

Special Issue: Race and Mental Health Among Older Adults: Original Report

Do Depressive Symptoms Shape Blacks' Perceptions of Stress Over Time?

DeAnnah R. Byrd, PhD,^{1,*} Roland J. Thorpe Jr, PhD,^{2,3} and Keith E. Whitfield, PhD⁴

¹Institute of Gerontology, Wayne State University, Detroit, Michigan. ²Hopkins Center for Health Disparities Solutions, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland. ³Program for Research on Men's Health, Hopkins Center for Health Disparities Solutions, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland. ⁴Department of Psychology, Wayne State University, Detroit, Michigan.

*Address correspondence to: DeAnnah R. Byrd, PhD, Institute of Gerontology, Wayne State University, 87 E. Ferry St., Detroit, Michigan 48202.
E-mail: deannahbyrd@wayne.edu

Received: December 18, 2019; Editorial Decision Date: April 30, 2020

Decision Editor: Robert J. Taylor, PhD, MSW

Abstract

Background and Objectives: Previous studies have linked stress to multiple negative mental health outcomes, including depression. This established stress–depression association is typically examined in one direction and cross-sectionally. This study examined the bidirectional relationships between depressive symptoms and changes in perceived stress over time in Blacks.

Research Design and Methods: The present study uses a community-dwelling sample of 450 Black adults, aged 51–96 years old, who participated in the Baltimore Study of Black Aging—Patterns of Cognitive Aging. Perceived stress—measured by the Perceived Stress Scale—and depressive symptoms—measured using the Center for Epidemiologic Studies Depression scale—were both assessed at baseline and follow-up 33 months later. Ordinary least squares regression was used to examine 2 bidirectional longitudinal relationships between (1) stress–depression and (2) depression–stress, and whether these associations are modified by age.

Results: Initial analyses testing the typical stress–depression relationship showed an effect in the expected direction, that is stress leading to more depressive symptoms over time, adjusting for model covariates, but the effect was not statistically significant ($b = 0.014, p = .642$). After accounting for baseline perceived stress level, age, sex, education, and chronic health conditions, depressive symptoms were positively associated with follow-up stress ($b = 0.210, p < .000$). The depression–stress association further varied by age group such that the impact of baseline depression on changes in perceived stress was greatest in Blacks in their 60s versus those in their 50s ($b = 0.267, p = .001$), controlling for model covariates.

Discussion and Implications: Contrary to previous work, the results suggest that an individual's mental health shapes his/her perception of stressful events and this relationship varies by age group. While the typical finding (stress impacting depression) was not significant, the findings reported here highlight the importance of considering the possible bidirectional nature of the relationships between psychosocial measures of stress and mental health in later life among Blacks.

Translational Significance: This analysis suggests that an individual's mental health shapes his or her perception of stress over time and this effect is more pronounced in Blacks in their 60s. These findings emphasize the contribution of depressive symptoms to perceptions of stress in racial and ethnic older adults, particularly Blacks. The U.S. population is aging and becoming more racially and ethnically diverse; therefore, public health efforts should continue research on the stress and mental health risk factors that contribute to poor health and health disparities in Blacks and pursue the protective factors that promote better psychological well-being through the aging process.

Keywords: African Americans, perceived stress, depression, age effects

Background and Objectives

Stress has been shown to negatively influence both physical and mental health outcomes, such as depressive symptoms (Cohen, Kamarck, & Mermelstein, 1983; Monroe, 2008). Holmes and Rahe (1967) originally conceptualized stress as any environmental (entering school, starting a job), social (interpersonal interactions), or internal (emotional reactions) demand that requires an individual to change or readjust his or her routine pattern of behavior (Holmes & Rahe, 1967). This conception considers the demand (vs. resource) aspect of stress and the relationship between the person and the environment. Stress has further been defined as one's perception of difficulty adjusting to or coping with life's challenges such as major trauma or everyday hassles (Scott, Jackson, & Bergeman, 2011). For instance, Lazarus and Folkman (1984) emphasize the psychological appraisal of stress and describe it as the "particular relationship between the person and the environment that is appraised ... as taxing or exceeding his or her resources and endangering his or her well-being" (Lazarus & Folkman, 1984, p. 19). Collectively, these definitions consider not only the demands of stress but also the perception and appraisal of an event as stressful.

More specifically, researchers have examined both the occurrence of stressful events and one's perceptions of stress. Cohen and colleagues (1983), for example, developed a measure that captures how different life events affect one's thoughts, feelings, and perceived stress level. This measure assesses the frequency of one's feelings such as uncontrollability, overload, or distress when life, in general, is seen as stressful during the past month (Cohen et al., 1983). In this context, stress is commonly used as a predictor and examined in a unidirectional way in the literature such that perceived stress is associated with worse mental health outcomes. This approach is based on the notion that each uncontrollable, distressing, or life-threatening circumstance creates an event-specific perception of stress and this perception of stress in turn affects one's mental health (Ghorbani, Krauss, Watson, & Lebreton, 2008).

Yet, the stress–outcome relationship may not be a simple unidirectional effect, whereby, stress produces negative health and well-being outcomes through changes in one's generalized view of stress (Scott et al., 2011). Rather, this relationship could also work in the opposite way, such that poor health or depression contributes to greater perceptions of stress (Mitsonis, Potagas, Zervas, & Sfagos, 2009). Indeed, research shows that certain health problems and psychosocial factors produce a stressed state across a variety of age groups. For instance, specific psychological domains and contextual factors have been shown to produce perceptions of being stressed in both midlife (Scott, Whitehead, Bergeman, & Pitzer, 2013) and later life (Scott et al., 2011). Specifically, in older adults (54–91 years) loneliness, poor neighborhood quality, and financial strain are all important predictors of

perceived stress (Scott et al., 2011), whereas in middle-aged adults (37–64 years), higher levels of loneliness are associated with greater perceptions of stress (Scott et al., 2013). Thus, different mental health and contextual factors affect perceptions of stress in adulthood. The aim of this article is to better understand how depressive symptoms relate to changes in perceived stress in mid- and later life in a sample of Black adults and the modifying effect of age, given that different factors emerge as more salient in midlife versus old age. In particular, we sought to explore the bidirectional relationships between (1) stress–depression and (2) depression–stress and whether age modifies these associations.

