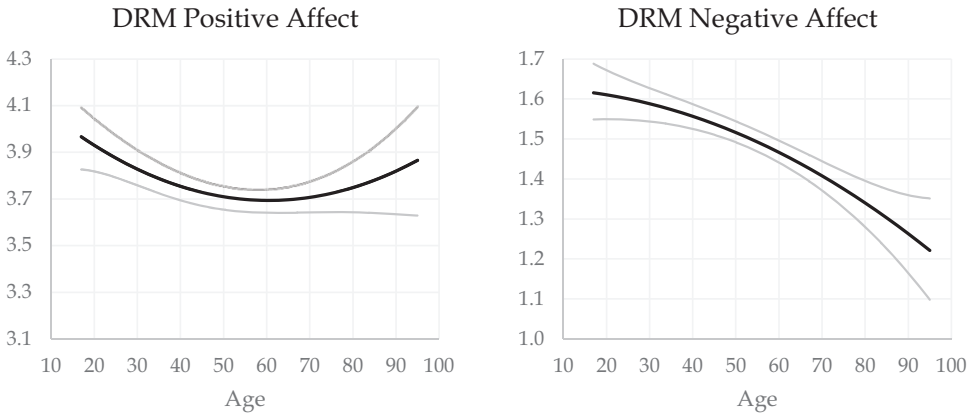

Figure 1. Model-predicted cross-sectional age patterns in experiential well-being with 95% confidence bands. All vertical axes depict 1 *SD* in the well-being variable. Day reconstruction method (DRM) positive and negative affect were rated on a scale ranging from 1 to 7, with higher numbers indicating greater affect.

Table 3
Age and Time Predicting Global Well-Being

	Global positive affect				Global negative affect				Life satisfaction			
		95% CI				95% CI				95% CI		
Predictor	*b*	LB	UB	β	*b*	LB	UB	β	*b*	LB	UB	β
Intercept	3.53	3.50	3.57	—	2.28	2.24	2.32	—	7.34	7.25	7.42	—
Age/10	**−.07**	−.08	−.05	**−.14**	**−.03**	−.05	−.02	**−.07**	−.02	−.06	.01	−.02
$(Age/10)^2$	.00	−.00	.01	.02	**−.01**	−.02	−.00	**−.04**	.02	−.00	.03	.03
Time	−.01	−.04	.01	−.01	**−.04**	−.06	−.01	**−.04**	**−.07**	−.12	−.02	**−.02**
(Age/10) × Time	**−.02**	−.03	−.00	**−.03**	.00	−.01	.01	.00	.01	−.01	.03	.01
$(Age/10)^2$ × Time	.00	−.00	.01	.00	.00	−.01	.01	.00	.01	−.00	.02	.01

Note. DRM = day reconstruction method; CI = confidence interval; LB = lower bound; UB = upper bound; 95% CIs for parameter estimates in boldface do not include zero.

most years of life (see Figure S1 in the supplementary materials for a clearer depiction of this effect).

Collectively, as can be seen by comparing the cross-sectional and longitudinal trends in Figure 3, the cross-sectional and longitudinal analyses converge on the idea that both positive and negative affect generally decrease with age—both experientially and globally. Notably, however, the longitudinal changes observed in our study were conspicuously large. Indeed, as an example, our cross-sectional analyses suggested that for each *decade* of life, people report 0.03 scale units less global negative affect; yet our longitudinal analyses suggested that people drop 0.04 scale units each *year*. This implies that people decrease 0.40 units in global negative affect over a decade—an amount that is more than 13 times higher than the cross-sectional estimate. Moreover, the longitudinal changes in global negative affect were not moderated by age. Thus, the discrepancy between the longitudinal and cross-sectional analyses cannot be explained, for example, by age differences in the rate at which people change in global negative affect (e.g., middle-age adults drop sharply, but these declines level off). As we elaborate in the Discussion, the large longitudinal changes observed in our study are likely attributable, in part, to testing effects (see, e.g., Baird et al., 2010; Lucas & Donnellan, 2011).

Is Age-Based Variation in Well-Being Attributable to Daily Time Usage?

Thus far, our data suggest that older individuals report less positive and negative affect than do younger persons—and people generally experience longitudinal declines in positive and negative affect and life satisfaction over time. For our next series of analyses, we explored whether these phenomena might be attributable to differences in the amount of time that people of varying ages allot to different activities. We first examined whether age predicted daily time usage. As can be seen in Table 4, there were numerous associations between age and time allocated to various activities. For example, for each decade of life, people tended to spend 21.83 more minutes (95% CI [19.71, 23.96]) watching TV, and 57.75 fewer minutes (95% CI [−61.99, −53.50]) working per day.

