

STRESS AND HEALTH AMONG RACIAL/ETHNIC MINORITIES:  
THE ROLE OF CULTURAL MISMATCH

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A Dissertation

Presented to

The Faculty of the Department

of Psychology

University of Houston

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In Partial Fulfillment

Of the Requirements for the Degree of

Doctor of Philosophy

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By

David C. Talavera

May, 2017

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## ABSTRACT

Stress is a strong risk factor for poor health outcomes and is widely regarded as a main culprit in the alarming rates of health disparities among ethnoracial minorities (Schneiderman, Ironson, and Siegel, 2005). In order to better understand the association between stress and poor health, it is crucial to examine the role of contextual factors (Todorova, et al., 2013) in ethnoracial minority populations. One phenomenon that can potentially shed light on the association between stress and health is that of “cultural mismatch,” which posits that individuals experience psychological distress when their cultural values, customs, and beliefs are incongruent with their environmental context (Halpern-Felsher et al., 1997). Although previous studies have shown that cognitive vulnerabilities mediate the association between stress and health (Manack et al., 2013), no studies to the best of my knowledge have accounted for cultural mismatch in this stress to poor health process. Thus, the current study examined if the extent to which cognitive vulnerability mediates the stress to poor health process is contingent on differing levels of independent self-construal among ethnoracially diverse individuals. The results showed that when predicting health perception, both the overall model ( $R^2 = 0.26$ ,  $df = 5, 462$ ,  $F = 32.21$ ,  $p < .0001$ ) and the moderated mediation were significant ( $b = 0.058$ ,  $SE = 0.035$ , 95% CI [0.002, 0.143]). Further inspection of the interaction showed that the association between stress and cognitive vulnerabilities was stronger for those with lower levels of independent self-construal ( $b = 3.61$ ,  $t = 5.22$ ,  $p < .001$ ) relative to persons who reported higher independent self-construal ( $b = 1.24$ ,  $t = 2.64$ ,  $p < .001$ ).

## TABLE OF CONTENTS

Introduction .....	1
Review of The Related Literature .....	2
Health Status Among Ethnoracial Groups.....	2
Stress: A Precipitant of Poor Health Outcomes .....	3
The Stress to Health Process: Lazarus and Folkman’s Transactional Model as a Theoretical Framework.....	5
The Potential Role of Cultural Mismatch.....	7
Focusing on Young Adults.....	10
Current Study.....	11
Hypotheses.....	11
Methodology.....	13
Participants .....	13
Measures .....	13
Self-Construal Scale (SCS) .....	13
Perceived Stress Scale (PSS-10) .....	14
Dysfunctional Attitude Scale (DAS).....	15
Medical Outcomes Study Short Form (MOS SF-20).....	15
Procedure .....	16
Analytic Plan .....	16
Sample Size Planning and Statistical Power.....	16
Data Analysis.....	17
Results.....	19
Preliminary Analyses.....	19
Hypothesis 1a: Meditating Role of Cognitive Vulnerability in The Relation Between Stress and Health Perception.....	21
Hypothesis 1b: Meditating Role of Cognitive Vulnerability in The Relation Between Stress and Physical Functioning.....	22
Hypothesis 2a: Moderated Mediation Analyses of Health Perception.....	22
Hypothesis 2b: Moderated Mediation Analysis of Physical Functioning	24
Discussion.....	25
References.....	31

## LIST OF TABLES

<i>Table 1.</i> Intercorrelations, Means, and Standard Deviations for Independent and Dependent Measures.....	50
<i>Table 2.</i> Tukey HSD Post-hoc Test Results Comparing Ethnoracial Groups on the DAS and Independent Self-Construal.....	51
<i>Table 3.</i> Mediation and Moderated Mediation Model Results.....	52

## LIST OF FIGURES

<i>Figure 1.</i> Indirect Effects of Perceived Stress on Health Perception through Cognitive Vulnerability.....	53
<i>Figure 2.</i> Indirect Effects of Perceived Stress on Physical Functioning through Cognitive Vulnerability.....	54
<i>Figure 3.</i> Indirect Effects of Perceived Stress on Health Perception through Cognitive Vulnerability with Independent Self-Construal as a First Stage Moderator.....	55
<i>Figure 4.</i> Indirect Effects of Perceived Stress on Physical Functioning through Cognitive Vulnerability with Independent Self-Construal as a First Stage Moderator.....	56
<i>Figure 5.</i> Simple Slopes Analysis on the Interaction Between Stress and Independent Self-Construal in Predicting Cognitive Vulnerability.....	57

## **Introduction**

There are substantial health disparities among racial/ethnic minorities (Benjamin et al., 2012; Todorova et al., 2013). Ethnoracial minorities experience disproportionate health risks and outcomes when compared to White Americans (Sheinfeld, 2006). A reoccurring precipitating factor accounting for poor health outcomes is elevated stress, of which racial/ethnic minorities experience at disproportionate rates (Braveman, Egerter, & Mockenhaupt, 2011). A common pathway through which stress leads to poor health outcomes is rooted in the appraisal of stress. Lazarus & Folkman's, (1984) Transactional Model of Stress and Coping (TMSC) provides the theoretical foundation for this stress to health process. They state that the appraisal of stress is what determines detrimental outcomes, including psychological distress and health problems.

