THESIS

UNDERSTANDING RACIAL HEALTH DIFFERENCES: THE ROLE OF STRESSOR EXPOSURE AND AFFECT REACTIVITY

Submitted by

Carla Michelle Arredondo

Department of Human Development and Family Studies

In partial fulfilment of the requirements

For the Degree of Master of Science

Colorado State University

Fort Collins, Colorado

Spring 2019

Master's Committee:

Advisor: Gloria Luong

J. Douglas Coatsworth
Evelinn A. Borrayo

ABSTRACT

UNDERSTANDING RACIAL HEALTH DIFFERENCES: THE ROLE OF STRESSOR EXPOSURE AND AFFECT REACTIVITY

Despite all that is known about racial differences in health and well-being outcomes, much less is known about the processes that give rise to these differences. Previous work examining racial differences in stress-health processes has primarily focused on examining stressor exposure as a predictor and posits that mediating effects account for the racial differences in health and well-being outcomes. This study expands on previous work by examining the extent to which different stressor characteristics (i.e., stressor exposure and affect reactivity) may account for racial group differences in the following health and well-being outcomes: grip strength, health conditions, self-rated health, depressive symptoms, loneliness, and life satisfaction, and by testing for both mediating and moderating effects of each stressor characteristic. Results demonstrate that there were racial differences in self-rated health, depressive symptoms, and loneliness. In all instances, Whites demonstrated more favorable outcomes compared to non-Whites. These racial differences, however, were not accounted for by mediating effects of either stressor characteristic. Furthermore, the results indicate that race moderated the association between the stressor characteristics and grip strength, loneliness, and life satisfaction. Results are discussed in light of a stress-health framework and implications for minority health and well-being are discussed.

TABLE OF CONTENTS

INTRODUCTION

Racial minorities in the United States, such as Latinxs and African Americans, tend to experience more stressors and health problems, compared to Whites (Cardarelli et al., 2010; Perez, Fortuna, & Alegria, 2008). Given that experiencing stressors is associated with poorer health and well-being (Glei, Goldman, Chuang, & Weinstein, 2007; Marin et al., 2011), previous research has primarily focused on examining how differences in exposure to the number of stressors may explain health differences between racial minorities and Whites (Thoits, 2010). Nevertheless, differences in stressor exposure do not fully account for the discrepancies in health and well-being outcomes between Whites and non-White racial minorities. Therefore, it is important to examine other stressor characteristics aside from mere stressor exposure to gain a better understanding of the pathways and the mechanisms linking stressors to health and well-being. Indeed, recent research demonstrates that *how* people respond to stressors (i.e., affect reactivity) is a stronger predictor of long-term physical health and well-being than mere exposure to stressors (Charles, Piazza, Mogel, Sliwinski, & Almeida, 2013; Piazza, Charles, Sliwinski, Mogel & Almeida, 2013). These studies suggest that understanding affective reactions to stressors may provide additional information about the ways in which stressors contribute to health differences for racial minorities.

Stressor Exposure

Stressors are stimuli or events that have the real or perceived potential to threaten one's well-being (Lazarus & Folkman, 1984). Consequently, stressor exposure refers to the number of stressors that one experiences. Racial minorities are more likely to report higher levels of stressor exposure, relative to Whites, because they are more likely to come from lower socioeconomic backgrounds (Williams, Mohammed, Leavell, & Collins, 2010) and to experience neighborhood stressors, such as violence or crime (Glister, 2014). Furthermore, racial minorities are also subjected to minority-status stressors including discrimination (Perez, Fortuna, & Alegria, 2008; Williams & Mohammed, 2009) and acculturation stressors (Finch, Frank, & Vega, 2004).

Affect Reactivity

According to Lazarus and Folkman (1984), however, it is necessary to examine both the occurrence of a stressor, *and* an individual's response to that stressor, to better understand how stressors undermine physical health and well-being. In contrast to stressor exposure, stress reactivity refers to an individual's response to a stressor, such as their affect reactivity (e.g., increases in negative affect; Luong, Arredondo, & Wrzus, in press; Sliwinski, Almeida, Smyth, & Stawski, 2009). Various theoretical frameworks such as the stress and coping model (Lazarus & Folkman, 1984), biopsychosocial models (Blascovich & Mendes, 2000), and allostatic load models (McEwen & Stellar, 1993), provide support for the importance of examining affect reactivity to understand the link between stressors and physical health and well-being.

For example, the stress and coping and biopsychosocial models state that appraisals, or

evaluations, of stressor severity can influence affect reactivity. According to these theoretical frameworks, two people who encounter the same stressor may exhibit different levels of affect reactivity if they vary on their appraisals of the stressor (Siemer, Mauss, & Gross, 2007). In general, more threatening and negative appraisals of stressors are associated with greater affect reactivity (i.e., greater increases in negative affect and greater decreases in positive affect). Furthermore, according to allostatic load models, greater affect reactivity is associated with physiological activation which over time contributes to wear and tear on the body (McEwen & Stellar, 1993), that subsequently results in poor physical health and well-being (Glei et al., 2007; Juster, McEwen, & Lupien, 2010).

Previous research has shown that stressor exposure is associated with a variety of negative physical health and well-being outcomes, including an increased risk for health conditions such as hypertension (Heard, Whitfield, Edwards, Bruce, & Beech, 2011) and diabetes (Novak, Bjork, Giang, Heden-Stahl, Wilhelmsen, & Rosengren, 2012), and an increased risk for mental health problems such as depression (Hammen, 2005). Nevertheless, recent research suggests that when daily stressor exposure and affective reactivity are both considered, affective reactivity to daily stressors is a stronger predictor of physical health and well-being outcomes (Charles et al., 2013; Piazza et al., 2013). Hence, it may be the case that affect reactivity functions through more proximal pathways to predict health and well-being outcomes relative to stressor exposure.

Additionally, given that affect reactivity can be further broken down by valence (negative vs. positive affect reactivity), it may be pertinent to examine both of these independent constructs to fully understand the pathways through which affect reactivity is associated to health and well-being (Ong, Riffin, & Zautra, 2013; Piazza et al., 2013; Watson, 1988). Indeed, research demonstrates that positive and negative affect reactivity independently predict health and well-being outcomes. For example, one study found that negative affect reactivity, but not positive affect reactivity, to daily stressors predicted depressive symptoms (Parrish, Cohen, & Laurenceau, 2011). Furthermore, another study found that negative affect reactivity to daily stressors predicted general affective distress (e.g., feeling nervous, hopeless, or worthless) a decade later (Charles et al., 2013). Additionally, Sin and colleagues (2015) found that positive affect reactivity to daily stressors, when controlling for negative affect reactivity, predicted

elevated levels of interleukin-6 (IL-6), a mediator of bodily inflammation that is associated with frailty (i.e., low muscle strength), the development of certain types of cancer, and diabetes (Maggio, Guralnik, Longo, & Ferrucci, 2006). Finally, another study found that positive affect reactivity uniquely predicted an increased risk of mortality, but negative affect reactivity did not (Mroczek, et al., 2013). These studies suggest that although affect reactivity is related to a variety of physical health and well-being outcomes, that there may be different pathways through which positive and negative affect reactivity predict each outcome.

HEALTH DIFFERENCES: THE ROLE OF STRESS PROCESSES

Whites generally experience more favorable health and well-being outcomes compared to non-Whites. For example, there are racial differences in objective indicators of physical health, such as hand grip strength. Weak hand grip strength has been associated with frailty (Syddall, Cooper, Martin, Briggs, & Sayer, 2003), prospective disability (Rantanen, 2003), and even mortality risk (Gale, Martyn, Cooper, & Sayer, 2007; Rantanen, 2003). One study looking at racial differences in grip strength found that, relative to Whites, Latinxs had lower grip strength after controlling for childhood health, current adult health, and socioeconomic status (Haas, Krueger, & Rohlfsen, 2012). Furthermore, other studies have found that compared to Whites, African Americans have the higher rates of hypertension (Kramer, et al., 2004), whereas Latinxs have a higher risk of developing diabetes (Narayan, Boyle, Thompson, Sorensen, & Williamson, 2003). Other studies have also found racial differences in self-rated health, such that racial minorities on average tend to report poorer subjective health relative to Whites (Borrell & Dallo, 2008; Cummings & Jackson, 2008).