Despite these systematic differences in how people of varying ages spend their time each day, as can be seen in Tables 5 and 6, including all 20 daily time usage variables (i.e., total minutes allotted to each activity at each wave) in the model did not significantly change any of the cross-sectional associations between age and well-being, nor any of the longitudinal associations between Time and well-being (i.e., all of the parameter estimates

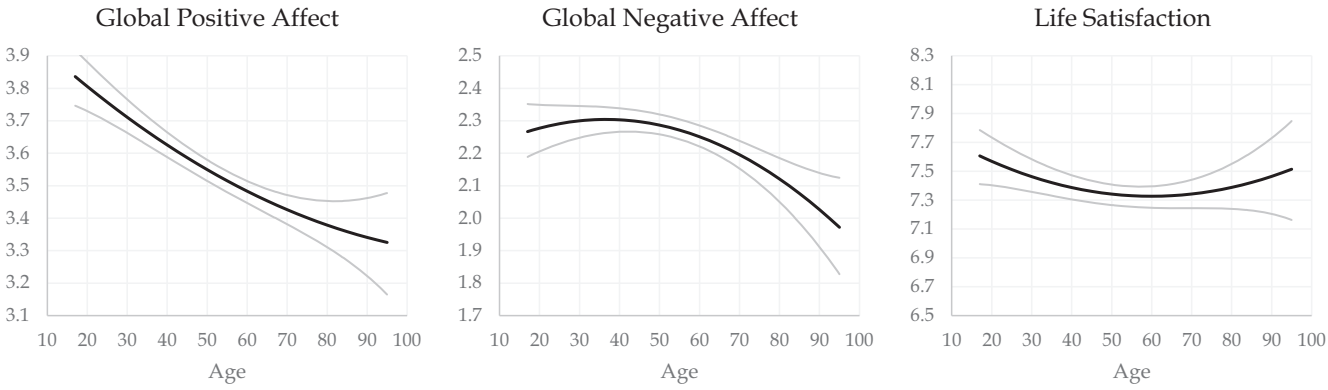

Figure 2. Model-predicted cross-sectional age patterns in global well-being with 95% confidence bands. All vertical axes depict 1 *SD* in the well-being variable. Global positive and negative affect were rated on a scale from 1 to 5, with higher numbers indicating greater affect. Life satisfaction was rated on a scale from 0 to 10, with higher numbers indicating greater satisfaction.

