

## ABSTRACT

BELLINGTIER, JENNIFER ANN. Implications of Awareness of Aging for Daily Well-Being in Older Adults. (Under the direction of Dr. Shevaun D. Neupert).

As sentient creatures, humans possess the ability to contemplate their own aging. Thus aging is not merely something that happens to individuals, but a process that individuals actively construct. The thoughts and feelings surrounding aging may influence important aging outcomes. Indeed, prior cross-sectional and longitudinal research has shown that a variety of awareness of aging constructs predict developmental outcomes including health, well-being, and mortality. This dissertation investigates the implications of awareness of aging for *daily* well-being in older adults.

The first manuscript examines the role of major life-event stressors and daily stressors in predicting daily subjective ages. Stressors may be a contributing factor in determining how old an individual feels, looks, or would like to be. However, few studies have explicitly examined the link between stress and subjective age in older adults. The findings indicate the importance of *both* daily and major life-event stressors for predicting daily subjective ages. Furthermore, mediational analyses indicate that the daily relationship between stressors and subjective age is mediated by negative affect.

The second manuscript investigates the influence of aging attitudes on daily stressor reactivity. Previous research comparing stressor reactivity in younger and older adults has produced mixed findings. The results indicated that aging attitudes may be an important individual differences factor that moderates older adults' reactivity to daily stressors. Those with more positive aging attitudes responded more resiliently to daily stressors.

The third manuscript brings together two awareness of aging constructs (i.e., Awareness of age-related change and attitudes toward own aging) to examine their interaction on daily negative affect. The study is the first to demonstrate significant intraindividual fluctuation in awareness of age-related losses and gains. Furthermore, the results indicated that individuals with more positive aging attitudes tend to report more awareness of aging-related gains, and less awareness of aging-related losses, whereas the reverse is true for those with more negative aging attitudes. Finally, findings suggest that when individuals with generally more positive aging attitudes experience awareness of an age-related loss they react with greater negative affect than individuals with generally more negative aging attitudes.

The discussion integrates the findings within the context of the current awareness of aging literature, as well as forging connections with Stereotype Embodiment Theory, the Weathering Hypothesis, Montepare's Lifespan Framework of Subjective Aging, and Baltes' Lifespan Psychology framework. Limitations and future research directions are discussed.

In sum, the three manuscripts all speak to the implications of awareness of aging for the daily well-being of older adults. They provide a complement to the existing literature that speaks to broader individual differences or that looks at change across larger time-scales (e.g., years or decades). The findings suggest that a complete understanding of daily well-being in adulthood should consider broader contexts, individual differences, and daily variability.

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Implications of Awareness of Aging for Daily Well-Being in Older Adults

by  
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## **DEDICATION**

To my husband, without whom our house would not be clean, our children would not be fed, and this dream would be unfulfilled. You are my lovely other dinosaur.

## BIOGRAPHY

Jennifer started work on her PhD in Lifespan Development at North Carolina State University in 2014. Prior to coming to NC State, she completed her BA at the University of Southern California, and her MA in Social Psychology at the University of Northern Iowa. At NC State she was a member of the Daily Well-Being in Adulthood Lab under the supervision of Dr. Shevaun Neupert. Her research interests focus on individuals' attitudes, beliefs, and feelings about their own aging, as well as how those beliefs develop and impact well-being. Her research has been featured by Time Magazine, CBS, and Fox News. She serves as the student representative on the executive boards of the American Psychological Association (Division 20) and the Southern Gerontological Society, as well as on the editorial board of the *Journal of Gerontology: Psychological Sciences*. After graduation, she will work as a postdoctoral research associate at Friedrich-Schiller-Universität in Jena, Germany.

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## TABLE OF CONTENTS

<b>LIST OF TABLES</b> .....	viii
<b>LIST OF FIGURES</b> .....	ix
<b>CHAPTER 1: Introduction</b> .....	1
Manuscript Aims .....	3
Summary .....	8
References .....	9
<b>CHAPTER 2: The Combined Effects of Daily Stressors and Major Life Events on Daily Subjective Ages</b> .....	16
Introduction .....	16
Method .....	18
Results .....	20
Discussion .....	21
References .....	23
<b>CHAPTER 3: Negative aging attitudes predict greater reactivity to daily stressors in older adults</b> .....	26
Introduction .....	26
Method .....	27
Results .....	28
Discussion .....	28
References .....	29
<b>CHAPTER 4: Aging Attitudes and Daily Awareness of Age-Related Change Interact to Predict Negative Affect</b> .....	31
Introduction .....	32
Method .....	35
Results .....	40
Discussion .....	41
References .....	44
<b>CHAPTER 5: Discussion</b> .....	51
Summary of Key Findings .....	51
Integration with Awareness of Aging .....	55
Connections to Stereotype Embodiment Theory .....	65
Connections to the Weathering Hypothesis .....	67
Connections to the Lifespan Framework of Subjective Aging .....	68
Broader Implications for the Lifespan Framework .....	69
Limitations & Future Directions .....	71

Conclusions.....	72
References.....	74
<b>APPENDICES.....</b>	<b>85</b>

## LIST OF TABLES

CHAPTER 2	
<b>Table 1.</b> Descriptive Statistics For Study Variables.....	18
CHAPTER 3	
<b>Table 1.</b> Unstandardized Coefficients (and Standard Errors) of Multilevel Model of Negative Affect .....	29
CHAPTER 4	
<b>Table 1.</b> Descriptive Statistics for Study Variables .....	48
<b>Table 2.</b> Unstandardized Estimates (and Standard Errors) from a Multilevel Model Predicting Daily Negative Affect.....	49

## LIST OF FIGURES

### CHAPTER 2

**Figure 1.** Interaction between major life event stressors (as measured by ELSI) and daily stressors for subjective ages (Panel A: Felt Age; Panel B: Ideal Age; Panel C: Look Age) .....21

### CHAPTER 3

**Figure 1.** Significant interaction between aging attitudes (as measured by ATOA) and daily stressors for negative affect.....29

### CHAPTER 4

**Figure 1.** Cross-level interaction of daily AARC losses and baseline ATOA predicting daily negative affect.....50

### CHAPTER 5

**Figure 1.** Awareness of Aging (AoA) in the context of life-span developmental processes and outcomes. ....84

## **CHAPTER 1: Introduction**

For humans, aging is not simply a matter of maturation, but a concept that is constructed and contemplated across time. The subjective interpretation of aging has been shown to have important developmental implications across the lifespan (Montepare, 2009). For example, perceiving the self to be subjectively younger is associated with increased positive affect (Westerhof & Barrett, 2005), higher life satisfaction (Gana, Alaphilippe, & Bailly, 2004; Kleinspehn-Ammerlahn, Kotter-Grühn, & Smith, 2008), increased self-efficacy (Boehmer, 2007), and flourishing mental health (Keyes & Westerhof, 2012). Furthermore, subjectively perceiving the aging process in a more positive light is associated with higher levels of life-satisfaction (Brothers, Miche, Wahl, & Diehl, 2015), better self-rated health (Beyer, Wolff, Warner, Schuz, & Wurm, 2015), improved social networks (Menkin, Robles, Gruenewald, Tanner, & Seeman, 2016), and higher levels of well-being (Levy, 2003).

In light of the predictive value of subjective aging constructs and the many ways the concepts have been assessed, Diehl and colleagues (2014) proposed the use of awareness of aging as an overarching term that captures the many ways we acknowledge, contemplate, and reflect on aging. Underneath this superordinate construct are the constructs of subjective age, aging attitudes, and awareness of age-related change (AARC). Subjective age refers to how old or young individuals seem to themselves including how old one feels (felt age), looks (look age), or would like to be (ideal age) (Kastenbaum, Derbin, Sabatini, & Artt, 1972).

Aging attitudes capture feelings and beliefs regarding the aging process. They are often measured using the Attitudes Toward Own Aging subscale of the Philadelphia Geriatric Center Morale Scale (Lawton, 1975) which asks individuals to make global evaluation of

their own aging (e.g., feeling less useful with age or as if things continue to get worse with age). A related construct, self-perceptions of aging is often used to refer to individuals' perceptions and evaluations of aging but assumes a multidimensional structure such that these perceptions are thought to be more complex than simply positive or negative (Diehl et al., 2014) and is often used in connection to stereotype embodiment theory (Levy, 2009) which theorizes that aging attitudes are shaped by a lifetime of exposure to aging stereotypes.

AARC is a relatively new construct that includes “all those experiences that make a person aware that his or her behavior, level of performance, or ways of experiencing his or her life have changed as a consequence of having grown older (i.e., increased chronological age)” (Diehl & Wahl, 2010, p. 340). AARC exists when individuals subjectively perceive themselves to have changed or experienced an event differently due to an increase in chronological age. These experiences may underlie individuals' subjective ages and aging attitudes.

Thus, previous work has demonstrated the important implications of subjective constructions of aging for well-being between-people and within-people across the years, but relatively little work has investigated the impact of awareness of aging for daily well-being. The following papers investigate the daily implications of multiple awareness of aging constructs for daily well-being, especially in regards to daily stressors.

## **Manuscript Aims**

The following manuscripts sought to address three main aims. First, we sought to investigate the stability of awareness of aging constructs by examining daily intraindividual variability. Second, we sought to identify daily factors associated with fluctuations in awareness of aging constructs. Third, we sought to examine the broader contexts, attitudes, and dispositions that moderate daily reactivity. In other words, we wanted to examine the between-person factors that are important for understanding within-person variability.

### **Manuscript 1**

The first manuscript examines the role of major life-event stressors and daily stressors in predicting daily subjective ages (felt, look, and ideal ages). Stressors may be a contributing factor in determining how old an individual feels, looks, or would like to be. Geronimus' (1992) weathering hypothesis proposes that increased exposure to stressors may artificially age or "weather" an individual. However, few studies have explicitly examined the link between stress and subjective age in older adults.

Schafer and Shippee (2010) examined changes in subjective age over a ten-year timeframe using data from the National Survey of Midlife Development in the United States (MIDUS; Brim et al., 1996; Ryff et al., 2006). They found that stressors increased middle-aged adults' felt age. In addition, Kotter-Grühn, Neupert, and Stephan (2015) found a within-person association between felt age and daily markers of well-being, including negative affect and total daily stressors.

The first manuscript is the first study to consider both major life-event stressors and daily stressors together in the context of subjective age. Stressors come in many varieties,

and in order to understand their impact, it is necessary to consider a broader picture of stressor exposure (Wheaton, 1999). Thus, the first aim of the first manuscript was to explore the interaction between major life-event stressors that have occurred over the past year and daily stressors reported on eight consecutive days.

We predicted that the relationship would vary based on the dimension of subjective age measured. For felt age we predicted that major life-event stressors would operate as an “anchor” (Montepare, 2009) that would remind older adults of their place in the lifespan and leave less room for daily “adjustment.” For look age we predicted that a stressful day would be more likely to result in an older look age for individuals who had previously experienced major life-event stressors. Finally, for ideal age we predicted that individuals high in both life-event and daily stressors would desire to return to a younger, presumably perceived as more positive (Ward, 2013), period in the lifespan and report younger ideal ages than individuals with fewer stressors.

Our second aim was to examine the process by which daily stress may relate to subjective ages. Shafer and Shippee (2010) demonstrated that the relationship between stress and felt age over a ten-year period was mediated by positive affect and personal control. We examined these relationships, as well as potential mediation by negative affect which has previously been associated with older subjective ages (Mock & Eibach, 2011; Westerhof & Barrett, 2005) and has been linked to higher levels of stress (Montpetit, Bergeman, Deboeck, Tiberio, & Boker, 2010; Watson, 1988). Taken together, we predicted that when a significant relationship exists between daily stressors and subjective age, it will be mediated by positive affect, personal control, and negative affect.

Data were drawn from the Anticipatory Coping Every Day (ACED) study (Neupert, Ennis, Ramsey, & Gall, 2016), consisting of 43 community dwelling older adults (39 women) ranging in age from 60-96 years. A nine day daily-diary survey assessed participants' stressors, control beliefs, positive and negative affect, and subjective ages. The first survey completed on Day 1 contained baseline assessments of individual difference variables including major life-event stressors; the remaining 8 days contained our diary measures (daily felt, look, and ideal ages, daily positive and negative affect, and daily control). Data were analyzed using multilevel modeling (MLM; Raudenbush & Bryk, 2002).

## **Manuscript 2**

The second paper investigates the relationship between aging attitudes and daily stressor reactivity. Those who report high levels of negative affect in response to daily stressors may be more likely to experience detrimental outcomes in regards to their mental (Charles, Piazza, Mogle, Sliwinski, & Almeida, 2013) and physical (Sin, Graham-Engeland, Ong, & Almeida, 2015) health. Older individuals may be among those who show heightened reactivity to daily stressors (Sliwinski, Almeida, Smyth, & Stawski, 2009), although evidence is mixed with some finding older age associated with less reactivity (Hay & Diehl, 2010) or no difference in reactivity (Schilling & Diehl, 2014). Differences in age-related findings may be due to individual differences in older adults (Hooker & McAdams, 2003). We proposed that individuals with more positive aging attitudes would be less reactive to daily stressors.

Possessing more positive aging attitudes could act as a resource that helps to protect individuals from negative reactions to stressors. For example, Levy, Hausdorff, Hencke, and Wei (2000) subliminally primed older adult participants with words related to either positive

(e.g., wise and creative) or negative (e.g., decrepit and senile) stereotypes of aging.

Individuals exposed to the negative stereotypes experienced greater cardiovascular reactivity in response to stressors, whereas those exposed to positive stereotypes experienced less cardiovascular reactivity and were less reactive to additional stressors (Levy et al., 2000).

Negative aging attitudes could act as a stress-diathesis, such that negative aging attitudes may function as a personal vulnerability to react negatively to stressful events (Laidlaw, 2010). Similarly, older adults with negative stereotypes of aging were 50% more likely to experience a stressful event (i.e., hospitalization) than their counterparts with positive stereotypes of aging (Levy, Slade, Chung, & Gill, 2014). Thus aging attitudes may be an important individual difference factor that impacts older adults' reactions to daily stressors. However, the impact of aging attitudes on daily stressors had yet to be investigated.

This study draws from the same dataset as the first manuscript, but here we focus on aging attitudes that were assessed on Day 1 using the Attitudes Towards Own Aging (ATOA) subscale of the Philadelphia Geriatric Center Morale Scale (Lawton, 1975). Additionally, we controlled for personality in our models as personality has been associated with both awareness of aging and reactions to stressors.

### **Manuscript 3**

The third manuscript brings together two awareness of aging constructs to examine their interaction on daily negative affect. Although previous work has included AARC in a qualitative daily diary study (Miche et al., 2014) and one study showed links between AARC loss and depression over 2.5 years (Dutt, Gabrian, & Wahl, 2016), we are unaware of any

studies that have examined the quantitatively measured day-to-day fluctuation in AARC and whether that fluctuation predicts daily well-being.

This study had three goals. First, we sought to examine if AARC demonstrates significant intraindividual fluctuation in both the losses (e.g., “With my awareness of aging today, I realize that I am slower in my thinking”) and gains (e.g., “With my awareness of aging today, I realize that I try to be more myself”) dimensions. Second, we sought to test if AARC experiences are related to aging attitudes. The AARC construct is thought to underlie other awareness of aging constructs (Diehl & Wahl, 2010), but this had not been tested on the daily level. We hypothesized that individuals who experience more AARC gains and fewer AARC losses would report more positive aging attitudes, whereas those who experience more AARC losses and fewer AARC gains would report more negative aging attitudes. Third, we examined how individuals’ aging attitudes moderate reactions to daily AARC losses. Based on Charles’ (2010) Strength and Vulnerability Integration which predicts that older adults have both strengths and vulnerabilities that impact their reactions to stressors, we expected that, for individuals with more positive aging, the relatively unfamiliar experience of a daily AARC loss would predict higher daily negative affect when compared to those with more negative aging attitudes who more frequently experience daily AARC losses.

