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Coping With Chronic Stress by Unhealthy Behaviors: A Re-Evaluation Among Older Adults by Race/Ethnicity

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Abstract

Objective: To assess the role of unhealthy behaviors in the relationship between chronic stress and significant depressive symptoms by race/ethnicity among older adults.

Method: Participant data from the 2006 to 2008 Health and Retirement Study were analyzed. Unhealthy behaviors included current smoking, excessive/binge drinking, and obesity. Chronic stress was defined by nine previously used factors. The eight-item Center for Epidemiologic Studies Depression (CES-D) Scale measured depressive symptoms, where 4 symptoms defined significant. Multivariable logistic regression assessed the effects of chronic stress and unhealthy behaviors in 2006 on depressive symptoms in 2008.

Results: A higher chronic stress index score predicted depressive symptoms in 2008 among African Americans, Latinos, and Whites (adjusted odds ratio [aOR] = 1.78, 95% confidence interval [CI] = [1.48, 2.15]; aOR = 1.54, 95% CI = [1.15, 2.05]; and aOR = 1.40, 95% CI = [1.26, 1.56], respectively). Unhealthy behaviors moderated this relationship among Latinos (aOR = 1.54, 95% CI = [1.02, 2.33]).

Discussion: Unhealthy behaviors were not effective coping mechanisms for chronic stress in terms of preventing significant depressive symptoms. Instead, they strengthened the relationship between chronic stress and significant depressive symptoms among Latinos.

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Author Contributions

Dr. Erik Rodriquez and Dr. Eliseo Pérez-Stable designed the study. Dr. Rodriquez acquired the data, planned the analyses, and wrote the first draft of the article. Dr. Steven Gregorich provided statistical oversight and advice, and Dr. Livaudais-Toman provided analytic support.

Authors' Note

Dr. Pérez-Stable is currently at the National Institute of Minority Health and Health Disparities, National Institutes of Health, Bethesda, Maryland. All authors contributed to the writing of the paper and have approved the final article for submission. The corresponding author has full access to all aspects of the research and writing process, and takes final responsibility for the article. These results were presented in part in February 2014 at the annual meeting of the Resource Centers for Minority Aging Research, held in Los Angeles, California. The contents and views in this article are those of the authors and should not be construed to represent the views of the National Institutes of Health or any of the sponsoring organizations and agencies of the U.S. government.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Keywords

unhealthy behaviors; stress; depression; minorities

Introduction

Chronic stress, brought on by cumulative stressful life events, has a significant influence on depression. Among older adults, depression has been linked to increased mortality through its associations with increased morbidity; decreased physical, cognitive, and social functioning; increased self-neglect; and higher risk of suicide (Blazer, 2003). Research has consistently found a longitudinal relationship between life stressors experienced in adulthood and depression, with chronic exposure to stress having a greater effect than acute exposure (Estrada-Martinez, Caldwell, Bauermeister, & Zimmerman, 2012; Hammen, 2005; Paykel, 2003; Tennant, 2002). It is hypothesized that the stress from inequalities in social, economic, and environmental opportunities may cause worse mental health among minorities such as African Americans. However, the prevalence of 12-month major depression by race/ethnicity does not fully support this hypothesis (Dunlop, Song, Lyons, Manheim, & Chang, 2003; Gonzalez, Tarraf, Whitfield, & Vega, 2010; Jimenez, Alegria, Chen, Chan, & Laderman, 2010).

Recent research has found that comparable percentages of African Americans (4.2%–5.6%) and Whites (3.9%–5.3%) experience major depression, whereas Latinos experience major depression at a higher rate (7.9%–8.6%; Gonzalez et al., 2010; Jimenez et al., 2010). Researchers have begun to understand the effects that social, economic, and environmental stressors have on health and their contribution to racial/ethnic health disparities. The higher prevalence of major depression among Latinos may partially be the result of a differential effect that chronic stress and individual unhealthy behaviors have on depression for Latinos compared with African Americans or Whites, but there is limited published research in this area (Lipton, 1997).

Often linked to depression, the top three preventable causes of death and disability (i.e., cigarette smoking, obesity, and excessive alcohol use) also differ by race/ethnicity (Mokdad, Marks, Stroup, & Gerberding, 2004, 2005). African Americans and Whites are most likely to smoke (Clarke, Ward, Freeman, & Schiller, 2015; U.S. Department of Health and Human Services, 2014), whereas Latinos and African Americans are most likely to be obese (Centers for Disease Control and Prevention, 2009; The Henry J. Kaiser Family Foundation, n.d.). Although Whites are more likely to use alcohol, African American and Latinos are more likely to drink heavily (Chartier & Caetano, 2010).