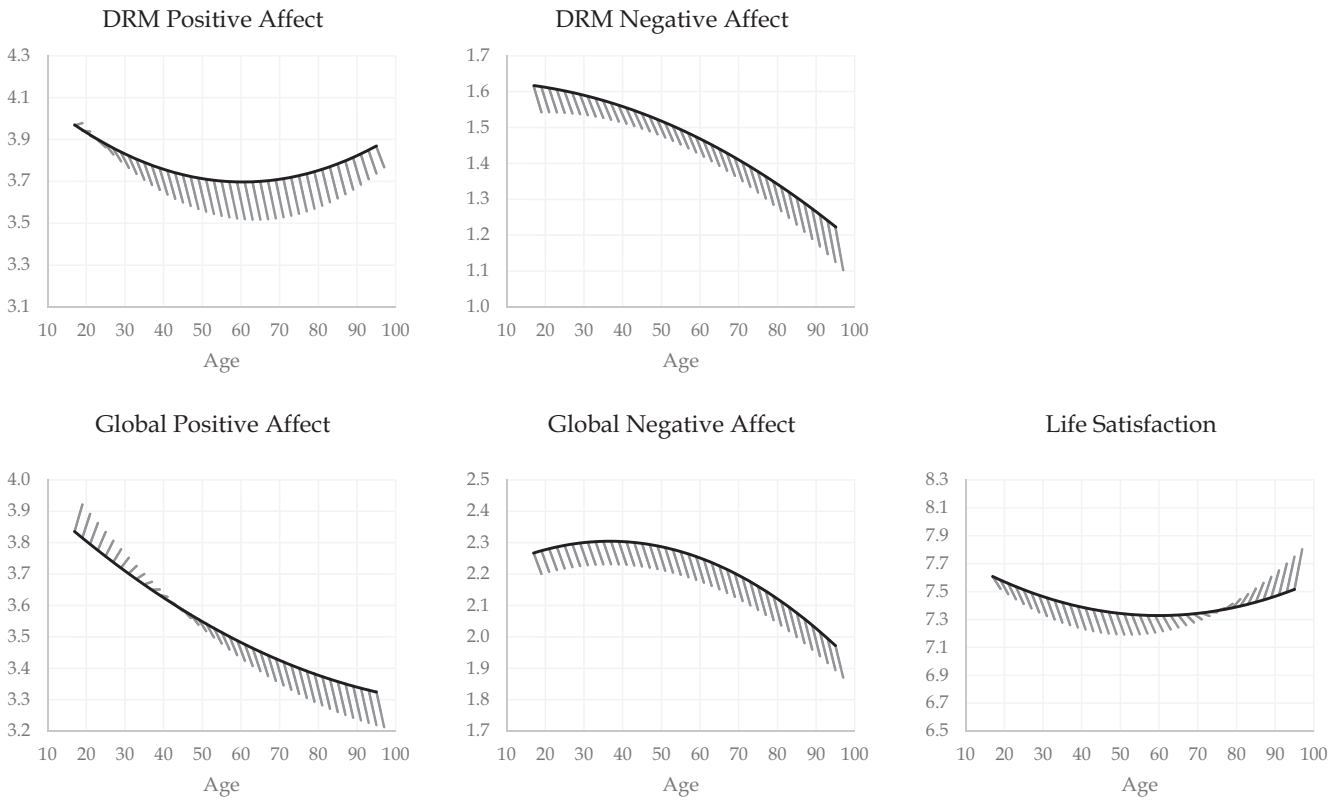

Figure 3. Combined model-predicted cross-sectional and longitudinal patterns in experiential and global well-being. All vertical axes depict 1 *SD* in the well-being variable. The solid dark lines represent the model-predicted cross-sectional associations between age and well-being. The short, gray lines represent the model-predicted 2-year longitudinal trajectories in each well-being variable for adults of different ages.

controlling daily time usage fell within the original/uncontrolled parameter estimates' confidence intervals). The only exception was that controlling daily time use reduced the linear association between age and daily negative affect ($b_L = -0.02$, 95% CI [−0.04, −0.01]; uncontrolled $b_L = -0.05$). Thus, the normative declines that occur with age and Time in both experiential and global affect generally cannot be explained by differences in how people of varying ages spend their time.[8]

Post Hoc Analyses

Analyses of individual emotions. Previous research suggests that "internalizing" negative emotions (e.g., sadness) may operate differently from "externalizing" ones (that compel external action; e.g., anger; Hudson, Lucas, Donnellan, & Kushlev, 2016). Moreover, older adults may strive to maximize low-arousal positive emotions (e.g., satisfaction) in lieu of high-arousal ones (e.g., enthusiasm; Scheibe et al., 2013). For our next series of analyses, we explored whether age might differentially predict the individual positive and negative emotions that were included in our composites.

As can be seen in Table 7, there were negative linear cross-sectional associations between age and daily enthusiasm, anger, worry, frustration, and stress (b_Ls ranged from $b_L = -0.12$, 95% CI [−0.14, −0.11] [stress] to $b_L = -0.02$, 95% CI [−0.03, −0.00] [worry]). In contrast, age was positively related to daily sadness ($b_L = 0.02$, 95% CI [0.01, 0.03], $\beta_L = .05$), and it was quadratically related to daily happiness ($b_Q = 0.02$, 95% CI [0.00, 0.03], $\beta_Q = .04$). In terms of longitudinal effects, all daily positive emotions as well as daily sadness decreased over time (bs ranged from $b = -0.09$, 95% CI [−0.05, −0.01] [happiness] to $b = -0.03$, 95% CI [−0.05, −0.01] [sadness]).

As can be seen in Table 8, this pattern partially replicated in the global emotion variables: age was negatively related to global anger ($b_L = -0.13$, 95% CI [−0.15, −0.11], $\beta_L = -.23$; $b_Q = -0.03$, 95% CI [−0.04, −0.02], $b_Q = -.09$) and was positively related to global sadness ($b_L = 0.03$, 95% CI [0.01,

[8] It is also possible that individual differences might moderate the associations between time use and well-being. For example, watching TV and working may spur loneliness and other negative affect when these activities are performed alone versus with others (e.g., Queen, Stawski, Ryan, & Smith, 2014). In the present data, statistically controlling for daily loneliness and total daily time alone did not statistically significantly alter the age or Time parameter estimates presented in Tables 2 and 3 (i.e., the controlled parameter estimates fell within the original estimates' CIs). Nevertheless, other individual differences—such as tendency to perceive events as stressful or disruptive—may moderate and/or mediate the effects of time use of well-being (e.g., Brose, Scheibe, & Schmiedek, 2013; Charles et al., 2010).