Additionally, similar patterns have been observed with regard to indicators of well-being, such as depressive symptoms, loneliness, and life satisfaction. For example, one study found that compared to Whites, racial minorities experienced more depressive symptoms (Plant & Sachs-Ericsson, 2004). Similarly, another study found that Latinx and African Americans generally reported more loneliness relative to Whites (Hawkley et al., 2008). Finally, a study examining racial differences in life satisfaction among a nationally representative sample of U.S. adults found that African Americans and Latinxs reported lower levels of life satisfaction compared to Whites (Barger, Donoho, & Wayment, 2009).

Based on the literature reviewed (Charles et al., 2013; Heard et al., 2011; Marin et al., 2011; Novak et al., 2012; Piazza et al., 2013), it is evident that both stressor exposure and affect reactivity to daily stressors are related to physical health and well-being. Hence, it is also important to determine how and the extent to which stressor exposure and affect reactivity differentially contribute to health differences between Whites and non-Whites. Examining the role of both of these stressor characteristics could further elucidate how racial health differences emerge. For example, some models posit that the association between race and poorer health and well-being outcomes are *mediated* by differences in stressor exposure and affect reactivity. These models suggest that racial differences in stressor exposure and affect reactivity account for the levels and prevalence of different health and well-being outcomes for Whites and non-Whites. Another, not mutually exclusive, possibility is that race *moderates* the association between stressor characteristics and physical health and well-being. These models suggest that racial minorities may show stronger stressor-health linkages than Whites. That is, according to these models, when racial minorities experience stressors, they are more likely to experience health and well-being problems compared to Whites who experience similar stressors. Preliminary evidence for this claim comes from work examining health differences between African Americans and Whites (Geronimus, Hicken, Keene, & Bound, 2006). This work has found that the same risk factors vary in the degree to which they contribute to different health outcomes by racial group, with risk factors exerting stronger effects with older age for African Americans compared to Whites, due to cumulative disadvantages over time (Geronimus et al., 2006).

The Strength and Vulnerability Integration (SAVI) model posits that older age is associated with strengths (i.e., more effective cognitive-behavioral emotion regulation skills) and vulnerabilities (i.e., declines in cardiovascular flexibility) that can impact affect reactivity (Charles & Luong, 2013). According to this model, due to a lifetime of expertise with emotions and other age-related motivational factors, older adults generally exhibit decreased levels of affect reactivity to daily life stressors (Charles & Luong, 2013). However, even if there are general age-related decreases in affective reactivity to daily stressors, affect reactivity differences between Whites and racial minorities would likely be maintained, or even exacerbated later in late life, due to cumulative disadvantages of racial minorities over the life course (Geronimus et al., 2006). Hence, these differences in affect reactivity could subsequently result in poorer health and well-being outcomes for racial minorities. On the other hand, it may also be the case that racial minorities who have survived to later adulthood are more resilient and exhibit more robust and effective methods to deal with stressors which may, in fact, result in health differences with some advantages for older racial minorities (Markides & Eschbach, 2005; Cunningham, et al., 2017).

Nevertheless, much less work has focused on examining racial group differences in stress processes that may predict health and well-being outcomes in older adulthood (Birditt, Cichy, & Almeida, 2011; Cichy, Stawski, & Almeida, 2012). Preliminary work with younger adults, however, suggests that race can be an important factor to consider when examining the effects of stressors of physical health and well-being. For example, one study examining racial group differences in emotional experiences found that Mexican Americans demonstrated higher levels

of affect reactivity to a standardized stimulus compared to other racial groups (Soto, Levenson, & Ebling, 2005). Furthermore, affect reactivity may be more consequential for older adults given that they exhibit longer recovery times once they are activated (Luong, Arredondo, & Wrzus, in press). Indeed, age-related changes in the body, such as dysregulation in the cardiovascular and neuroendocrine systems, make it increasingly difficult for older adults to effectively manage the high levels of physiological activation that are associated with high affective reactivity (Charles & Luong, 2013). These findings suggest that stressor exposure and affect reactivity may be more detrimental to the health and well-being of racial minority older adults compared to White older adults.

THE CURRENT STUDY

Previous research has established the associations between both stressor exposure and affective reactivity in relation to a variety of physical and well-being outcomes (Glei et al., 2007, Marin et al., 2011 Charles et al., 2013, Piazza et al., 2013). Research examining health differences, however, has primarily focused on examining stressor exposure despite the fact that affect reactivity is also associated with many physical health and well-being outcomes. Hence, one goal of the current study was to examine both the role of stressor exposure and affect reactivity with regard to physical health and well-being outcomes and to determine the extent to which there were racial group differences in stressor exposure and affect reactivity to daily stressors. Given that one of our goals was to examine affective reactivity to daily stressors, we used ecological momentary assessments (EMA) to measure momentary affect and minimize potential recall bias in the assessments of affective reactivity. Furthermore, another goal of the current study was to examine the possible *mediating* effects of stressor exposure and/or affect reactivity on the association between racial group and health and well-being outcomes. Additionally, we were also interested in examining the extent to which race *moderated* the associations between stressor exposure and affect reactivity with the different health and well-being outcomes.

Research Aims and Hypotheses

This study examined the extent to which there were racial group differences between Whites and non-Whites in stressor exposure and affect reactivity to daily stressors, as well as health and well-being. We hypothesized that non-Whites would report greater levels of stressor exposure and affect reactivity, and poorer health and well-being, compared to Whites.

Furthermore, this study examined the extent to which stressor exposure and/or affect reactivity explained racial group differences in health and well-being. We hypothesized that non-Whites would report greater levels of stressor exposure and that they would have higher levels of affect reactivity that would partially account for (i.e., *mediate*) racial health differences in indicators of objective functional health (e.g., grip strength and total number of health conditions), subjective health (e.g., self-rated health), and well-being (e.g., depressive symptoms, loneliness, and life satisfaction). Finally, this study also examined how strongly stressor exposure and affect reactivity were linked to indicators of objective functional health, subjective health, and well-being and the degree to which these associations were *moderated* by racial group. We hypothesized that stressor exposure and affect reactivity would be more strongly associated with indicators of objective functional health, subjective health, and well-being for non-Whites compared to Whites.

METHOD

Participants

Participants for this study were part of a larger research project, the Daily Experiences and Well-Being Study (DEWS), conducted by the University of Texas at Austin. A total of 333 adults, 151 men and 182 women, over the age of 65 years (M = 74.15, SD = 6.57) were recruited from the Austin Metropolitan Statistical Area (MSA) by The University of Michigan's Survey Research Center (SRC). Professionally-generated name and address lists, cell phone user lists, and random digit dialing with the Austin MSA area codes were used to contact potential participants. Given the age range of the sample, participants were screened for dementia prior to determining eligibility for the study. Eligible participants were community-dwelling older adults who were not employed full time, and who did not have severe visual or hearing impairments, or mobility disabilities. In this sample, 93% of participants had at least a high school degree and 57% reported having at least a bachelor's degree. Furthermore, the racial demographics of the sample were as follows: 224 participants (67.3%) identified as White, 51 participants (15.3%) identified as Latinx, 52 participants (15.6%) identified as African American, and 6 participants (1.8%) identified as other. The final sample size for the current analysis was 289, after excluding the participants who indicated their race as other and those with incomplete data. Furthermore, given that cell sizes with 3 racial groups were too small and power was a concern, all analyses were performed using a dichotomized race variable (White vs non-White (including African American and Latinx/Hispanic)).