Although racial/ethnic minorities experience disproportionately elevated stress and poor health, available research has failed to address the role of contextual factors in the stress to health process (cf. Fisher, et al., 2007). In particular, there are no studies investigating what, if any role, cultural mismatch plays in the association between stress and health. Despite the fact that cultural mismatch has been shown to be linked with high stress and increased health problems, no study to date has looked at cultural mismatch in conjunction with stress and health (Stephens et al., 2012; Schwartz, et al., 2013; Todorova et al., 2013). Given that stress is linked with poor health outcomes, and cultural mismatch is uniquely associated with stress and health, investigating the role of cultural mismatch in the stress-health process among racial/ethnic minorities is a cogent next step in the scientific literature. Building off of this framework, the overarching goal of this study is to investigate the role of cultural mismatch in the stress-health process among

racial/ethnic minorities. Understanding these mechanisms will expand our current knowledge on the cultural determinants of adverse health consequences for racial/ethnic minorities. In addition, from a preventative health perspective, the outcomes of this study may also promote the assessment of contextual factors among ethnoracial groups with elevated stress in order to deliver more specialized and targeted treatments to underserved populations.

## **Review of The Relevant Literature**

### **Health Status Among Ethnoracial Groups**

By 2050, nearly half of the US population is expected to identify as racial or ethnic minority – underscoring the significance of investigating health disparities among underrepresented groups (Grieco, 2000). Health disparities research aims to pinpoint and understand differences in health outcomes among racial/ethnic groups (Braveman, 2006). Currently, racial and ethnic minorities experience disparities in both outcomes and access to treatment for health outcomes compared to White Americans (Sheinfeld, 2006). For instance, morbidity and mortality is higher for racial/ethnic minorities than White Americans (Schoenfeld et al., 2013). Studies illustrating the widening health gaps between racial/ethnic minorities and White Americans underscore the fact that progress toward reducing health disparities in the U.S. is underdeveloped. In many cases, gaps have increased rather than decreased (Center for Disease Control, 2005). Ultimately, the prospect of reducing health disparities is rooted in the longevity and health of those of those that identify as racial or ethnic minority (House and Williams, 2000).

An important first step in mitigating health disparities is to examine perceived health (Chen, 2014). Perceived health has been shown to be associated with help seeking



behaviors and future health service use (Idler and Benyamini, 1997; Benyamini and Idler, 1999). It is also highly correlated with other health indicators and is a robust predictor of mortality, even after adjusting for illness and functional limitations (Fayers and Sprangers 2002; Kahn and Fazio 2005). Thus, perceived health can be a straightforward and practical tool to help clinicians examine the degree to which health ailments are affecting the individual (Guyatt et al., 1993). Currently, the literature operationalizes perceived health in terms of several domains, including social functioning, physical functioning, and mental health functioning (Parrick and Erickson, 1993). Although these different conceptualizations of self-rated health have been useful in previous research, for the purposes of this study, self-rated health will primarily focus on one's current health perception and the extent to which health interferes with daily functioning. This definition of health has been used in the past as a reliable way of monitoring population health by the World Health Organization (WHO) and the Centers for Disease Control and Prevention (De Bruin, 1996; Hennessey et al., 1994).

### **Stress: A Precipitant for Poor Health Outcomes**

Understanding how stress affects physical health is critical since chronic health conditions exacerbated by stress are a major cause of death and disability in developed countries (World Health Organization, 2005; Mohr, Hart, Julian, Cox, Pelletier, 2004). Stress is defined as a situation “in which environmental demands, internal demands, or both, tax or exceed the adaptive resources of an individual, social system, or tissue system,” (Monat & Lazarus, 1991). Stress is prevalent among nearly one third of Americans and is consistently rated on the high end of stress scales (APA, 2008). Early studies demonstrated that stress is a physiological reaction to negative or positive life

events (Haynes, Follingstad, & McGowan, 1974). In both of these situations, physiological reactions can occur in an individual. These reactions often include muscle contraction, adrenal gland secretion, increased heart rate and blood pressure, and increased inhibition of the digestive system (Verkuil, Brosschot, Gebhardt, & Thayer, 2010). There are also several known consequences of stress including psychological distress, physical health ailments, reduced immune functioning, and mortality (Braveman, Egerter, & Mockenhaupt, 2011; Lantz, House, Mero, & Williams, 2005; Brosschot, Godaert, Benschop, et al., 1998; Miller, Cohen, & Ritchey, 2002). Furthermore, stress is also consistently linked to chronic conditions such as inflammatory bowel disease and chronic pain (Caltabiano et al., 2008; Bomholt et al., 2004).

Current research indicates that ethnoracial groups experience more stress when compared to White Americans. Specifically, studies report greater exposure to stressful life events, chronic stressors, discrimination, and perceived stress among racial/ethnic minorities (Kessler et al., 1999; Turner and Avison, 2003). In a review on the association between stressful life events, demographic variables, and race and ethnicity, Hatch and Dohrenwend (2007) found that the distribution of stressful life events disproportionately affected racial/ethnic minorities. Investigating these elevated levels of stress among underrepresented groups is critical as racial/ethnic minorities have exhibited poor health outcomes in the presence of elevated stress (Williams & Jackson, 2005). Furthermore, although these studies demonstrate ethnoracial minorities disproportionately experience elevated rates of poor health outcomes, the current literature has yet to examine which, if any, sociocultural determinants play a role in the stress to health process.