Stress and Depression in African Americans

Although there has been an increase in psychiatric research on the prevalence of mental disorders in older African Americans (Aranda et al., 2012; Chatters, Taylor, Woodward, & Nicklett, 2015; Pickett, Bazalais, & Bruce, 2013; Woodward, Taylor, Abelson, & Matusko, 2013), few studies have investigated key risk factors that shape not only mental health within this population but also their perceptions of stress. "Social scientists have long noted that racial/ethnic minorities experience disproportionately higher levels of certain risk factors, such as racism (Harrell, 2000; Paradies et al., 2015; Williams & Mohammed, 2009), which then puts them at a greater risk for depression" (Kessler, Mickelson, & Williams, 1999; Molina & James, 2016, p. 2), and this depression is often more severe and disabling when compared with non-Latino Whites (Williams et al., 2007).

Over the course of their lives, older Blacks have endured a lifetime of discriminatory practices, including segregated neighborhoods, political disenfranchisement, worse medical care, and underserved and under-resourced schools. Research shows that older Blacks compared with non-Hispanic Whites report more discrimination, including a higher prevalence of major lifetime and everyday discrimination (Ayalon & Gum, 2011; Luo, Xu, Granberg, & Wentworth, 2012); and these discriminatory events have been linked to worse mental health outcomes such as depression. For instance, Mouzon, Taylor, Keith, Nicklett, and Chatters (2017) examined the association between everyday discrimination (defined as chronic, and unfair treatment that occurs in commonplace social encounters; Kessler et al., 1999) and mental health outcomes in a sample of older Blacks aged 55 and older. They found that everyday discrimination (measured by overall, racial, or nonracial) was associated with a higher risk of psychiatric disorders, depressive symptoms, and serious psychological distress (Mouzon et al., 2017). Likewise, other studies have also found that older Blacks reporting high levels of everyday discrimination also experience more depressive

symptoms (Marshall & Rue, 2012). A common finding across these studies is a dose–response relationship: greater discrimination is associated with worse mental health in older Blacks. A finding confirmed by a recent meta-analysis of studies published between 1983 and 2013 (Paradies et al., 2015) and a more recent literature review of articles published through 2019 (Williams, Lawrence, Davis, & Vu, 2019), showed, in general, racism and discrimination are associated with an increased risk of diagnosed depression. Moreover, stress exposure in terms of everyday discrimination, chronic stress, and financial stress has been associated with higher depressive symptoms in Blacks, even after adjusting for other stress exposures and psychological resources (Erving, Satcher, & Chen, 2020). Thus, investigating the association between stress and depression in older Blacks is important.

Depression and Perceived Stress

Although considerable research has shown a robust relationship between stress and depression in older adults (Ghorbani et al., 2008; Guo et al., 2018; Kwag, Martin, Russell, Franke, & Kohut, 2011; Liu et al., 2017), few studies (Scott et al., 2011, 2013), if any, have examined the depression–stress association and determined whether psychological conditions, like depressive symptoms, are implicated as a potential contributor to elevated perceptions of stress in Blacks. Two broad possibilities exist, therefore: (1) stress operates as a causal factor in the typical stress–outcome relationship as identified by most studies or (2) stress might instead be a *byproduct* of those dynamics. The Byproduct Model was tested and postulated by Ghorbani and colleagues (2008). They argue that “generalized perceptions of stress may arise from an anxiety-inducing view of the world as uncontrollable” (p. 959). In this Byproduct Model, perceived stress is a consequence or byproduct of one’s view of the world, rather than an antecedent (Ghorbani et al., 2008). This perspective is based on the idea that anxiety has been increasingly identified as a correlate of perceived stress and found to completely explain the relationship between stress and depression, such that the relationship between generalized perceived stress and depression is completely dependent on changes in perceived control and anxiety. That is to say, that anxiety is frequently correlated with greater perceived stress, suggesting that anxiety might be linked to perceptions of stress (Ghorbani et al., 2008). Anxiety has further been identified as a stress-related precursor to depression (Ghorbani et al., 2008). Research also indicates that anxiety is a key component of and a risk factor for depression (Chorpita & Barlow, 1998). This theoretical framework thus implies that depression may predict one’s perceived level of stress.

To date, few studies have examined the association between depressive symptoms and longitudinal perceptions of stress exclusively among middle to older age Blacks. As

most of the aforementioned mental health stress studies have been cross-sectional, used recursive partitioning techniques (regression trees and random forests), and conducted on majority White samples, with less than 20% of the participants being African American. This article examines the bidirectional relationships between psychosocial measures of stress and mental health in Blacks. Specifically, this study tests the bidirectional longitudinal relationships between (1) stress and depression and (2) depression and stress, and whether these associations are modified by age. We hypothesize that higher perceived stress levels will be associated with greater depressive symptoms at follow-up. Likewise, we hypothesize that higher levels of depressive symptoms will contribute to the appraisal that life is stressful and these associations will further vary by age.

Research Design and Methods

Study Design

The present study used a correlational research design to explore the bidirectional relationships between stress and depression and depression and stress. This type of research design recognizes trends and patterns in the data, but it does not go so far in its analysis to prove causes for the observed patterns. Thus, cause and effect are not the basis of this type of observational research design. Given that there may not be a causal relationship between stress and depression and depression and stress, this study examined the data, bidirectional relationships, and distributions of variables, but does not assert causality.

Sample

The Baltimore Study of Black Aging—Patterns of Cognitive Aging (BSBA-PCA) is a longitudinal study designed to examine changes in cognition, health, and psychosocial factors among middle-aged and older Blacks. It has a total sample of 602 adults (aged 49–95 years; $M = 69.1$; $SD = 9.8$) at the first time point (Wave 1) and 450 adults (aged 51–96 years; $M = 71.4$; $SD = 9.2$) at the second time point (Wave 2), on average approximately 33 months later.