Investigations to explain the use of unhealthy behaviors (e.g., cigarette smoking, alcohol use, and unhealthy eating that leads to obesity) to cope with chronic stress have identified several potential biological mechanisms (Dallman, Akana, et al., 2003; Dallman, Pecoraro, et al., 2003; Koob et al., 1998; Piazza & Le Moal, 1996, 1998). Specifically, such mechanisms include (a) the influence of stress on glucocorticoids to increase sensitivity of mesencephalic dopaminergic neurons to substances such as nicotine (Piazza & Le Moal, 1998); (b) the stress response of corticotropin-releasing factor, which alters neurological circuits

responsible for reinforcement of excessive consumption of ethanol (Koob et al., 1998); and (c) the activation of glucocorticoids and glucocorticoid receptor occupancy by stress, having an effect on a metabolic feedback signal that inhibits stressor-induced direct glucocorticoid drive on the brain, which therefore increases the desire for sugary foods (Dallman, Akana, et al., 2003). These mechanisms may help explain the role of unhealthy behaviors in the relationship between chronic stress and depression.

Prior research by Jackson et al. showed that among African American adults, as chronic stress increases, those who engaged in unhealthy behaviors were able to prevent a future episode of clinical depression to some degree (Jackson, Knight, & Rafferty, 2010). This empirical evidence supported the notion that unhealthy behaviors modify the effect of chronic stress on subsequent depression among African Americans, but not among Whites (Jackson et al., 2010). Based on neurobehavioral research, a framework called the Environmental Affordances model has been proposed as an explanation for how stress and behaviors may interact and effect health (Mezuk et al., 2013).

The study mentioned above had several limitations including using data from the mid-1980s, combining smoking, obesity, and alcohol use into a single unhealthy behavior indicator, only comparing African Americans and Whites, and being limited to younger or middle-aged adults (Jackson et al., 2010). The present study addressed the question of whether unhealthy behaviors modify the effect of chronic stress on subsequent depression among racial/ethnic groups by using more recent data from the Health and Retirement Study (HRS), more accurately measured predictors, examining unhealthy behaviors independently, and including Latinos in the sample. We hypothesized that the unhealthy coping strategies to protect the mental health of African Americans, as reported in previous research (Jackson et al., 2010), may have a different effect on depression when used by Latinos. This may partially explain why the prevalence of major depression among Latinos is higher than that of African Americans or Whites. We tested the following hypotheses: Engaging in one or more unhealthy behaviors weakens the relationship between chronic stress and depressive symptoms for African Americans and strengthens this relationship among Latinos. This analysis attempted to replicate previous research (Jackson et al., 2010), which examined the role of unhealthy behaviors in the relationship between chronic stress and depression among African Americans and Whites, and extend the analysis to Latinos.

Method

Data Set and Sample

The HRS is a longitudinal survey of U.S. adults born between 1931 and 1941. It employs a stratified multistage probability sampling design to assess the health, family structure, and economic resources of adults approaching retirement or already retired. Details on the sampling frame and study design of the HRS have been published (Heeringa & Connor, 1995; Survey Research Center, 2008a, 2008b). All data and supporting documentation from this study can be accessed at the HRS website (<http://hrsonline.isr.umich.edu/>).

The present analysis was limited to participants who responded to the 2006 Leave-Behind Questionnaire and 2008 Core interview. After their in-person interview in 2006, HRS

respondents were left with a self-administered questionnaire to collect additional data without adding length to the interview. The HRS provides special sampling weights for the sub-population of participants who completed the Leave-Behind Questionnaire.

Age, gender, and highest level of education were assessed by self-report from baseline data in 2006. Race/ethnicity was determined by self-report and the final sample size of adults above the age of 50 was 6,479: 843 African Americans, 494 Latinos, and 5,142 Whites.

Components of chronic stress.—In 2006, each participant was asked about stress-related experiences that belonged to one of nine factors with predetermined time frames. Factors were selected based on their similarity to those previously used in this area by Jackson and colleagues (2010). The nine chronic stress areas were (a) *ever being threatened or harassed* (proxy for serious physical attack; Jackson et al., 2010); (b) *ever had a life-threatening illness such as cancer, lung disease, heart attack, congestive heart failure, heart treatment or surgery, past or recent stroke*; (c) *ever had an accidental injury such as a broken hip*; (d) *moving to a worse residence or neighborhood in the last 5 years* (modified from “new residence”; Jackson et al., 2010); (e) *losing a job involuntarily (excluding retirement) in the last 5 years*; (f) *being robbed or burglarized in the last 5 years*; (g) *had any other upsetting event in the last 5 years such as being unemployed or having a household member who has been unemployed for longer than 3 months*; (h) *helped a sick, limited, or frail family member or friend on a regular basis in the last year*; or (i) *having an injury or sudden crisis (health problem) in the last year*. An index, ranging from 0 to 9, was created to summarize “yes” responses to the areas of chronic stress.