## **The Stress to Health Process: Lazarus and Folkman's Transactional Model as a Theoretical Framework**

The effects of stress on health have been a major topic of research for several years, and, as a result, their association is well known and accepted in medical and psychological literature (cf. Schneiderman, Ironson, & Siegel, 2005). Examining the direct pathways in which stress leads to negative health consequences is largely based on studies and writings by Lazarus & Folkman. Their Transactional Model of Stress and Coping offers a theoretical foundation for how the appraisal of stress can lead to poor health outcomes (Lazarus & Folkman, 1984). According to the model, the impact of a stressor is mediated by an individual's appraisal of the stressor. This premise has been corroborated in the literature as heightened perception of risk has been linked to increased psychological distress (Schwartz, Lerman, Miller, Daly, & Masny, 1995; Slattery et al., 2013; Manack et al., 2013). Lazarus & Folkman outline several different modes of cognitive appraisal, including the primary and secondary appraisal processes. Primary appraisal relies on an individual's perception to determine the relevance of the situation. If the situation is considered pertinent, the individual's perception of the event will then determine if the situation is a source of harm. Secondary appraisal, on the other hand, focuses on the person's perception of available resources to cope with the stressful situation.

Accordingly, a substantial amount of research on stress has focused on the role of cognitive vulnerabilities in the appraisal of stressful events. One commonly studied cognitive vulnerability is dysfunctional attitude. Beck noted that dysfunctional attitudes influence the perception of circumstances in one's life, leading to biased interpretations

and exaggerated emotional responses in the face of stress (Beck, 1987). These attitudes can influence information processing and result in negative evaluations of stressful events. In the context of the transactional model of stress, stress can activate dysfunctional attitudes, which in turn, serve to interpret the taxing event. Research has also demonstrated dysfunctional attitudes are considered latent until activated by stressful events (Hollon and Beck, 1979; Persons and Miranda 1992). Once triggered by stressful events, these attitudes lead to specific negative cognitions, or automatic thoughts, that take the form of overly negative view about oneself, one's world, and one's future. Thus, the presence of a stressful event is processed through this negative filter which appraises the situation as excessively stressful. A repeated negative appraisal of potentially taxing situations can therefore be understood as a cognitive vulnerability.

This premise has been supported in the literature. Olinger, Kuiper and Shaw (1987), for instance, found that individuals scoring high on the Dysfunctional Attitudes Scale (DAS) thought about stressful events more often and rated stressful events as more distressing than those with low dysfunctional attitudes. Their results demonstrate that cognitively vulnerable individuals appraise stressful events as more distressing than do individuals with low dysfunctional attitudes. As a result, this negative appraisal can potentially induce a highly vigilant state, which may in turn generate chronic levels of activation for the cardiovascular system, immune system, and the hypothalamic-pituitary-adrenal axis (Dickerson and Kemeny, 2004). Chronic activation of the hypothalamic-pituitary-adrenal axis, in particular, has generally been shown to render individuals more susceptible to disease states via suppression of the immune system, resulting in deleterious health effects (Cohen, Janicki- DeVers et al. 2007; Pruessner and Malla

2008). Grounded in these studies, cognitive vulnerability can therefore be used as a mediator, or pathway, through which a stressor exercises its effects on the body's systems.

### **The Potential Role of Cultural Mismatch**

A common theme in stress and health studies among ethnoracial groups is that stress develops in tandem with other factors. That is, reactions to stress are affected not only by the circumstances of the affected individual, but also the dynamic and sociocultural context reflected in racial/ethnic group memberships (Broman, 1995). Despite the widening health gaps between racial/ethnic minorities and White Americans, few studies have examined the potential role of contextual factors in the association between stress and health.

To fully understand the stress and health process among racial/ethnic minorities, it is necessary to consider potential contextual determinants in this process. Moderators may be conceptualized as vulnerabilities or protective factors, as they represent pre-existing characteristics that increase or decrease the likelihood that stressors will lead to negative health outcomes. The notion that moderators influence the relation between stress and psychological problems and adverse health behaviors has been examined in previous studies (cf., Bitsika and Sharpley, 2013; Garey et al., 2015). However, the extent to which cultural moderators influence the stress to health process has yet to be examined. In a review of interventions aimed to reduce racial and ethnic disparities in health care, it was shown that multilevel, multicomponent, culturally-tailored interventions that target different causes of health disparities hold the most promise (Chin et al., 2007). Nonetheless the authors of the study also emphasize the needed for future

work to examine use of cultural determinants and their implementation in treatment. In fact, the examination of cultural factors in context of racial health disparities is regularly called upon by researchers (cf., Chaturvedi et al., 2011; Fisher, et al., 2007; Chin et al., 2007; Gorin et al., 2012).

One potential cultural phenomenon that can shed light on the association between stress and health among racial/ethnic minorities is the cultural mismatch hypothesis (Halpern-Felsher et al., 1997). This hypothesis suggests that members of ethnic minority groups may be more adversely affected by psychological factors when exposed to incongruent social norms than when they are in more congruent social settings. In other words, an individual's psychological well-being is contingent on whether an individual experiences a match or a mismatch between one's own cultural norms and those of the surrounding environment (Stephens, Townsend, et al., 2012).

Self-construal, or the manner in which individuals from different cultures define themselves (Markus & Kitayama, 1991), is routinely used to examine cultural mismatch theory (Stephens, Townsend, Markus, & Phillips, 2012). Individuals with high independent self-construal place value in autonomy, sense of control, and separateness from others. Conversely, individuals who endorse high interdependent self-construal tend to value group harmony and connectedness to others. Among individualist cultures, taking direct action, confronting others, or speaking up in one's own behalf are socially sanctioned, preferred means of addressing daily life stressors (Weisz, Rothbaum, & Blackburn, 1984). Previous research has shown that cultural differences exist in the thought processes and emotional/behavioral characteristics between individuals residing in and out of the United States (Khakimova, Zhang, & Hall, 2012). Overall, studies on

self-construal have demonstrated that this cultural factor may protect against mental illnesses (Juhl & Routledge, 2014) and psychological distress (Liu & Goto, 2007; Ross & Murdock, 2014).