Procedure

Participants first completed an initial face-to-face interview followed by 4 days of

ecological momentary assessments (EMA). Professional research staff met participants in their home to conduct the initial interview, which lasted approximately 90 minutes. Interviewers conducted a Computer-Assisted Personal Interview (CAPI) in which they verbally asked participants questions and used computers to document the participant's responses. The initial interview evaluated overall emotional health (i.e., depression symptoms, loneliness, and life satisfaction), physical functioning (i.e., health conditions and perceived health), and background characteristics, including socioeconomic status, age, gender, and race. Furthermore, during the initial interview, hand grip strength (as an index of muscle strength) was measured using a dynamometer.

At the end of the initial interview, participants were loaned an iPod Touch that administered daily EMA surveys via a mobile app for the next phase of the study, which was a four-day EMA period whereby participants received 6 EMA surveys per day for a total of 24 assessments. At the end of the initial interview, participants also received instructions on how to answer the EMA surveys and recharge the iPod. The four-day EMA period was scheduled to begin on a Thursday, Friday, or Saturday, so that the study period would consist of two weekdays and two weekend days for each participant. Preprogrammed surveys on the iPod touch prompted participants to complete daily questionnaires that assessed a variety of daily experiences. For the purposes of this study, we focused on assessments of current mood six times throughout the day, or approximately every three hours, during participants' reported waking hours. Additionally, at the end of each EMA survey day, participants were prompted to report whether they had experienced any stressors that day.

Measures

Covariates

Several covariates associated with physical health and well-being outcomes were included in the analyses. For gender, females were coded as 1 and males were coded as -1. For education, participants were asked to report the highest level of education completed. Coding for the different education levels was as follows: 1 (*no formal education*), 2 (*elementary school*), 3 (*some high school*), 4 (*high school*), 5 (*some college/ vocational or technical school*), 6 (*college graduate*), 7 (*post college, no degree*) and 8 (*advanced degree*).

Outcome Variables

The section that follows outlines all of the outcome variables of interest. Given that there are racial health differences in physical and mental health, this study examined both physical and mental health outcomes.

Hand Grip Strength

Hand grip strength is an objective health measure that is assessed with a dynamometer and is inversely associated with frailty. Participants were instructed to squeeze the dynamometer (Smedlay's Dynamometer, TTM, Tokyo, 100 kg) as hard as possible for a few seconds and then release. Participants began the test using their left hand and were instructed to alternate hands between trials for a total of 4 trials, or 2 on each hand. In between the participant's trials, members of the research staff would reset the dynamometer to zero before beginning a new trial. If participants were unable to perform the test with both hands, they were instructed to wait 30 seconds before performing the next trial with the same hand. Responses from each trial were recorded to the nearest whole half kilogram (e.g., 10.5kg) of force and the two trails from each hand were averaged. The averaged responses from each hand were then

combined into one average grip strength score for each participant.

Total Number of Health Conditions

With regards to total number of health conditions, participants used a checklist adapted from the Health and Retirement study (HRS; Wallace & Herzog, 1995) to report whether a doctor had ever indicated that they have any of the following eight conditions: High blood pressure, diabetes, cancer, chronic lung disease, heart attack, stroke, arthritis, or osteoporosis.

Self-Rated Health

Participants' subjective rating of their physical health was measured using a single item from the Medical Outcomes Study (MOS; Ware Jr & Sherbourne, 1992). Participants indicated the status of their health using a five-point Likert scale, from 1 (*Excellent*) to 5 (*Poor*).

Depressive Symptoms

Depressive symptoms were assessed using a modified version of the 11-item Center for Epidemiological Studies – Depressive Symptoms scale (CES-D; Kohout, Berkman, Evans, & Cornoni-Huntley, 1993). Participants indicated the extent to which they have experienced each item (e.g., I felt depressed, my sleep was restless, and I enjoyed life (reverse scored)) during the past week using a 4-point Likert scale from 1 (*Rarely or none of the time*) to 4 (*Most of all of the time*) (α = .78).

Loneliness

Loneliness was measured using a modified version of the UCLA Loneliness Scale (Russell, 1996) that was specifically developed for use in large surveys by Hughes and colleagues (2004). Using a three-point Likert scale (1= *Hardly ever,* 3= *Often*), participants indicated the extent to which they felt left out, isolated from others, and that they lacked companionship in the past month. Loneliness scores were calculated for each participant by

taking the average of these three items (α = .73).

Life Satisfaction

Overall life satisfaction was assessed using a single item used in previous studies (Diener, Gohm, Suh, & Oishi, 2000), with a ten-point Likert scale, from 1 (*Not at all satisfied*) to 10 (*Completely satisfied*).

Proposed Moderators and Mediators of Racial Group Differences in Health and Well-Being.

Race

Race for the White group was coded as 0 and participants who indicated that they were either African American or Latinx/Hispanic were placed into the non-White racial group and coded as 1.

Stressor Exposure

Stressor exposure was assessed using a one-item measure of daily stressors based on the Daily Inventory of Stressful Events (DISE; Almeida, 1998). At the end of each of the 4 EMA survey days, participants were asked whether anything happened that most people would consider stressful (1 = *yes* or 0 = *no*). Responses to this question were summed across days to create a total stressor exposure score for each participant, ranging from 0 (no stressors reported) to 4 (stressors reported on each study day).

Positive and Negative Affect

Affect was assessed using a modified version of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The modified PANAS was a 9-item self-report measure of affect that included 4 items assessing momentary positive affect (e.g., proud, content, loved, and calm; α = .75) and 5 items assessing momentary negative affect (e.g., nervous, irritated, bored, lonely, and sad; α = .86). Participants used a 5-point Likert scale (1=

not at all, 5= *a great deal*) to rate the extent to which they were currently experiencing each emotion.

Affect Reactivity

Similar to Almeida (2005), positive and negative affect reactivity was operationalized as the difference in positive and negative affect, respectively, on days when individuals experienced a stressor and days when they did not. That is, affect reactivity referred to how much people changed in their levels of affect when they experienced stressors vs. when they did not. Given this operational definition, we could not calculate reactivity scores for individuals who did not experience any stressors across the four-day study period.

Momentary affect was aggregated at the day level for each participant and the following 4 composite scores were created: negative affect on stressor days, positive affect on stressor days, negative affect on non-stressor days, and positive affect on non-stressor days. After the composite scores were created, negative affect reactivity was calculated for each participant by subtracting the negative affect (NA) on non-stressor days from the negative affect on stressor days (i.e., stressor day NA – non-stressor day NA). Positive affect (PA) reactivity was then calculated using a similar process (e.g., non-stressor day PA – stressor day PA) and, in both instances, larger scores indicated more reactivity. For negative affect, greater NA reactivity indicated that participants had reported more NA on stressor days relative to non-stressor days, whereas for positive affect, greater PA reactivity indicated greater reductions in PA on stressor days relative to non-stressor days.

Data Analytic Plan

The first research question examined the extent to which there were racial group differences in stress exposure, reactivity, and the physical health and well-being outcomes.

Independent samples t-tests were conducted to determine the extent to which racial group differences in these variables were present. The next research question examined the extent to which racial group differences in physical health and well-being outcomes were explained by indirect effects of stressor exposure and/or affect reactivity. Multiple regression analyses and bootstrapping were used to determine the indirect effects of each stressor characteristic. Finally, the last research question examined the extent to which the association between the stressor characteristics and the health and well-being outcomes were stronger for racial minorities compared to Whites. Multiple regression analyses were used to examine the degree to which racial group moderated the association between the stressor characteristics and the physical health and well-being outcomes.