Data for this study was collected online by adapting our paper and pencil measures for use with Qualtrics. Participants were recruited from across the US via Amazon’s Mechanical Turk (mTurk). We are aware of only one previous study using mTurk with a daily diary design and this represents an innovative aspect of the study. Of 139 initial

participants, 116 continued to the daily diary portion of the study. Participants were aged 60-90 ( $M = 64.71$ ,  $SD = 4.98$ , 61% women).

Participants completed online surveys over nine consecutive days. The Day 1 survey collected demographic information (e.g., age and SES) and individual differences in aging attitudes and AARC. The Day 2-9 surveys contained items assessing daily stressors, affect, and daily AARC.

### **Summary**

The following papers investigate the variety of ways awareness of aging influences the daily lives of older adults. Beginning with multidimensional subjective age, moving to attitudes towards aging, and concluding with AARC, we demonstrate that awareness of aging constructs can help us understand well-being in later life.

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# CHAPTER 2: The Combined Effects of Daily Stressors and Major Life Events on Daily Subjective Ages



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## The Combined Effects of Daily Stressors and Major Life Events on Daily Subjective Ages

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### Abstract

**Objectives:** Stressors may be a contributing factor in determining how old an individual feels, looks, or would like to be. Currently, little research has been devoted to understanding the relationship between stressors and subjective age in older adults. We focus on the combined impact of major life-event stressors and daily stressors on multiple indicators of subjective age: felt age, ideal age, and look age. Furthermore, we examine the process by which daily stressors relate to subjective ages by testing whether positive affect, control, and negative affect mediate this relationship.

**Method:** Using a daily-diary design, the current study measured older adults' (60–96 years old) stressors, subjective ages, personal control, and affect.

**Results:** Felt, ideal, and look ages each demonstrated a unique pattern of interactions between daily stressors and major life-event stressors. Furthermore, our findings suggest that on the daily level, the relationship between stressors and felt age is mediated by negative affect but not by control and positive affect.

**Discussion:** Findings indicate the need to consider the broader contextual picture of stressors, as well as their differential impact on multiple indicators of subjective age.

**Key Words:** Affect—Control—Daily stressors—Stressful life events—Subjective age.

A stressful day can make people feel older than their years. Although many have experienced the feeling, little research has been devoted to understanding the relationship between stressors and subjective age. Subjective age refers to how old or young individuals seem to themselves including how old one feels, looks, or would like to be (Kastenbaum, Derbin, Sabatini, & Artt, 1972). Although experience may confer wisdom and grace, a youthful identity is valued in many societies (Butler, 2005), and adults tend to report feeling younger than their chronological age (Barak & Stern, 1986).

Stress, or any event resulting in mental or physical distress (Aldwin, 2007), may be a factor individuals consider when determining their subjective ages. Increased exposure to stressors may artificially age, or “weather,” an individual. Geronimus (1992) originally proposed the “weathering hypothesis” to explain increased infant mortality rates among African American mothers compared with same-aged European American mothers. The accumulated stress of years of racial and social inequality had an aging effect on African American mothers, such that their physical age

was older than that of their European American counterparts. Foster, Hagan, and Brooks-Gunn (2008) extended the thinking on weathering from biological markers of physical age to subjective age. They showed that increased early-life stress amplified individual's perceptions of their age. In this case, young women who experienced higher levels of adolescent stress reported feeling older than their years.

Few studies have explicitly examined the link between stress and subjective age in older adults. Schafer and Shippee (2010) examined changes in subjective age (defined as felt age, or how old one feels) over a 10-year timeframe using data from the National Survey of Midlife Development in the United States (MIDUS; Brim et al., 1996; Ryff et al., 2006). They found that stressors increased middle-aged adults' felt age. In order to better understand the relationship between stressors and subjective age, a resource deterioration model was investigated. This model posits a mediational relationship, such that stress diminishes an individual's psychosocial resources, which then leads to reductions in well-being (Ensel & Lin, 1991). Congruent with this model, personal control and positive affect, both psychosocial resources, mediated the relationship between stressors and felt age (Schafer & Shippee, 2010). In addition, our work has documented a within-person association between felt age and daily markers of well-being, including negative affect and total daily stressors (Kotter-Gröhn, Neupert, & Stephan, 2015). Specifically, older adults felt older on days when they experienced more stressors or higher negative affect.

Daily exploration is critical because daily stressors, the annoying hassles of everyday life, can have a strong relationship with how one feels, which can be greater than the impact of major life events (Almeida, 2005; Kanner, Coyne, Schaefer, & Lazarus, 1981). Indeed, previous research looking at the impact of major life events such as retirement and widowhood (Ward, 2013) and death of a parent or sibling (Schafer & Shippee, 2010) found them to be unrelated to changes in subjective ages. Although major life events may not predict changes in subjective age independently, they can set the backdrop against which daily stressors are experienced. For example, mothers who previously experienced life-event stressors exhibited flattened levels of cortisol in response to daily stressors when compared with mothers without life-event stressors (Wong, Seltzer, Greenberg, & Hong, 2012). Stressors come in many varieties, and in order to understand their impact, it may be necessary to consider a broader picture of stressor exposure (Wheaton, 1999).

### Daily Stressors, Major Life-Event Stressors, and Subjective Age

The first aim of the current study is to explore the interaction between major life-event stressors that have occurred over the past year and daily stressors reported on 8 consecutive days. We suspect that this relationship may vary based on the dimension of subjective age measured. Embracing

current calls to adopt multidimensional approaches toward subjective age (Diehl, Wahl, Brothers, & Miche, 2015), we explore three facets of subjective age: felt age, ideal age, and look age.

### Felt Age

Prior work examining the relationship between stressors and subjective age has focused exclusively on felt age. Numerous studies have documented a relationship between youthful felt ages and desirable developmental outcomes: increased positive affect (Westerhof & Barrett, 2005), increased self-efficacy (Bohmer, 2007), flourishing mental health (Keyes & Westerhof, 2012), and longer life expectancies (Kotter-Gröhn, Kleinspehn-Ammerlahn, Gerstorf, & Smith, 2009). As the presence of stressors tends to be negatively associated with many of these indicators of well-being (Lazarus, 2006), it follows that the presence of stressors may also predict a tendency to feel older. However, when examining major life-event stressors the association has generally failed to emerge except in limited specific circumstances (cf. Schafer & Shippee, 2010), thus we do not expect to find it here. Nonetheless, individuals who have experienced major life-event stressors can react differently to daily stressors than individuals without this stressful history (Wong et al., 2012). Subjective ages may reflect a process of "anchoring and adjusting" one's perception of age based on internal and external cues (Montepare, 2009, p. 43). Life-event stressors may serve as an "anchor" for the felt age of older individuals, a major reminder of their place in the life course. Although this may not result in older felt ages in comparison to individuals who have not experienced these stressors, it may create a situation where they perceive less room for daily "adjustments." Individuals without major life-event stressors may therefore be more strongly affected by daily stressors, and thus more likely to report older felt ages on days with daily stressors.

### Ideal Age

Ideal age (also called desired age) reflects how old one would like to be. Ideal age captures a broader assessment of one's life (Ward, 2010), potentially making it less likely to be influenced by any one stressor (i.e., it may require one to consider both recent and past events). Furthermore, younger ideal ages (i.e., wanting to be younger than one's actual age), are related to *lower* levels of well-being perhaps reflecting a dissatisfaction with one's current age (Ward, 2010). Experiencing multiple types of stressors has also been associated with decreases in well-being (Mc Elroy & Hevey, 2014). We predict that individuals high in both life-event and daily stressors may desire to return to a younger, presumably perceived as more positive (Ward, 2013), period in the lifespan and report younger ideal ages than individuals with less stressors.

## Look Age

Look age refers to how old people believe they appear. Individuals often blame stress for changes in physical appearance. When recently asked what he would do differently if he could go back to his first day on the job, President Obama remarked that he would consider dying his hair sooner (Condon, 2015), presumably reflecting the toll of his stressful position. In the lab, stress has also been linked to a graying mane (Hara et al., 2011). Although stress may affect appearance, it is not clear whether those impacts would be felt immediately—if a single stressful day could produce an older perceived look age. We predict that a stressful day will be more likely to result in an older look age for individuals who have previously experienced major life-event stressors. We do not suspect that look age will be associated with daily stressors for individuals lacking this context.

## Personal Control and Affect as Mediators

The second aim of this study was to reexamine the process by which daily stress may relate to subjective ages. Schafer and Shippee (2010) demonstrated that the relationship between stress and felt age over a 10-year period was mediated by positive affect and personal control. Following this model, we also include measurements of positive and negative affect (Watson, Clark, & Tellegen, 1988), and personal control (Eizenman, Nesselroade, Featherman, & Rowe, 1997) as mediators at the daily level. Positive affect and control are thought to be psychosocial resources that enable individuals to maintain youthful identities (Ensel & Lin, 1991). In the Schafer and Shippee study, when stressors were present, individuals reported lower levels of resources (e.g., low positive affect), and low levels of resources predicted higher estimates of felt age. We expect a comparable mediating effect for positive affect and personal control on the daily level. We further suspect that on a daily level, individuals' subjective age may be influenced by negative affect. This assumption is based on findings from previous studies in which negative affect was associated with older subjective ages (Mock & Eibach, 2011; Westerhof & Barrett, 2005) and was linked to higher levels of stress (Montpetit, Bergeman, Deboeck, Tiberio, & Boker, 2010; Watson, 1988). Taken together, we predict that when a significant relationship exists between daily stressors and subjective age, it will be mediated by positive affect, personal control, and negative affect.

## Method

### Participants

Data were drawn from the Anticipatory Coping Every Day (ACED) study (Neupert, Ennis, Ramsey, & Gall, 2015), consisting of 43 community dwelling older adults (39 women) ranging in age from 60 to 96 years

**Table 1.** Descriptive Statistics for Study Variables

Variable	M	SD	Range
Total daily stressors	0.65	0.86	3.38
Life-event stressors	2.44	2.11	10.00
Personal control	3.04	0.58	2.00
Positive affect	3.20	0.81	3.72
Negative affect	1.13	0.19	0.90
Chronological age	74.65	8.19	36.00
Felt age	60.86	10.94	50.33
Felt age discrepancy	-13.84	11.28	47.21
Ideal age	54.85	13.87	64.79
Ideal age discrepancy	-19.80	13.45	55.45
Look age	63.69	9.01	38.63
Look age discrepancy	-10.97	8.44	35.50

Notes. Except in the case of life-event stressors which were measured once at baseline, means, standard deviations, and ranges are person-level average scores (averaged across all eight assessments). Discrepancy scores were calculated by subtracting chronological age from subjective age.

(see Table 1). Participants self-identified as European American ( $n = 20$ ), African American ( $n = 22$ ), and Asian ( $n = 1$ ). Their education level ranged from high school graduate (most common) to PhD or other professional degree, with the average being some college education. Nearly all participants reported their employment status as retired ( $n = 41$ ). Participants were compensated with a \$20 gift card.

Similar to past research, paired-samples  $t$  tests revealed that participants' chronological age ( $M = 74.65, SD = 8.19$ ) was significantly older than the age they felt ( $M = 60.86, SD = 10.94, t(42) = 8.01, p < .001, r = .33$ ), their ideal age ( $M = 54.85, SD = 13.87, t(42) = 9.65, p < .001, r = .35$ ), and their look age ( $M = 63.69, SD = 9.01, t(42) = 8.52, p < .001, r = .52$ ). The subjective age measures were themselves modestly correlated within-individuals (felt and ideal:  $\gamma_{10} = 0.26, t = 4.96, p < .001$ ; look and felt:  $\gamma_{10} = 0.31, t = 9.37, p < .001$ ; look and ideal:  $\gamma_{10} = 0.19, t = 5.48, p < .001$ ).

Based on previous work examining the weathering hypothesis, which posits that the accumulated stress experienced by African Americans due to racism and prejudice can have an aging effect, we examined our data for differences between our African American and European American participants. There were no differences between European American and African American participants in regards to number of reported total daily stressors ( $t(40) = 1.11, p = .271, \eta^2 = .04$ ), major life-event stressors ( $t(40) = -1.03, p = .308, \eta^2 = .03$ ), felt age ( $t(40) = -0.60, p = .555, \eta^2 = .01$ ), nor look age ( $t(40) = 1.11, p = .273, \eta^2 = .03$ ). However, African Americans ( $M = 71.86, SD = 8.48$ ) were significantly younger than European Americans ( $M = 77.90, SD = 6.94, t(40) = 2.51, p = .016, \eta^2 = .14$ ), and African Americans ( $M = -15.57, SD = 12.74$ ) reported significantly less discrepancy between their chronological age and ideal age than European Americans

( $M = -23.40$ ,  $SD = 12.75$ ,  $t(40) = -1.99$ ,  $p = .054$ ,  $\eta^2 = .15$ ). On average, African Americans reported that they would choose to be 15.57 years younger than their chronological age, whereas European Americans would choose to be 23.40 years younger than their chronological age. This resulted in African Americans ( $M = 56.30$ ,  $SD = 12.06$ ) and European Americans ( $M = 54.50$ ,  $SD = 15.14$ ) desiring to be roughly the same ideal age, approximately 55 years old ( $t(40) = -0.43$ ,  $p = .672$ ,  $\eta^2 = .76$ ).

### Procedure

A 9-day daily-diary survey assessed participants' stressors, control beliefs, positive and negative affect, and subjective ages. Surveys were given to participants at senior-centers and club meetings in conjunction with a cognitive screening (Short Blessed Test; Katzman et al., 1983). Only individuals who scored below 8 on the screening were included. Participants completed the survey on a daily basis in their own homes. Individuals were instructed to fill in the date, start time, and end time daily for each survey and to complete the surveys on consecutive days. In line with previous paper and pencil diaries with older adults documenting high compliance rates (e.g., Normative Aging Study; Neupert, Almeida, Mroczek, & Spiro, 2006a, 2006b, Neupert, Mroczek, & Spiro, 2008) participants were not given daily reminders, but were told to skip a day and move on to the next if a day was missed. All participants completed at least 6 days.

The first survey completed on Day 1 contained baseline assessments of individual difference variables including major life-event stressors; the remaining 8 days contained our diary measures. Participants returned their surveys by mail at the end of the study. The compliance rate was 98.2%, with 380 out of a possible 387 days completed. It is important to note that the aims for the present study rely on day-level information, so power was primarily derived from the number of days (Snijders, 2005). Post hoc estimates of power (Faul, Erdfelder, Lang, & Buchner, 2007) for the most complex analysis (i.e., within-person main effects, between-person main effects, and the cross-level interaction) indicated that we had a power level of .82 when assuming a small effect size (.15).

### Daily-Diary Measures

#### Daily Stressors

Daily stressors were measured using the Daily Inventory of Stressful Events (DISE; Almeida, Wethington, & Kessler, 2002). Participants indicated whether they had experienced seven types of stressors within the past 24 hr, these included: disagreements, potential disagreements, stressful events in the workplace/volunteer setting, stressors at home, network stressors, (e.g., stressors occurring to one's family and friends), personal health stressors, (e.g., problems receiving treatment, medication-related issues, and illnesses),

and other stressors. Individuals received a summed total stressor score for each day with higher scores indicating more stressors. For a description of daily stressor frequencies in the ACED sample see Neupert et al., 2015. Overall, participants reported at least one daily stressor on 36% of study days and multiple stressors on 15% of study days, similar to reported levels (39% and 10% respectively) of daily stressors in the National Study of Daily Experiences (Almeida et al., 2002).