The BSBA-PCA used convenience sampling to recruit Black adults aged 48 years and older from 29 senior apartment buildings and 1 senior center in the city of Baltimore, Maryland. A trained research assistant assessed each participant on two separate occasions (Wave 1 and Wave 2), spaced roughly 3 years apart. Each testing session lasted approximately 2.5 h and consisted of a face-to-face interview in which participants completed a battery of cognitive tests, three blood pressure and lung functioning measurements, as well as measures that assessed demographic and other health-related factors. Data collection lasted 18 months and took place between 2006 and 2008 (Aiken-Morgan, Gamaldo, Sims, Allaire, & Whitfield, 2015; Gamaldo et al.,

2014; Sims et al., 2015; Thorpe, Clay, Szanton, Altaire, & Whitfield, 2011).

The present study consisted of 450 community-dwelling, independently living Black adults (aged 51–96 years; $M = 71.4$; $SD = 9.2$) who completed both waves of the BSBA-PCA institutional review board approval obtained from Duke University #1610 (Aiken-Morgan et al., 2015; Gamaldo et al., 2014). These data are not publicly accessible (principal investigator: K. E. Whitefield).

Attrition

Between the two waves of data collection, there were 152 participants lost due to attrition (i.e., death, refusal, relocation, and sickness). To address losses to follow-up, we used an independent two-sample t test and Pearson's chi-square test to compare those who remained in the study with those who dropped out on key demographics, depression, and perceived stress variables. Specifically, tests of differences between completers and dropouts were based on an independent two-sample t test with equal variances for monthly family income (range: less than \$100 to \$2,300 or more), depressive symptoms, and perceived stress level. Pearson's chi-square test was used for categorical age, sex, and education. We found that participants who dropped out of the study did not significantly differ by sex, education, depressive symptoms, or perceived stress level from those who completed both waves. These findings were similar to what other studies have reported (Aiken-Morgan et al., 2015; Gamaldo et al., 2014). However, there were significant differences between completers and dropouts by age categories (Pearson $\chi^2(3) = 20.33$, $p = .000$) and family income ($t(576) = -2.09$, $p = .037$), such that those who remained in the study were older and had higher monthly incomes versus those who dropped out. Four participants who had missing data on any of the demographic, depression, and/or perceived stress outcome variables were excluded from the present analyses. This resulted in a final analytic sample of 446 participants for the stress–depressive symptoms analyses. Two additional participants who were missing on the perceived stress outcome variable at follow-up were further excluded, resulting in a final analytic sample of 444 participants for the depression–stress analyses.

Measures

Perceived stress

This study used a 14-item version of the *Perceived Stress Scale* (PSS) (Cohen et al., 1983) to measure the presence of psychological stress in the past 30 days. Although this classic tool was originally developed in 1983, it remains one of the most widely used instruments for global stress assessment. Scale items are intended to capture both the occurrence of stressful events and how an individual appraises stressful

events when they arise. Representative questions included: “In the last month, how often have you ...: ‘been upset because of something that happened unexpectedly’; ‘felt that you were unable to control the important things in your life’; and ‘felt nervous and stressed’?” Respondents indicate on a five-point Likert-type scale ranging from 1 (*never*) to 5 (*very often*) how often these feelings and thoughts have occurred in the last month. Higher scores indicate a greater perceived stress level. Sample range = 3 (*never*) to 43 (*very often*). Coefficient alpha reliability for the PSS ranges from 0.84 to 0.86. Depending upon time to retest, test–retest reliability ranges between 0.55 and 0.85 (Cohen et al., 1983).

Depressive symptoms

Depressive symptoms were assessed using the 20-item *Center for Epidemiologic Studies Depression scale* (CES-D) (Radloff, 1977). The CES-D is a brief, well-validated self-report measure designed to assess depressive symptomatology in the general population (Kohout, Berkman, Evans, & Cornoni-Huntley, 1993). This 20-item scale has been used as an indicator of negative psychological well-being among older Black adults and measures one's current level of depressive symptoms or the extent to which a person feels depressed (Sims et al., 2011). Representative questions included: “I felt depressed”; “I felt that everything I did was an effort”; “My sleep was restless”; “I enjoyed life” (reverse-coded) and “I could not get ‘going.’” Responses were (0) “rarely or never,” (1) “sometimes,” (2) “frequently,” or (3) “most of the time.” Positive valence items were reverse-coded and summed resulting in a continuous measure; higher scores on the CES-D suggest more depressive symptoms. Reliability estimates for the CES-D range from 0.87 (Wave 1) to 0.85 (Wave 2) (Radloff, 1977).

Control variables

Control variables included age, sex, years of education, and chronic health conditions. Age was measured in years and categorized as 50–59 (reference group), 60–69, 70–79, and 80 and older. Sex was dichotomized with female as the reference category. Years of education was measured by the highest grade attained and treated as continuous. A count of chronic conditions was created by summing participants' self-report of whether they had been told by a physician or nurse any of the following conditions (yes/no response): diabetes, cardiovascular disease, high blood pressure/hypertension, arthritis, stroke, heart attack, angina, and asthma. Due to the small number of participants reporting having had a heart attack or angina, a binary variable (0 = absent and 1 = present) representing heart troubles was created, as done by other studies (Thorpe et al., 2011). We examined these conditions as they represent a “multisystem of dysregulation” (Wei, Levine, Zahodne, Kabeto, & Langa, 2020, p. 5) and disproportionately affect Blacks (Witters & Wood, 2014). All seven conditions were summed to create a continuous variable representing the total number of health

conditions as done by other studies (Aiken Morgan, Sims, & Whitfield, 2010). This approach provided greater variability in examining health problems and/or disease burden among Blacks versus using a binary scale of individual health conditions, that is, two or more health conditions versus those with one or none as done by other studies (Byrd, Thorpe, & Whitfield, 2019; Carmasin, Mast, Allaire, & Whitfield, 2014; Thorpe et al., 2011).

Statistical Analyses

Descriptive statistics were calculated to examine the demographic and health characteristics of the sample at follow-up. Ordinary least squares (OLS) linear regression was used to examine two bidirectional longitudinal relationships: (1) the stress–depression and (2) depression–stress association. For example in the latter model, change-score OLS regression (Wolinsky et al., 2011) was used to examine the relationships between baseline depression and changes in perceived stress, controlling for baseline perceived stress, age, sex, education, and health problems. This approach has been used by other longitudinal studies on older Black adults (Byrd, 2017; Byrd et al., 2019). To determine whether the effect of perceived stress on depression and depression on perceived stress levels varied by age group, regression models included interaction terms between (1) age and baseline perceived stress and (2) age and baseline depression. To facilitate interpretation of our OLS estimates, we generated empirical change plots to display the predicted depression and stress slopes in the data according to each age group for significant interaction terms.