RESULTS

Descriptives

On average, participants reported relatively few day-level stressors ($M = 0.48$, $SD = 0.77$) over the four-day study period. Out of the 289 participants, a total of 191 reported no day-level stressors over the four-day period, 67 reported experiencing 1 stressor, 22 reported 2 stressors, and 9 reported 3 stressors. No participants reported experiencing day-level stressors all four days. Given the operational definition of affect reactivity (i.e., differences in affect on days when stressors are reported relative to days when no stressors are reported), reactivity scores could not be calculated for the 191 individuals who did not report any day-level stressors over the four-day study period. As a result, the sample contributing to affect reactivity analyses was smaller ($N = 91$) compared to the full sample contributing information on daily stressor exposure ($N = 289$). Of the 91 participants included in the affect reactivity analyses, 71 were white and 20 were non-White (9 Latinxs and 11 African Americans), and for the stressor exposure analyses of the 284 participants, 202 were White and 82 were non-White (39 Latinxs and 43 African Americans).

Bivariate Correlations among Study Variables

Because there are known differences in physical and mental health outcomes for people of different ages, gender, and education level, bivariate correlations among these three variables and the outcomes of interest were examined to determine potential covariates to include in the models. Table 1 demonstrates the bivariate correlations between the potential covariates and the physical health and well-being outcomes. As can be seen in Table 1 the bivariate correlations revealed that gender ($r = -.13$, $p = .025$) and education ($r = -.23$, $p < .001$) had small

negative associations with the total number of health conditions reported. Age, on the other hand, had a small positive association with total number of health conditions ($r = .29$, $p < .001$). Education also had a small negative association with self-rated health ($r = -.29$, $p < .001$). Furthermore, bivariate correlations between the potential covariates and the well-being outcomes demonstrated that education had a small negative association with depressive symptoms ($r = -.13$, $p = .025$) and loneliness ($r = -.13$, $p = .025$). No other bivariate correlations between the potential covariates and the physical health and well-being outcomes were statistically significant. Given the statistically significant bivariate correlations, age, gender, and education, were included as covariates in the physical health models and education was the only covariate included in the well-being models.

Testing Racial Differences in Stress, Health, and Well-being

We first examined if there were racial group differences in stressor characteristics (stressor exposure and affect reactivity), as well as health and well-being outcomes. Independent samples t-tests were conducted to test the hypotheses that non-Whites would report greater levels of stressor exposure and affective reactivity compared to Whites. The results did not support the hypothesis that there were statistically significant racial group differences in stressor exposure between Whites ($M = .53$, $SD = .80$) and non-Whites ($M = .36$, $SD = .68$), $t(189.52) = 1.88$, $p = .062$. Furthermore, the t-tests examining racial group differences in positive affect reactivity, $t(90) = .613$, $p = .542$, and negative affect reactivity, $t(90) = .764$, $p = .447$, also did not support the hypothesis that there were statistically significant differences in affect reactivity between the two racial groups.

Next, we tested for racial group differences in the physical health (e.g., hand grip strength, total number of health conditions, and self-rated health) and well-being (e.g.,

depressive symptoms, loneliness, and life satisfaction) outcomes using independent samples t-tests. The analyses demonstrated that non-Whites (M = 2.97, SD = .895) reported poorer self-rated health (higher scored indicated poorer health), relative to Whites (M = 2.20, SD = .977), $t(200.49) = -6.80$, $p < .001$, 95% CI [-.987, -.543]. Furthermore, we found statistically significant racial group differences in depressive symptoms, loneliness. Specifically, non-Whites (M = 18.21, SD = 5.50) reported more depressive symptoms relative to Whites (M = 15.68, SD = 4.08), $t(145.27) = -4.05$, $p < .001$, 95% CI [-3.62, -1.43]. Similarly, non-Whites (M = 1.31, SD = .490) reported more loneliness compared to Whites (M = 1.19, SD = .355), $t(143.13) = -2.14$, $p = .034$, 95% CI [-.228, -.022]. There were, however, no significant racial group differences in hand grip strength, total number of health conditions, or, life satisfaction, p's > .05.

Testing Indirect Effects of Affect Reactivity and Stressor Exposure on Racial Group Differences in Physical Health and Well-Being

Although there were no differences between the racial groups on any of the stressor characteristics (i.e., stressor exposure, positive affect reactivity, negative affect reactivity), analyses were still conducted to test for the indirect effects of each stressor characteristic on the association between race, self-rated health, depressive symptoms, and loneliness. According to Hayes (2009), it is possible to have a significant indirect effect regardless of whether there is a significant association between the predictor and the mediator, or the mediator and the outcome of interest. Furthermore, the popularized causal steps approach is among one of the most underpowered methods for testing mediation (Hayes, 2009).

We therefore tested the hypotheses that stressor exposure and affect reactivity may independently have indirect effects partially accounting for the racial group differences that we

found in the health and well-being outcomes (i.e., self-rated health, depressive symptoms, and loneliness). Thus, to test for these indirect effects, regression analyses and bootstrapping with 10,000 samples were used to test for the indirect effect of stressor exposure and affect reactivity on the association between race and the health and well-being outcomes. The following three regression analyses would typically be conducted to test for the mediating effects of the affect reactivity on health and well-being outcomes: 1) regress the stress variable (mediator) on race variable (IV) to obtain regression coefficient a, 2) regress the health or well-being outcome (DV) on the race variable and stress variable to obtain both the $c'$and b regression coefficients, and 3) regress the health or well-being outcome on the race variable to get the regression coefficient c. The PROCESS macro (Hayes, 2013) in SPSS v. 2.16.3 was used to conduct all three regression analyses in one step.

Stressor Exposure

First, we tested the conventional model of indirect effects to examine whether stressor exposure at least partially accounts for the racial group differences in health and well-being (Thoits, 2010). As described previously with regard to our covariates, the indirect effects analyses for the physical health outcomes were conducted using age, gender, and education level as covariates in the model, whereas the analyses for the well-being outcomes only included education as a covariate. The results of the mediation analyses revealed that there were no statistically significant indirect effects of stressor exposure on the association between racial group and the various physical health and well-being outcomes (all CIs included zero).

Affect Reactivity

Next, we tested the alternative model that affect reactivity at least partially accounts for the racial group differences in health and well-being. The results of the mediation analyses

revealed that there were no statistically significant indirect effects of affect reactivity on the association between racial group and the various physical health and well-being outcomes (all CIs included zero).

Testing Moderating Effects of Race on the Association between Stressor Exposure and Affect Reactivity and Physical Health and Well-Being Outcomes

Finally, we tested the extent to which race moderated the association between stressor characteristics and the health and well-being outcomes. We hypothesized that the associations between the stressor characteristics would be more strongly linked to health and well-being for non-White as compared to White participants. To test this hypothesis, we conducted moderation analyses using multiple regression. Separate sets of analyses were conducted with stressor exposure, positive affect reactivity, and negative affect reactivity as predictors of each of the physical health and well-being outcomes, with racial group as the moderator. The PROCESS macro in SPSS v. 2.16.3 was used to conduct these analyses given that this script automatically creates interaction terms and conducts multiple regression with mean centered variables. Mean centered variables help to reduce non-essential multicollinearity between the interaction term (e.g., Negative affect reactivity × racial group) and the lower-ordered terms (i.e., main effects) in the model (Aiken & West, 1991).

Testing Stressor Exposure by Race Effects

In the first set of analyses we tested the extent to which Stressor Exposure × Racial Group predicted each of the following outcomes in separate models of physical health (average grip strength, number of health conditions, and self-rated health) and well-being (loneliness, depressive symptoms, and life satisfaction) controlling for the covariates mentioned previously. The multiple regression analyses demonstrated that the only statistically significant Stressor

Exposure × Racial Group interaction effect was for average grip-strength. Model 1 in Table 2 provides a summary of the findings from this moderation analysis. The regression coefficient for the interaction term was statistically significant, b_3 = -50.09, $t(271)$ = -2.04, p = .042. The interaction term accounted for 1.5% of the variance in average grip strength, and the overall regression accounted for 2.5% of the variance in average grip strength. Figure 1 displays the conditional regression slopes for the different racial groups. Simple slope analyses revealed that the simple slopes for Whites, b = 20.02, $t(271)$ = 1.64, p = .102, 95% CI [-3.995, 44.04] and non-Whites, b = -30.07 , $t(271)$ = -1.40, p = .163, 95% CI [-72.358, 12.212] were not significantly different from zero. Although the simple slopes were not statistically significantly different from zero, the moderation analysis suggested that the slopes were moving in different directions and that they were statistically significantly different from each other.