Definitions of Unhealthy Behaviors

From the 2006 data, current smoking, excessive and/or binge drinking, and obesity were used as categories of unhealthy behaviors. Obesity was used as a proxy measure for a poor diet and physical inactivity (Jackson et al., 2010). Current smokers (yes/no) were identified if the participant had an affirmative response to the question, *do you smoke cigarettes now*, after the question, *have you ever smoked cigarettes*.

Participants who currently engaged in alcohol use (yes/no) were identified by the question, *do you ever drink any alcoholic beverages such as beer, wine, or liquor*. Among those who reported using alcohol, excessive drinking was determined by the following established criterion (National Institute on Alcohol Abuse and Alcoholism [NIAAA], n.d.): (a) for men <65 years old: >2 drinks per day on average or >14 drinks per week and (b) for all women and men ≥65 years old: >1 drink per day on average or >7 drinks per week. The number of days in the last month a participant had four or more drinks of alcohol on one occasion, binge drinking, was also captured by self-report. For analytical purposes, the two measures were then combined into one of excessive and/or binge drinking (yes/no).

Self-reported height and weight of participants were used to calculate body mass index (BMI) with values ≥30 kg/m² defining obesity (yes/no). Obesity levels were categorized into not obese, mild, moderate, and severe obesity, for a BMI <30 kg/m², 30 but <35 kg/m², 35 but <40 kg/m², and ≥40 kg/m², respectively.

Lastly, an unhealthy behavior index was defined by summing the dichotomous versions of each unhealthy behavior. These dichotomous variables included the primary risk factors of current smoking, excessive and/or binge drinking, and obesity (range = 0–3).

Assessment of Depressive Symptoms

Depressive symptoms were assessed in 2006 and 2008 by the same eight-item short-form Center for Epidemiologic Studies Depression (CES-D) Scale (Wallace et al., 2000). The items consisted of having the following experiences much of the time during the past week: *felt depressed*, *felt everything was an effort*, *sleep was restless*, *was happy*, *felt lonely*, *enjoyed life*, *felt sad*, and *could not get going*. Response options for each item were “yes” or “no” and corresponded with the scores of 1 or 0, respectively, except for two items (*was happy* and *enjoyed life*) that were scored 0 or 1, respectively. A dichotomous version of depressive symptoms was created for each year with the pre-established cutoff score of 4 (Wallace et al., 2000) to define significant symptoms.

Statistical Analysis

Descriptive analyses, bivariate logistic and linear regression, and multivariable logistic regression, stratified by race/ethnicity, were used for the present analysis. Descriptive analyses are presented in Table 1, bivariate logistic and linear regression is presented in Table 2, and multivariable logistic regression is presented in Tables 3 and 4.

Our analysis sought to answer the question of whether unhealthy behaviors modify the effect of chronic stress on subsequent depression among racial/ethnic groups. Our hypotheses included (a) engaging in one or more unhealthy behaviors weakens the relationship between chronic stress and depressive symptoms for African Americans compared with Whites and (b) engaging in one or more unhealthy behaviors strengthens the relationship between chronic stress and depressive symptoms for Latinos compared with Whites.

Within each racial/ethnic group, means and standard deviations were calculated for continuous variables including chronic stress index and unhealthy behaviors index. Frequencies were calculated for all categorical variables. Chi-square and *t* tests evaluated racial/ethnic differences on sample characteristics.

An interaction term was constructed between the chronic stress index and unhealthy behaviors index to test our hypothesis. Separate interaction terms were also constructed between the chronic stress index and each individual unhealthy behavior, including current smoking, excessive and/or binge drinking, and obesity defined as BMI ≥ 30 .

The relationships between chronic stress in 2006, unhealthy behaviors in 2006, and depressive symptoms in 2008 were modeled using logistic and linear regression, stratified by race/ethnicity. Bivariate models were fit prior to the construction of multivariable models. These included (a) the association between chronic stress and unhealthy behaviors, (b) chronic stress predicting depressive symptoms, and (c) unhealthy behaviors predicting depressive symptoms.

Multivariable models assessed chronic stress, unhealthy behaviors, and their interactions in predicting depressive symptoms. Two multivariable models were fit and stratified by race/ethnicity. The primary model included the interaction term between the chronic stress index and unhealthy behaviors index. The secondary, exploratory model included interaction terms between the chronic stress index and each individual unhealthy behavior, resulting in a total of three interaction terms. Non-significant ($p > .05$) interaction terms were dropped via a backward elimination procedure. Regression models were adjusted for age, gender, educational attainment, and depressive symptoms at baseline in 2006. Models included participants with non-missing data for all variables analyzed. The complex sampling design of the HRS and weighting procedures for the Leave-Behind Questionnaire sub-population were accounted for by survey data analysis procedures for means, percentages, and logistic and linear regression modeling. Analyses were conducted using Stata, Version 11.2 (StataCorp LP, College Station, Texas).