All p values less than .05 were considered statistically significant. Analyses were conducted using STATA, version 15, software (StataCorp., 2017).

Results

Sample Characteristics

Table 1 presents the demographic characteristics of the BSBA-PCA sample who completed both waves. Of the 450 participants, there was good representation across the age groups with those 80 and older being nearly 17% of the sample. The majority of the sample was female (77.33%) and had an average education of 11.52 years (range 0–22 years). The majority of participants reported having diabetes (26.91%), high blood pressure (61.96%), and arthritis (48.84%). The mean perceived stress score was 19.80 (range 3–43) and the average level of depression was 13.45 (range 0–38). We further examined age differences in perceived stress levels and depressive symptoms at baseline and follow-up to better understand the modifying effect of age (Table 2). We found significant age differences at baseline and follow-up for both perceived stress and depressive symptoms, except for those 60–69 years did

Table 1. Sample Characteristics of the Participants Who Completed Baseline and Follow-Up

| Characteristics | |
|---|--------------|
| % Age (years) | |
| 50–59 | 9.47 |
| 60–69 | 20.76 |
| 70–79 | 27.57 |
| 80+ | 16.94 |
| % Female | 77.33 |
| % Years of education | |
| No education (0 years) | 0.17 |
| Grade school (8 years or less) | 8.64 |
| High school (9–12 years) | 47.34 |
| College, vocational or trade school (13–16 years) | 15.61 |
| Graduate school (17+ years) | 2.82 |
| Chronic health conditions | |
| Diabetes | 26.91 |
| Cardiovascular disease | 22.26 |
| Hypertension | 61.96 |
| Arthritis | 48.84 |
| Stroke | 14.45 |
| Heart troubles | 16.11 |
| Asthma | 14.78 |
| Mean perceived stress score (SD) | 19.80 (7.50) |
| Mean depression score (SD) | 13.45 (4.49) |

Note: Baltimore Study of Black Aging—Patterns of Cognitive Aging ($N = 450$).

not significantly differ from 50–59 years old on follow-up depression scores ($b = -1.16$, $p = .062$). Overall, Blacks in their 50s had significantly higher stress and depression scores at baseline and follow-up compared with those older than 50. The largest differences were seen for baseline perceived stress scores, such that those 70 and older had significantly lower scores ($M = 16.27$ and 16.16 , respectively) than those 50–59 years ($M = 21.57$).

OLS Regression Models

Initial analyses tested the typical directional stress–depression relationship. This analysis showed a relationship in the expected direction, that is, stress leading to more depressive symptoms over time, but the effect was not statistically significant ($b = 0.01$, $p = .642$). The interaction term between age and baseline perceived stress was also nonsignificant ($F(3,434) = 0.56$, $p = .639$). Results, that is, the unstandardized (b) adjusted regression coefficients from the change-score multiple linear regression models, are given in Table 3. Additional analyses tested the atypical depression–stress relationship. The association between baseline depression and changes in perceived stress level, controlling for baseline cognition, age, sex, education, and chronic health conditions is displayed in Table 4. Baseline perceived stress was positively associated with a change in follow-up perceived stress level ($b = 0.21$, $p < .001$). The change-score OLS model illustrates that

Table 2. Regression Analysis for Age Differences in Perceived Stress (PSS) and Depression (CES-D) at Baseline and Follow-Up Among Adults in the Baltimore Study of Black Aging—Patterns of Cognitive Aging

| | Baseline <i>b</i> (SE) | | Follow-up <i>b</i> (SE) | |
|--------------------------|------------------------|-----------------|-------------------------|-----------------|
| | PSS1 | CES-D1 | PSS2 | CES-D2 |
| Age ^a (years) | | | | |
| 60–69 | –3.50*** (1.16) | –4.81*** (1.10) | –2.24* (1.04) | –1.16 (0.62) |
| 70–79 | –5.30*** (1.15) | –4.84*** (1.09) | –2.28* (1.03) | –1.77*** (0.61) |
| 80+ | –5.42*** (1.38) | –3.88*** (1.32) | –3.41** (1.36) | –1.86* (0.80) |
| Constant (50–59 years) | 21.57*** (10.93) | 15.06*** (0.89) | 21.81*** (0.85) | 14.72*** (0.50) |

Note: *b* = unstandardized coefficient; SE = standard error; PSS = Perceived Stress Scale; CES-D = Center for Epidemiologic Studies Depression scale.

^aReference group = 50–59 years.

p* < .05, *p* < .01, ****p* < .001.

Table 3. Change-Score Regression Analysis for Baseline Perceived Stress Predicting Changes in Depression Among Adults in the Baltimore Study of Black Aging—Patterns of Cognitive Aging (*N* = 446)

| | <i>b</i> (SE) |
|--|----------------|
| Baseline depression | 0.17*** (0.03) |
| Age ^a (years) | |
| 60–69 | –1.82 (1.28) |
| 70–79 | –2.39 (1.28) |
| 80+ | –1.75 (1.54) |
| Female | 1.29** (0.48) |
| Education | –0.03 (0.07) |
| Chronic health conditions | 0.24 (0.14) |
| Baseline perceived stress | –0.03 (0.05) |
| Age ^a × Baseline stress interaction | |
| 60–69 | 0.06 (0.06) |
| 70–79 | 0.05 (0.06) |
| 80+ | –0.002 (0.08) |
| R ² | 0.152 |

Note: *b* = unstandardized coefficient; SE = standard error.

^aReference group = 50–59 years.

p* < .05, *p* < .01, ****p* < .001.

higher levels of depression are associated with more perceived stress at follow-up and this relationship varies by age group ($F(3,432) = 3.86, p = .010$). In addition sex ($b = 0.89, p = .218$) and education ($b = 0.16, p = .146$) were both nonsignificant predictors of changes in perceived stress level, whereas chronic conditions was significant ($b = 0.16, p = .003$). Overall results indicate that higher baseline depressive symptoms contribute to the future appraisal that life is stressful and this association is modified by age.