Testing Positive Affect Reactivity by Race Effects

In the next set of analyses, we tested the extent to which Positive Affect Reactivity × Racial Group predicted each of the health and well-being outcomes controlling for mean positive affect and age, gender, and education level in the models looking at physical health outcomes and controlling for mean positive affect and education in the models looking at well-being outcomes. There were no significant Positive Affect Reactivity × Racial Group interaction effects for any of the physical health or well-being outcomes, p's > .05.

Testing Negative Affect Reactivity by Race Effects

Finally, in the last set of multiple regression analyses we tested the extent to which Negative Affect Reactivity × Racial Group predicted each of the health and well-being outcomes controlling for mean negative affect, age, gender, and education level in the models looking at physical health outcomes, and controlling for mean negative affect and education in

the models looking at well-being outcomes. The regression analyses demonstrated that there were significant Negative Affect Reactivity × Racial Group interaction effects for loneliness and life satisfaction in separate models. Model 2 in Table 2 provides a summary of the findings for the model predicting loneliness. As can be seen in Table 2, the regression coefficient for the interaction term was statistically significant, b_3 = -1.05, $t(86)$ = -2.74, p = .008. The interaction term accounted for 5.71% of the variance in loneliness, and the overall regression accounted for 34.5% of the variance in loneliness. Figure 2 displays the conditional regression slopes for the different racial groups. Simple slope analyses revealed that the slope for Whites was not significantly different from zero, b = 0.13, $t(86)$ = .79, p = .432, 95% CI [-.196, .455]. Thus, for Whites, increases in negative affect reactivity were not associated with loneliness. The simple slope for non-Whites, however, was significantly different from zero, b = -0.925, $t(86)$ = -2.60, p = .011, 95% CI [-1.63, -.219], such that increases in negative affect reactivity scores were associated with *lower* levels of loneliness for non-Whites.

Model 3 in Table 2 provides a summary of the findings from the moderation analysis examining Negative Affect Reactivity × Racial Group predicting life satisfaction. The regression coefficient for the interaction term was statistically significant, b_3 = 4.69, $t(86)$ = 2.93, p = .004. The interaction term accounted for 8.04% of the variance in life satisfaction, and the overall regression accounted for 20.2% of the variance in life satisfaction. Figure 3 displays the conditional regression slopes for the two racial groups. Simple slope analyses demonstrated that the simple slope for Whites was not significantly different from zero, b = -0.59, $t(85)$ = -.86, p = .393, 95% CI [-1.94, .771]. The simple slope for the non-Whites was statistically significant, b = 4.11, $t(85)$ = 2.78, p = .007, 95% CI [1.16, 7.05] and indicated that there was a strong positive association between negative affect reactivity and life satisfaction, such that

greater negative affect reactivity scores were associated with *more* life satisfaction for non-Whites.

DISCUSSION

The current study sought to understand the extent to which stressor characteristics (stressor exposure and affect reactivity) may account for racial group differences in health and well-being. We found statistically significant racial group differences in self-rated health, depressive symptoms, and loneliness. Our findings, however, also demonstrate that there were no statistically significant differences in stressor exposure or affect reactivity between Whites and racial minorities. This finding is noteworthy because an absence of racial group differences in stressor exposure and affect reactivity suggest that there may be different underlying processes, other than differences in exposure or reactivity, that are associated with stress that are contributing to poorer outcomes in physical health and well-being for racial minorities. Furthermore, we did not find an indirect effect of stressor exposure or affect reactivity on the association between racial group and self-rated health, depressive symptoms, and loneliness. As a result, rather than indirect effects accounting for racial group differences in health and well-being, it appears that there are moderating effects. Hence, this suggests that stressor characteristics are differentially related to health and well-being for non-Whites compared to Whites.

Indeed, our results show that race moderated the association between the stressor characteristics and some of the physical health and well-being outcomes. More specifically, we found that the association between stressor exposure and average grip strength was moderated by race. In this instance, the simple slopes were not statistically significantly different from zero, but they were different from each other and moving in different directions for the different racial groups. Additionally, we found that race moderated the associations between negative

affect reactivity and loneliness and negative affect reactivity and life satisfaction. It is important to note, however, that these associations were in the opposite direction of what was expected based on prior research. The affect reactivity literature consistently suggests that higher levels of reactivity are associated with poorer outcomes, yet our findings demonstrate that higher levels of affect reactivity were associated with *better* outcomes for racial minorities. For Whites, these associations were non-existent. Hence, it may be the case that despite higher levels of affect reactivity, racial minorities are also more resilient to stressors (Assari, 2017). Such resilience allows racial minorities to demonstrate favorable outcomes despite exhibiting what may be considered a maladaptive stress response.

Nevertheless, it would be premature to conclude that higher levels of negative affect reactivity are more adaptive for racial minorities; more research is needed to replicate these findings and to fully identify the conditions and/or mechanisms that give rise to such an association. Additionally, it is also to note that a limitation of this study is that we did not have affect reactivity scores for all of our participants. As previously described in the results section, the manner in which we operationalized affect reactivity, and that fact that the EMA period only lasted 4 days, meant that we could not obtain reactivity scores for participants who reported experiencing no stressors over the four-day period. As a result, our effective sample size in all of the analyses involving affect reactivity was reduced. Future studies should seek to replicate these findings using more complete data on affect reactivity. Another possible limitation of this study is that the age range of this sample contributed to null indirect effects of stressor exposure and affect reactivity. In general, older adults tend to report fewer daily stressors and experience lower level of affect reactivity relative to younger adults (Charles & Luong, 2013). Future research should seek to use a more diverse age range which could provide a wider range of

stressor exposure and affect reactivity scores to better understand the indirect effects of stressor exposure and affect reactivity on the racial group differences in health and well-being outcomes.

This study, however, also had noteworthy strengths. For example, we used EMA to assess day-level affect which allowed us to minimize the recall bias that is typically present in global assessments of affect that require longer recall times. Similarly, another strength of this study was that we calculated reactivity scores rather than having participants make judgements on how they reacted to stressors. This strategy allowed us to minimize socially desirable responding on behalf of participants and to avoid issues with introspection. Furthermore, we examined both stressor exposure and affect reactivity which allowed us to parse out the contributions that each of these stressor characteristics with regard to our outcomes of interest. Future work, however, should seek to better understand the role of each of these constructs with regards to a broader range of physical health and well-being outcomes and should examine these associations by racial group rather than grouping minorities into one group. Although we did not have the power to conduct our analyses using specific racial groups (e.g., Latino/Hispanic vs African American vs Whites) in our sample, we believe that future work would benefit from examining each racial group individually. Given the existing differences in the rates of physical health and well-being outcomes among Latinxs and African Americans, we strongly believe that these association might even vary between the different racial minority groups. Hence, it would be worthwhile to see if our findings are replicated when examining association between stressor characteristics and health and well-being by racial group. Overall, our study expands on previous work examining the effects of stressors on health and well-being by examining affect reactivity, in addition to stressor exposure, and testing for

moderating effects. The findings of this study contribute to our understanding of racial health differences and provide some information on how stressor characteristics are associated with racial group differences in health and well-being outcomes. Understanding the processes through which these racial group differences in health and well-being emerge, is an important step in developing and implementing prevention and intervention program that can help address these health differences.

Table 1

Correlations between potential covariates and physical health and well-being outcomes.