The adverse consequences of cultural incongruence have also been investigated in the literature (Todorova, et al., 2013). In culturally incongruent settings, for example, ethnic minorities who espouse low independence may fail to recognize and produce socially accepted behaviors that elicit approval from an independent-dominant society. Consequently, ethnic minorities who espouse less independent self-view may experience greater distress in highly independent contexts due to the resultant discrepancy. Multiple lines of evidence show how having low levels of independence in high independent environments can have detrimental effects on the mental health of ethnic minorities (Cross, 1995; Hyun, 2000). Okazaki (1997), for example, showed that lower independent self-construal was significantly associated with greater social distress for Asian American compared to White-European American college students. Additionally, research has shown that among Asian students studying in Canada, a lack of perceived cultural fit was negatively associated with life satisfaction and positively associated with physical health problems and depression (Chirkov, Lynch, and Niwa, 2005). Likewise, Schwartz et al., (2014) found that individuals with different cultural values than those in the US reported more health risk behaviors. Collectively, these studies indicate that culturally mismatched environments, in this case a mismatch between independent environmental context and independent self-construal, may adversely affect health outcomes for racial/ethnic minorities.

Cultural mismatch is also associated with cognitive vulnerabilities and, in particular, dysfunctional attitudes. Specifically, previous work has shown that Turkish individuals with low independent self-construal living in highly individualistic societies (Germany) displayed high cognitive vulnerability when they relied on low individualist practices (Arens et al., 2013). Since cultural mismatch may augment cognitive vulnerability, which in turn activates negative appraisals resulting in adverse health consequences, individuals in a culturally incongruent setting may be at an increased risk for poorer health outcomes. In sum, the process of navigating a culture different from one's own can be an important factor in the maladaptive appraisal of stress and, as a result, may generate poorer health outcomes.

### **Focusing on Young Adults**

Approaching the current health disparities through a preventative medicine perspective can potentially mitigate the elevated rates of health problems among underserved populations. Young adults, in particular, may serve as an ideal group to focus preventative efforts since several lines of evidences point to this age of development as a critical period in life where individuals start to exhibit poor health behaviors as a result of increasing stress. Young adulthood is often recognized as a stressful stage in life that can result in lowered levels of health quality of life. Several stressors including living away from home, academic stress, relationship demands, pressure from peers, and financial worry have been identified as common stressors among university students (Dahlin et al., 2005; Hamaideh, 2009). In turn, studies looking at young adults with chronic stressors show that after a four year follow up, they were more likely to develop smoking, risky behaviors, such as alcohol abuse (Zimmerman et



al., 2003), and have impaired social and role functioning (Bovier et al., 2004; Hyun et al., 2007;). Furthermore, among college students, in particular, stress has been linked to adverse health behaviors and mental health distress, including depression, anxiety, and thoughts of death (Marshall et al., 2008; Walker et al., 2008). Therefore, aiming specialized preventative efforts at at-risk racial/ethnic young adults may aid in reducing the growing health inequalities.

### **Current Study**

Considering the current demographic shifts in the population, there is a need to understand the correlates and potential determinants in the stress to health outcome inequalities (Grieco, 2000). An important risk factor associated with poor health outcomes is stress (Schneiderman, Ironson, and Siegel, 2005). Using the Transactional Model of Stress and Coping, one can examine how the appraisal of stress can adversely impact health outcomes (Lazarus & Folkman, 1984). However, to fully understand the stress to poor health process among racial/ethnic minorities, it is crucial to examine the role of contextual factors, as they have been shown to influence health outcomes (Todorova, et al., 2013). Investigation of cultural mismatch can shed light on the association between stress and health among unrepresented groups (Halpern-Felsher et al., 1997). To the best of my knowledge, no research has been undertaken to investigate the role cultural mismatch plays in the association between stress and health among ethnoracial groups.

### **Hypotheses**

In light of these current shortcomings in the health disparities literature, the overarching goal of the present study is to explore if the association between stress and

health via cognitive vulnerabilities, measured by the DAS, depends on self-construal (i.e. moderated mediation) for young adult racial/racial minorities. The present study is part of a larger investigation of stress, cultural factors, beliefs, and behaviors among university students. The explicit hypotheses for the current study are:

Hypothesis 1a: Using the Transactional Model of Stress and Coping as a theoretical foundation, cognitive vulnerability (M) will at least partially explain the relation between perceived stress (X) and health perception (Y).

Hypothesis 1b: Similarly, cognitive vulnerability (M) is expected to at least partially explain the relation between perceived stress (X) and physical functioning (Y).

Hypothesis 2a: The extent to which cognitive vulnerability (M) accounts for the association between perceived stress (X) and health perception (Y) is expected to depend on independent self-construal (W; i.e. the first path in first stage moderated mediation). Specifically, the process through which stress (X) generates to poor health perception (Y) is expected to be contingent on low independent self-construal (W) and a mediating cognitive vulnerability (M).

Hypothesis 2b: The extent to which cognitive vulnerability (M) accounts for the association between perceived stress (X) and physical functioning (Y) is expected to depend on independent self-construal (W; i.e. first stage moderated mediation). Specifically, the process through which stress (X) generates to poor physical functioning (Y) is expected to be is contingent on low independent self-construal (W) and a mediating cognitive vulnerability (M).