Figure 1 plots the estimated effects of follow-up perceived stress scores by depressive symptoms and age group. Specifically, it plots the OLS-derived estimates of the post-estimation contrasts of group differences and their 95% confidence intervals. This figure helps to quantify the significant differences in perceived stress slopes between age groups; whereas 60–69 years old differ from the 50- to

59-year-old cohort, they do not differ from the other two age groups. More specifically, the incremental changes in perceived stress (or slope of change) becomes steeper as baseline scores of depressive symptoms increase for those 60–69 years old. This suggests that depressive symptoms have a greater impact on perceived stress levels among those in their 60s compared with those in their 50s. Overall this figure indicates that individuals in their 60s show a distinct pattern in their predicted values or slopes of perceived stress that becomes steeper at higher levels of depressive symptoms.

Discussion and Implications

The goal of this article was to examine the bidirectional longitudinal relationships between (1) stress and depressive symptoms and (2) depressive symptoms and changes in perceived stress levels over time; and whether these associations are modified by age using a sample of middle-aged and older Blacks. While the typical finding of stress impacting depressive symptoms was not significant, the main findings show that higher levels of depressive symptoms are associated with changes in perceptions of stress over time in Blacks. More specifically, the results showed that greater depressive symptoms at baseline were associated with higher perceived stress levels at 33-month follow-up and this relationship varied by age; whereby, Blacks in their 60s had significantly higher perceived stress scores than those in their 50s. These findings demonstrate that greater depressive symptoms at baseline are associated with an increased perception of stress at follow-up, particularly among those in their 60s. These findings suggest that depressive symptomology is important to consider when examining changes in global perceptions of stress among middle-aged and older Blacks.

Blacks, in comparison to other racial/ethnic groups, experience higher levels of stress (Sheffler & Sachs-Ericsson, 2016) and greater race-related stress in particular (Utsey, Chae, Brown, & Kelly, 2002). Previous studies have shown that race-related stress (vs. stressful

Table 4. Change-Score Regression Analysis for Baseline Depression Predicting Changes in Perceived Stress Among Adults in the Baltimore Study of Black Aging—Patterns of Cognitive Aging ($N = 444$)

| | b (SE) |
|--|-----------------|
| Baseline perceived stress | 0.21*** (0.05) |
| Age ^a (years) | |
| 60–69 | –3.97*** (1.39) |
| 70–79 | –2.43* (1.45) |
| 80+ | –2.51 (1.92) |
| Female | 0.89 (0.72) |
| Education | 0.16 (0.11) |
| Chronic health conditions | 0.66*** (0.22) |
| Baseline depression | 0.21 (0.05) |
| Age ^a × Baseline depression interaction | |
| 60–69 | 0.27*** (0.08) |
| 70–79 | 0.16 (0.09) |
| 80+ | 0.03 (0.13) |
| R^2 | 0.304 |

Note: b = unstandardized coefficient; SE = standard error.

^aReference group = 50–59 years.

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

life events; Utsey, Giesbrecht, Hook, & Stanard, 2008) and institutional racism-related stress (measured by the Index of Race-Related Stress; Utsey & Ponterotto, 1996) are significant predictors of poor psychological health (e.g., psychological distress, mental health status) in older Blacks (Utsey, Chae, et al., 2002; Utsey, Payne, Jackson, & Jones, 2002; Utsey et al., 2008). Thus, the impact of race-related stress on depressed mood may be particularly unique to the Black experience in the United States and perhaps confers greater risk. As such, discrimination and other types of race-related stress may contribute to depressive symptoms, which in turn are associated with future perceptions of stress and the overall reported stress levels of Blacks. Hence, future studies should continue to explore the bidirectional longitudinal relationships between stress–depression and depression–stress, as well as examining multiple measures of stress, including individual and institutional racism-related stress, as the pathways by which the contextual features of one’s environment shape a person’s psychological well-being and perceptions of stress remain unclear.

Our findings are further consistent with previous work that shows mental health, psychosocial, and contextual factors are predictive of stress perceptions among middle-aged and older adults (Scott et al., 2011, 2013). For instance, Scott and colleagues (2011) examined how various contextual features (e.g., social isolation, neighborhood quality, health problems, age discrimination, financial concerns, and recent life events) of later life contribute to overall feelings of stress. Their findings show that loneliness is a key psychological domain in predicting perceptions of stress. However, this cross-sectional study was limited in

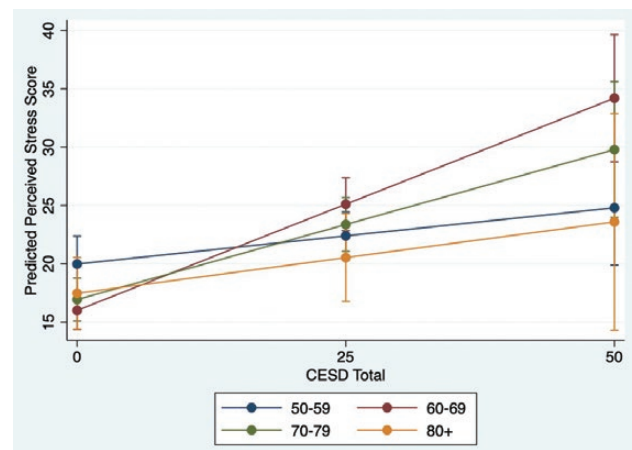


Figure 1. The longitudinal relationship between baseline depression and changes in perceived stress as moderated by age (50–80+ years). Baltimore Study of Black Aging—Patterns of Cognitive Aging ($N = 444$). Note: Adjusted for sex, education, and chronic health conditions.

that it used a relatively all White cohort of older adults, that is, approximately 90% of the full sample was White, whereas the remaining 10% was Black or African American (Scott et al., 2011). In comparison, the current study included a larger sample of all Black adults and highlights the varied pathways and elucidates possible but different contributors to perceived stress levels. It may be that whereas loneliness has been shown to consistently influence stress perceptions among Whites (Scott et al., 2011, 2013), depressive symptoms may be more salient among Blacks. Another strength of the current study is that it assessed the depression–stress relationship longitudinally and explored changes in perceptions of stress over time versus at one time point, providing additional support that mental health differentially influences changes in perceptions of stress in middle-aged and older Blacks.