#### Daily Personal Control

Personal control was assessed by a four-item inventory, which asked participants to indicate how much control they felt over four areas (memory, physical activity, schedule, and things overall) in the past 24 hr (Eizenman et al., 1997). Five answer choices were provided, ranging from "0-not at all" to "4-in complete control." Scores were averaged across items, and participants received a daily score indicating their average level of control (for Day 1,  $\alpha = .71$ ).

#### Daily Positive and Negative Affect

Positive and negative affect were assessed using the Positive and Negative Affect Schedule (PANAS; Watson, et al., 1988). The PANAS consists of two 10-item mood scales. Positive affect was measured by words such as excited, attentive, and enthusiastic, whereas negative affect was measured by words such as hostile, scared, and distressed. Participants were asked to indicate the extent to which they felt these emotions in the past 24 hr. Responses were measured on a 5-point Likert scale, such that higher scores indicated more of the affect. Scores for each item were averaged, and the participants received a daily score for positive and negative affect (for Day 1: PA  $\alpha = .89$ ; NA  $\alpha = .84$ ).

#### Daily Subjective Age

Subjective age was assessed with three items: How old do you feel today? (felt age); If you could choose your age, how old would you want to be today? (ideal age); and How old would you say you look today? (look age) (cf. Kastenbaum et al., 1972). Participants indicated their response by filling in the appropriate number of years. We used discrepancy scores calculated by subtracting chronological age from each subjective age score. Positive scores indicated a subjective age older than the participant's chronological age. Negative scores were more common and indicated that participants reported a subjective age younger than their chronological age.

#### Major Life-Event Stressors

The Elders Life Stress Inventory (ELSI; Aldwin, 1991) measures 31 major life-event stressors that older adults may experience. Among the most commonly reported stressors were: death of a friend, death of a close family member, deterioration in finances, and deterioration

in health. Participants checked yes or no to indicate if they had experienced any of these stressors in the past 12 months.

### Analysis

Data were analyzed using multilevel modeling (MLM; Raudenbush & Bryk, 2002). In our first models we predicted daily changes in each of our three subjective age measures (felt age, ideal age, and look age) using total daily stressors (Level 1) and major life-event stressors (Level 2), as well as several between-person covariates considered by Schafer and Shippee (2010): chronological age, education, income, gender, race, and retirement status (Level 2). Given the low number of men in our sample, all analyses were rerun with men ( $n = 4$ ) excluded. All pattern of results (including interactions) remained.

Chronological age was a significant covariate for felt age ( $\gamma_{01} = -0.60$ ) and look age ( $\gamma_{01} = -0.52$ , but not ideal age ( $\gamma_{01} = -0.49$ ). As chronological age was not a significant covariate of ideal age, we examined a model excluding it. This did not change the pattern of results. Chronological age was retained in all subsequent analyses, whereas the other nonsignificant covariates have been removed from our models. There was one other significant covariate. Specifically, race was a significant covariate for look age ( $\gamma_{03} = 5.45$ ). A model including race as a covariate did not change the pattern of results. To maintain consistency across subjective age variables, we report the model excluding race.

We also tested linear time (i.e., day of study) as a within-person (Level 1) covariate. It was not significantly related to any of the indicators of subjective age so it was not retained in the models. In addition, all models were conducted with group-mean centered (Raudenbush & Bryk, 2002) within-person scores to adjust for the fact that some participants might be exposed to more daily stressors on a regular basis than others. The pattern of results remained unchanged so we report the uncentered results for ease of interpretation.

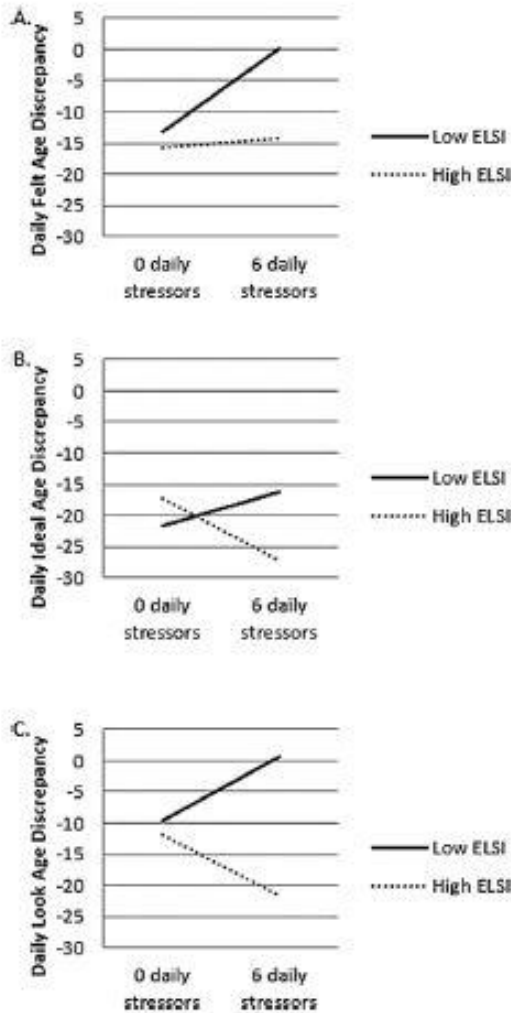
### Results

We conducted unconditional models to assess the level of variability within (Level 1) and between (Level 2) individuals in the subjective age measures. As previously noted in Kotter-Gröhn et al. (2015), 77% of variability in felt age was between people and 23% of variability was within people. For ideal age 83% of variability was between people and 17% of variability was within people. For look age, 81% of variability was between people and 19% of variability was within people. All three subjective age measures demonstrated significant variability ( $p < .0001$ ) within people, suggesting significant day-to-day variability in all indicators of subjective age.

Our first aim concerned the daily association between daily stressors, major life-event stressors, and three separate measures of subjective age when controlling for chronological age. Each additional daily stressor predicted a 2.41 years increase in felt age ( $\gamma_{10} = 2.41, t = 2.90, p = .004$ ; cf. Kotter-Gröhn et al., 2015) and a 2.01 years increase in look age ( $\gamma_{10} = 2.01, t = 3.67, p = .0003$ ). For example, on days when individuals experienced two stressors, they felt approximately 5 years older and believed that they looked over 4 years older than they did on a stressor-free day. There was not a significant main effect of daily stressors on ideal age ( $\gamma_{10} = 1.12, t = 1.35, p = .178$ ). Most participants reported experiencing life-event stressors, however 16% reported none. As predicted, there were no main effects for major life-event stressors: felt age ( $\gamma_{02} = -0.58, t = -0.75, p = .459$ ), ideal age ( $\gamma_{02} = 1.08, t = 1.09, p = .282$ ), and look age ( $\gamma_{02} = -0.55, t = -0.99, p = .330$ ). These models included the interaction of life-event stressors and daily stressors.

As can be seen in Figure 1, main effects were qualified by significant cross-level interactions within all dimensions of subjective age: felt age ( $\gamma_{11} = -0.48, t = -2.05, p = .041$ ), ideal age ( $\gamma_{11} = -0.62, t = -2.66, p = .008$ ), and look age ( $\gamma_{11} = -0.80, t = -5.20, p < .0001$ ). Individuals who had not experienced a major life-event stressor in the past year tended to feel older on days with daily stressors, but individuals who had experienced life-event stressors did not show this trend. In regards to ideal age, individuals experiencing both daily stressors and major life-event stressors desired to be younger than individuals only experiencing daily stressors. Finally, individuals high in major life-event stressors perceived themselves to look younger on days high in daily stressors, but those low in life-event stressors did not follow this trend. These models explained 12%, 2%, and 20% of the within-person variance and 15%, 2%, and 22% of the between-person variance in felt, ideal, and look age, respectively (Snijders & Bosker, 2012).

For our second aim, we tested whether the relationship between daily stressors and subjective age was mediated by daily measures of control and affect when including the contextual effect of major life event stressors and controlling for age differences. Following the conventions for lower level mediation in multilevel modeling outlined by Kenny, Korchmaros, and Bolger (2003), mediation effects were only assessed in situations where daily stressors significantly predicted changes in subjective age. In our study this applied to felt age as predicted by total stressors (when we removed the cross-level interaction of major life-event stressors and daily stressors, the main effect of daily stressors on look age was no longer significant,  $\gamma_{10} = -0.35, t = -1.09, p = .2752$ ). The first step of mediation found that total stressors were significantly related to felt age ( $\gamma_{10} = 1.01, t = 2.12, p = .0345$ ). In the second step of mediation, a higher number of total stressors was significantly related to higher positive affect ( $\gamma_{10} = 0.10, t = 3.00, p < .003$ ) and higher negative affect ( $\gamma_{10} = 0.10, t = 6.44,$



**Figure 1.** Interaction between major life-event stressors (as measured by the Elders Life Stress Inventory [ELSI]) and daily stressors for subjective ages (A: felt age; B: ideal age; C: look age). Low and high ELSI were operationalized as 1 *SD* below and above the mean, respectively. All interactions are significant.

$p < .0001$ ), but not control ( $\gamma_{10} = -0.07, t = -1.86, p = .064$ ). In the third step of mediation, total stressors ( $\gamma_{10} = 1.09, t = 2.27, p = .024$ ) remained significant whereas positive affect ( $\gamma_{20} = -0.72, t = -0.91, p = .364$ ) did not significantly relate to felt age (Sobel test,  $z = -0.87, p = .398$ ). Thus, we found no evidence for mediating effects of positive affect or control. However, the relationship between total stressors and felt age ( $\gamma_{10} = 0.67, t = 1.36, p = .175$ ) was fully mediated by negative affect ( $\gamma_{20} = 3.92, t = 2.41, p = .017$ ). A follow-up Sobel test confirmed mediation ( $z = 2.26, p = .024$ ), and this model accounted for 10% of the within-person and 12% of the between-person variance.

## Discussion

The present study expands current understandings of the relationship between stressors and subjective age at the daily level. Specifically, this is the first study to consider the combined impact of major life-event stressors and daily stressors on multiple measures of subjective age. Furthermore, we examined the mediational role of personal control and affect. Additionally, this is the first study to demonstrate significant daily within-person variance in ideal age and look age.

Our initial aim concerned the interaction of daily stressors and major life-event stressors. The latter had often proven unrelated to judgments of subjective age (Ward, 2013), but they had yet to be examined in conjunction with daily stressors. We believe major life-event stressors can serve as a context for understanding the impact of daily stressors (Wheaton, 1999). Supporting this view, we found that major life-event stressors do not independently predict changes in subjective ages, but in each case significantly and uniquely qualify the relationship between daily stressors and each measure of subjective age: felt, ideal, and look ages.

We predicted that felt age might be more strongly anchored for individuals who had previously experienced life-event stressors (Barrett & Montepare, 2015), whereas individuals who lacked this context would show a greater response to daily stressors. Our results support this view. Individuals high in major life-event stressors showed little change in their felt age ratings in response to daily stressors, but individuals without major life-event stressors felt considerably older when faced with daily stressors. This finding supports the premise that it is important to consider both distal and proximal sources of influence when assessing felt ages (Montepare, 2009). It also qualifies findings of a main effect for daily stressors on felt ages (Kotter-Grüthn et al., 2015). Daily stressors appear to have a larger impact for individuals who have not experienced major life-event stressors in the past year. On the other hand, individuals who have experienced a major loss or change may find their daily stressors less influential in determining how old they feel.

Ideal age captures a broader assessment of one's life, and is less swayed by minor events (Ward, 2010). Therefore, we expected that alterations in ideal age would require a higher combination of stressors. Individuals who had experienced both major life-event stressors and daily stressors desired to be younger than individuals without this combination of stressors, although this accounted for a relatively small proportion of the variance. Coveting a younger age may reflect a desire to escape from the multitude of stressors one faces. Humans show a tendency to idealize the past and see earlier times through rose-colored glasses (Mitchell, Thompson, Peterson, & Cronk, 1997). It is interesting to note that on average our sample desired to be 55 years old. This may reflect an interest in returning to a period of "peak functioning" as the midlife years have been

described (Lachman, 2004) or a desire to return to a more rosy historical moment. This cohort of adults would have hit midlife in the late 1990s, a period of economic prosperity and before the war on terror. When faced with both life-event stressors and daily stressors, older adults may be more inclined to seek the solace of a younger, perhaps perceived as more positive, age.

Look age captures an assessment of our physical appearance, how old we look when gazing into a mirror (Kastenbaum et al., 1972). Stress is associated with changes in physical appearance such as gray hairs (Hara et al., 2011). We anticipated that daily stressors would not be enough to change assessments of look age, absent the contextual stress of major life events. Contrary to our expectations, individuals without major life-event stressors trended toward older assessments of look age on days with daily stressors, perhaps reflecting a similar pattern of adjustment seen in felt age (i.e., look ages are more malleable for individuals who have not experienced a major life-event stressor in the past year). Surprisingly, individuals who had previously experienced major life-event stressors perceived themselves to look younger on days with daily stressors. These individuals may be better able to put daily stressors into perspective, or to use them as opportunities to successfully manage stressors. Alternately, look ages have been found to more closely match observers' estimates of ages than individuals' chronological ages (Kotter-Grühn & Hess, 2012). Perhaps stressful days also contain more opportunities for interactions with others, which then impact judgments of look age.

In order to understand how stressors potentially affect subjective age, we tested the following three mediators: positive affect, negative affect, and control. Schafer and Shippee's (2010) 10-year study found that positive affect and control served as mediators between stress and subjective age. In the present study control was unrelated to daily stressors. Daily fluctuations in control beliefs may be less meaningful for subjective age than more global trait-like measures. Although changes in daily stressors were related to changes in positive affect, positive affect did not mediate the relationship between the total number of stressors and felt age. Furthermore, on a daily basis positive affect and stressors were positively correlated in direct contradiction of the resource deterioration model (Ensel & Lin, 1991), which hypothesizes that stressors would lead to a reduction in positive affect.

Empirical evidence provides mixed results in regards to the daily relationship between stress and positive affect. Stawski, Sliwinski, Almeida, and Smyth (2008) found lower levels of positive affect in older adults, but not in younger adults, on stressor days. Röcke, Li, and Smith (2009) found the reverse: positive affect was lower in younger adults on stressor days, but unaffected in older adults. Similar to our findings, Uchino, Berg, Smith, Pearce, and Skinner (2006) found higher levels of positive affect in older adults when they had recently experienced a stressor. Thus a clear

relationship has yet to be established on the daily level. One possibility could be that older adults who experience stressors, but have success in managing them, may experience an uptick in positive affect. Thus stressors that are successfully managed may lead one to feel older in a positive sense, such that one has overcome a difficulty and is now older and wiser as a result of the experience. Although positive affect did not mediate relationship between stressors and felt age in our sample, it may be worth reexamining in future studies.

We found evidence for a mediation role of negative affect in regards to total stressors and felt age. Adding negative affect into our model completely mediated the relationship between daily stressors and felt age. Stress has been previously linked to higher levels of negative affect on the daily level (Röcke, et al., 2009; Uchino, et al., 2006), and higher negative affect is associated with higher subjective age estimates between (Mock & Eibach, 2011; Westerhof & Barrett, 2005) and within people (Kotter-Grühn et al., 2015). It appears that the negative mood that often accompanies stressors, although not necessarily wholly attributable to stressors, may be responsible for the higher gauging of felt age.