Table 4
Associations Between Age and Daily Time Usage

	Intercept			Age/10				$(Age/10)^2$			
		95% CI			95% CI				95% CI		
Outcome, minutes allocated to:	*b*	LB	UB	*b*	LB	UB	β	*b*	LB	UB	β
TV	123.70	118.58	128.83	**21.83**	19.71	23.96	**.32**	**2.04**	.93	3.15	**.06**
Eating	69.77	67.60	71.94	**9.42**	8.52	10.32	**.31**	**.61**	.14	1.08	**.04**
Rest/relaxation	49.13	45.47	52.79	**7.29**	5.77	8.82	**.14**	**3.00**	2.21	3.80	**.11**
Reading	14.84	12.98	16.71	**6.22**	5.44	7.00	**.24**	**1.31**	.91	1.72	**.10**
Housework	65.89	61.91	69.87	**5.66**	4.01	7.31	**.11**	**−2.09**	−2.95	−1.22	**−.08**
Gardening	16.88	14.64	19.12	**5.41**	4.47	6.34	**.17**	−.19	−.68	.30	−.01
Preparing food	31.08	29.23	32.93	**3.47**	2.70	4.24	**.15**	**−.75**	−1.15	−.35	**−.06**
Shopping	29.07	26.98	31.15	**2.93**	2.06	3.80	**.10**	**−.49**	−.95	−.04	**−.03**
Healthcare	6.82	5.67	7.97	**1.38**	.90	1.86	**.07**	.00	−.26	.25	.00
Phone	4.81	4.11	5.50	**.49**	.20	.78	**.04**	−.06	−.21	.10	−.01
Personal care	28.04	27.01	29.08	**.43**	.00	.86	**.03**	.22	−.01	.44	.03
Religion	1.42	.87	1.97	.15	−.08	.38	.02	.00	−.12	.13	.00
Pet care	9.32	7.87	10.78	.13	−.47	.73	.01	**−.52**	−.84	−.21	**−.06**
Sexual activity	.44	.11	.77	**−.16**	−.29	−.02	**−.03**	.02	−.05	.09	.01
Sports	11.33	9.50	13.16	−.17	−.93	.59	−.01	.27	−.13	.67	.02
Computer use	25.43	22.23	28.63	**−3.40**	−4.72	−2.07	**−.08**	.66	−.03	1.35	.03
Socializing	23.94	20.62	27.26	**−4.56**	−5.95	−3.18	**−.10**	**2.31**	1.59	3.04	**.09**
Commuting	52.55	48.50	56.61	**−8.83**	−10.51	−7.15	**−.15**	−.64	−1.53	.23	−.02
Childcare	31.91	27.97	35.85	**−9.59**	−11.21	−7.95	**−.20**	**−1.50**	−2.35	−.65	**−.06**
Working	215.64	205.40	225.90	**−57.75**	−61.99	−53.50	**−.42**	**−11.29**	−13.50	−9.07	**−.16**

Note. CI = confidence interval; LB = lower bound; UB = upper bound; 95% CIs for parameter estimates in boldface do not contain zero.

0.05], $\beta_L = .06$). Longitudinally, both anger and sadness decreased over time, whereas worry did not.

Finally, controlling for daily time use partially reduced the age patterns for only daily anger ($b_L = -0.04$, 95% CI [−0.05, −0.02], $\beta\text{-}_L = -.08$) and daily stress ($b_L = -0.06$, 95% CI [−0.08, −0.04], $\beta\text{-}_L = -.11$; see Tables S1 and S2 in the supplementary materials). All other estimates of the cross-sectional age associations controlling for daily time usage fell within the uncontrolled parameters' confidence intervals.

Thus, of the experiential positive emotions, only enthusiasm decreased as a function of age. In contrast, all experiential negative emotions were negatively correlated with age, except sadness. Global anger was also negatively related to age. In contrast, both experiential and global sadness were positively related to age. Longitudinally, only daily happiness, daily enthusiasm, daily satisfaction, daily sadness, global anger, and global sadness were predicted to decrease over time.

Can health and/or education explain our pattern of findings? Reviewers requested information regarding education and health—and whether controlling education and health might influence our pattern of findings. On average, participants had 12.20 years of education (*SD* = 2.65) and self-rated their overall health to be 3.39 (*SD* = 1.00) on a scale from 1 (*bad*) to 5 (*very good*). In 2012, health was correlated with daily positive affect ($r = .11$, 95% CI [.07, .15]), daily negative affect ($r = -.08$, 95% CI [−.12, −.04]), global positive affect ($r = .31$, 95% CI [.27, .35]), global negative affect ($r = -.31$, 95% CI [−.35, −.27]), and life satisfaction ($r = .43$, 95% CI [.40, .46]). In contrast, education was related only to global well-being (positive affect: $r = .07$, 95% CI [.03, .11]; negative

Table 5
Age and Time Predicting Experiential Well-Being, Controlling Daily Time Usage

	DRM positive affect				DRM negative affect			
		95% CI				95% CI		
Predictor	*b*	LB	UB	β	*b*	LB	UB	β
Intercept	4.04	3.90	4.19	—	1.69	1.61	1.77	—
Age/10	**−.04**	−.07	−.02	−.06	**−.02**	−.04	−.01	**−.06**
$(Age/10)^2$	.01	−.04	.02	.02	.00	−.01	.01	−.01
Time	**−.07**	−.11	−.03	**−.04**	−.01	−.03	.02	−.02
(Age/10) × Time	−.01	−.03	.00	−.02	.00	−.01	.01	.00
$(Age/10)^2$ × Time	.00	−.01	.01	.01	.00	−.01	.00	−.01

Note. DRM = day reconstruction method; CI = confidence interval; LB = lower bound; UB = upper bound; 95% CIs for parameter estimates in boldface do not include zero.