An individual’s reported level of perceived stress may provide insight into the extent by which he or she generally feels overwhelmed or overloaded. However, the psychological factors contributing to this appraisal may not be the same across age groups or individuals, especially in racial and ethnic minorities who have typically been excluded from this type of research (Scott et al., 2011). Individual variability in psychological and contextual factors such as depressive symptoms, loneliness, or financial strain may better elucidate the differential factors contributing to perceptions of stress in older Blacks and Whites. Scholars have argued that Blacks are not a homogenous group and although they have a shared history or ancestry their everyday experiences may differ (Whitfield et al., 2008). As such, within-group comparisons may better explain sources of individual variability in perceptions of stress in Blacks. The current study findings suggest that depressive symptoms may be a key risk domain and psychological source of individual variability in perceptions of stress in older Blacks.

Some limitations of the current study should be recognized. First, the BSBA-PCA was a sample of convenience drawn from community-dwelling older Blacks living in Baltimore so generalizability to Blacks who reside in other regions of the country or in rural settings may be limited. Research demonstrates rural Blacks reporting more material hardship and poorer self-rated physical health have higher levels of depressive symptoms and psychological distress compared with their counterparts with less hardship and better self-rated health. Further, older rural Blacks have more symptoms of psychological distress than their younger counterparts, suggesting that older rural Blacks may be at higher risk for mental health problems and warrant further study (Weaver, Taylor, Chatters, & Himle, 2018). Additionally, having a larger longitudinal sample may have yielded different findings because the present analyses were based on participants who completed both waves of the BSBA-PCA. Second, perceived stress (the primary outcome in the depression–stress relationship) was based on the participant’s subjective appraisal of stressful experiences, although the ability to examine these relationships longitudinally in Blacks is quite novel and provides additional explanatory power. Nonetheless, this study was limited in that it used only a single subjective measure of global stress and different findings might result, if additional measures were included. Measures of stress exposure, such as checklists of negative life events and counts of chronic conditions, may appear to be objective on face value; however, the reporting of these events is hampered by the appraisal process and tends to be intertwined with the reporting itself (Dohrenwend, 2006; Monroe, 2008). As such, these measures may be best described as subjectively identified stress exposure and may not operate the same as objective interview-based measures (Duggal et al., 2000). Future studies should include multiple measures of stress including race-related stress, given that much discussion in the stress literature has centered on the notions of objective and subjective measures of stress (Monroe, 2008). One key strength of the PSS is that it helps us understand how different situations affect our feelings and our perceived stress level. Moreover, the subjective data available for the present analyses provide important information on the contexts of people’s lives and the degree to which life, in general, is seen as stressful (Ghorbani et al., 2008; Scott et al., 2011). Third, measures of anxiety were not included in the BSBA-PCA data or the present analyses. There is potential support for observing that depression will influence perceptions of stress via anxiety, that is, the Byproduct Model, given that anxiety is a risk factor for depression (Chorpita & Barlow, 1998) and has been identified as a byproduct of stress (Ghorbani et al., 2008). However, depression and anxiety are distinct medical conditions. While the two may overlap, they can have independent effects on stress perceptions. Thus, to test whether the depression–stress association observed in the current study is driven by anxiety rather than depression, the BSBA-PCA sample would need to include participants

with symptoms of clinical anxiety, in particular, Generalized Anxiety Disorder. Thus, the present study does not assert causality. Rather, it shows how one’s mental health (based on depressive symptoms) may put individuals at differential risk for perceiving their life as stressful; however, future work should include multiple measures of psychological health to further examine these associations.

Conclusions

This study found that more depressive symptoms predicted greater perceptions of stress in old age, particularly among Blacks in their 60s. This finding highlights the diverse pathways mental health produces changes in one’s perceptions of stress over time. It may be among those in their 60s, the impact of depressive symptoms on perceived stress differs in part because of the varying demands from work, financial and retirement planning, and family responsibilities such as caring for grandchildren and great-grandchildren. In other words, older Blacks perceive their lives as stressful for different reasons. Public health efforts often target interventions based on demographic characteristics. The highest perceived stress in this sample was found among Blacks in their 60s who also reported high levels of depressive symptoms; however, these participants only differed from those in their 50s and not those in much older age categories (i.e., 70s and 80s). These differences may be rooted in the complex life contexts in which individuals operate such as around work, finances, and family. Although perceived stress is commonly employed as a predictor, research has not focused adequately on the psychological factors that are precursors to these perceptions. The current study identified depressive symptoms as a particularly important antecedent of this relationship. Intervention and prevention strategies need to be designed to consider the diverse pathways to perceived stress and the modifying influence of age. By doing so, we may better understand the complexity of individual differences in perceptions of stress in middle age and older Black adults, which may further generalize to other populations, offer means for reducing health disparities, and provide the basis for more appropriate cross-race comparisons.

Funding

This research was supported by the National Institutes of Aging (R01AG24108 and AG024108-02S1 to K.E. Whitfield; K02AG059140 and P30AG059298 to R.J. Thorpe; R01AG054363 to R.J. Thorpe and K.E. Whitfield) and the National Institute on Minority Health and Health Disparities (U54MD000214 to R.J. Thorpe).

Conflicts of Interest

None reported.

References

Aiken-Morgan, A. T., Gamaldo, A. A., Sims, R. C., Allaire, J. C., & Whitfield, K. E. (2015). Education desegregation and