Our findings should be viewed in light of the following limitations. First, our sample consisted of American older adults with a high percentage of female participants. Stressors may not have the same impact on the subjective age ratings of younger adults, a more gender balanced sample, or individuals residing in countries with more positive views of aging. However, our results in regards to the aging effects of stressors on felt age are consistent with findings from a larger MIDUS sample (Schafer & Shippee, 2010). Next, although we had sufficient variability to examine within-person effects, our variability was lowest for ideal age, which may be the reason why we were able to account for a relatively small proportion of the within-person variance in this variable. Finally, our data are correlational and thus cannot make statements about the direction of effects. For instance, it may be that on days when individuals feel older they are more likely to experience stressors.

Moving forward, future work should consider other stressor types. Although we have added nuance to the understanding of the impact of stressors by considering both daily stressors and major life-event stressors, chronic stressors should also be examined as part of the broader stressor context. These reoccurring problematic stressors can permeate daily life and serve as an additional context from which to understand other stressors (Wheaton, 1999). Additionally, although many dimensions of subjective age do not show a gender difference, look age has shown discrepancies in the past (Henderson, Goldsmith, & Flynn, 1995), thus our finding regarding the interactions of daily stressors and major life-event stressors on look age should be further investigated with men.

In regards to our mediational analyses, we were able to show that mediational relationships that work across

a decade (cf. Schafer & Shippee, 2010) do not necessarily hold on a day-to-day basis. However, there is a vast chasm of time between a day and a decade. The mediating role of negative affect, found here at the daily level, should be reexamined on a longer time frame. It may be that negative affect has its greatest impact on the daily level, and that as time passes older adults are able to reevaluate the stressor thereby removing some of its negative impact (Urban, Charles, Mogle, & Almeida, 2014). Additionally, the mediational role of positive affect and control might re-emerge when measured monthly or yearly. Ultimately, understanding the associations between stressors and subjective ages may allow us to identify new pathways through which we can optimize life satisfaction.

In conclusion, this is the first study to concurrently examine the impact of daily stressors and major life-event stressors on subjective age. Our findings indicate that the impact of major life-event stressors may be missed when it is studied individually. Furthermore, our findings suggest that on the daily level, the relationship between stressors and felt age is explained by negative affect. Finally, by taking a multidimensional approach to the measurement of subjective age, we were able to show that stressors have unique impacts on felt, look, and ideal ages.

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# CHAPTER 3: Negative aging attitudes predict greater reactivity to daily stressors in older adults



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Brief report

## Negative Aging Attitudes Predict Greater Reactivity to Daily Stressors in Older Adults

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### Abstract

**Objectives:** In order to understand conflicting findings regarding the emotional reactions of older adults to daily stressors, we examined the possibility that negative aging attitudes could function as an important individual differences factor related to stressor reactivity.

**Method:** Using a daily diary design, we examined the aging attitudes of 43 older adults reporting on 380 total days. Participants reported their aging attitudes on Day 1, followed by their stressor exposure and negative affect on Days 2–9. Covariates included age, gender, education, and personality.

**Results:** Using multilevel modeling, our results suggest that individuals with more positive aging attitudes report consistent levels of affect across study days regardless of stressors, whereas those with more negative aging attitudes reported increased emotional reactivity to daily stressors.

**Discussion:** Positive aging attitudes may serve as a resource that helps buffer reactions to daily stressors.

**Keywords:** Affect—Aging attitudes—Daily stressors—Reactivity

Daily stressors often elicit negative emotional reactions (Almeida, 2005), although individuals vary in their reactivity (Neupert, Almeida, & Charles, 2007). Those who report high levels of negative affect in response to daily stressors may be more likely to experience detrimental outcomes in regard to their mental (Charles, Piazza, Mogle, Sliwinski, & Almeida, 2013) and physical (Sin, Graham-Engeland, Ong, & Almeida, 2015) health. Older individuals may be among those who show heightened reactivity to daily stressors (Sliwinski, Almeida, Smyth, & Stawski, 2009), although evidence is mixed with some finding older age associated with less reactivity (Hay & Diehl, 2010) or no difference in reactivity (Schilling & Diehl, 2014). Differences in age-related findings may be due to individual differences in older adults (Hooker & McAdams, 2003). We propose that individuals with more positive aging attitudes may be less reactive to daily stressors.

### Aging Attitudes

Individuals vary in their response and feelings regarding the aging process (Mock & Fibach, 2011). Although aging may be associated with feelings that one has become less useful, others may feel similarly happy and lively in older age as compared to their youth (Lawton, 1975). Possessing more positive views of one's own aging is associated with higher levels of life satisfaction (Brothers, Miche, Wahl, & Diehl, 2015), better self-rated health (Beyer, Wolff, Warner, Schütz, & Wurm, 2015), improved social networks (Menkin, Robles, Gruenewald, Tanner, & Seeman, 2016), and better well-being (Levy, 2003).

Given its association with advantageous developmental outcomes, possessing more positive aging attitudes (or self-perceptions of aging) may act as a resource that helps to protect individuals from negative reactions to stressors. For example, Levy, Hausdorff, Hencke, and Wei (2000) subliminally primed older adult participants with words related

to either positive (e.g., wise and creative) or negative (e.g., decrepit and senile) stereotypes of aging. Individuals exposed to the negative stereotypes experienced greater cardiovascular reactivity in response to stressors, whereas those exposed to positive stereotypes experienced less cardiovascular reactivity and were less reactive to additional stressors (Levy et al., 2000). Additionally, women with more negative attitudes toward aging reported experiencing more intense menopausal symptoms than women with more positive attitudes (Nosck et al., 2010).

Negative aging attitudes could act as a stress–diathesis, such that negative aging attitudes may function as a personal vulnerability to react negatively to stressful events (Laidlaw, 2010). Similarly, older adults with negative stereotypes of aging were 50% more likely to experience a stressful event (i.e., hospitalization) than their counterparts with positive stereotypes of aging (Levy, Slade, Chung, & Gill, 2014). Thus, aging attitudes may be an important individual difference factor that affects older adults' reactions to daily stressors. However, the impact of aging attitudes on daily stressors has yet to be investigated.

### Daily Stressors and Affect

Referring to the everyday hassles of life, daily stressors can have a substantive impact on well-being, sometimes eclipsing the impact of major life events (Almeida, 2005). The effect of daily stressors may be felt differently across the life span. Older adults may develop better emotional regulation skills over a lifetime of managing stressors, and these skills may help them to avoid or reframe the meaning of stressful events (Charles, 2010). On the other hand, older adults may be more vulnerable to stress due to diminished physiological flexibility or fewer social supports (Charles, 2010; Schilling & Diehl, 2014).

Emotional/affective reactivity refers to the degree of an individual's change in affect (typically negative) on days with, as opposed to without, stressors (Stawski, Sliwinski, Almeida, & Smyth, 2008). Empirical findings regarding developmental differences in negative emotional reactions to daily stressors have been mixed with some reporting more (Sliwinski et al., 2009), less (Hay & Diehl, 2010), or no (Schilling & Diehl, 2014) age-related differences in reactivity.

### The Present Study

The goal of the present study was to examine how individual differences in aging attitudes relate to daily emotional reactivity to stressors in older adults. Broadly speaking, we expect that negative aging attitudes could be an important individual differences factor that may predispose individuals to react more strongly to daily stressors. Specifically, we anticipate that individuals with more negative aging attitudes will experience higher levels of negative affect on days with stressors as compared to individuals with more positive aging attitudes.

## Method

### Participants

Participants were 43 community-dwelling older adults in the Anticipatory Coping Every Day (ACED) study designed to assess the relationship between anticipatory coping and reactions to daily stressors (Neupert, Ennis, Ramsey, & Gall, 2015). Participants (39 women) ranged in age from 60–96 years ( $M = 74.65$ ,  $SD = 8.19$ ) and self-identified as African American ( $n = 22$ ), European American ( $n = 20$ ), and Asian ( $n = 1$ ). Most participants were retired ( $n = 41$ ), with education levels ranging from high school graduate to PhD or other professional degree. On average, they reported some college education. All received a US\$20 gift card as compensation for their participation.

### Procedure

All participants were initially screened for cognitive impairment. Those who scored  $\leq 8$  on the Short Blessed Test (Katzman et al., 1983) received a packet containing nine daily surveys and prepaid return envelopes. The Day 1 survey contained baseline measures including aging attitudes and sociodemographic variables. Days 2–9 contained our repeated measurements including daily affect and daily stressors. Participants were instructed to complete each survey nightly before bed and indicate the times when they started and finished each survey. In the case where surveys were missed, participants were instructed to leave the missed survey blank and continue the next day. All participants returned at least six completed surveys by mail at the completion of the study. This resulted in a compliance rate of 98.2%, with 380 of a possible 387 days completed.

### Measures

#### Aging attitudes

Aging attitudes were assessed on Day 1 with the Attitudes Toward Own Aging (ATOA) subscale of the Philadelphia Geriatric Center Morale Scale (Lawton, 1975). The measure includes 5 items assessing overall views of the aging process (e.g., "I am as happy now as I was when I was younger"). Items were answered on a 5-point scale from 1 = *does not apply to me* to 5 = *applies very well*. Scores were averaged, and higher scores indicated more positive attitudes toward aging ( $M = 3.77$ ,  $SD = 0.76$ , Cronbach's  $\alpha = .62$ ).

#### Daily stressors

Daily stressors were assessed using a paper-and-pencil version of the Daily Inventory of Stressful Events (DISE; Almeida, Wethington, & Kessler, 2002). This form of the DISE was originally used in the VA Normative Aging Study (Neupert, Almeida, Mroczek, & Spiro, 2006), as well as the ACED study (Bellingtier, Neupert, & Kotter-Gröhn, 2015; Neupert et al., 2015), and individuals report similar levels

of stressors to the interview version, (e.g. the National Study of Daily Experiences; Almeida et al., 2002). Participants checked "yes" or "no" to indicate whether seven types of stressors had happened to them in the past 24 hr (e.g., disagreements, home stressors, and health stressors). A total stressor score was calculated for each day, with higher scores indicating more stressors (between-person  $M = 0.65$ ,  $SD = 0.86$ ). At least one stressor was reported on 36% of study days.

#### Daily negative affect

Daily affect was assessed using the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The 10-item negative mood scale included words such as irritable, nervous, and afraid. Participants indicated the extent to which they felt each emotion in the past 24-hr on a Likert-type scale ranging from 1 to 5 with higher scores indicating more of the affect. Scores for each item were averaged to create a daily score (between-person  $M = 1.13$ ,  $SD = 0.19$ , for Day 1 Cronbach's  $\alpha = .84$ ).

#### Covariates

Covariates were assessed on Day 1. Gender was coded as 1 = male and 2 = female. Education was treated as a continuous variable with responses ranging from 0 = no school or some grade school to 11 = PhD or other professional degree ( $M = 6.74$ ,  $SD = 2.27$ ). Personality was measured with the NEO Five Factor Inventory (NEO-FFI; Costa & McCrae, 1992) consisting of five 12-item scales assessing extraversion ( $M = 3.47$ ,  $SD = 0.39$ , Cronbach's  $\alpha = .65$ ), neuroticism ( $M = 2.19$ ,  $SD = 0.55$ , Cronbach's  $\alpha = .75$ ), conscientiousness ( $M = 3.90$ ,  $SD = 0.55$ , Cronbach's  $\alpha = .84$ ), openness ( $M = 3.28$ ,  $SD = 0.43$ , Cronbach's  $\alpha = .72$ ), and agreeableness ( $M = 4.00$ ,  $SD = 0.35$ , Cronbach's  $\alpha = .67$ ). Participants indicated how well the description of each trait described themselves from 1 = strongly disagree to 5 = strongly agree. One item from the agreeableness scale regarding cooperation was dropped as it loaded negatively on its scale, resulting in a change in Cronbach's  $\alpha$  from .53 to .67.

#### Analysis

Data were analyzed using multilevel modeling (Raudenbush & Bryk, 2002). Between-person covariates in our model include gender, age, education, and personality, given the small number of men in our sample, we also examined a model excluding gender. The pattern of results remained unchanged. Personality was included because it has been shown to affect both aging attitudes (Shenkin et al., 2014) and response to daily stressors (Neupert, Mroczek, & Spiro, 2008). Additionally, a model including each personality by total daily stressor interaction was conducted. No interactions were significant and the pattern of results remained unchanged, thus the personality by stressor interactions has been removed from our model for simplicity. Furthermore,

we investigated the relationship between our checklist of chronic conditions measure (first used in the Midlife in the United States Survey [MIDUS]) done on Day 1 and aging attitudes; they were significantly negatively correlated ( $r = -0.48$ ,  $p < .01$ ). However, when we controlled for chronic conditions in our model, the relationship between aging attitudes, daily stressors, and negative affect remains significant ( $\gamma_{11} = -.08$ ,  $p < .001$ ), as does the main effect of daily stressors ( $\gamma_{10} = -.08$ ,  $p < .001$ ). The pattern of results remained unchanged and thus chronic conditions were not considered further. With regard to our predictors, scores on the ATOA scale were grand-mean centered (i.e., deviations from the sample mean), and daily stressor scores were group-mean centered (i.e., average person-level stressors were included at Level 2) to adjust for varying levels of average daily stressor exposure. We also tested linear time (i.e., day of study) as a within-person (Level 1) covariate. It was not significantly related to negative affect and was not retained in the models.

#### Results

An unconditional model was conducted to measure the level of variability within (Level 1) and between (Level 2) individuals in negative affect. Results suggest significant daily variability in affect as 39% of variance was between people ( $\tau_{00} = .03$ ,  $p < .0001$ ) and 61% was within people ( $\sigma^2 = .05$ ,  $p < .0001$ ).

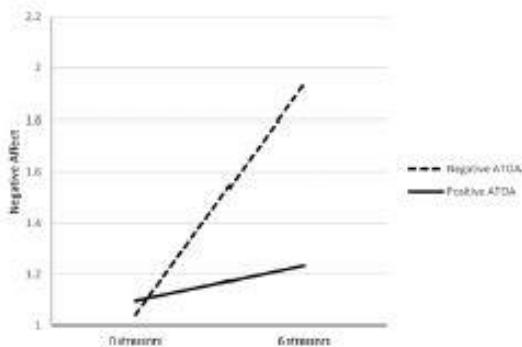
Next, we predicted daily negative affect from ATOA, daily stressors, and the interaction of ATOA with daily stressors while controlling for gender, age, education, and personality (see Table 1). There was a main effect for daily stressors on negative affect ( $\gamma_{10} = 0.08$ ,  $t = 4.95$ ,  $p < .0001$ ), indicating that on days with more stressors individuals report higher levels of negative affect. There was no main effect for ATOA ( $\gamma_{001} = 0.04$ ,  $t = 0.81$ ,  $p = .422$ ), but the hypothesized cross-level interaction was significant ( $\gamma_{11} = -0.08$ ,  $t = -3.56$ ,  $p < .001$ ). As can be seen in Figure 1, individuals with more positive aging attitudes maintained a low level of negative affect across study days regardless of stressors, whereas individuals with more negative aging attitudes had increased emotional reactivity to daily stressors. This model explained 22% of the within-person variability and 44% of the between-person variability in negative affect (Snijders & Bosker, 2012).