## **Methodology**

### **Participants**

A total of 478 students enrolled at a large university in the southwestern region of the United States were included in the study. The mean age for the total sample is 21.59 years ( $SD = 4.1$  years) with an age range of 18 to 59 years. The sample included 232 males (46.6%) and 256 females (53.4). The majority of participants are characterized as single, and single, never married (89.82%). The ethnic composition of the sample is diverse, with 186 Asian Americans (38.8%), 149 Hispanic (31.1%), 80 African Americans (16.7%), 27 Arab (5.6%), 19 Multicultural (4%), and 18 Unknown, non-White/European (3.8%).

### **Measures**

**Self-Construal Scale (SCS).** The SCS is a widely used 30-item self-report measure of self-construal (Singelis, 1994). The SCS assesses an individual's thoughts, feelings, and actions based on two dimensions: independent self-construal and interdependent self-construal. The independent self-construal subscale (15 items) measures an individual's: 1) internal abilities, thoughts, and feelings; 2) ability to express the self and be unique; 3) desire to promote one's goals; and 4) directness in communication (Markus & Kitayama, 1991). A sample independent item is "I do my own thing, regardless of what others think." Conversely, the interdependent self-construal subscale (15 items) measures an individual's: 1) external, public features such as status, role, and relationships; 2) desire to fit in and belong; 3) ability to know and occupy one's proper place and act appropriately; and 4) indirectness in communication (Markus & Kitayama, 1991). A sample interdependent item is "I feel good when I cooperate with

others.” Participants were asked to rate each item on a Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). For the purposes of this study, only the SCS-Independent subscale will be used. Research has demonstrated acceptable internal consistency among ethnically diverse college samples in the past with a Cronbach’s alpha of .70 for independent self-construal and .70 for interdependent self-construal (Singelis, 1994). Past studies investigated the psychometric properties of the SCS and found a Cronbach’s alpha of 0.76 (Yamada & Singelis, 1999) and test-retest reliability between 0.79 and 0.83 after one month (Huang, Liu, & Yao, 2009). For the current study, alpha reliability is estimated at .79 for independent self-construal.

**Perceived Stress Scale (PSS-10).** The PSS is a 10-item self-report questionnaire that measures a persons’ evaluation of stressfulness of situations in their lives (Cohen, Kamarck, & Mermelstein, 1983). The PSS was created for the use in community samples with at least a junior high school education. Participants are asked to respond to each question on a five-point Likert scale ranging from 0 (never) to 4 (very often), indicating how often they felt stressful within the past month. The scores range from 0 to 40, where higher scores indicating greater perceived stress. Convergent validity of the PSS has been previously demonstrated in comparison with the BDI-II among a Hispanic sample (Ramírez & Hernández, 2007). The PSS-10 also demonstrates good internal reliability with an ethnically diverse sample with Cronbach’s alpha of .86 (Wang et al., 2011). In a recent review on the psychometric properties of the PSS, Lee, (2012) showed that the PSS-10 was superior to the 14-item and 4-item PSS, with past studies showing Cronbach’s alpha ranging from .70 to .86 using the PSS-10. The present study demonstrated an acceptable Cronbach’s alpha of .86.

**Dysfunctional Attitude Scale (DAS).** The DAS (Weissman, 1979) is a measure of cognitive vulnerability that assesses dysfunctional attitudes. The DAS consists of 40 statements that represent implicit rules and standards for the self and rigid expectations regarding how others should act. High scores are regarded as cognitive vulnerabilities because they are rigid and unrealistic (e.g., “If someone disagrees with me, it probably indicates he does not like me”; “If I fail partly, it is as bad as being a complete failure.”). Participants respond using a 7-point scale (1 = Totally disagree, 7 = totally agree). Adequate convergent validity of the DAS has been previously demonstrated in comparison with the Cognitive Bias Questionnaire ranging from .53 to .57 (Beevers et al., 2007). Previous studies have indicated a Cronbach’s alpha of .84 (Beevers et al., 2007) and .92 (Ebrahimi et al., 2012). In the current study, the measure demonstrated a Cronbach’s alpha of .90.

**Medical Outcomes Study Short Form (MOS SF-20).** The MOS SF-20 (Stewart, Hays, & Ware, 1988) is a 20-item self-report measure of functional health status as defined by the Medical Outcomes Study (Tarlov et al., 1989). It measures six health domains: physical functioning (e.g., “How long has your health limited you in the kinds or amounts of moderate activities you can, walking uphill or climbing a few flights of stairs?”), role functioning (e.g., “Have you been unable to do certain kinds of work housework or schoolwork because of your health?”), social functioning (e.g., “How much of the time, during the past month, has your health limited your social activities such as visiting with friends or close relatives?”), health perceptions (e.g., “My health is excellent”), pain (e.g., “How much bodily pain have you had during the past 4 weeks?”), and mental health (“How much of the time in the past month have you felt downhearted

and blue?”). Scores for each item, as well as each domain, range from 0 to 100, with higher scores representing healthier physical functioning and less impairment. For the social functioning and pain scales, only one item exists and is scored. Reliability and validity of the MOS SF-20 has been supported by numerous studies across various community and patient populations with Cronbach’s alpha ranging from .74 and .81 (Huprich et al., 2009). For the present study only the health perception and physical functioning domains will be used. In the current study, the Cronbach’s alpha for health perception and physical functioning domains were .81 and .90 respectively.