- cognitive change in African American older adults. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 70, 348–356. doi:10.1093/geronb/gbu153
- Aiken Morgan, A. T., Sims, R. C., & Whitfield, K. E. (2010). Cardiovascular health and education as sources of individual variability in cognitive aging among African Americans. *Journal of Aging and Health*, 22, 477–503. doi:10.1177/0898264310361627
- Aranda, M. P., Chae, D. H., Lincoln, K. D., Taylor, R. J., Woodward, A. T., & Chatters, L. M. (2012). Demographic correlates of DSM-IV major depressive disorder among older African Americans, Black Caribbeans, and non-Hispanic Whites: Results from the National Survey of American Life. *International Journal of Geriatric Psychiatry*, 27, 940–947. doi:10.1002/gps.2805
- Ayalon, L., & Gum, A. M. (2011). The relationships between major lifetime discrimination, everyday discrimination, and mental health in three racial and ethnic groups of older adults. *Aging & Mental Health*, 15, 587–594. doi:10.1080/13607863.2010.543664
- Byrd, D. R. (2017). *A longitudinal study of Black–White disparities in cognitive aging (Doctor of philosophy in public health dissertation)*. University of California, Los Angeles, CA.
- Byrd, D. R., Thorpe, R. J., Jr, & Whitfield, K. E. (2019). Greater disease burden, greater risk? Exploring cognitive change and health status among older Blacks. *Journal of Aging and Health*, 1–21. doi:10.1177/0898264319853138
- Carmasin, J. S., Mast, B. T., Allaire, J. C., & Whitfield, K. E. (2014). Vascular risk factors, depression, and cognitive change among African American older adults. *International Journal of Geriatric Psychiatry*, 29, 291–298. doi:10.1002/gps.4007
- Chatters, L. M., Taylor, R. J., Woodward, A. T., & Nicklett, E. J. (2015). Social support from church and family members and depressive symptoms among older African Americans. *The American Journal of Geriatric Psychiatry*, 23, 559–567. doi:10.1016/j.jagp.2014.04.008
- Chorpita, B. F., & Barlow, D. H. (1998). The development of anxiety: The role of control in the early environment. *Psychological Bulletin*, 124, 3–21. doi: 10.1037/0033-2909.124.1.3
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24, 385–396. www.jstor.org/stable/2136404. Accessed July 14, 2020.
- Dohrenwend, B. P. (2006). Inventorying stressful life events as risk factors for psychopathology: Toward resolution of the problem of intracategory variability. *Psychological Bulletin*, 132, 477–495. doi:10.1037/0033-2909.132.3.477
- Duggal, S., Malkoff-Schwartz, S., Birmaher, B., Anderson, B. P., Matty, M. K., Houck, P. R., . . . Frank, E. (2000). Assessment of life stress in adolescents: Self-report versus interview methods. *Journal of the American Academy of Child and Adolescent Psychiatry*, 39, 445–452. doi:10.1097/00004583-200004000-00013
- Erving, C. L., Satcher, L. A., & Chen, Y. (2020). Psychologically resilient, but physically vulnerable? Exploring the psychosocial determinants of African American women's mental and physical health. *Sociology of Race and Ethnicity*. Advance online publication. doi:10.1177/2332649219900284
- Gamaldo, A. A., Gamaldo, C. E., Allaire, J. C., Aiken-Morgan, A. T., Salas, R. E., Szanton, S., & Whitfield, K. E. (2014). Sleep complaints in older blacks: Do demographic and health indices explain poor sleep quality and duration? *Journal of Clinical Sleep Medicine*, 10, 725–731. doi:10.5664/jcsm.3858
- Ghorbani, N., Krauss, S., Watson, P., & Lebreton, D. (2008). Relationship of perceived stress with depression: Complete mediation by perceived control and anxiety in Iran and the United States. *International Journal of Psychology: Journal internationale de psychologie*, 43(6), 958–968. doi:10.1080/00207590701295264
- Guo, L. N., Liu, Y. J., McCallum, J., Söderhamn, U., Ding, X. F., Yv, S. Y., . . . Guo, Y. R. (2018). Perceived stress and depression amongst older stroke patients: Sense of coherence as a mediator? *Archives of Gerontology and Geriatrics*, 79, 164–170. doi:10.1016/j.archger.2018.08.010
- Harrell, S. P. (2000). A multidimensional conceptualization of racism-related stress: Implications for the well-being of people of color. *The American Journal of Orthopsychiatry*, 70, 42–57. doi:10.1037/h0087722
- Holmes, T. H., & Rahe, R. H. (1967). The Social Readjustment Rating Scale. *Journal of Psychosomatic Research*, 11, 213–218. doi:10.1016/0022-3999(67)90010-4
- Kessler, R. C., Mickelson, K. D., & Williams, D. R. (1999). The prevalence, distribution, and mental health correlates of perceived discrimination in the United States. *Journal of Health and Social Behavior*, 40, 208–230.
- Kohout, F. J., Berkman, L. F., Evans, D. A., & Cornoni-Huntley, J. (1993). Two shorter forms of the CES-D (Center for Epidemiological Studies Depression) depression symptoms index. *Journal of Aging and Health*, 5, 179–193. doi:10.1177/089826439300500202
- Kwag, K. H., Martin, P., Russell, D., Franke, W., & Kohut, M. (2011). The impact of perceived stress, social support, and home-based physical activity on mental health among older adults. *International Journal of Aging & Human Development*, 72, 137–154. doi:10.2190/AG.72.2.c
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.
- Liu, Y., Li, T., Guo, L., Zhang, R., Feng, X., & Liu, K. (2017). The mediating role of sleep quality on the relationship between perceived stress and depression among the elderly in urban communities: A cross-sectional study. *Public Health*, 149, 21–27. doi:10.1016/j.puhe.2017.04.006
- Luo, Y., Xu, J., Granberg, E., & Wentworth, W. M. (2012). A longitudinal study of social status, perceived discrimination, and physical and emotional health among older adults. *Research on Aging*, 34, 275–301. doi:10.1177/0164027511426151
- Marshall, G. L., & Rue, T. C. (2012). Perceived discrimination and social networks among older African Americans and Caribbean blacks. *Family & Community Health*, 35, 300–311. doi:10.1097/FCH.0b013e318266660f
- Mitsonis, C. I., Potagas, C., Zervas, I., & Sfagos, K. (2009). The effects of stressful life events on the course of multiple sclerosis: A review. *The International Journal of Neuroscience*, 119, 315–335. doi:10.1080/00207450802480192
- Molina, K. M., & James, D. (2016). Discrimination, internalized racism, and depression: A comparative study of African American and Afro-Caribbean adults in the US. *Group Processes & Intergroup Relations*, 19, 439–461. doi:10.1177/1368430216641304
- Monroe, S. M. (2008). Modern approaches to conceptualizing and measuring human life stress. *Annual Review of Clinical Psychology*, 4, 33–52. doi:10.1146/annurev.clinpsy.4.022007.141207