Table 6
Age and Time Predicting Global Well-Being, Controlling Daily Time Usage

	Global positive affect				Global negative affect				Life satisfaction			
		95% CI				95% CI				95% CI		
Predictor	*b*	LB	UB	β	*b*	LB	UB	β	*b*	LB	UB	β
Intercept	3.46	3.37	3.55	—	2.30	2.22	2.38	—	7.45	7.27	7.63	—
Age/10	**−.06**	−.08	−.04	**−.13**	**−.04**	−.06	−.02	**−.09**	.01	−.03	.05	.01
$(Age/10)^2$	.01	−.00	.02	.03	**−.01**	−.02	−.00	**−.04**	**.02**	.00	.04	**.04**
Time	−.02	−.04	.00	−.01	**−.03**	−.06	−.01	**−.04**	**−.07**	−.12	−.02	**−.02**
(Age/10) × Time	**−.02**	−.03	−.00	**−.03**	.00	−.01	.01	.00	.02	−.01	.04	.01
$(Age/10)^2$ × Time	.00	−.00	.01	.00	.00	−.01	.01	.00	.01	−.00	.02	.01

Note. CI = confidence interval; LB = lower bound; UB = upper bound; 95% CIs for parameter estimates in boldface do not include zero.

affect: $r = -.05$, 95% CI [−.09, −.01]; life satisfaction: $r = .08$, 95% CI [.04, .12]), but not experiential well-being (daily positive affect: $r = -.01$, 95% CI [−.05, .03]; daily negative affect: $r = .02$, 95% CI [−.02, .06]). Nevertheless, controlling education and health did not affect the basic pattern of results presented in Tables 2 and 3 with the exception that, holding health and education constant, age had a *positive* linear association with life satisfaction, $b = 0.11$, 95% CI [0.08, 0.16], β = .13. This may indicate that, were it not for systematic variation in health and education as a function of age, older adults would report greater life satisfaction than would their younger counterparts. This may suggest, for example, that age-graded changes in health may reduce well-being, whereas other factors that systematically vary with age (e.g., emotional stability; Roberts et al., 2006) may, in the absence of health problems, augment well-being.

Table 7
Age and Time Predicting Individual Experiential Emotions

	DRM happiness				DRM enthusiasm				DRM satisfaction			
		95% CI				95% CI				95% CI		
Predictor	*b*	LB	UB	β	*b*	LB	UB	β	*b*	LB	UB	β
Intercept	3.89	3.79	3.92	—	3.04	2.97	3.11	—	4.21	4.15	4.27	—
Age/10	−.02	−.05	.01	−.03	**−.06**	−.08	−.03	**−.07**	.00	−.02	.03	.00
$(Age/10)^2$	**.02**	.00	.03	**.04**	.01	−.01	.02	.02	.01	−.00	.03	.03
Time	**−.09**	−.14	−.04	**−.04**	**−.07**	−.12	−.02	**−.04**	**−.07**	−.11	−.02	**−.03**
(Age/10) × Time	−.01	−.03	.01	−.01	**−.02**	−.04	−.00	**−.02**	−.01	−.03	.01	−.01
$(Age/10)^2$ × Time	.01	−.01	.02	.01	.00	−.01	.02	.01	.01	−.01	.02	.01

	DRM anger				DRM sadness				DRM worry			
		95% CI				95% CI				95% CI		
Predictor	*b*	LB	UB	β	*b*	LB	UB	β	*b*	LB	UB	β
Intercept	1.59	1.55	1.62	—	1.26	1.23	1.29	—	1.52	1.48	1.56	—
Age/10	**−.07**	−.08	−.05	**−.14**	**.02**	.01	.03	**.05**	**−.02**	−.03	−.00	**−.03**
$(Age/10)^2$	−.01	−.02	.00	−.03	.01	−.00	.01	.03	.00	−.01	.01	−.01
Time	−.01	−.04	.02	−.02	**−.03**	−.05	−.01	**−.02**	.00	−.04	.03	−.01
(Age/10) × Time	.01	−.01	.02	.01	.00	−.01	.01	.00	−.01	−.02	.01	−.01
$(Age/10)^2$ × Time	.00	−.01	.00	−.01	.01	−.00	.01	.02	.00	−.01	.00	−.01