## **Procedures**

Participants for the present study completed a computerized battery of online questionnaires and had the option of doing so at a private location of their choosing. Participants completed the questionnaire battery using the survey software Qualtrics as part of a larger study of stress, cultural factors, beliefs, and behaviors across Hispanic, Asian American, White Americans, and African Americans, which took approximately 60 minutes to complete. Individuals interested in the study first reviewed an information cover letter that described the nature of the study. All potential participants were then informed that their participation would be confidential. Participants were recruited from the Department of Psychology subject pool and were compensated class credit after successful completion of the study.

## **Analytic Plan**

**Sample Size Planning and Statistical Power.** The first power analysis was conducted to determine the number of participants needed for bivariate correlation analyses. An estimated medium effect size (.30) for such an analysis was used as

suggested by Cohen (1988, 1992). Based on this estimate with an  $\alpha = .05$  and power = 0.80, the projected sample size needed with this effect size (Faul, Erdfelder, Buchner, & Lang, 2009) is 84 total participants.

A second power analysis was conducted to determine the number of participants necessary for the mediation procedure. An estimated medium effect size of Cohens  $r^2$  (.09) was used for such analysis as suggested by Cohen (1988; 1992). Based on this estimate with an  $\alpha = .05$  and power = .80, the projected sample size needed with this effect size (Faul, Erdfelder, Buchner, & Lang, 2009) is 101 total participants for this analysis.

The primary outcome for the current study is the independent self-construal x perceived stress interaction on cognitive vulnerabilities in predicting health status among ethnically diverse participants. In order to determine the number of participants necessary to analyze this independent self-construal x perceived stress interaction, a third power analysis was conducted. The largest number of variables entered in a single multiple regression in predicting cognitive vulnerability will total six, which includes stress, independent self-construal, the interaction term, and the covariates of age, sex and race/ethnicity. An estimated medium effect size of Cohens  $r^2$  (.09) for such an analysis is used as suggested by Cohen (1988, 1992). Based on this estimate with an  $\alpha = .05$  and power = 0.80, the projected sample size needed with this effect size is 145 total participants (Faul, Erdfelder, Buchner, & Lang, 2009).

**Data Analysis.** In order to examine hypothesis 1, two mediation models will be conducted using the PROCESS macro for SPSS (Hayes, 2013; model 4 = simple mediation). All relative indirect effects are subject to bootstrap analyses with 10,000

samples and a 95-percentile confidence interval estimate (as recommended by Hayes & Matthes, 2009). The first mediation model will use scores on the PSS as an independent variable to predict scores on the MOS Health Perception subscale. Scores on the DAS will be entered as a mediator in the association between PSS and MOS Health Perception subscale (Figure 1). The second mediation model will use PSS as an independent variable to predict the MOS Physical Functioning subscale. Scores on the DAS will be entered as a mediator in the association between PSS and MOS Physical Functioning subscale (Figure 2). For both mediation models, age, sex, and race/ethnicity will be entered as covariates.

To test hypothesis 2, two moderated mediation analyses will be conducted using the PROCESS macro for SPSS (Hayes, 2013; model 7 = moderated mediation). The first moderated mediation model will include PSS as an independent variable to predict MOS Health Perception subscale scores with the DAS scores entered as a mediator. SCS-Independent scores will be entered as a moderator in the association between PSS and DAS (Figure 3). The second moderated mediation model will use PSS as an independent variable to predict MOS Physical Functioning subscale scores, with DAS scores entered as a mediator. Independent self-construal will be entered as a moderator in the association between PSS and DAS (Figure 4). For both moderated mediation models, age, sex, and race/ethnicity will be entered as covariates.

The Index of Moderation Mediation calculated by the PROCESS macro will be inspected to assess the moderator's impact on the indirect effects of the model. According to Hayes, (2015) if the moderator (W) is significantly different from zero, then one can conclude that the indirect effect of X (PSS) on Y (MOS Health Perception) via M (DAS)



is dependent on W (Independent Self-Construct). The moderated mediation analyses will also be conducted using 10,000 bootstrapped samples. This approach is considered more powerful than causal steps (Baron and Kenny, 1986) or the Sobel test (Sobel, 1982) given its ability to better control Type I error (Hayes, 2009, 2013). Additionally, bootstrapping allows for the use of confidence intervals, which if they exclude zero provide evidence of significant indirect effects (Shrout and Bolger 2002). It should also be noted that all estimated effects reported by PROCESS are unstandardized regression coefficients.

## **Results**

### **Preliminary Analyses**

Data for 25 (of the 503) participants were not included in the study due to failure to complete measures. Outliers were examined and data transformations were considered. Across all participants, no outliers were found for the DAS, PSS-10, or SCS-Independent scales. Multicollinearity statistics were also acceptable, with tolerance values greater than .10 and VIF values less than 10 for each predictor. The standardized skewness coefficients and the standardized kurtosis coefficients were all within the range of +/- 3 for health perception (Onwuegbuzie & Daniel, 2002).

Data for the MOS Physical Functioning scale, however, showed ceiling effects with a kurtosis of 4.35. Preliminary analysis showed that 72% of the participants indicated having perfect physical functioning with no limitations in physical activities, ranging from basic to strenuous activities. A log transformation and square root transformations were attempted, but were not selected as the kurtosis increased to 13.156 for the square root transformation and 43.26 for the log transformation. Per suggestions from the committee members, the physical functioning subscale was transformed into a

dichotomous variable consisting of those who endorsed impairment in physical functioning (n=133) and those that did not (n=345). After the data were screened, analyses were conducted for a sample of 479 participants. Means and standard deviations for relevant variables are displayed in Table 1.