#### Discussion

The current study investigated how individuals' aging attitudes influenced their emotional reactions to daily stressors. As predicted, individuals with more negative attitudes toward aging reported more negative emotional reactivity on days with a higher number of stressors. In contrast, individuals with more positive attitudes toward aging reported relatively stable levels of affect regardless of stressors. These findings support the view that positive aging attitudes

**Table 1.** Unstandardized Coefficients (and SEs) of Multilevel Model of Negative Affect

Fixed effects	
Negative affect, $\beta_0$	
Intercept, $\gamma_{000}$	.82 (.52)
ATOA, $\gamma_{001}$	.04 (.04)
Person avg. stress, $\gamma_{002}$	.03 (.04)
Gender, $\gamma_{003}$	-.14 (.09)
Age, $\gamma_{004}$	-.003 (.003)
Education, $\gamma_{005}$	-.01 (.01)
Neuroticism, $\gamma_{006}$	.05 (.05)
Extraversion, $\gamma_{007}$	-.01 (.08)
Openness, $\gamma_{008}$	-.03 (.07)
Conscientiousness, $\gamma_{009}$	.04 (.05)
Agreeableness, $\gamma_{010}$	-.13 (.07)
Daily stressor slope, $\beta_1$	
Intercept, $\gamma_{10}$	.08* (.02)
ATOA, $\gamma_{11}$	-.08* (.02)
Random effects	
Between-person ( $\tau_{00}$ )	.02* (.006)
Within-person ( $\sigma^2$ )	.04* (.004)

\* $p < .01$ .**Figure 1.** Significant interaction between aging attitudes (as measured by ATOA) and daily stressors for negative affect. Positive ATOA was operationalized as 1 SD above the mean, and negative ATOA was operationalized as 1 SD below the mean. ATOA = Attitudes Toward Own Aging.

can function as a resource that helps reduce an individual's reactivity to stressors (Levy et al., 2000) perhaps by allowing individuals to cope more effectively with stressors. Additionally, our findings support an interpretation of negative aging attitudes as a potential stress-diathesis as the pairing of negative aging attitudes and daily stressors resulted in higher levels of emotional reactivity (Laidlaw, 2010).

In line with previous work, higher numbers of daily stressors predicted an increase in negative affect (Sliwinski et al., 2009). However, the significant cross-level interaction with ATOA suggests that this finding is mainly driven by those with negative aging attitudes. More emotional

reactions to stressors have been associated with higher levels of cardiovascular reactivity that predicts negative health outcomes such as impaired vascular responsiveness and atherosclerosis (Kaplan, Manuck, Williams, & Strawn, 1993). Our findings suggest that daily stressors may be more harmful for those with negative aging attitudes.

Our findings are limited by our sample that consisted solely of older adults living in the United States. Perceptions of aging vary from country to country (Löckenhoff et al., 2009), and thus the impact of positive or negative aging attitudes may be different in countries with alternate views of aging. Furthermore, women participants outnumbered men. Although gender was not associated with affect in our sample, a more gender-balanced study is needed to explore these relationships. Given past findings of more intense menopausal symptoms in those with negative aging attitudes (Nosek et al., 2010), our results may be especially applicable for women. Future research with multiple daily measurements would allow for a more nuanced view of the interaction.

In conclusion, our results suggest that individuals' attitudes toward their own aging are an important factor in predicting how they will react to daily stressors. Programs and interventions that foster positive attitudes toward aging (Brothers & Diehl, 2015) could help older adults respond more resiliently to daily stressors.

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## **CHAPTER 4: Aging Attitudes and Daily Awareness of Age-Related Change Interact to Predict Negative Affect**

Purpose of the study. Possessing more positive views of one's own aging is associated with better self-rated health, reduced reactivity to stressors, and better well-being. We examined two components of aging attitudes: awareness of age-related change (AARC) of loss and gain experiences and attitudes toward own aging (ATOA). We expected that AARC would vary day-to-day and interact with ATOA to predict daily negative affect.

Design and Methods. 116 participants (61% female, *M* age = 64.71, range 60-90) reported on 743 total days via an online daily diary study. On Day 1, participants reported baseline ATOA and baseline AARC for losses and gains. On Days 2-9, daily stressor exposure, daily AARC losses and gains, and negative affect were reported.

Results. Unconditional multilevel models revealed significant within-person fluctuation in daily AARC losses and gains. Controlling for daily stressors, age, and baseline AARC, daily increases in AARC losses were associated with increases in negative affect, and a cross-level interaction revealed that this effect was stronger for those with more positive ATOA.

Implications. AARC gains and losses vary from day-to-day, suggesting that interventions targeting the contextual fluctuations in daily life may be a promising avenue for future research. Specifically, individuals who feel generally positive about their own aging, although less likely to report awareness of daily age-related losses, may be the most vulnerable when they do occur. Efforts to reduce daily AARC losses (e.g., limiting activities due to age, receiving help because others assume age-related deficits) may improve the daily well-being of older adults.

## **Aging Attitudes and Daily Awareness of Age-Related Change Interact to Predict Negative Affect**

Possessing more positive views of one's own aging (or self-perceptions of aging, Levy, 2009) is associated with higher levels of life satisfaction (Brothers, Miche, Wahl, & Diehl, 2015), better self-rated health (Beyer, Wolff, Warner, Schüz, & Wurm, 2015), and better well-being (Levy, 2003). A negative attitude toward one's own aging tends to be associated with poorer subjective health, lower life satisfaction, and other indicators of poorer functioning (Diehl, Wahl, Brothers, & Miche, 2015). In Stereotype Embodiment Theory, Levy (2009) proposed that self-perceptions of aging are the result of internalized age stereotypes. These self-perceptions of aging act as a lens through which age-related changes are interpreted and their causes attributed (Sargent-Cox, Anstey, & Luszcz, 2014), thus making the experience of aging subjective (Miche et al., 2014). Negative aging attitudes can act as a stress–diathesis, such that negative aging attitudes function as a personal vulnerability to react negatively to stressful events (Bellintier & Neupert, 2016; Laidlaw, 2010). Stressors that activate the pre-existing vulnerability of negative age self-stereotypes are loss experiences associated with aging and are the result of a person-experience interaction (Laidlaw, 2010). In the current study we examine the person-experience interaction through the interplay of individual differences in attitudes toward own aging (ATOA) and daily fluctuations in awareness of age-related change (AARC).

AARC focuses on concrete and everyday experiences (Brothers et al., 2015) that underlie individuals' evaluations of self-perceptions of aging (or subjective age, Diehl et al., 2015). Specifically, these are “experiences that make a person aware that his or her behavior,

level of performance, or ways of experiencing his or her life have changed as a consequence of having grown older (i.e., increased chronological age)” (Diehl & Wahl, 2010, p. 340).

This definition relies on the conscious perceptions of changed behavior as well as the direct attribution to increased chronological age, rather than to other changes such as health status (Diehl et al., 2015). A critical feature of this approach, congruent with self-perceptions of aging and age stereotypes, is that losses as well as gains are considered (Diehl et al., 2015). The awareness of age-related losses may impose developmental constraints on a person’s behavior and experiences, whereas awareness of age-related gains may highlight developmental opportunities and motivate positive behaviors (Diehl & Wahl, 2010).

Strength and Vulnerability Integration (Charles, 2010) predicts that older adults have both strengths and vulnerabilities that impact their emotional reactions to stressors. The effects of daily experiences may be felt differently across the lifespan. Older adults may develop better emotion regulation skills over a lifetime of managing stressors, and these skills may help them avoid or reframe the meaning of stressful events (Charles, 2010). On the other hand, older adults may be more vulnerable to stressors due to diminished physiological flexibility or fewer social supports (Charles, 2010; Schilling & Diehl, 2014). Positive ATOA may influence the situations older adults find themselves in (i.e., less likely to report a hospitalization; Levy, Slade, Chung, & Gill, 2014) and may serve as a lens through which experiences of aging are understood. For example, older adults with more negative ATOA responded with greater negative affect to daily stressors compared to those with more positive ATOA (Bellingtier & Neupert, 2016). Those with more positive aging attitudes may be best able to capitalize on the strengths of aging by effectively selecting

situations that increase positive affect, (i.e., AARC gains), and effectively regulating their affect (Bellingtier & Neupert, 2016), but may also be most vulnerable to situations that threaten their positive views (i.e., AARC losses). Those with more negative aging views may experience fewer AARC gains and more AARC losses but be less distressed by any individual AARC loss. Thus, AARC losses and AARC gains represent the experiences that may underlie self-perceptions of aging. Although daily AARC experiences have been captured using a qualitative approach (Miche et al., 2014), no empirical research has yet incorporated AARC into a daily experience sampling study to allow for advanced empirical modeling. Establishing within-person variability in AARC is a necessary first step in demonstrating that these constructs are state-like rather than merely trait-like.

The present study used daily diary methods to address the interaction of interindividual differences in ATOA with the intraindividual association of AARC and daily negative affect. Befitting Diehl and Wahl's (2010) definition of AARC reflecting experiences, we apply a process approach to capture the changing experiences that can occur to highlight one's awareness of age-related change on a daily basis. Hypothesis 1 reflects the expected dynamic nature of AARC; we expected significant intraindividual fluctuation in AARC losses and AARC gains. Hypothesis 2 tested whether ATOA would be positively associated with AARC gains and negatively associated with AARC losses, following the propositions of Strength And Vulnerability Integration (Charles, 2010). Hypothesis 3 focused on the interplay of individual differences in ATOA and daily AARC losses, tying in the expected person-experience interactions (Laidlaw, 2010) to self-perceptions of aging. We focused on AARC losses as opposed to AARC gains because the magnitude of the

relationship between ATOA and AARC losses tends to be stronger than the link between ATOA and AARC gains (Brothers et al., 2015). Further, Meisner's (2012) meta-analysis of positive and negative age stereotype priming found negative stereotypes to exert nearly a three times larger effect on the behavior of older adults than positive stereotypes. Consistent with daily stressor research (e.g., Neupert, Almeida, & Charles, 2007), we operationalized emotional reactivity as the within-person slope between daily AARC and negative affect. Specifically, we expected that emotional reactivity would depend on individual differences in ATOA. Based on Strength And Vulnerability Integration (Charles, 2010), we expected that individuals with generally positive aging attitudes would be more vulnerable/reactive to daily increases in awareness of losses.

## **Method**

### **Participants and Procedure**

Participants were from the Mindfulness and Anticipatory Coping Everyday study and were recruited through Amazon's Mechanical Turk. Recruitment involved posting a Human Intelligence Task requesting adults 60 and older with a link to the survey. Filters restricted participants to those living in the United States. When participants clicked the link to the survey they were redirected to Qualtrics where they provided informed consent and then continued with the Day 1 survey. Upon completion of the Day 1 survey, participants' responses were reviewed to ensure that their stated age and date of birth aligned. Participants with matching age and date of birth indicating age 60 or older as well as indicating that a doctor had never told them that they had dementia or mild cognitive impairment were invited to continue with the daily portion of the study.

171 people completed Day 1, but 32 were not qualified to move on (not 60+, not in the U.S., or identified a cognitive impairment) and 23 were qualified to move on but chose not to. These 23 individuals were not significantly different in ATOA, age, neuroticism, chronic health conditions, life event stressors, or education from those who did move on to Day 2. Those who did continue on to Day 2 were significantly higher in baseline AARC gains. A similar pattern holds when comparing individuals who did at least 3 days compared to those who did only 2 days. Of the initial participants, 116 continued to the daily diary portion of the study. 71 (61%) participants completed all 9 days. The compliance rate was 71.2%, with 743 out of 1044 possible days completed.

Participants were aged 60-90 ( $M = 64.71$ ,  $SD = 4.98$ , 61% women) and most (90%) identified as White. Education ranged from less than a High School degree to a graduate degree, with Bachelor's degree the most common (30%).

Participants completed online surveys over nine consecutive days. The Day 1 survey collected demographic information (e.g., age and SES) and individual differences in aging attitudes and awareness of age-related change. The Day 2-9 surveys contained items assessing daily stressors, affect, daily awareness of age-related change, and other measures not examined in the current study. Participants were compensated \$1 per study day completed.

## **Measures**

**Aging Attitudes** were assessed on Day 1 with the Attitudes Towards Own Aging (ATOA) subscale of the Philadelphia Geriatric Center Morale Scale (Lawton, 1975). The measure includes five items assessing overall views of the aging process (e.g., "I am as

happy now as I was when I was younger”). Items were answered on a 5-point Likert scale from 1 (*does not apply to me*) to 5 (*applies very well*). Scores were averaged and higher scores indicated more positive attitudes towards aging ( $\alpha = .82$ ).

**Awareness of Age-Related Change** (AARC; Diehl & Wahl, 2010) was assessed at baseline on Day 1 and daily on Days 2-9 via a short 20-item version of the AARC Questionnaire (AARC-20; Brothers et al., 2015). The Day 1 measure was included to control for baseline and trait-level differences in AARC. The measure was adapted for daily use on Days 2-9 by adjusting the lead-in to each item (i.e., instead of beginning each prompt with “With my increasing age...” we began each prompt with, “With my awareness of aging today...”). There were two subscales reflecting daily perceptions of age-related gains (e.g., “With my awareness of aging today, I realize that I try to be more myself”) and age-related losses, (e.g., “With my awareness of aging today, I realize that I am slower in my thinking”). Responses were measured on a 5-point Likert scale and summed for each subscale with higher scores reflecting greater daily perceptions of age-related gains and losses respectively (Day 1 gains  $\alpha = .85$ ; Day 2 gains  $\alpha = .88$ , Day 1 losses  $\alpha = .90$ ; Day 2 losses  $\alpha = .90$ ).

**Daily Negative Affect** was assessed on Days 2-9 using the Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988), consisting of two 10-item mood scales. Negative affect was measured by words such as irritable, ashamed, and nervous. Participants were asked to indicate the extent to which they felt these emotions in the past 24-hours. Responses were measured on a 5-point Likert scale, such that higher scores indicated more negative affect. Scores for each item were averaged, and participants received a daily score (Day 2  $\alpha = .90$ ).

**Covariates.** *Daily stressors* were included as a covariate because they are associated with increased daily negative affect (Almeida, Wethington, & Kessler, 2002) and interact with ATOA to predict negative affect (Bellinger & Neupert, 2016). Daily stressors were assessed on Days 2-9 with the Daily Inventory of Stressful Events (Almeida et al., 2002) querying yes/no responses to stressors in seven domains (e.g., arguments, home-related stressors, social network stressors). Daily scores were created by summing the number of affirmative responses each day. *Age* was also used as a covariate to control for differences in affect (Charles, 2010) and ATOA (Miche, Elsässer, Schilling, & Wahl, 2014) between young-old and older-old adults.