	DRM frustration				DRM stress			
		95% CI				95% CI		
Predictor	*b*	LB	UB	β	*b*	LB	UB	β
Intercept	1.51	1.47	1.54	—	1.64	1.60	1.68	—
Age/10	**−.05**	−.06	−.03	**−.10**	**−.12**	−.14	−.11	**−.22**
$(Age/10)^2$	−.01	−.01	.00	−.03	**−.01**	−.02	−.00	**−.04**
Time	−.01	−.04	.02	−.03	−.03	−.07	.01	−.03
(Age/10) × Time	.00	−.01	.01	.00	.00	−.01	.02	.00
$(Age/10)^2$ × Time	.00	−.01	.00	−.01	.00	−.01	.01	.00

Note. DRM = day reconstruction method; CI = confidence interval; LB = lower bound; UB = upper bound; 95% CIs for parameter estimates in boldface do not include zero.

Table 8
Age and Time Predicting Individual Global Emotions

	Global anger				Global sadness				Global worry			
		95% CI				95% CI				95% CI		
Predictor	*b*	LB	UB	β	*b*	LB	UB	β	*b*	LB	UB	β
Intercept	2.77	2.73	2.82	—	2.24	2.19	2.28	—	1.84	1.79	1.88	—
Age/10	**−.13**	−.15	−.11	**−.23**	**.03**	.01	.05	**.06**	.01	−.01	.03	.01
$(Age/10)^2$	**−.03**	−.04	−.02	**−.09**	.00	−.01	.01	−.01	.00	−.01	.00	−.02
Time	**−.06**	−.09	−.02	**−.04**	**−.04**	−.07	−.00	**−.03**	−.01	−.04	.02	−.02
(Age/10) × Time	−.01	−.03	.00	−.02	.00	−.01	.02	.00	.01	−.01	.02	.01
$(Age/10)^2$ × Time	.00	−.00	.01	.01	.00	−.01	.01	.00	.00	−.01	.00	−.01

Note. CI = confidence interval; LB = lower bound; UB = upper bound; 95% CIs for parameter estimates in boldface do not include zero. Global happiness was the only indicator of global positive affect; see Table 3.

Discussion

Previous research suggests that people's global evaluations of their well-being increase with age (e.g., Carstensen et al., 1996, 2000; Charles & Piazza, 2009; Diener et al., 1985; Kunzmann et al., 2013; Prenda & Lachman, 2001). There is increasing recognition, however, that people's global reports of their well-being are not identical to their in vivo experiences of well-being. For example, individuals' global evaluations of their well-being may capture their top-down beliefs and expectations regarding well-being (Robinson & Clore, 2002a, 2002b), which might be distinct from their actual momentary affective experiences (Kahneman et al., 2004; Kim-Prieto et al., 2005; Lucas et al., 1996). Given that experiential and global well-being are discriminant, the purpose of the present study was to examine whether experiential well-being—daily emotions—follows similar developmental patterns to global well-being.

Developmental Patterns in Global Well-Being

In our study, both global positive and negative affect exhibited negative cross-sectional associations with age and longitudinal decreases over 2 years, converging on the idea that older individuals may report less frequent emotions—whether positive or negative—as compared with younger persons. Thus, our study bolsters the conclusion that negative affect declines as a function of age—an effect that has been repeatedly observed in both the well-being (e.g., Charles et al., 2001; Lawton et al., 1993) and personality development literatures (e.g., Hudson et al., 2015; Roberts et al., 2006). This phenomenon likely represents a combination of normative changes in negative affectivity (Roberts, Wood, & Caspi, 2008), as well as older adults using emotion regulation strategies—such as selecting out of negatively emotionally charged situations—to a greater degree than do younger adults (Charles & Carstensen, 2008; Charles et al., 2009).

In contrast to negative affect, the existing literature on developmental patterns in positive affect is considerably more mixed—with studies variously finding that positive affect increases, decreases, or remains constant with age (e.g., Carstensen et al., 2011; Diener & Suh, 1998; Kunzmann et al., 2013; Vaux & Meddin, 1987). Our study aligns with prior research suggesting that global positive affect ebbs as a function of age (Diener & Suh, 1998; Lucas & Gohm, 2000). Collectively, this may point to a phenomenon in which older adults' emotional experiences—irrespective of valence—are attenuated. In other words, older adults may report lower levels of both positive and negative emotional experiences, as compared with their younger peers. This finding dovetails nicely with personality literature suggesting that aspects of extraversion—which includes positive affect—and neuroticism—negative affect—both appear to decrease with age (Roberts & Mroczek, 2008; Roberts et al., 2006).