The present study used de-identified public use data, which is not considered human subjects research, and thus was not reviewed by the institutional review board (IRB) of the University of California, San Francisco.

Results

The final sample size was 6,479; there were 843 African Americans, 494 Latinos, and 5,142 Whites. More than 40% of African American and Latino older adults were between the ages of 50 and 59 whereas the proportion of White older adults was more evenly distributed across the age groups (Table 1; $p < .05$). Regardless of race/ethnicity, women comprised the majority of the sample population ($p < .01$). Latinos were the least educated group with 50% having less than a high school education compared with 33.9% of African Americans and only 12.9% of Whites. Among Whites, 44.1% were college graduates compared with 28.3% of African Americans and 20.3% of Latinos ($p < .001$).

Depressive Symptoms, Chronic Stressors, and Unhealthy Behaviors

Latinos were more likely to have a CES-D score ≥ 4 , ≥ 4 indicating insignificant depressive symptoms, with 34.8% compared with 24% among African Americans and 17.2% among Whites ($p < .001$). Among the chronic stressors, the likelihood of being threatened or harassed was highest among Whites (23%; $p < .05$), having a life-threatening illness was lowest among Latinos (30%; $p < .05$), having any other upsetting event was highest among African Americans (18%; $p < .01$), and having an injury or other ongoing health problem was highest among Latinos (44%; $p < .05$; Table 1). However, the mean chronic stress index was similar across all racial/ethnic groups.

Cigarette smoking, excessive and/or binge drinking, and obesity differed by race/ethnicity. African Americans were most likely to be current smokers (24%; $p < .001$), Whites were more likely to report excessive or binge drinking (22%; $p < .001$), and both African Americans and Latinos were more likely to be obese (47% and 41%, respectively; $p < .001$). The mean unhealthy behavior index was highest among African Americans (0.84; $p < .001$).

Associations Between Chronic Stress and Unhealthy Behaviors

In Table 2, results from models adjusted for age, gender, highest level of education, and depressive symptoms at baseline showed that a higher level of chronic stress was associated with an increased odds of having ever smoked among Whites (adjusted odds ratio [aOR] = 1.15, 95% confidence interval [CI] = [1.08, 1.23]) and current smoking among Latinos (aOR = 1.36, 95% CI = [1.04, 1.79]). Among African Americans and Whites, more chronic stress was also linked to a greater likelihood of obesity (aOR = 1.22, 95% CI = [1.02, 1.45] and aOR = 1.14, 95% CI = [1.07, 1.22], respectively). Whites were also more likely to engage in any unhealthy behavior with higher levels of chronic stress (estimate = 0.03, 95% CI = [0.01, 0.05]).

Interactions Between Chronic Stress and Unhealthy Behaviors

The primary multivariable analysis assessed the effects of the chronic stress index, the unhealthy behaviors index, and their interaction on the binary indicator of significant depressive symptoms in 2008. The interaction between the chronic stress index and unhealthy behavior index was significant among Latinos (aOR = 1.54, 95% CI = [1.02, 2.33]), but not among African Americans (aOR = 0.96, 95% CI = [0.76, 1.21]) or Whites (aOR = 1.00, 95% CI = [0.87, 1.14]). For Latinos, the effect of chronic stress on depressive symptoms increased with each level of unhealthy behavior (0 unhealthy behaviors: aOR = 1.16, 95% CI = [0.79, 1.72]; one unhealthy behavior: aOR = 1.78, 95% CI = [1.28, 2.49]; two unhealthy behaviors: aOR = 2.74, 95% CI = [1.44, 5.22]; and three unhealthy behaviors: aOR = 4.21, 95% CI = [1.50, 11.8]). Table 3 contains results from adjusted models by race/ethnicity excluding the chronic stress index and unhealthy behavior index interaction term. In these analyses, chronic stress was found to be predictive of future depressive symptoms among all racial/ethnic groups (African Americans: aOR = 1.78, 95% CI = [1.48, 2.15]; Latinos: aOR = 1.54, 95% CI = [1.15, 2.05]; and Whites: aOR = 1.40, 95% CI = [1.26, 1.56]). Higher levels of formal education were protective for developing significant depressive symptoms in all racial/ethnic groups but this was only significant for Whites.