In order to verify there were no racial/ethnic group differences between the variables used in the study, scores from the PSS, SCS-Independent subscale, DAS, MOS Health Perception, and MOS Physical Functioning were entered as independent variables in a multivariate analysis of variance (MANOVA). Race/ethnicity was used as the independent variable. The results of this analysis, reported in terms of Wilks Lambda converted to an exact multivariate  $F$  statistic, produced a significant multivariate effect for racial/ethnic identity,  $F(25, 1740) = 2.353, p = .000$ ; Wilk's  $\Lambda = 0.884$ , partial  $\eta^2 = .024$ ). Post-hoc analyses revealed no group differences in PSS, MOS Health Perception, and MOS Physical Functioning using the Tukey HSD post-hoc criterion for significance. Results revealed potential group differences in DAS scores whereby the Asian American group ( $M = 140.26, SD = 30.85$ ) reported higher DAS scores than for the Latino group ( $M = 121.46, SD = 30.59$ ),  $p < .001$ . Though post-hoc analyses indicated that the SCS-Independent subscale scores were higher for the Unknown, non-White/European group ( $M = 5.49, SD = .54$ ) than for the Asian American group ( $M = 4.91, SD = .77$ )  $p < .001$ , these results must be interpreted with caution given the Unknown, non-White/European group's minimal sample size ( $n=18$ ; 3.8%). Thus, all hypotheses were tested via a combined sample of Asian American, Hispanic, African American, Multiracial, and Unknown, non-White/European group. Race/ethnicity was also used as a covariate in all

of the following analyses. Post-hoc analyses of significant findings are reported in Table 2.

Preliminary analyses also revealed noteworthy correlations. In particular, Pearson product-moment correlation coefficient showed a significant negative correlation between perceived stress and health perception in the entire sample [ $r(479)=-.473$ ,  $p<.001$ ]. These results suggest that as stress increases, perceptions of health quality decreased. However, there was no significant correlation between perceived stress and physical functioning, [ $r(479)=0.064$ ,  $p=.165$ ]. Bivariate Pearson correlations are presented in Table 1.

### **Hypothesis 1a: Meditating Role of Cognitive Vulnerability in The Relation Between Stress and Health Perception**

The first aim of the study was to examine the mediating role of cognitive vulnerability in the association between stress and health perception. Age, sex, and race/ethnicity, were entered as covariates, with the PSS as the independent variable ( $X$ ), the MOS Health Perception as the dependent variable ( $Y$ ), and the DAS as the mediator variable ( $M$ ). The total direct model was significant ( $R^2=.231$ ,  $df=4$ ,  $466$ ,  $F=34.78$ ,  $p<.0001$ ), as was the full model with DAS included as the mediator ( $R^2=0.26$ ,  $df=5$ ,  $462$ ,  $F=31.86$ ,  $p<.0001$ ). The direct effect ( $c'$  path) of PSS scores on MOS Health Perception scores accounting for the covariates of age, sex, race/ethnicity and DAS scores ( $M$ ) remained significant per Maximum Likelihood (ML) confidence intervals,  $t=-7.73$ ,  $p<.001$ , 95% CI [-1.43, -0.85]. Although path  $c'$  remained significant, there was a significant indirect effect of the scores on the PSS on MOS Health Perception subscale scores through the DAS (effect  $aI*bI$ ), as demonstrated by the bootstrapped 95% CI of

the indirect effect,  $b=-0.31$ ,  $SE = 0.08$ , 95% CI  $[-0.48, -0.15]$ . Results from the conditional process models are presented in Table 3.

### **Hypothesis 1b: Meditating Role of Cognitive Vulnerability in The Relation Between Stress and Physical Functioning**

The DAS was examined as a mediator (M) of the link between PSS (X) and MOS Physical Functioning (Y) using the PROCESS macro for SPSS (Hayes, 2013; model 4 = mediation). Path coefficients predicating dichotomous outcomes generated PROCESS are maximum-likelihood based logistic regression coefficients. Age, sex, and race/ethnicity were entered as covariates with 10,000 bias corrected bootstrap samples requested. The results showed a significant indirect effect of stress on physical functioning through cognitive vulnerabilities. Specifically, PSS significantly predicted DAS scores (path a;  $b=2.57$ ,  $p<.001$ ). DAS scores also significantly predicted MOS Physical Functioning scores (path b;  $b=.008$ ,  $p=.039$ ,  $OR=1.01$ ), which suggests that as DAS scores increase by one unit, the odds of having impaired Physical Functioning increase by 1.01 units. After controlling for DAS, the direct effect of PSS on MOS Physical Functioning was not significant (path c';  $b=.028$ ,  $Z=1.43$ ,  $p=.151$ ,  $OR=1.03$ , 95% CI  $[-.01, .067]$ ). A bias-corrected CI for the indirect effect of PSS( $b=.021$ ) on MOS Physical Functioning did not contain zero (.001 to .044), which indicates a significant mediation of the effect of PSS on MOS Physical Functioning through DAS. Results from the conditional process models are presented in Table 3.