Finally, our study found somewhat mixed cross-sectional and developmental patterns for life satisfaction. Age was negatively correlated with life satisfaction on a zero-order level, and life satisfaction tended to longitudinally decrease over time. However, these linear effects seemed to be an oversimplification of the patterns in our data. Specifically, despite neither effect reaching the threshold for statistical significance, both the cross-sectional and longitudinal analyses generally converged on the idea that life satisfaction may follow a U-shaped trajectory across adulthood—decreasing until about age 60–70, and then rebounding in late life (Baird et al., 2010; Blanchflower & Oswald, 2008; also see Figure S1 in the supplementary materials).

Developmental Patterns in Experiential Well-Being

Fewer existing studies have examined developmental patterns in experiential well-being—and these studies have found either no association between age and daily emotions (Charles & Pasupathi, 2003), or that daily positive affect increases as a function of age (Carstensen et al., 2011; Charles et al., 2010; Riediger et al., 2009). In contrast to these studies, we found that, mirroring the global patterns, composites of both daily positive affect and daily negative affect generally tended to decrease as a function of age and time. With respect to the former, in cross-sectional analyses, positive affect appeared to abate until about age 65 and then rebound in the lattermost years of life.

Why does experiential positive affect rebound among older adults? There are at least two potential explanations. First, late-life events may trigger increased positive affect. For example, retirement and the increased ability to freely pursue one's own interests may foster positive emotions. Seemingly arguing against this explanation is the fact that age-graded differences in daily time usage (e.g., time spent at work) did not attenuate the associations between age and experiential affect in our study (including the curvilinear association between age and positive affect). Never-

theless, *perceived* changes to one's circumstances (e.g., "I no longer *must* work") may facilitate positive affect, despite the fact that changes in actual time usage do not. Indeed, scholars have argued that the affective changes that accompany age may be largely attributable to differences in perspective (e.g., Brose, Scheibe, & Schmiedek, 2013; Charles & Piazza, 2009).

Second, the rebound in positive affect in old age may be attributable to attrition. Specifically, individuals who experience greater amounts of positive affect may live longer than those who experience fewer positive emotions (Carstensen et al., 2011). Thus, mean levels of positive affect may increase in old age merely because of greater mortality among those with lower levels of trait positive affect. Supporting this explanation, we did not find longitudinal increases in positive affect among the oldest adults in our sample; rather positive affect tended to universally longitudinally decrease across all ages.

Finally, it is worth mentioning that—although both experiential and global positive affect tended to decrease as a function of age—experiential positive affect rebounded among the oldest adults in our study, whereas global positive affect did not. This discontinuity may suggest that experiential and global well-being follow disparate developmental patterns in the lattermost years of life. Alternatively, there were various other differences between our global and experiential measures that may explain the divergence in their associations with age. For example, global positive affect had only one indicator—happiness—whereas the experiential measure of positive affect was a composite of three emotions: happiness, enthusiasm, and satisfaction. Moreover, the experiential measures asked participants to rate affective intensity (e.g., the *extent* to which an emotion was experienced) on a 7-point scale and were aggregated across only a single day, whereas the global measures contained questions regarding affective frequency over the prior 4 weeks (e.g., how *often* emotions were experienced) on a 5-point scale. These differences between the measures, rather than the global versus experiential distinction per se, may have contributed to the somewhat different developmental patterns observed in the lattermost years of life.

Exploratory Analyses of Specific Emotions

In addition to examining associations between age and broad dimensions of positive and negative affect (e.g., Watson et al., 1988), an emerging body of research has begun to examine whether discrete emotions exhibit differential associations with age. These studies have tentatively converged on the idea that anger cross-sectionally decreases across adulthood—perhaps because of older adults' greater ability to regulate their emotions—whereas sadness may remain constant across the majority of adulthood before increasing in the lattermost years of life, perhaps because of increasing prevalence of negative health and interpersonal experiences that accompany old age (e.g., death of loved ones; Kunzmann et al., 2014, 2013). Consistent with these emerging studies, we found negative cross-sectional associations between age and both global and experiential anger—and global (but not experiential) anger also longitudinally decreased over time. The age-graded patterns for sadness were, however, less consistent in our analyses. Specifically, both global and experiential sadness were positively correlated with age, but tended to decrease longitudinally over time.

Along these lines, scholars have recently begun to argue that, as compared with younger persons, older adults may strive to maximize low-arousal positive affective states (e.g., relaxation) in lieu of higher-arousal emotions (e.g., enthusiasm; Scheibe et al., 2013). Our findings provided mixed support for this notion. Although we did find a negative association between age and experiential enthusiasm, the only low-arousal positive emotion included in our study—satisfaction—did not increase cross-sectionally as a function of age, and it tended to longitudinally *decrease* over the study duration.