- Mouzon, D. M., Taylor, R. J., Keith, V. M., Nicklett, E. J., & Chatters, L. M. (2017). Discrimination and psychiatric disorders among older African Americans. *International Journal of Geriatric Psychiatry*, *32*, 175–182. doi:10.1002/gps.4454
- Paradies, Y., Ben, J., Denson, N., Elias, A., Priest, N., Pieterse, A.,...Gee, G. (2015). Racism as a determinant of health: A systematic review and meta-analysis. *PLoS One*, *10*, e0138511. doi:10.1371/journal.pone.0138511
- Pickett, Y. R., Bazelaes, K. N., & Bruce, M. L. (2013). Late-life depression in older African Americans: A comprehensive review of epidemiological and clinical data. *International Journal of Geriatric Psychiatry*, *28*, 903–913. doi:10.1002/gps.3908
- Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, *1*, 385–401. doi:10.1177/014662167700100306
- Scott, S. B., Jackson, B. R., & Bergeman, C. S. (2011). What contributes to perceived stress in later life? A recursive partitioning approach. *Psychology and Aging*, *26*, 830–843. doi:10.1037/a0023180
- Scott, S. B., Whitehead, B. R., Bergeman, C. S., & Pitzer, L. (2013). Combinations of stressors in midlife: Examining role and domain stressors using regression trees and random forests. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, *68*, 464–475. doi:10.1093/geronb/gbs166
- Sheffler, J., & Sachs-Ericsson, N. (2016). Racial differences in the effect of stress on health and the moderating role of perceived social support. *Journal of Aging and Health*, *28*, 1362–1381. doi:10.1177/0898264315618923
- Sims, R. C., Thorpe, R. J. Jr, Gamaldo, A. A., Aiken-Morgan, A. T., Hill, L. K., Allaire, J. C., & Whitfield, K. E. (2015). Cognition and health in African American men. *Journal of Aging and Health*, *27*, 195–219. doi:10.1177/0898264314543474
- Sims, R. C., Whitfield, K. E., Ayotte, B. J., Gamaldo, A. A., Edwards, C. L., & Allaire, J. C. (2011). Subjective memory in older African Americans. *Experimental Aging Research*, *37*, 220–240. doi:10.1080/0361073X.2011.555640
- StataCorp. (2017). *Stata statistical software: Release 15*. College Station, TX: StataCorp LLC.
- Thorpe, R. J. Jr, Clay, O. J., Szanton, S. L., Allaire, J. C., & Whitfield, K. E. (2011). Correlates of mobility limitation in African Americans. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, *66*, 1258–1263. doi:10.1093/gerona/glr122
- Utsey, S. O., Chae, M. H., Brown, C. F., & Kelly, D. (2002). Effect of ethnic group membership on ethnic identity, race-related stress, and quality of life. *Cultural Diversity & Ethnic Minority Psychology*, *8*, 366–377. doi:10.1037/1099-9809.8.4.367
- Utsey, S. O., Giesbrecht, N., Hook, J., & Stanard, P. M. (2008). Cultural, sociofamilial, and psychological resources that inhibit psychological distress in African Americans exposed to stressful life events and race-related stress. *Journal of Counseling Psychology*, *55*, 49–62. doi:10.1037/0022-0167.55.1.49
- Utsey, S. O., Payne, Y. A., Jackson, E. S., & Jones, A. M. (2002). Race-related stress, quality of life indicators, and life satisfaction among elderly African Americans. *Cultural Diversity & Ethnic Minority Psychology*, *8*, 224–233. doi:10.1037/1099-9809.8.3.224
- Utsey, S. O., & Ponterotto, J. G. (1996). Development and validation of the Index of Race-Related Stress (IRRS). *Journal of Counseling Psychology*, *43*, 490–501. doi:10.1037/0022-0167.43.4.490
- Weaver, A., Taylor, R. J., Chatters, L. M., & Himle, J. A. (2018). Depressive symptoms and psychological distress among rural African Americans: The role of material hardship and self-rated health. *Journal of Affective Disorders*, *236*, 207–210. doi:10.1016/j.jad.2018.04.117
- Wei, M. Y., Levine, D. A., Zahodne, L. B., Kabeto, M. U., & Langa, K. M. (2020). Multimorbidity and cognitive decline over 14 years in older Americans. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, *75*, 1206–1213. doi:10.1093/gerona/glz147
- Whitfield, K. E., Allaire, J. C., Gamaldo, A., Aiken-Morgan, A. T., Sims, R., & Edwards, C. (2008). Blood pressure and memory in older African Americans. *Ethnicity & Disease*, *18*, 181–186.
- Williams, D. R., González, H. M., Neighbors, H., Nesse, R., Abelson, J. M., Sweetman, J., & Jackson, J. S. (2007). Prevalence and distribution of major depressive disorder in African Americans, Caribbean blacks, and non-Hispanic whites: Results from the National Survey of American Life. *Archives of General Psychiatry*, *64*, 305–315. doi:10.1001/archpsyc.64.3.305
- Williams, D. R., Lawrence, J. A., Davis, B. A., & Vu, C. (2019). Understanding how discrimination can affect health. *Health Services Research*, *54*(Suppl 2), 1374–1388. doi:10.1111/1475-6773.13222
- Williams, D. R., & Mohammed, S. A. (2009). Discrimination and racial disparities in health: Evidence and needed research. *Journal of Behavioral Medicine*, *32*, 20–47. doi:10.1007/s10865-008-9185-0
- Witters, D., & Wood, J. (2014). *U.S. blacks suffer disproportionately from chronic conditions*. <https://news.gallup.com/poll/180329/blacks-suffer-disproportionately-chronic-conditions.aspx>. Accessed March 30, 2020.
- Wolinsky, F. D., Bentler, S. E., Hockenberry, J., Jones, M. P., Weigel, P. A., Kaskie, B., & Wallace, R. B. (2011). A prospective cohort study of long-term cognitive changes in older Medicare beneficiaries. *BMC Public Health*, *11*, 710. doi:10.1186/1471-2458-11-710
- Woodward, A. T., Taylor, R. J., Abelson, J. M., & Matusko, N. (2013). Major depressive disorder among older African Americans, Caribbean blacks, and non-Hispanic whites: Secondary analysis of the National Survey of American Life. *Depression and Anxiety*, *30*, 589–597. doi:10.1002/da.22041