Variable	1	2	3	4	5	6	7	8	9
1. Gender	–								
2. Age	.015	–							
3. Education	.172**	-.072	–						
4. Depressive Symptoms	-.028	.012	-.265**	–					
5. Loneliness	-.007	.007	-.136*	.618**	–				
6. Life Satisfaction	-.012	.045	.002	-.494**	-.463**	–			
7. Grip Strength	-.073	.055	-.079	.033	-.030	.054	–		
8. Self-Rated Health	-.040	.043	-.295**	.395**	.196**	-.279**	.112	–	
9. Total Health Conditions	-.127*	.291**	-.230**	.257**	.094	-.075	.125*	.427**	–

Note: * $p < .05$, ** $p < .01$, *** $p < .001$

Table 2

Summary of the Findings from the Three Sets of Moderation Analyses

Variable		*Coefficient*	*SE*	*t*	*p*
Model 1: Average Grip-Strength					
Intercept	i_1	10.96	105.71	0.10	.918
Stressor Exposure	b_1	5.246	10.773	0.49	.627
Racial Group	b_2	-9.273	18.885	-0.49	.624
Stressor Exposure X Racial Group	b_3	-50.09	24.511	-2.04	.042
Age	b_4	1.297	1.324	0.98	.328
Gender	b_5	-10.93	16.575	-0.66	.510
Education	b_6	-4.380	5.661	-0.77	.440
				R^2 = 0.025, *MSE* =17670.11	
				F(6,271) =9.63, *p* < .325	
Model 2: Loneliness					
Intercept	i_1	0.369	0.226	1.61	.107
Negative affect reactivity (NAR)	b_1	-0.111	0.153	-0.73	.468
Racial Group	b_2	0.223	0.091	2.45	.017
NAR X Racial Group	b_3	-1.054	0.385	-2.74	.008
Education	b_4	0.004	0.025	0.16	.872
Mean Negative Affect	b_5	0.672	0.128	5.24	< .001
				R^2 = 0.345, *MSE* =0.117	
				F(5,86) = 9.04, *p* < .001	
Model 3: Life Satisfaction					
Intercept	i_1	10.316	0.942	10.95	< .001
Negative affect reactivity (NAR)	b_1	-0.498	0.637	0.78	.437
Racial Group	b_2	0.078	0.381	0.21	.837
NAR X Racial Group	b_3	4.695	1.605	2.93	.004
Education	b_4	0.026	0.105	0.25	.806
Mean Negative Affect	b_5	-1.913	0.535	-3.57	< .001
				R^2 = 0.202, *MSE* =2.035	
				F(5,85) = 4.30, *p* = .002	

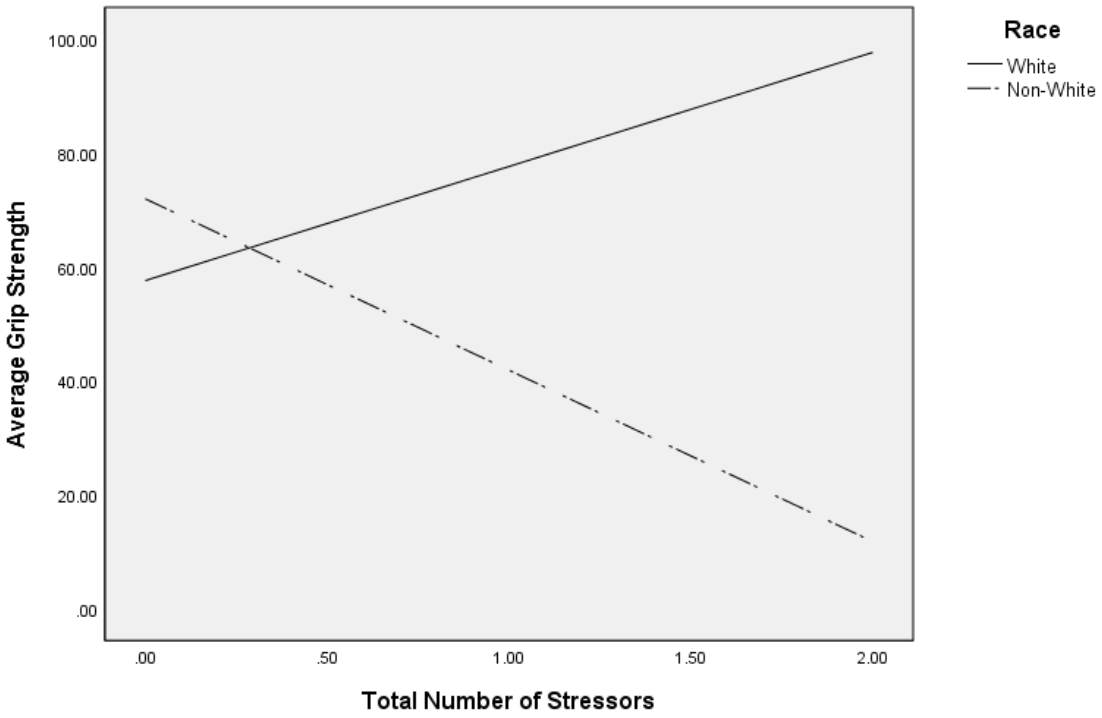

Figure 1. Regression slope estimates showing the association between stressor exposure and average grip strength for Whites and non-Whites.

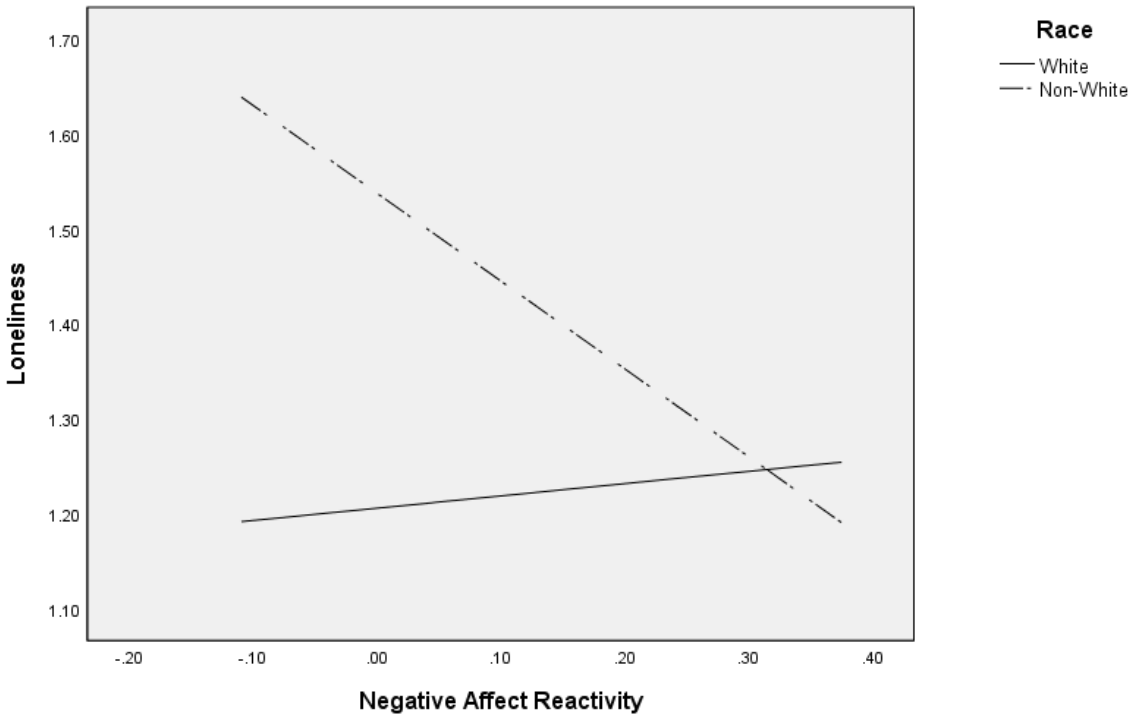

Figure 2. Regression slope estimates showing the association between negative affect reactivity and loneliness for Whites and non-Whites.