In secondary multivariable analyses, exploring whether individual unhealthy behaviors modified the effect of chronic stress on future depressive symptoms, no interaction terms were statistically significant within any racial/ethnic group. Because individual unhealthy behaviors did not significantly interact with chronic stress, the multivariable models were re-fit after dropping these interaction terms (Table 4). In these models, Latinos with mild obesity were 2.5 times more likely to report future depressive symptoms (aOR = 2.51, 95% CI = [1.10, 5.73]) and White current smokers had a 48% increased risk of depressive symptoms (aOR = 1.48, 95% CI = [1.05, 2.07]).

Discussion

Our study re-evaluated the effect of chronic stress and unhealthy behaviors on significant depressive symptoms 2 years later among older adults. We did not find a significant interaction between the chronic stress index and unhealthy behavior index among African Americans. However, we did observe a significant and positive interaction among Latinos. It has been hypothesized that the relatively low prevalence of depression observed among

African Americans may be the result of effective, yet unhealthy, behaviors that alleviate the symptoms of chronic stress by working through the same biological mechanism that contributes to some mental disorders (Jackson et al., 2010). Jackson and colleagues assessed the interaction between chronic stress and unhealthy behaviors by race and found that as chronic stress increased, African Americans who engaged in more unhealthy behaviors were protected from experiencing an episode of clinical depression in the future (Jackson et al., 2010). Evidence exists to explain how the use of unhealthy behaviors such as smoking (Piazza & Le Moal, 1998), drinking alcohol (Koob et al., 1998; Piazza & Le Moal, 1996), and eating unhealthy foods may act along this pathway (Dallman, Akana, et al., 2003; Dallman, Pecoraro, et al., 2003). However, the results of the present analysis did not confirm this hypothesis. The inability to confirm this hypothesis may have been due to the limitations of the depressive symptoms measure.

Our analysis was designed to study a similar age group of adults and use a similar assessment of factors defining chronic stress and unhealthy behaviors as in Jackson et al. (2010). In their study, the mean age of participants was 53 years. The mean participant age in the present study was 64 years. Individual unhealthy behaviors were summed into an index by Jackson and colleagues. However, in the present analysis, unhealthy behaviors were modeled both as an index and individually. A significant result was identified: increased depressive symptoms in Latinos who engaged in more unhealthy behaviors with increased chronic stress. Although all other analyses were not significant in establishing an association of unhealthy behaviors modifying stress, this significant finding among Latinos is noteworthy because it adds a novel finding to the literature.

The major difference between the two studies was in the measure of depression. The present study made use of the CES-D Scale to define significant depressive symptoms, whereas data on clinical depression, which were not available for the present analysis, were used in the other study (Jackson et al., 2010). One would expect that significant depressive symptoms are on the pathway to clinical depression and would have similar effects in evaluating coping mechanisms for chronic stress. However, significant depressive symptoms do not equate with a clinical diagnosis of depression and do not carry the same consequences.

Debate has taken place as to whether unhealthy behaviors are coping mechanisms for chronic stress among African Americans (Bates, Barnes, & Keyes, 2011; Boardman & Alexander, 2011; Mezuk et al., 2010), but limited published research has been able to either support or refute the relationships between chronic stress, unhealthy behaviors, and depression (Walsh, Senn, & Carey, 2013). One study failed to confirm the association of coping with chronic stress through unhealthy behaviors using longitudinal, nationally representative data and *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association, 1994) diagnoses of major depression (Keyes, Barnes, & Bates, 2011). Keyes et al. found an interaction between race, stress, and coping behavior for BMI where elevated BMI was protective against major depression among African Americans, but a lack of protection against major depression for African Americans who engaged in unhealthy behaviors (Keyes et al., 2011). Findings from the present study add to the research of Keyes and colleagues in understanding the relationships between chronic stress, unhealthy behaviors, and significant depressive symptoms. Cumulatively,

unhealthy behaviors may strengthen the relationship between chronic stress and depression among certain racial/ethnic groups such as Latinos.

Analysis of individual unhealthy behaviors revealed several significant relationships. First, the risk of future depressive symptoms was 2.5 times higher for Latinos who were mildly obese. Of note, the non-significant point estimates for the relationships between moderate or severe obesity and future depressive symptoms were in the opposite direction. In addition, the association between chronic stress and obesity was not observed among Latinos as it was in other groups. Second, current smoking was linked to an increased risk of depressive symptoms among Whites.