### Analyses

Multilevel modeling using SAS (1997) Proc Mixed with the REML estimation method (because we assumed data were missing at random) was implemented to address Hypotheses 1 and 3. MLM adjusts estimates when there are different number of days per person and is frequently used to model intraindividual variability; that is, people's variability around their own average. This technique was especially useful in the current study because we sought to examine interindividual differences (e.g., ATOA) in reactivity (e.g., the within-person relationship between AARC and negative affect), which we modeled using the following formula to test Hypothesis 3:

$$\text{Level 1: NEGATIVE AFFECT}_{it} = \beta_{0it} + \beta_{1it}(\text{STRESSORS}) + \beta_{2it}(\text{AARC LOSSES}) + r_{it} \quad (1)$$

$$\text{Level 2: } \beta_{0i} = \gamma_{00} + \gamma_{01}(\text{AGE}) + \gamma_{02}(\text{AVERAGE AARC LOSSES}) + \gamma_{03}(\text{DAY 1 AARC LOSSES}) + \gamma_{04}(\text{ATOA}) + u_{0i} \quad (2)$$

$$\beta_{1i} = \gamma_{10} \quad (3)$$

$$\beta_{2i} = \gamma_{20} + \gamma_{21}(\text{ATOA}) \quad (4)$$

In Equation 1, the intercept ( $\beta_{0it}$ ) is defined as the expected level of negative affect for person  $i$  on days when no stressors (i.e.,  $\text{STRESSOR} = 0$ ) and no AARC losses ( $\text{AARC LOSSES} = 0$ ) occurred. The  $\beta_{1it}$  slope is the expected change in negative affect associated with days when stressors increase and the  $\beta_{2it}$  slope is the expected change in negative affect associated with days when AARC losses increase. The error term ( $r_{it}$ ) represents a unique effect associated with person  $i$  (i.e., fluctuation around the mean). Equation 2 includes age, average AARC losses (which served to person-mean center the daily AARC variable and focus on state-like deviations of losses from one's own average), Day 1 AARC losses (to adjust for trait-level differences between people) as covariates and tests for ATOA differences in the average level of negative affect, with the intercept ( $\gamma_{00}$ ) representing the average level of negative affect when all predictors are at 0. Equation 3 yields  $\gamma_{10}$  representing the average relationship between daily stressors and negative affect. Equation 4 provides the average relationship between daily AARC losses and negative affect ( $\gamma_{20}$ : reactivity) and tests whether there is a cross-level interaction of ATOA (between-person) X AARC (within-person) ( $\gamma_{21}$ : ATOA differences in reactivity). Interindividual deviations from the mean level are represented by  $u_{0i}$ .

Fully unconditional multilevel models (Raudenbush & Bryk, 2002) were used to test the dynamic nature of AARC losses and gains expected in Hypothesis 1. These models contained no predictors and yielded estimates of within-person ( $\sigma^2$ ) and between-person ( $\tau_{00}$ ) variability. The estimates were used to obtain the intraclass correlation coefficient [ $\rho = \tau_{00} / (\tau_{00} + \sigma^2)$ ], which represents the amount of between-person variance in the dependent variable.

Significant  $z$  statistics for the variability estimates indicate a significant amount of variance from that respective level of analysis.

## Results

Descriptive statistics for all study variables can be found in Table 1. Results from fully unconditional MLMs indicated that, consistent with expectations, there was a significant amount of within-person variance for AARC losses (8% of the variance was within-person;  $\sigma^2 = 5.34$ ,  $z = 16.19$ ,  $p < .0001$ ) and AARC gains (9% of the variance was within-person;  $\sigma^2 = 6.02$ ,  $z = 16.19$ ,  $p < .0001$ ).

Hypothesis 2 addressed the relationship between ATOA and AARC. In line with expectations, between-person Pearson correlations revealed that people with more positive views of their own aging reported more AARC gains at baseline,  $r(104) = .48$ ,  $p < .0001$  as well as more AARC gains across the study period,  $r(104) = .36$ ,  $p < .001$ . Also consistent with expectations, those with more positive views of their own aging reported fewer AARC losses at baseline,  $r(104) = -.71$ ,  $p < .0001$  and across the study period,  $r(104) = -.66$ ,  $p < .0001$ .

Results from the model to test Hypothesis 3 can be found in Table 2. People with more positive attitudes toward their own aging reported less negative affect ( $\gamma_{04}$ ) than people with less positive attitudes toward their own aging. Importantly, the within-person relationship between daily AARC losses and negative affect was moderated by ATOA ( $\gamma_{21}$ ); as can be seen in Figure 1, those with more positive ATOA were more reactive (i.e., exhibited a steeper within-person slope) to increases in daily AARC losses compared to those with less positive ATOA.

## Discussion

The goals of the current study were to examine the dynamic nature of AARC and explore the person-environment interaction of individual differences in aging attitudes and daily experiences of AARC losses on daily negative affect. These results extend previous research that treated AARC as an individual difference characteristic (e.g., Brothers et al., 2015; Diehl & Wahl, 2010) or examined change in AARC over longer periods of time (Dutt, Gabrian, & Wahl, 2016).

Results from the unconditional multilevel models support the first hypothesis that there would be significant intraindividual variability in daily AARC. Consistent with the theoretical description of AARC (Brothers et al., 2015; Diehl & Wahl, 2010), the experiences that underlie individuals' self-perceptions of aging do appear to change on an everyday basis. This suggests that the experiences tied to changes in daily AARC do not need to be severe or infrequent; instead, they can be seemingly minor, common experiences (e.g., realizing that one is slower in thinking today than usual). It is important to note that there were also significant individual differences in AARC, which in previous studies have been associated with psychological well-being (Brothers, Gabrian, Wahl, & Diehl, 2016), functional health, and satisfaction with life (Brothers et al., 2015).

Consistent with Strength And Vulnerability Integration (Charles, 2010) and the second hypothesis, people with more positive views of their own aging reported more gains and fewer losses with respect to their awareness of age-related change compared to people with less positive views of their own aging. Those with positive aging attitudes may be best able to capitalize on the strengths of aging by effectively selecting situations that increase

positive affect, (i.e., AARC gains), and effectively regulating their affect (Bellintier & Neupert, 2016). Examining the specific mechanisms under which these processes operate could be a fruitful avenue for future research.

Also in line with Strength And Vulnerability Integration (Charles, 2010) and the third hypothesis, those with more positive ATOA were more reactive to increases in daily AARC losses compared to those with less positive ATOA, suggesting vulnerability to situations that threaten positive views (i.e., AARC losses). Because we person-mean centered daily AARC losses, our results suggest that even when controlling for individual differences in AARC, deviations in losses from one's own typical average are important for well-being and interact with individual differences in ATOA. It could be that individuals with more positive ATOA have a higher threshold for reporting AARC losses. Perhaps the loss needs to be perceived as more serious for them to report it than individuals with less positive ATOA who may be generally inclined to see losses in everyday life. Thus the stronger link between AARC loss and daily negative affect in those with more positive ATOA could reflect more severe AARC losses. This appraisal of AARC losses, similar to appraisals of stressors (Lazarus, 1999) and the lens through which age-related changes are interpreted (Sargent-Cox et al., 2014), will be important for future research.

There are several implications of these findings for service-delivery and practice. AARC gains and losses vary from day-to-day, suggesting that interventions targeting the contextual fluctuations in daily life may be promising for future research (Wahl, Iwarsson, & Oswald, 2012). Specifically, individuals who feel generally positive about their own aging may be the most vulnerable to daily fluctuations in loss-based experiences of their awareness

of aging. For example, when these individuals feel they must limit their daily activities or others assume they need assistance due to their age it takes a toll. Efforts to help older adults remain active (e.g., Aging<sup>PLUS</sup>; Brothers & Diehl, 2016) or that reduce societal ageist beliefs could help reduce the daily experience of AARC losses and boost well-being.

Results of the current study should be considered in light of some limitations. The sample was mostly White and younger old with a mean age of 65, although we did have a wide age range (60-90). Including age as a covariate did not alter the results but future studies with a more diverse sample in terms of racial and ethnic backgrounds would provide an opportunity to more clearly examine the role of chronological age and race as moderators. We also note that the Positive and Negative Affect Schedule (Watson et al., 1988) tends to focus on high arousal states and may not generalize to all negative affect states. We were able to find significant within-person variance in the daily AARC measures with 8 consecutive days of measurement, but future studies with more consecutive days which could include an important event that would create a big shift in AARC may be able to increase the within-person variance estimates. If AARC is truly more variable than we have identified in the current study, it may be a good target for interventions because it does change on a rather rapid basis.

Limitations notwithstanding, this is the first investigation to establish the daily dynamic nature of AARC and focus on the person-environment interaction of ATOA and AARC from a daily perspective. Our results suggest that interventions targeting daily fluctuations in loss-based domains of AARC may be especially helpful for those who already possess a generally positive view of their own aging.

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TABLES

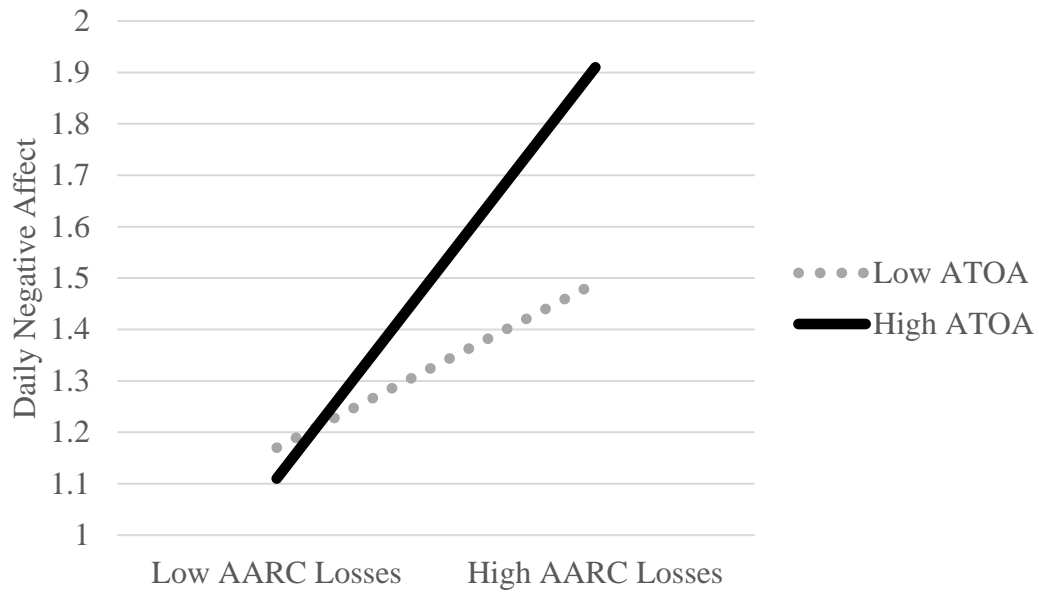
**Table 1.**  
Descriptive Statistics for Study Variables

	<i>M</i>	<i>SD</i>	Range
Age	64.71	4.98	60-90
Day 1 AARC Losses	22.49	8.29	10-39
Day 1 AARC Gains	37.69	7.10	19-50
Average AARC Losses	20.41	7.87	10-42
Average AARC Gains	37.41	8.38	10-50
Daily AARC Losses	19.86	7.89	10-42
Daily AARC Gains	37.80	8.21	10-50
Daily Stressors	0.49	0.81	0-5
ATOA	3.38	0.95	1-5
Negative Affect	1.35	0.56	1-4

*Note.* Between-person scores: Age, Day 1 AARC Losses, Day 1 AARC Gains, Average AARC Losses (between-person average based on daily assessments), Average AARC Gains (between-person average based on daily assessments), ATOA. Within-person scores: Daily AARC Losses, Daily AARC Gains, Daily Stressors, Negative Affect.

**Table 2.**  
Unstandardized Estimates (and Standard Errors) from a Multilevel Model Predicting  
Daily Negative Affect

Fixed Effects	
Negative Affect, $\beta_0$	
Intercept, $\gamma_{00}$	1.80**(.68)
Age, $\gamma_{01}$	-0.01(.01)
Average AARC Losses, $\gamma_{02}$	0.02(.01)
Day 1 AARC Losses, $\gamma_{03}$	-0.00(.01)
ATOA, $\gamma_{04}$	-0.22*(.10)
Daily Stressors, $\beta_1$	
Intercept, $\gamma_{10}$	0.09***(.02)
Daily AARC Losses, $\beta_2$	
Intercept, $\gamma_{20}$	-.02(.01)
ATOA, $\gamma_{21}$	.02***(.004)
Random Effects	
Negative Affect ( $\tau_{00}$ )	0.17***(.03)
Within-Person Fluctuation ( $\sigma^2$ )	0.08***(.004)
R <sup>2</sup> between-person	35%
R <sup>2</sup> within-person	11%
Note: * $p < .05$ , ** $p < .01$ , *** $p < .001$ . Estimates of effect size were calculated based on the pseudo-R <sup>2</sup> method outlined by Raudenbush and Bryk (2002).	



**Figure 1.** Cross-level interaction of daily AARC losses and baseline ATOA predicting daily negative affect. Predicted points were plotted using low ( $M - 1SD$ ) and high ( $M + 1SD$ ) values of each variable.

## **CHAPTER 5: Discussion**

The preceding papers capture the variety of ways awareness of aging influences the daily lives of older adults. They addressed the main dissertation aims. First, we established daily variability in subjective age (feel, ideal, and look) and AARC gains and losses. Second, we found that daily fluctuations in awareness of aging constructs are associated with daily stressors and negative affect. Third, we found that daily reactivity is moderated by major life-event stressors and aging attitudes.

In the following discussion I will provide a summary of the findings from each of the papers. Subsequently, I will integrate the findings within the context of the current awareness of aging literature. Specifically, I will make connections to Stereotype Embodiment Theory (Levy, 2009), the Weathering Hypothesis (Geronimus, 1992), and Montepare's lifespan framework of subjective aging (Montepare, 2009). I will then provide a broader discussion which situates the findings within a lifespan framework (Baltes, 1997). Next, I will discuss some of the specific limitations of the articles, as well as general limitations in awareness of aging research. Finally, I will discuss potential future directions for the field and my own future research directions.

### **Summary of Key Findings**

#### **Manuscript 1**

The first aim of this manuscript was to explore the combined influence of major life-event stressors and daily stressors on subjective age. We found that each additional daily stressor predicted a 2.41 years increase in felt age and a 2.01 years increase in look age. For example, on days when individuals experienced two stressors, they felt approximately five

years older and believed they looked over four years older than they did on a stressor-free day. There was not a significant main effect of daily stressors on ideal age.

The main effects of daily stressors were qualified by significant cross-level interactions within all dimensions of subjective age (i.e., felt, ideal, and look age). Individuals who had not experienced a major life-event stressor in the past year tended to feel older on days with daily stressors, but individuals who had experienced major life-event stressors did not show this trend. In regards to ideal age, individuals experiencing both daily stressors and major life-event stressors desired to be younger than individuals only experiencing daily stressors. Finally, individuals high in major life-event stressors perceived themselves to look younger on days high in daily stressors, but those low in life-event stressors did not follow this trend. These models explained 12%, 2%, and 20% of the within-person variance and 15%, 2%, and 22% of the between-person variance in felt, ideal, and look age, respectively (Snijders & Bosker, 2012).

For our second aim, we tested whether the relationship between daily stressors and subjective age was mediated by daily measures of control and affect when including the contextual effect of major life-event stressors and controlling for age differences. We found no evidence for mediating effects of positive affect or control. However, the relationship between total stressors and felt age was fully mediated by negative affect.

Taken together, our findings indicate the importance of both daily and major life-event stressors for predicting daily subjective ages. These stressors interact to predict unique patterns for daily felt, look, and ideal ages. Our findings suggest that the impact of major life-event stressors may be missed when it is studied individually as there was no main effect for

this type of stressor. Furthermore, our findings suggest that on the daily level, the relationship between stressors and felt age is explained by negative affect.

## **Manuscript 2**

In the second manuscript we investigated the relationship between aging attitudes and daily stressor reactivity. We predicted daily negative affect from aging attitudes, daily stressors, and the interaction of aging attitudes with daily stressors while controlling for gender, age, education, and personality. There was a main effect for daily stressors on negative affect, indicating that on days with more stressors individuals report higher levels of negative affect. There was no main effect for aging attitudes, but the hypothesized cross-level interaction was significant. Individuals with more positive aging attitudes maintained a low level of negative affect across study days regardless of stressors, whereas individuals with more negative aging attitudes had increased emotional reactivity to daily stressors. This model explained 22% of the within person variability and 44% of the between person variability in negative affect (Snijders & Bosker, 2012).