Implications, Limitations, and Future Directions

Our study suggests that older adults generally report lower levels of emotions—whether positive or negative, experiential or global—as compared with their younger counterparts. Moreover, both the cross-sectional and longitudinal analyses generally converged on these developmental patterns. Nonetheless, there were large discrepancies in the cross-sectional and longitudinal effect sizes. For instance, the cross-sectional analyses suggested that, for each decade of life, people tend to decrease 0.03 scale units in global negative affect (i.e., 0.003 units per year), whereas the longitudinal analyses suggested that people drop 0.04 units in global negative affect each year—an amount that is more than 13 times higher than the cross-sectional estimate.

Although our study is certainly not the first to find larger longitudinal associations than cross-sectional ones (e.g., Pinquart, 2001), the discrepancy in effect sizes is striking. We suspect some of these differences reflect methodological artifacts, such as testing effects. Specifically, repeatedly administering questionnaires has the potential to influence people's responses (Baltes, 1968; Choquette & Hesselbrock, 1987; Schaie, 1965; Sharpe & Gilbert, 1998; Windle, 1954). For example, people may be motivated to present an overly positive impression of themselves at first, and may then answer questions more realistically and honestly on subsequent waves—leading to apparently sharp, albeit ultimately artifactual, longitudinal declines over time. Alternatively, people may mentally compare their present situation to previous answers with repeated measurement (e.g., "Am I happier than I was *last time I completed the questionnaire*?"), producing exaggerated apparent changes over time. Ultimately, however, these types of testing effects are impossible to separate from true longitudinal changes with only a few waves of data and without refreshment samples who are reporting on survey items for the first time at different waves. Presumably such testing effects should become less problematic over extended periods of time and with many measurement occasions.

A second limitation of our study is that we did not have data on mechanisms that might link age to reductions in affect. Although we found that age-graded differences in daily time usage cannot explain developmental patterns in affect, other possibilities remain. For example, differences in life perspective (Charles & Piazza, 2009) or emotion regulation strategies (Charles et al., 2009) may explain differences in experiential well-being among younger and older adults. Future research should explicitly measure these potential mechanisms and test whether they mediate the link between age and well-being.

A third limitation is that we did not have data to explore potential moderators of our findings. For example, it may be the

case that older adults value low-arousal positive affective states (e.g., tranquility), as opposed to higher-arousal emotions (e.g., excitement, pride; Haase et al., 2012; Scheibe et al., 2013). Thus, it may be the case that high-arousal emotions, such as anger, enthusiasm, worry, or stress may correlate negatively with age (e.g., Kunzmann et al., 2014), whereas lower-arousal positive emotions may not. Future research should explore this and other potential moderators.

A fourth limitation is that we measured participants' experiential well-being using the day reconstruction method, which may be a less optimal measure of experiences than experience sampling (cf. Kahneman et al., 2004; also see the supplementary materials). This problem may be compounded if older adults have greater trouble remembering their affective states from the previous day—which may reduce the validity of their retrospective reports and bias them to be more similar to their global reports (e.g., Charles et al., 2015). Future research should directly compare the extent to which DRM and ESM produce similar patterns of findings for adults of different ages (e.g., Tweten et al., 2016).

One final limitation of our study is that we followed only one single cohort over a relatively short period of time. Thus, it is possible that our cross-sectional effects may have been attributable to cohort effects (rather than true age effects), and that our longitudinal effects represent history effects (rather than true developmental effects). Collectively, cohort and history effects can only be concretely evaluated (and potentially ruled out) by following multiple cohorts across a substantial portion of adulthood. Researchers should endeavor to collect this type of immensely valuable data; and when it is available, future scholars should examine the longitudinal and cross-sectional developmental patterns in well-being across many years in numerous cohorts.

Conclusion

Researchers have long been interested in identifying patterns of age-related variation in well-being. This interest stems, in part, from the fact that life circumstances potentially relevant to well-being change in systematic ways over the life span—and at the same time, various psychological processes that govern people's responses to life circumstances also change with age. Thus, age-related variation provides insight into the relative influence of circumstantial and psychological factors, and provide opportunities to test theories about why these factors may or may not matter. Our study extends past work on these questions by focusing both on global measures of well-being, including life satisfaction, positive affect, and negative affect; along with experiential measures of well-being, including day reconstruction method measures of positive and negative affect. The main conclusion of our study—that both global and experiential measures of affect seem to decline across the life span—has important implications for theories of well-being and life span development. Future work can extend these conclusions by continuing to refine experiential measures of well-being and by examining how these measures change over one's life.

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