To better understand how the interactions between chronic stress and unhealthy behaviors influence health disparities among racial/ethnic groups, a theoretical model is warranted. The model of Environmental Affordances has been proposed as a possible framework by which physical and mental health disparities among racial/ethnic groups may arise (Mezduk et al., 2013). Within the context of sociological theory, this model makes use of neurobiological knowledge from experimental and laboratory studies on stress and behavior to predict how individual- and societal-level factors interact. Results from the present study would suggest that this model is relevant for Latinos. Engaging in unhealthy behaviors appears to interact with chronic stress and increase the risk of future depressive symptoms among Latinos. Past research (Lipton, 1997) has linked heavy alcohol consumption, in the presence of stress, to increased depressive symptoms among foreign-born Mexicans and Whites but not U.S.-born Mexicans.

We also found that an increased level of formal education tended to prevent participants from developing significant depressive symptoms in all three racial/ethnic groups. The observation was most robust and only significant among Whites, although the point estimates were similar across the three racial/ethnic groups. Thus, promoting more years of formal education, especially at the college level, may result in a lower proportion of persons with significant symptoms of depression in the future as a consequence of chronic stress.

Our study has several limitations. Significant effects of this analysis may have gone unobserved due to the assessment of depressive symptoms using a standard scale instead of diagnostic criteria for clinical major depression. The assessment of chronic stress and unhealthy behaviors at the same time point by self-report only is an additional limitation. The 2-year time period between baseline and follow-up assessments may be too short to detect how unhealthy behaviors moderate the effect of chronic stress on depression. Because only non-missing data were analyzed, our results may have been biased away from observing additional significant relationships. Finally, conducting this study among adults

50 years may have prevented us from observing significant interactions between chronic stress and unhealthy behaviors that may be stronger among younger or middle-aged adults. This bias may have prevented us from observing other differences by race/ethnicity because health disparities shrink in late age because of death. Future research may address this limitation by using physiological measures to quantify chronic stress with allostatic load and current smoking with a biomarker on nicotine intake such as cotinine.

In summary, the present study used more recent longitudinal data from a nationally representative sample of older adults, with oversamples of African Americans and Latinos, and a comprehensive assessment of chronic stress factors and individual unhealthy behaviors to address the question of whether engaging in unhealthy behaviors modifies the relationship between chronic stress and depressive symptoms. Our results showed that engaging in more unhealthy behaviors did not alleviate the effects of chronic stress on future depressive symptoms for any group. Instead, engaging in more unhealthy behaviors strengthened the relationship between chronic stress and future depressive symptoms among certain racial/ethnic groups such as Latinos. These findings add to our understanding of the role of unhealthy behaviors in the relationship between chronic stress and significant depressive symptoms as well as expand our knowledge from past research to another racial/ethnic group: Latinos. Clinicians working with older aged Latinos may use these findings to inform their decisions to screen and provide recommendations for stress and unhealthy behaviors among those reporting symptoms of depression.

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Sample Characteristics by Race/Ethnicity: Health and Retirement Survey Participants Age 50 Years ($n = 6,479$) Responding to the Leave-Behind Questionnaire, 2006.

Table 1.

	African American $n = 843$	Latino $n = 494$	White $n = 5,142$	
	% ^a	% ^a	% ^a	<i>P</i>
Dependent measure (2008)				
Depressive symptoms (CES-D score 4)	21.0	30.7	16.8	<.001
Control measures (2006)				
Age ($M \pm SE$)	64.0 ± 0.42	62.9 ± 0.88	65.4 ± 0.26	<.05
Age (categorical)				
50–59 years	43.7	45.5	37.4	<.05
60–69 years	29.7	34.8	30.5	
70 years	26.6	19.7	32.1	
Gender				
Men	39.5	45.7	46.5	<.01
Women	60.5	54.3	53.5	
Highest level of education				
Less than high school	33.9	50.7	12.9	<.001
High school or some college	37.9	29.0	42.9	
College graduate or more	28.3	20.3	44.1	
Depressive symptoms (CES-D score 4)	24.0	34.8	17.2	<.001
Chronic stressors (2006)				
Serious physical attack (ever)	17.3	16.8	22.5	<.05
Life-threatening illness (ever)	38.7	30.5	38.8	<.05
Accidental injury (ever)	2.1	2.5	1.7	.470
Moved to a new residence in last 5 years	2.5	2.2	2.2	.929
Involuntary loss of job in last 5 years	7.7	10.0	8.0	.382
Robbery or burglary in last 5 years	5.1	6.2	4.1	.188
Other upsetting event in last 5 years	18.2	16.5	12.7	<.01
Providing care to family member in last year	13.6	11.7	15.0	.275