These findings support the view that positive aging attitudes can function as a resource that helps reduce an individual's reactivity to stressors (Levy, Hausdorff, Hencke, & Wei, 2000) perhaps by allowing individuals to cope more effectively with stressors. Additionally, the findings support an interpretation of negative aging attitudes as a potential stress-diathesis as the pairing of negative aging attitudes and daily stressors resulted in higher levels of emotional reactivity (Laidlaw, 2010). Programs and interventions that foster positive attitudes towards aging (Brothers & Diehl, 2015) could help older adults respond more resiliently to daily stressors.

### **Manuscript 3**

The third manuscript combined two awareness of aging constructs (i.e., aging attitudes and AARC) to examine their interaction on daily negative affect. In line with our predictions, we were first able to establish that there is significant intraindividual variation in AARC losses and AARC gains. We next demonstrated that people with more positive views of their own aging reported more AARC gains at baseline, as well as more AARC gains across the study period. Also consistent with expectations, those with more positive views of their own aging reported fewer AARC losses at baseline and across the study period. Finally, we documented a main effect of aging attitudes such that people with more positive attitudes toward their own aging reported less negative affect than people with less positive attitudes toward their own aging. Importantly, the within-person relationship between daily AARC losses and negative affect depended on aging attitudes; those with more positive attitudes were more reactive to increases in daily AARC losses compared to those with less positive attitudes.

There are several implications of these findings for service-delivery and practice. AARC gains and losses vary from day-to-day, suggesting that interventions targeting the contextual fluctuations in daily life may be a promising avenue for future research (Wahl, Iwarsson, & Oswald, 2012). Specifically, individuals who feel generally positive about their own aging may be the most vulnerable to daily fluctuations in loss-based experiences of their awareness of aging. For example, when these individuals feel they must limit their daily activities or others assume they need assistance due to their age it takes a toll. Efforts to help

older adults remain active (e.g., Aging<sup>PLUS</sup>; Brothers & Diehl, 2016) or that reduce societal ageist beliefs could help reduce the daily experience of AARC losses and boost well-being.

### **Integration with Awareness of Aging**

To better understand the relationship between the manuscripts, I will situate the findings within the current awareness of aging literature. As described in the introduction, awareness of aging serves as a superordinate construct which encompasses the variety of constructs that have been used to assess and conceptualize subjective aging (Diehl et al., 2014). These concepts reflect a form of personal awareness and knowledge which can subsequently influence an individual's actions, thoughts, and well-being.

Diehl and colleagues provide a conceptual model to highlight the key influences and outcomes of awareness of aging (Diehl et al., 2014, p. 103). This is currently the only comprehensive model to attempt to integrate the various awareness of aging constructs with their developmental antecedents and outcomes, as such I will use this model to guide my discussion of the manuscripts findings (see Figure 1).

In this model, awareness of aging constructs are organized on a spectrum of consciousness ranging from implicit/pre-conscious to explicit/conscious awareness. On the explicit end of the spectrum are subjective age (a consciously chosen age), as well as AARC the conceptual definition of which requires the conscious awareness of changes related to aging. On the implicit side of the spectrum are attitudes towards aging. These attitudes are thought to develop early in life (Levy, 2003, 2009) via cultural and developmental messages regarding aging that may surreptitiously infiltrate our beliefs and feelings without conscious endorsement. Although the typical measures of aging attitudes are explicit, they are thought

to reflect implicit biases towards older adults (Nosek, Banaji, & Greenwald, 2002). Thus the awareness of aging constructs measured in this dissertation (i.e., subjective age, attitudes toward aging, and AARC) reflect both ends of the consciousness spectrum.

Furthermore, the conceptual model predicts that implicit and explicit measures will share a bidirectional influence over each other with the hypothesized caveat that implicit measures will be more strongly influenced by the explicit measures than vice versa. This relationship between awareness of aging constructs is most clearly assessed in the third manuscript. Here we see the positive relationship between more positive views of aging and the experience of more AARC gains and fewer AARC losses. Although the correlational nature of the study precludes tests of directionality, the findings indicated that aging attitudes measured on Day 1 predicted not only concurrently assessed AARC gains and AARC losses, but also predicted subsequent reports of additional AARC gains and AARC losses across the remaining 8 study days. These relationships may function as developmental cascades (Masten & Cicchetti, 2010) such that negative aging attitudes developed early in life predict subsequent awareness of age-related loss which then predict negative developmental outcomes across many domains (e.g., lower levels of well-being, health, and activity engagement) which further sour one's aging attitudes and so on. This hypotheses awaits longitudinal confirmation, but is promising avenue for future research.

Beyond the direct relationship between aging attitudes and AARC, the third paper assessed the possibility that aging attitudes moderate the emotional consequences of daily AARC. This hypothesis aligns with the model's assertion that implicit awareness of aging influences explicit awareness of aging (Diehl et al., 2014), but interestingly the findings may

appear to initially contradict expectations. We found that individuals with generally more positive aging attitudes were most reactive to AARC losses. To understand this finding it is important to remember that our model included the average daily AARC losses reported by each individual (i.e., we person-mean centered AARC losses; Raudenbush & Bryk, 2002). Thus the significant interaction reflects emotional reactions to AARC losses that were above an individual's typical level of AARC losses. Our results, in line with previous findings (Brothers, Miche, Wahl, & Diehl, 2015), indicate that individuals with positive aging attitudes generally report low levels of AARC losses, thus the atypical experience of AARC loss may have been especially salient to them whereas those with negative aging attitudes who typically report higher levels of AARC losses may have experienced an additional AARC loss as a mere drop in the bucket. These findings suggest that the complexities of the relationship between awareness of aging constructs may be masked when constructs are measured only once and assumed to not vary within the individual (Molenaar, 2004).

The conceptual model acknowledges that an understanding of awareness of aging should be situated within an understanding of an individual's place in the life course including chronological age and objective age-related changes (Diehl et al., 2014). It further hypothesizes several key influencers of awareness of aging including cultural and developmental influences, as well as socio-economic and psychological resources (Diehl et al., 2014). Each of these influencers will now be examined in more detail.

### **Influencers of Awareness of Aging**

**Cultural influences.** Awareness of aging is thought to be influenced and shaped by cultural influences including socially shared images, expectations, and norms regarding aging

(Diehl et al., 2014). For example, in a study of cross-cultural differences in perceptions of aging, older age was perceived to be negatively associated with life satisfaction in Serbia and Slovakia, but perceived as positively associated with life satisfaction in China and the United States (Löckenhoff et al., 2009). Additionally, cultural influences include social policies related to aging. For example, countries may have different policies regarding mandatory retirement and shared social responsibilities for the welfare of older adults (Westerhof & Barrett, 2005). It is thought that cultural influences may influence us without our conscious awareness, and thus play a key role in shaping the implicit end of the awareness of aging spectrum (e.g., attitudes towards aging) (Diehl et al., 2014; Levy, 2003, 2009). Accordingly, the findings from the second and third manuscripts regarding attitudes toward aging must be understood to be primarily applicable to members of the United States. It may be that possessing more positive individual views of aging serve to buffer reactions to stress most strongly in cultures with generally less positive views of aging (Bellingtier & Neupert, 2016). It could also be the case that personal subjective aging experiences which underlie the awareness of age-related change (Miche et al., 2014) are more influential in individualistic cultures. Thus the associations we documented between AARC and attitudes toward own aging in the third manuscript would likely fluctuate when measured in different cultures (Neupert & Bellingtier, 2016).

Cultural variation often exists not only between cultures but within cultures (Geronimus, 1992). Although not the primary focus of the manuscripts presented here, we did examine differences in subjective age between African American and European Americans in the first manuscript (Bellingtier, Neupert, & Kotter-Grühn, 2015) as the

participants in this study were roughly evenly divided between these groups. African Americans and European Americans did not differ in their reported felt ages nor their look ages. However, we did find a significant difference in ideal ages such that African Americans reported less discrepancy between their chronological and ideal ages than did European Americans (i.e., African Americans wished to be about 16 years younger and European Americans wished to be about 23 years younger). Although due to the younger average chronological age of the African American participants, we found that both groups reported similar ideal ages (roughly 55 years old). Though these findings do not support within culture variation in subjective age, it should be noted that these participants were also quite similar in other ways (e.g., they did not vary in total number of reported daily stressors nor major life event stressors) and that these participants all resided in the greater Raleigh area. Future research examining participants with more varied life histories or from different geographical areas would likely yield different results.

**Developmental influences.** Developmental influences on awareness of aging include social support, lifetime health, early childhood experiences, and major life events (Diehl et al., 2014). These personal experiences and relationships can shape how individuals understand their own aging. This category of influences is most clearly examined in the first manuscript (Bellingtier et al., 2015). Here we sought to better understand the impact of major life events on felt, ideal, and look ages. As noted above, previous research has often failed to find evidence of their influence on subjective age (Schafer & Shippee, 2010; Ward, 2013), but this may be due to a failure to consider their influence on reactions to additional stressors (Wheaton, 1999; Wong et al., 2012). Thus we sought to test the combined influence of major

life event stressors (e.g., death of a friend or close family member) and daily stressors (e.g., interpersonal arguments or minor healthcare problems) on subjective ages. Although, as expected, we did not find a main effect of major life event stressors, we did find that these stressors moderated the impact of daily stressors on felt, ideal, and look ages.

Our findings suggest that major events do relate to subjective age, but that cross-sectional and traditional longitudinal designs may fail to detect their influence. It is likely that the influence of major events on subjective age changes over time and is moderated by subsequent life events and current stressors (Aldwin, 2007). When measurements are taken in close temporal proximity to their occurrence it is likely that they would exert a significant influence on subjective age, however as these major stressors become temporally more distant, their influence likely becomes more subtle. With more frequent within-person measurements, daily diary designs may be better suited to detect these subtle effects (Almeida, 2005). Furthermore, although current models of awareness of aging (Diehl et al., 2014) assume influences will shift over time, the pathways through which this will manifest have yet to be explicated. Our findings suggest the full influence of past events on awareness of aging may be missed when daily influences are ignored.

**Socio-economic resources.** A third source of hypothesized influence on awareness of aging are socio-economic resources including income, education, material assets, and access to healthcare (Diehl et al., 2014). Past studies examining the relationship between socioeconomic status indicators (e.g., income and education) have not found them to be strong predictors of subjective age (Henderson, Goldsmith, & Flynn, 1995; Rubin & Berntsen, 2006), and I am unaware of any studies directly assessing the relationship between

healthcare access and awareness of aging (although health itself is clearly related; Westerhof et al., 2014). In our own analyses, we have included education as a covariate, but found no significant effects (Bellintier et al., 2015; Bellintier & Neupert, 2016). It may be that current measurement approaches have been too global, and that more precise measurements (e.g., occupational status, disposable income) might find meaningful associations. It may also be the case that the impact of socio-economic resources should not be conceptualized as a direct influencer of awareness of aging (Diehl et al., 2014), but instead as a moderator of other sources of influence (developmental, cultural, or psychological). Future empirical research may help to clarify this element of the conceptual model (Diehl et al., 2014).

**Psychological resources.** The final category of proposed influencers of awareness of aging are psychological resources. These are thought to include emotional regulation, personality, behavioral competences, styles of coping, and personality (Diehl et al., 2014). Previous research has found that the relationship between stressors and subjective age was mediated by the deterioration of adaptive psychological resources (i.e., control and positive affect) over ten years (Schafer & Shippee, 2010). In the first manuscript, we examined the mediating role of control and affect on daily subjective ages (Bellintier et al., 2015). In contrast to the previous study (Schafer & Shippee, 2010), we were unable to find evidence that daily control or daily positive affect mediated the relationship between daily stressors and older subjective ages. However, negative affect fully mediated the relationship between daily stressors and daily felt age. This suggests that psychological resources may influence subjective age differently depending on the time scale assessed. It may be that negative affect has its largest impact on subject age in the immediate aftermath of a negative event, but that

with time older adults are able to draw upon their psychological resources in order to mitigate the long-term impact of stressors (Charles, 2010; Urban, Charles, Mogle, & Almeida, 2014) and maintain younger subjective ages.

We also considered psychological resources within the second manuscript (Bellintier & Neupert, 2016). The main focus of this manuscript was to examine how attitudes towards aging moderated affective reactivity to stressors. However, given that personality has been previously associated with differences in awareness of aging constructs (Stephan, Sutin, & Terracciano, 2015; Wahl, Konieczny, & Diehl, 2013) and is hypothesized to influence awareness of aging within the conceptual model (Diehl et al., 2014), we included measures of the extraversion, neuroticism, openness to experience, agreeableness, and conscientiousness in our models. In an additional model, we tested for personality by daily stressor interactions. Regardless of how we modeled personality, we consistently found that individuals with more positive aging attitudes responded more resiliently to daily stressors. Thus personality may influence the awareness of aging constructs, including attitudes toward aging, but it does not explain the relationship between more positive aging attitudes and diminished reactivity to stressors.

### **Developmental Outcomes**

Ultimately, awareness of aging is thought to influence important developmental outcomes such as health and longevity (Westerhof et al., 2014), psychological well-being (Mock & Eibach, 2011), activity engagement (Wolff, Warner, Ziegelmann, & Wurm, 2014), and successful aging (Cheung & Wu, 2014; Shrira, Palgi, Ben-Ezra, Hoffman, & Bodner, 2016). This influence may be direct or indirect through its influence on self-regulatory

developmental processes such as selection of primary vs. secondary control or use of selection, optimization, and compensation (Diehl et al., 2014).

Given that the current manuscripts focus on daily well-being, the outcomes assessed were reactivity to daily stressors (Bellingtier & Neupert, 2016) and daily negative affect (Neupert & Bellingtier, 2017). Past research looking at stressor reactivity in older adults has failed to coalesce on a clear developmental association with some studies finding higher levels of reactivity in older adults in comparison to younger adults (Sliwinski, Almeida, Smyth, & Stawski, 2009), but others reporting the reverse (Hay & Diehl, 2010) or no age-related association (Schilling & Diehl, 2014). In the second manuscript, we proposed that aging attitudes may be an important individual differences factor to consider when researching stressor reactivity in older adults (Bellingtier & Neupert). In this study we found that those with more positive attitudes towards their own aging were able to maintain low levels of negative affect on days with and without stressors, whereas those with more negative aging attitudes reported more negative affect on days with stressors (i.e., greater stressor reactivity).

These findings support the hypothesized indirect pathway from awareness of aging to developmental outcomes via self-regulatory processes in the conceptual model (Diehl et al., 2014). In other words, individuals with more positive aging attitudes may be better able to regulate their reactions to daily stressors (Levy et al., 2000), and lower levels of stressor reactivity is then associated with successful developmental outcomes such as improved cardiovascular health (Kaplan, Manuck, Williams, & Strawn, 1993; Levy, Slade, May, & Caracciolo, 2006). Importantly, our findings indicated that aging attitudes are associated with

the day to day well-being of older adults, in addition to more long-term developmental outcomes. Daily hassles and uplifts are often better able to predict well-being outcomes as compared to major life events (Almeida, 2005; Kanner, Coyne, Schaefer, & Lazarus, 1981) and thus the ability of aging attitudes to improve daily well-being could have a substantive impact on the overall well-being of older adults.