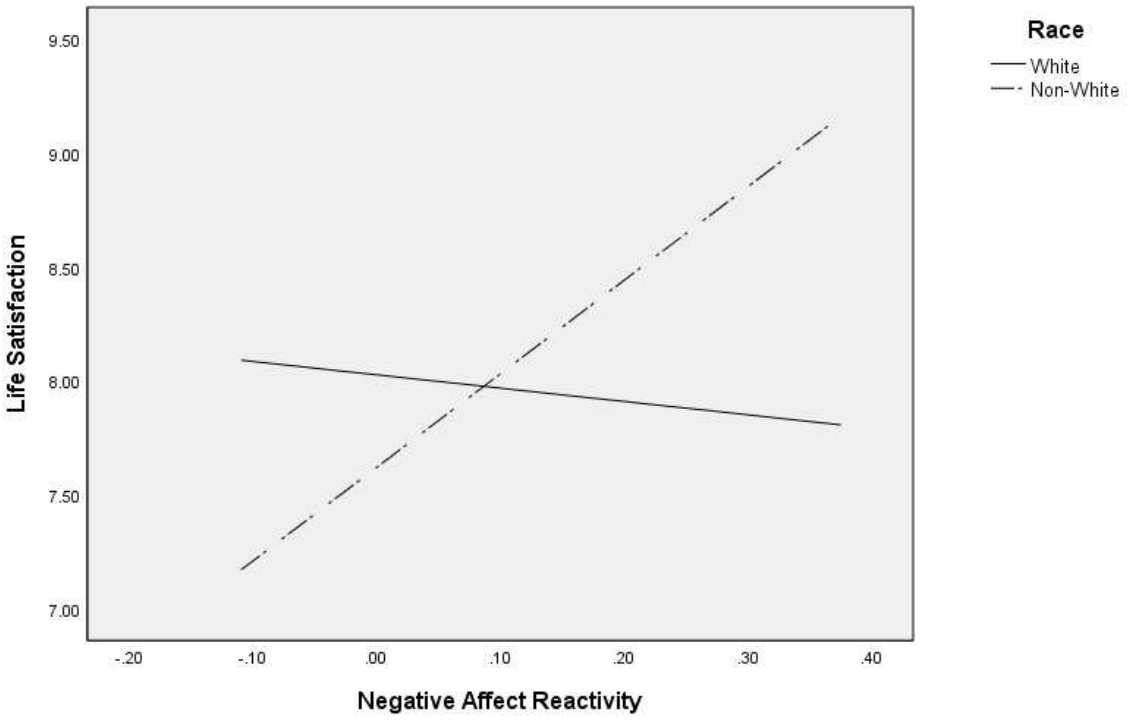

Figure 3. Regression slope estimates showing the association between negative affect reactivity and life satisfaction for Whites and non-Whites.

REFERENCES

Aiken, L. S., & West, S. G. (1991). Multiple regression: Testing and interpreting interactions. Newbury Park: Sage.

Almeida, D. M. (1998). *Daily Inventory of Stressful Events (DISE) expert coding manual.* Tucson: Division of Family Studies and Human Development, University of Arizona.

Almeida, D. M. (2005). Resilience and vulnerability to daily stressors assessed via dairy methods. *Current Directions in Psychological Science, 14,* 64-68.

Assari, S. (2017). Number of chronic medical conditions fully mediated the effects of race on mortality; 25-year follow-up of a nationally representative sample of Americans. *Journal of Racial and Ethnic Health Disparities, 4,* 623-631.

Barger, S. D., Donoho, C. J., & Wayment, H. A. (2009). The relative contributions of race/ethnicity, socioeconomic status, health, and social relationships to life satisfaction in the United States. *Quality of Life Research, 18,* 179-189.

Borrell, L. N., & Dallo, F., J. (2008). Self-rated health and race among Hispanic and non-Hispanic adults. *Journal of Immigrant Minority Health, 10,* 229-238.

Birditt, K. S., Cichy, K. E., & Almeida, D. M. (2011). Age differences in exposure and reactivity to interpersonal tensions among Black and White individuals across adulthood. *Race and Social Problems, 3,* 225-239.

Cichy, K. E., Stawski, R. S., & Almeida, D. M. (2012). Racial differences in exposure and reactivity to daily family stressors. *Journal of Marriage and Family Therapy, 74,* 572-586.

Blascovich, J., & Mendes, W. B. (2000). Challenge and threat appraisals: The role of affective cues. In J. Forgas (Ed.), *Feeling and Thinking: The Role of Affect in Social Cognition* (pp. 59–82). Cambridge, England: Cambridge University Press.

Cardarelli, R., Cardarelli, K., Fulda, K. G., Espinoza, A., Cage, C., Vishwanatha, J., … & Carroll, J. (2010). Self-reported racial discrimination, response to unfair treatment, and coronary calcification in asymptomatic adults- the North Texas Health Heart study. *Public Health, 10,* retrieved from http://www.biomedcentral.com/1471-2458/10/285

Charles, S. T., & Luong, G. (2013). Emotional experience across adulthood: The theoretical model of strength and vulnerability integration. *Current Directions in Psychological Science, 22,* 443-448.

Charles, S. T., Piazza, J. R., Mogel, J., Sliwinski, M. J., & Almeida, D. M. (2013). The wear and tear of daily stressors on mental health. *Psychological Science, 24,* 733-741.

Cummings, J. L., & Jackson, P. B. (2008). Race, gender, and SES disparities in self-assessed health, 1974-2004. *Research on Aging, 30,* 137–167.

Cunningham, T. J., Croft, J. B., Liu, Y., Lu, H., Eke, P. I., & Giles, W. H. (2017). Vital signs: Racial disparities in age-specific mortality among Blacks of African Americans – United States, 1999-2015. *Morbidity and Mortality Weekly Report, 66,* 444-456. doi: 10.15585/mmwr.mm6617e1

Diener, E., Gohm, C. L., Suh, E., & Oishi, S. (2000). Similarity of the relationship between marital status and subjective well-being across cultures. *Journal of Cross-Cultural Psychology, 31,* 419-436.

Finch, B. K., Frank, R., & Vega, W. A. (2004). Acculturation and Acculturation Stress: A Social-Epidemiological Approach to Mexican Migrant Farmworkers' Health. *The International Migration Review, 38,* 236-262.

Gale, C. R., Martyn, C. N., Cooper, C., & Sayer, A. A. (2007). Grip strength, body composition, and mortality. *International Journal of Epidemiology, 36*, 228–235.

Geronimus, A. T., Hicken, M., Keene, D., & Bound, J. (2006). "Weathering" and age patterns of allostatic load scores among Blacks and Whites in the United States. *American Journal of Public Health, 96,* 826-833.

Glei, D. A., Goldman, N., Chuang, Y., & Weinstein, M. (2007). Do chronic stressors lead to physiological dysregulation? Testing the theory of allostatic load. *Psychosomatic Medicine, 69,* 769-776.

Gilster, M. E. (2014). Neighborhood stressors, mastery, and depressive symptoms: Racial and ethnic differences in an ecological model of the stress process in Chicago. *Journal of Urban Health: Bulletin of the New York Academy of Medicine, 91,* 690-706.

Gunnar, M., & Quevedo, K. (2007). The neurobiology of stress and development. *Annual Review of Psychology, 58,* 145-173.

Haas, S. A., Krueger, P. M., & Rohlfsen, L. (2012). Race/ethnic and nativity disparities in later life physical performance: The role of health and socioeconomic status over the life course. *The Journals of Gerontology, Series B: Psychological and Social Sciences, 67,* 238-248

Halbesleben, J. R. B., Neveu, J.-P., Paustian-Underdahl, S. C., & Westman, M. (2014). Getting to the "COR": Understanding the role of resources in Conservation of Resources Theory. *Journal of Management, 40,* 1334–1364. http://dx.doi.org/10.1177/0149206314527130

Hammen, C. (2005). Stress and depression. *Annual Review of Clinical Psychology* 1, 293–319.

Hawkley, L. C., Hughes, M. E., Waite, L. J., Masi, C. M., Thisted, R. A., & Cacioppo, J. T. (2008). From social structural factors to perceptions of relationship quality and loneliness: The Chicago health, aging and social relations study. *Journals of Gerontology, Series B: Psychological and Social Sciences, 63,* S375-S384.

Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis is the new millennium. *Communication Monographs, 76,* 408-420.

Hayes, A. F. (2013). Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. New York: The Guilford Press.

Heard, E., Whitfield, K. E., Edwards, C. L., Bruce, M. A., & Beech, B. M. (2011). Mediating effects of social support on the relationship among perceived stress, depression and hypertension in African Americans. *Journal of the National Medical Association, 103,* 116-122.

Hughes, M. E., Waite, L. J., Hawkley, L. C., & Cacioppo, J. T. (2004). A short scale for measuring loneliness in large surveys: Results from two population-based studies. *Research on Aging, 26,* 655-672.

Juster, R., McEwen, B. S., & Lupien, S. J. (2010). Allostatic load biomarkers of chronic stress and impact on health and cognition. *Neuroscience and Behavioral Reviews, 35,* 2-16.

Kramer, H., Han, C., Post, W., Goff, D., Diez-Roux, A., Cooper, R., & . . . Shea, S., (2004). Racial/Ethnic differences in hypertension and hypertension treatment and control in the mutli-ethnic study of atherosclerosis (MESA). *American Journal of Hypertension, 17,* 963-970.

Kohout, F. J., Berkman, L. F., Evans, D. A., & Cornoni-Huntley, J. (1993). Two shorter forms of the CES-D depression symptom index. *Journal of Aging and Health, 5,* 179-193.

Lazarus, R. S. (1999). Stress and emotion: A new synthesis. New York: Springer.

Lazarus, R. S., & Folkman, S. (1984). Stress, appraisal, and coping. New York: Springer.

Luong, G., Arredondo, C. M., & Wrzus, C. (in press). Age differences in emotion regulation dynamics: Anticipatory, reactivity, and recovery processes. To appear in P. M. Cole & T. Hollenstein (Eds.), *Emotion Regulation: A Matter of Time*. Oxford: Taylor & Francis.

Luong, G., & Charles, S. T. (2014). Age differences in affective and cardiovascular responses to a negative social interaction: The role of goals, appraisals, and emotion regulation. *Developmental Psychology, 50,* 1919-1930.

Maggio, M., Guralnik, J. M., Longo, D. L., & Ferrucci, L. (2006). Interleukin-6 in aging and chronic disease: A magnificent pathway. *The Journals of Gerontology Series A: Biological Sciences & Medical Sciences, 61,* 575-584.

Marin, M., Lord, C., Andrew, J., Juster, R., Sindi, S., Lapierre, G., … Lupien, S. J. (2011). Chronic stress, cognitive functioning and mental health. *Neurobiology of Learning and Memory, 96,* 583-595.

Markides, K. S., & Eschbach, K. (2005). Aging, migration, and mortality: Current status of research on the Hispanic paradox. *The Journals of Gerontology: Series B, 60,* S68-S75.

Matsumoto, D. (2006). Are cultural differences in emotion regulation mediated by personality traits? *Journal of Cross-Cultural Psychology*, 37, 421-437.

McEwen, B. S., & Stellar, E. (1993). Stress and the individual. Mechanisms leading to disease. *Archives of Internal Medicine, 153,* 2093-2101.

Mroczek, D. K., Stawski, R. S., Turiano, N. A., Chan, W., Almeida, D. M., Neupert, S. D., & Spiro, A., III. (2013). Emotional reactivity and mortality: longitudinal findings from the VA normative aging study. *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, *70*, 398–406.

Narayan, K. M., Boyle, J. P., Thompson, T.J., Sorensen, S. W., & Williamson, D. F. (2003). Lifetime risk for diabetes mellitus in the United States. *Journal of the American Medical Association, 290,* 1884-1890.

Novak, M., Bjorck, L., Giang, K. W., Heden-Stahl, C., Wilhelmsen, L., & Rosengren, A. (2012). Perceived stress and incidence of type 2 diabetes: A 35-year follow-up study of middle-aged Swedish men. *Diabetic Medicine, 30,* e8-e16.

Ong, A.D., Exner-Cortens, D., Riffin, C., Steptoe, A., Zautra, A., & Almeida, D. M. (2013). Linking stable and dynamic features of positive affect to sleep. *Annals of Behavioral Medicine, 46,* 52-61.

Parrish, B. P., Cohen, L. H., & Laurenceau, J. (2011). Prospective relationship between negative affective reactivity to daily stress and depressive symptoms. *Journal of Social and Clinical Psychology, 30,* 270-296.

Pascoe, E. A., & Richman, L. S. (2009). Perceived discrimination and health: A meta-analytic review. *Psychological Bulletin, 135,* 531-554.

Perez, D. J., Fortuna, L., & Alegria, M. (2008). Prevalence and correlates of everyday discrimination among U.S. Latinos. *Journal of Community Psychology*, *36,* 421–433.

Piazza, J. R., Charles, S. T., Sliwinski, M. J., Mogel, J., & Almeida, D. M. (2013). Affective reactivity to daily stressors and long-term risk of reporting a chronic physical health condition. *Annals of Behavioral Medicine, 45,* 110-120.

Plant, E. A., & Sachs-Ericsson, N. (2004). Racial and ethnic differences in depression: The roles of social support and meeting basic needs. *Journal of Counseling and Clinical Psychology, 72,* 41-52.

Rantanen, T. (2003). Muscle strength, disability and mortality. *Scandinavian Journal of Medicine & Science in Sports, 13*, 3–8.

Russell, D. W. (1996). UCLA Loneliness Scale (Version 3): Reliability, validity, and factor structure. *Journal of Personality Assessment, 66,* 20-40.

Siemer, M., Mauss, I., & Gross, J. J. (2007). Same situation-different emotions: How appraisals shape our emotions. *Emotion, 7,* 592-600.

Sin, N. L., Graham-Engeland, J. E., Ong, A. D., & Almeida, D. M. (2015). Affective reactivity to daily stressors is associated with elevated inflammation. *Health Psychology, 34,* 1154-1165.

Sliwinski, M. J., Almeida, D. M., Smyth, J., & Stawski, R. S. (2009). Intraindividual change and variability in daily stress processes: Findings from two measurement-burst diary studies. *Psychology and Aging, 24,* 828-840.

Soto, J. A., Levenson, R. W., & Ebling, R. (2005). Cultures of moderation and expression: Emotional experience, behavior, and physiology in Chinese Americans and Mexican Americans. *Emotion*, *5,* 154-165.

Spalter-Roth, R., Lowenthal, T. A., & Rubio, M. (2005). *Race, ethnicity, and the health of Americans*. Washington, DC: American

Syddall, H., Cooper, C., Martin, F., Briggs, R., & Sayer, A. A. (2003). Is grip strength a useful single marker of frailty? *Age and Ageing, 32,* 650-656.

Thoits, P. A. (2010). Stress and health: Major findings and policy implications. *Journal of Health and Social Behavior, 51,* S41-S53.

Wallace, R. B., & Herzog, A. R. (1995). Overview of the health measures in the Health and Retirement Study. *Journal of Human Resources, 30,* S84-S107.

Ware Jr, J. E., & Sherbourne, C. D. (1992). The MOS 36-item short-form health survey (SF-36): I. Conceptual framework and item selection. *Medical Care, 30,* 473-483.

Watson, D. (1988). Intraindividual and interindividual analyses of positive and negative affect: Their relationship to health complains, perceived stress, and daily activities. *Journal of Personality and Social Psychology, 54,* 1020-1030.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54,* 1063-1070.

Williams, D. R., & Mohammed, S. A. (2009). Discrimination and racial disparities in health: Evidence and needed research. *Journal of Behavioral Medicine, 32,* 20-47.

Williams, D. R., Mohammed, S. A., Leavell, J., & Collins, C. (2010). Race, socioeconomic status, and health: Complexities, ongoing challenges, and research opportunities. *Annals of the New York Academy of Sciences, 1186,* 69-101.