	African American <i>n</i> = 843	Latino <i>n</i> = 494	White <i>n</i> = 5,142	
	% ^a	% ^a	% ^a	<i>P</i>
Injury or crisis (health problem) in last year	39.0	44.1	35.7	<.05
Chronic stress index (0–9; <i>M</i> ± <i>SE</i>)	1.44 ± 0.06	1.42 ± 0.08	1.40 ± 0.02	.782
Unhealthy behaviors (2006)				
Ever smoked	61.4	53.5	56.1	.176
Currently smoke	23.9	11.5	13.7	<.001
Drink excessively ^b /binge drink ^c	12.8	13.7	21.5	<.001
Obesity category				
Not obese (BMI < 30 kg/m ²)	52.6	59.4	70.1	<.001
Mildly obese (BMI 30, but <35 kg/m ²)	27.1	24.9	18.8	
Moderately obese (BMI 35 but < 40 kg/m ²)	9.9	9.3	7.3	
Severely obese (BMI 40 kg/m ²)	10.4	6.4	3.9	
Unhealthy behavior index (0–3) ^d (<i>M</i> ± <i>SE</i>)	0.84 ± 0.03	0.67 ± 0.04	0.64 ± 0.02	<.001

Note. CES-D = Center for Epidemiologic Studies Depression Scale; BMI = body mass index; Bold values indicate statistical significance below $\alpha = .05$ level.

^aPercentages based on non-missing values.

^bDrink excessively: for men younger than 65 years of age: >2 drinks/day on average or >14 drinks per week; for all women and for men 65 and older: >1 drink/day on average or >7 drinks per week.

^cBinge drink: 4 drinks/day on at least 1 day in the last month.

^dUnhealthy behavior index includes count of currently smoke, drink excessively/binge drink, and obese.

Table 2.

Associations Between Chronic Stress Index^a (2006) and Individual Unhealthy Behaviors (2006): Health and Retirement Survey Participants Age 50 Years (*n* = 6,479) Responding to the Leave-Behind Questionnaire, 2006.

	African American	Latino	White
	aOR ^b (95% CI) or estimate (95% CI)	aOR ^b (95% CI) or estimate (95% CI)	aOR ^b (95% CI) or estimate (95% CI)
Ever smoked	1.03 [0.85, 1.24]	1.17 [0.94, 1.44]	1.15 [1.08, 1.23] ***
Currently smoke	0.94 [0.76, 1.17]	1.36 [1.04, 1.79] *	1.09 [0.98, 1.21]
Drink excessively/binge drink	1.06 [0.71, 1.59]	0.94 [0.68, 1.29]	0.92 [0.83, 1.02]
Obese	1.22 [1.02, 1.45] *	1.02 [0.80, 1.29]	1.14 [1.07, 1.22] ***
Unhealthy behavior index ^c (0–3)	0.05 [−0.04, 0.14]	0.02 [−0.05, 0.09]	0.03 [0.01, 0.05] **

Note. aOR = adjusted odds ratio; CI = confidence interval. Bold values indicate statistical significance below $\alpha = .05$ level.

^aChronic stress index includes serious physical attack (ever), accidental injury (ever), moved to a new residence in the last 5 years, involuntary loss of job in last 5 years, robbery or burglary in last 5 years, other upsetting event in last 5 years, providing care to family member in last year, and injury or crisis (health problem) in last year.

^bAdjusted for age, gender, highest level of education, and depressive symptoms in 2006.

^cUnhealthy behavior index includes count of currently smoke, drink excessively/binge drink, and obese.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 3.

Results of Logistic Regression, Including the Unhealthy Behaviors Index, Predicting Depressive Symptoms in 2008: Health and Retirement Survey Participants Age 50 Years Responding to the Leave-Behind Questionnaire, 2006.

	African American <i>n</i> = 578	Latino <i>n</i> = 310	White <i>n</i> = 3,769
	aOR ^a (95% CI)	aOR ^a (95% CI)	aOR ^a (95% CI)
Control measures (2006)			
Age 50–59 years	Reference	Reference	Reference
60–69 years	0.78 [0.37, 1.63]	1.32 [0.61, 2.88]	0.83 [0.61, 1.14]
70+ years	0.97 [0.39, 2.40]	1.11 [0.51, 2.41]	0.93 [0.70, 1.25]
Gender			
Male	Reference	Reference	Reference
Female	0.99 [0.59, 1.65]	1.50 [0.60, 3.79]	1.18 [0.92, 1.50]
Highest level of education			
Less than high school	Reference	Reference	Reference
High school or some college	0.66 [0.32, 1.36]	0.59 [0.25, 1.42]	0.62 [0.46, 0.83]**
College graduate or more	0.43 [0.17, 1.12]	0.44 [0.18, 1.07]	0.43 [0.32, 0.59]***
Depressive symptoms (CES-D)			
<4	Reference	Reference	Reference
4	5.93 [3.41, 10.3]***	10.6 [5.38, 20.9]***	6.71 [5.21, 8.65]***
Chronic stressors (2006)			
Chronic stress index ^b (0–9)	1.78 [1.48, 2.15]***	1.53 [1.15, 2.03]**	1.40 [1.26, 1.56]***
Unhealthy behaviors (2006)			
Unhealthy behavior index ^c (0–3)	1.08 [0.67, 1.74]	1.63 [0.89, 2.96]	1.01 [0.82, 1.25]

Note. aOR = adjusted odds ratio; CI = confidence interval; CES-D = Center for Epidemiologic Studies Depression Scale; Bold values indicate statistical significance below $\alpha = .05$ level.