In the third manuscript we found support for the direct effect of awareness of aging on developmental outcomes (Diehl et al., 2014), as more positive aging attitudes predicted lower levels of daily negative affect (Neupert & Bellingtier, 2016). In contrast to their typically low levels of negative affect, on days when individuals with positive aging attitudes experienced an AARC loss they were more likely to report an uptick in their negative affect than those with more negative aging attitudes. This supports the importance of considering the dynamic nature of AARC as well as its interplay with other awareness of aging constructs. Although more positive awareness of aging may generally offer a buffer from the detrimental effects of daily stressors (Bellingtier & Neupert, 2016), when daily experiences threaten one's perceptions of age-related change the outcomes may be especially negative to those whom are otherwise the most positive. Research and theory on stereotype threat indicates that individuals who perceive a stereotype as self-relevant are more likely to be negatively impacted by it (Steele & Aronson, 1995). Thus individuals who take pride in their positive outlook on aging may be more harmed by encounters that force them to acknowledge age-related loss. Future research combining controlled manipulations of stereotype threat with subjective measurements of AARC losses and gains could help assess this hypothesis.

## **Summary**

In sum, the three manuscripts provide support for many of the relationships proposed in conceptual model of awareness of aging (Diehl et al., 2014). The studies support (1) the conceptualized relationship between attitudes towards aging and AARC, (2) the proposed developmental influence of stressors on awareness of aging, (3) the influence of psychological resources on awareness of aging, and (4) the relationship between awareness of aging constructs and important developmental outcomes. On the other hand, the studies did not find evidence for (1) the influence of education on awareness of aging, (2) influence of personality on awareness of aging, and (3) cultural influences on awareness of aging, as measured by ethnicity. However, these non-significant findings should not be over-interpreted, as none of the studies were designed to focus on these predictors and thus our measures may lack the specificity and our samples may lack the diversity necessary to fairly examine these effects. Our findings suggest that the events and emotions of daily life are associated with changes in awareness of aging, and that these daily effects may moderate the influence of more macro between-person variables. Future research combining traditional longitudinal with daily diary designs (i.e., measurement-burst designs) would be able to track the interaction of these influences over time and provide a more complete picture of the interaction of distal and proximal influences.

### **Connections to Stereotype Embodiment Theory**

Stereotype embodiment theory proposes that individuals absorb cultural stereotypes about aging in their youth, but unlike other stereotypes such as those about gender or ethnicity that typically apply to individuals throughout their lifetime, do not concurrently

learn ways to cope with them (Levy, 2003, 2009). Thus when these stereotypes become salient and self-relevant in adulthood individuals may be unprepared to combat them and these stereotypes may have a negative impact on their well-being. The theory proposes that negative beliefs about aging utilize multiple pathways (physiological, psychological, and behavioral) to influence well-being (Levy, 2009). Included in the physiological pathway is heightened cardiovascular reactivity to stressors. Previous research has found that older adults primed with negative aging stereotypes experienced greater cardiovascular reactivity in response to stressors (Levy et al., 2000), that possessing more negative aging stereotypes in middle age is associated with a greater risk of a cardiovascular event later in life (Levy, Zonderman, Slade, & Ferrucci, 2009), and that older adults with more negative stereotypes of aging are more likely to experience future hospitalization (Levy, Slade, Chung, & Gill, 2014).

In the second manuscript, we examined if an additional pathway by which negative aging attitudes could influence well-being is through heightened affective reactivity to stressors (Bellintier & Neupert, 2016). The findings of greater stressor reactivity for those with more negative aging attitudes aligns with the previous findings (Levy et al. 2000; Levy et al., 2009; Levy et al., 2014), and suggests that greater stereotype embodiment has influences not only in the lab and in traditional longitudinal designs, but also in naturalistic daily diary designs. Future research including ambulatory assessments of physiological measures could extend this work to cardiovascular outcomes.

## **Connections to the Weathering Hypothesis**

The weathering hypothesis was originally proposed to explain increased infant mortality rates among African-American mothers compared to same-aged European-American mothers (Geronimus, 1992). The accumulated stress of years of racial and social inequality had an aging effect on African-American mothers, such that their physical age was older than that of their European-American counterparts (Geronimus, 1992). The weathering hypothesis is similar to the concept of allostatic load which refers to the wear and tear on bodily systems due to repeated and prolonged activation of the stress response (McEwen & Seeman, 1999).

The weathering hypothesis was originally conceived to address changes in biological aging, but has been extended to subjective indicators of age (Foster, Hagan, & Brooks-Gunn, 2008). For example, young women exposed to higher levels of adolescent stress reported older subjective ages than their less stressed counterparts (Foster et al., 2008). In the first manuscript we extend this theory to predict daily fluctuations in subjective ages. Each additional daily stressors that older adults reported corresponded to nearly a two and half year increase in how old they felt, and a two year increase in how old they believed they looked (Bellintier et al., 2015) supporting the weathering hypothesis.

Daily stressors were not significantly associated with how old older adults wished to be (i.e., ideal age) (Bellintier et al., 2015). Ideal age judgments also demonstrated less within person variability than felt and look ages, and are conceptually considered to reflect broader assessments of one's life (Ward, 2010). Our finding that the combination of higher levels of daily and major life stressors is associated with younger ideal ages supports the

view that stressors can produce a weathering effect on ideal ages, but that the broader stressor context must be considered (Wheaton, 1999).

In sum, our study lends credence to the view that daily stressors can produce a subjective weathering effect. Furthermore, the findings suggest that subjective weathering is a dynamic process that can vary based on the stressor load present on any given day. Future work that combines daily measures of biological and subjective weathering within the same model could help to determine if these fluctuations have ramifications for physiological health (Stephan et al., 2015).

### **Connections to the Lifespan Framework of Subjective Aging**

Montepare (2009) proposed a lifespan framework to integrate subjective age findings from adolescence to old age. The framework proposes that individuals construct their subjective age through a process of “anchoring and adjusting” to distal and proximal reference points (Montepare, 2009, p. 43). Distal reference points refer to individuals’ personal models of development, that is their expectations of the key trends involved in the aging process. In general, individuals expect developmental gains in their youth and relatively more losses in older age. Distal models are thought to be relatively stable and to guide subjective age judgments when lacking proximal reference points. Proximal reference points refer to salient historic, physical, normative, or interpersonal events which may shift subjective age judgments. These could include events such as birthdays and anniversaries (historical), a hip replacement (physical), retirement or graduation (normative), and being asked if you would like the senior discount (interpersonal). Proximal reference points provide an “adjustment” to the “anchor” of distal developmental models.

In our work we built on this framework to suggest that daily stressors may be more salient proximal events for those lacking a more prominent distal reference point (i.e., a major life event stressor) (Bellintier et al., 2015). Our findings indicated that individuals lacking a major life event stressors reported older felt and look ages on days with a daily stressors whereas those with a major life stressor seemed more “anchored” to their subject age regardless of daily stressors. When subjective age is measured once as an individual differences variable these smaller adjustments may be missed, but using a daily diary design allows for a more precise measurement of adjustments older adults make to their subjective ages.

A direction for future research is to integrate the lifespan framework of subjective age (Montepare, 2009) with stereotype embodiment theory (Levy, 2003, 2009). Stereotype embodiment theory proposes that we learn the aging stereotypes of our culture in our youth. Likely these stereotypes also guide the creation of individuals’ distal models of development as well as influence reactions to proximal age-salient events. Those who develop models of aging that include both gains and losses, as opposed to losses only, may be the ones for whom awareness of aging helps predict the best developmental outcomes (Mock & Eibach, 2011). Future research should seek to understand how individuals construct these models, and how they can be shaped to maximize successful aging.

### **Broader Implications for the Lifespan Framework**

Overall, an important goal for researchers of awareness of aging constructs is to integrate our findings within developmental meta-theories. The lifespan framework proposes three guiding principles of development across the life course: (1) evolutionary benefits

decrease with age, (2) the need for culture increases with age, and (3) the efficacy of culture decreases with age (Baltes, 1987, 1997). Montepare's (2009) lifespan framework of subjective aging builds on these constructs and proposes that distal models of development often include these constructs. However, there is likely to be significant individual variation in the models individuals construct.

Beliefs regarding the trajectory of decline are akin to expectations about aging and can influence developmental outcomes (e.g., Diehl et al., 2014). Furthermore, expectations regarding the efficacy of culture likely influence older adults' willingness to engage in activities that promote health and wellness. For example, individuals who associated aging with greater physical loss were less likely to engage in health promoting activities following a major health event compared to those with more positive perceptions of aging (Wurm, Warner, Ziegelmann, Wolff, & Schüz, 2013). Beliefs regarding the lifespan can turn into self-fulfilling prophecies, and thus subjective beliefs can help determine developmental outcomes.

Furthermore, research on awareness of aging should embrace the lifespan principles of multidimensionality and multidirectionality (Diehl, Wahl, Brothers, & Miche, 2015). Thus we chose multiple subjective age measurements for our first manuscript (Bellingtier et al., 2015), and examined AARC gains and AARC losses in the third manuscript (Neupert & Bellingtier, 2016), however our measurement of aging attitudes was unidimensional (Bellingtier & Neupert, 2016). Future work with multidimensional scales would allow for better integration with the lifespan framework.

## **Limitations & Future Directions**

The manuscripts presented here extend the literature on awareness of aging into the daily realm, yet there are important limitations to acknowledge within the studies. First, daily diary designs allowed us to track the associations between awareness of aging and well-being constructs across multiple days, but do not allow us to make claims about directionality nor causation. The relationships may be bidirectional and potentially produce developmental cascades over time (Masten & Cicchetti, 2010). Extending these studies with measurement burst designs could help test these hypotheses. Furthermore, including younger individuals and tracking them longitudinally would provide information on how awareness of aging constructs form, develop, and when they begin to significantly impact well-being.

Moreover, although our studies include older adults ranging in age from 60 to 90, some findings may represent cohort effects that may not replicate as future generations age (Cook & Campbell, 1979). Given that baby boomers in the United States have already altered stereotypes and beliefs related to gender and sexuality, it does not seem improbable that they may also be altering the subjective meaning of aging (Dychtwald, 2014). It remains to be seen if the benefits of positive aging attitudes will apply to younger cohorts.

Two of the studies make use of the Attitudes Towards Own Aging subscale of the Philadelphia Geriatric Morale Scale (Lawton, 1975). Although widely used in the literature, the scale is unidimensional and treats negative aging attitudes as the inverse of positive aging attitudes. The Attitudes to Ageing Questionnaire (Laidlaw, Power, Schmidt, & the WHOQOL-OLD Group, 2007) is a promising alternative consisting of three scales

measuring psychosocial loss, physical change, and psychological growth and allowing individuals to report experiencing both positive and negative aging attitudes.

In addition to our measurement of aging attitudes being unidimensional, it was also an explicit measure of aging attitudes. Implicit aging attitudes do not always align with explicit aging attitudes (Kornadt, Meissner, & Rothermund, 2016) and may have different implications for daily well-being. Indeed, implicit attitudes test (IAT: Greenwald, McGhee, & Schwartz, 1998) shows the largest bias for one group over another (Nosek et al., 2002). Incorporating measurements of implicit aging attitudes into future work would also help examine one of the tenets of stereotype embodiment theory: that aging attitudes can impact us without our awareness (Levy, 2009).

Finally, all of our study participants resided in the United States. Perceptions of aging vary from country to country (Löckenhoff et al., 2009), and thus the impact of awareness of aging constructs may be different in countries with alternate views of aging. For example, Liang (2014) surveyed a sample of Chinese adults over age 85 and found that only 8% reported not feeling “old.” In contrast, a similarly aged sample of Swedish older adults found that nearly 64% reported not feeling “old” (Infurna, Gerstorf, Robertson, Berg, & Zarit, 2010). Feeling old may have different ramifications in other cultures, and future research will be needed to determine if our findings will replicate outside the U.S.

### **Conclusions**

In sum, the three manuscripts all speak to the implications of awareness of aging for the daily well-being of older adults. They provide a complement to the existing literature that speaks to broader individual differences or that looks at change across larger time-scales

(e.g., years or decades). The findings suggest that a complete understanding of daily well-being in adulthood should consider broader contexts, individual differences, and daily variability.

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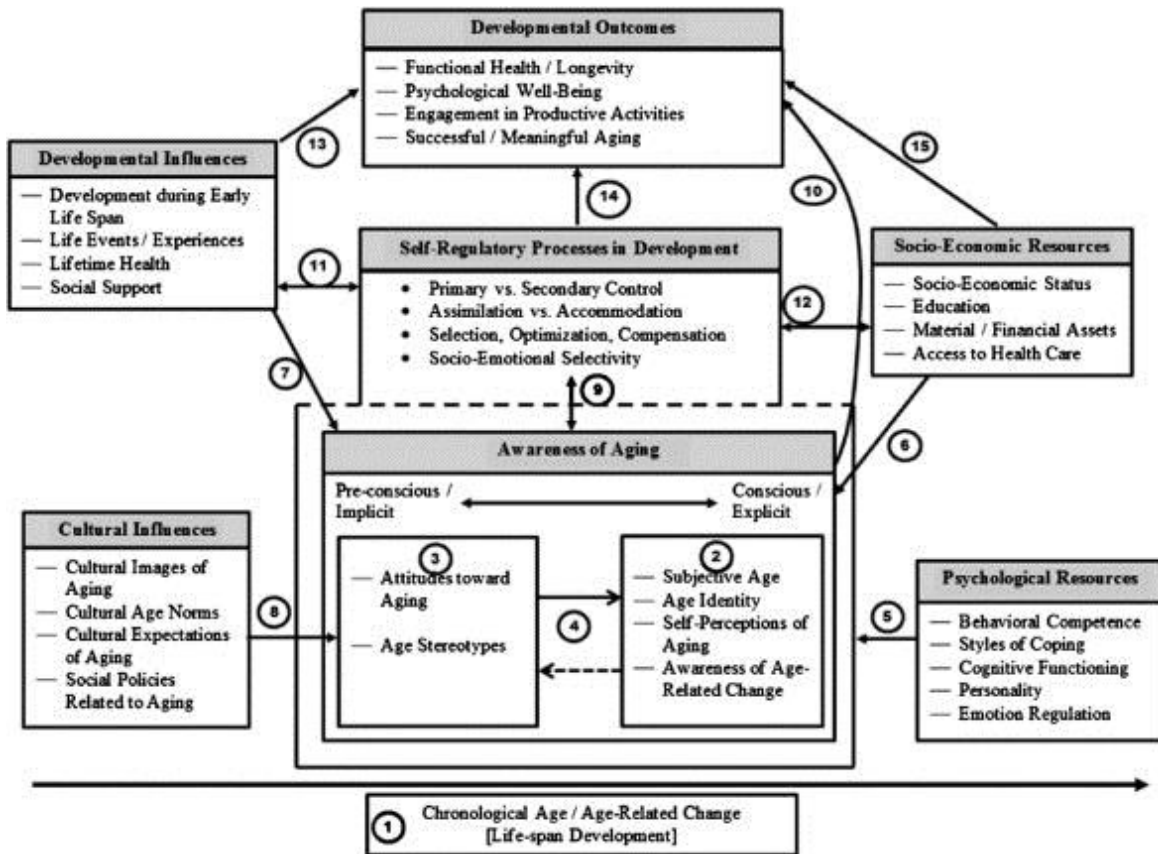
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**Figure 1.** Awareness of Aging (AoA) in the context of life-span developmental processes and outcomes. From “Awareness of Aging: Theoretical Considerations on an Emerging Concept,” by M. Diehl et al., 2014, *Developmental Review*, 34, p. 103. Copyright [2014] by Elsevier. Reprinted with permission (see Appendix B).

## APPENDICES

## APPENDIX A

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