^a Adjusted for age, gender, highest level of education, and depression in 2006.

^b Chronic stress index includes serious physical attack (ever), life-threatening illness (ever), accidental injury (ever), moved to a new residence in the last 5 years, involuntary loss of job in last 5 years, robbery or burglary in last 5 years, other upsetting event in last 5 years, providing care to family member in last year, injury or crisis (health problem) in last year.

^c Unhealthy behavior index includes count of currently smoke, drink excessively/binge drink, and obese.

.001 > *p* ***
.01 > *p* **
.50 > *p* *

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Results of Logistic Regression, Including Individual Unhealthy Behaviors, Predicting Depressive Symptoms in 2008: Health and Retirement Survey Participants Age 50 Years Responding to the Leave-Behind Questionnaire, 2006.

Table 4.

	African American <i>n</i> =578	Latino <i>n</i> = 310	White <i>n</i> = 3,769
	aOR ^a (95% CI)	aOR ^a (95% CI)	aOR ^a (95% CI)
Control measures (2006)			
Age 50–59 years	Reference	Reference	Reference
60–69 years	0.75 [0.35, 1.60]	1.11 [0.54, 2.28]	0.83 [0.60, 1.15]
70+ years	0.95 [0.37, 2.46]	0.95 [0.43, 2.10]	0.96 [0.72, 1.29]
Gender			
Male	Reference	Reference	Reference
Female	0.84 [0.49, 1.45]	1.62 [0.70, 3.77]	1.13 [0.88, 1.46]
Highest level of education			
Less than high school	Reference	Reference	Reference
High school or some college	0.66 [0.32, 1.34]	0.60 [0.25, 1.42]	0.65 [0.48, 0.87]**
College graduate or more	0.42 [0.17, 1.06]	0.41 [0.15, 1.10]	0.46 [0.33, 0.64]***
Depressive symptoms (CES-D)			
<4	Reference	Reference	Reference
4	6.13 [3.43, 11.0]***	13.1 [6.37, 26.8]**	6.48 [5.02, 8.37]***
Chronic stressors (2006)			
Chronic stress index ^b (0–9)	1.76 [1.46, 2.14]***	1.45 [1.11, 1.89]**	1.38 [1.24, 1.54]***
Unhealthy behaviors (2006)			
Current smoking			
Do not currently smoke	Reference	Reference	Reference
Currently smoke	1.05 [0.48, 2.30]	2.02 [0.78, 5.22]	1.48 [1.05, 2.07]*
Alcohol use			
Do not drink excessively or binge drink	Reference	Reference	Reference
Drink excessively or binge drink	0.79 [0.22, 2.90]	1.37 [0.32, 5.99]	0.73 [0.52, 1.03]
Obesity category			

	African American <i>n</i> =578	Latino <i>n</i> = 310	White <i>n</i> = 3,769
	aOR ^{<i>d</i>} (95% CI)	aOR ^{<i>d</i>} (95% CI)	aOR ^{<i>d</i>} (95% CI)
Not obese	Reference	Reference	Reference
Mildly obese	1.39 [0.72, 2.68]	2.51 [1.10, 5.73] [*]	0.93 [0.64, 1.34]
Moderately obese	1.96 [0.81, 4.76]	0.61 [0.16, 2.25]	1.15 [0.79, 1.68]
Severely obese	1.18 [0.45, 3.11]	0.58 [0.16, 2.16]	1.11 [0.66, 1.87]

Note. aOR = adjusted odds ratio; CI = confidence interval; CES-D = Center for Epidemiologic Studies Depression Scale; Bold values indicate statistical significance below $\alpha = .05$ level.

^{*d*}Adjusted for age, gender, highest level of education, and depressive symptoms in 2006.

^{*b*}Chronic stress index includes serious physical attack (ever), life-threatening illness (ever), accidental injury (ever), moved to a new residence in the last 5 years, involuntary loss of job in last 5 years, robbery or burglary in last 5 years, other upsetting event in last 5 years, providing care to family member in last year, and injury or crisis (health problem) in last year.

^{*}*p* < .05.

^{**}*p* < .01.

^{***}*p* < .001.