### **Hypothesis 2a: Moderated Meditation Analyses of Health Perception**

In order to test the extent to which scores on the SCS-Independent subscale moderated the mediational impact of PSS on MOS Health Perceptions through DAS

scores, a moderated mediation analysis was conducted. PROCESS “Model 7” (Figure 3) was used with PSS entered as the independent variable and MOS Health Perceptions as the outcome variable. Age, sex, and race/ethnicity were entered as covariates, and scores on the DAS was entered as the mediator (*M*) variable. SCS-Independent subscale scores were entered into the proposed moderator *W* field and 10,000 bias corrected bootstrap samples were requested. Covariates in the model were entered as covariates of both *M* and *Y* variables. The overall model was significant ( $R^2 = 0.26$ ,  $df = 5, 462$ ,  $F = 32.21$ ,  $p < .0001$ ). The direct effect (*c'* path) of PSS on MOS Health Perceptions after controlling for DAS scores (*M*), SCS-Independent subscale scores (*W*) and the interaction of DAS and SCS-Independent subscale scores ( $M*W$ ), remained significant ( $b = -1.14$ ,  $t = -7.73$ ,  $p < .0001$ ). There was a significant conditional indirect effect of PSS on MOS Health Perception scores through DAS with stronger effects observed for lower levels of independent self-construal. This result was demonstrated by the significant test of moderated mediation (index of moderated mediation),  $b = .058$ ,  $SE = .036$ , 95% CI [.003, .142]. Specifically, the association between stress and health perception mediated by cognitive vulnerabilities had a greater affect for individuals with low independent self-construal. Post-hoc simple slope analyses revealed that the association between stress and cognitive vulnerabilities was stronger among individuals with lower ( $b = 3.61$ ,  $t = 5.22$ ,  $p < .001$ ) relative to higher ( $b = 1.24$ ,  $t = 2.64$ ,  $p < .001$ ) ratings of independent self-construal. The interaction between stress and independent self-construal is graphically represented in Figure 5, demonstrating that individuals with lower independence and higher levels of stress were more likely to experience increased cognitive vulnerabilities.

## **Hypothesis 2b: Moderated Mediation Analysis of Physical Functioning**

In order to test the extent to which scores on the SCS-Independent subscale moderated the mediational impact of PSS on MOS Physical Functioning through DAS scores, a moderated mediation analysis was conducted. PROCESS “Model 7” (Figure 4) was used with PSS entered as the independent variable ( $X$ ) and MOS Physical Functioning as a dichotomous outcome variable ( $Y$ ). Age, sex, and race/ethnicity were entered as covariates, and scores on the DAS were entered as the mediator ( $M$ ) variable. SCS-Independent subscale scores were entered as a moderator ( $W$ ) with 10,000 bias corrected bootstrap samples requested. Covariates in the model were entered as covariates of both  $M$  and  $Y$  variables. Results showed a significant moderated mediation indirect effect of stress on physical functioning. In particular, PSS significantly predicted DAS scores (path  $a$ ;  $b=4.69$ ,  $p<.001$ ). DAS scores also significantly predicted MOS Physical Functioning scores (path  $b$ ;  $b=.008$ ,  $p=.039$ ,  $OR=1.01$ ), which suggests that as DAS scores increase by one unit, the odds of having impaired Physical Functioning increase by 1.01 units. The direct effect of PSS on MOS Physical Functioning after controlling for scores on DAS, Independent Self-Construct subscale, and the interaction between scores on the DAS and the Independent Self-Construct subscale, was non-significant (path  $c'$ ;  $b=.028$ ,  $Z=1.44$ ,  $p=.151$ ,  $OR=1.03$ , 95% CI  $[-.01, .066]$ ). Overall, there was a significant conditional indirect effect of PSS on MOS Physical Functioning through DAS scores at different levels of Independent Self-Construct scores as demonstrated by the test of moderated mediation (index of moderated mediation),  $b=-.004$ ,  $SE=.003$ , 95% CI  $[-.013, -.000]$ . Moderated mediation model parameters are reported in Table 3.

## Discussion

The current study evaluated the association between stress and health variables among racial/ethnic minority young adults. The Transactional Model of Stress and Coping was used as a framework to examine if dysfunctional attitude served as a conduit between stress and health outcomes. In addition, the role of independent self-construal was assessed to examine the role of cultural factors in the relation between stress and health. Overall, the hypotheses were generally supported such that cognitive vulnerabilities, investigated through the DAS, were found to partially mediate this relationship and was dependent on independent self-construal. Additionally, the data showed that cognitive vulnerabilities also mediated the association between stress and physical functioning. The results also showed that this model was also dependent on independent self-construal. Although the moderated mediation was significant, these findings should be interpreted with caution as the magnitude of the odds ratio was negligible ( $OR=1.01$ ) and the effect sizes were small (Cox & Snell = .036, and Nagelkerke  $R^2=.052$ ).

In order to test if independent self-construal plays a role in the Transactional Model of Stress and Coping, the mediating role of cognitive vulnerability was first examined. After controlling for age, sex, and race, cognitive vulnerability was found to at least partially mediate the stress to health perceptions and stress to physical functioning pathways. Specifically, the simple mediation models showed that individuals with increased stress showed higher levels of cognitive vulnerability, which in turn lowered their health perception and increased the odds of identifying an impairment with physical functioning. These findings coincide with the Transactional Model of Stress and Coping,

which states that the pathway from stress to health is mediated by a series of cognitive checkpoints starting from appraising the situation as threatening to assessing the available resources to cope with the situation (Lazarus & Folkman, 1984). This study extends this model by suggesting that stress not only impacts overall, global health perception, but also more specific evaluations of physical abilities. These findings also run parallel with research on allostatic load, which indicates that a repeated secretion of stress hormones contributes to the wear and tear of the human body (McEwen, 1998). In particular, it may be that in addition to biological consequences, stress can also have an indirect impact on subjective perceptions of physical abilities. This is particularly important as perceived impairments on physical functioning is associated with chronic conditions, such as thyroid dysfunction, cardiovascular disease, diabetes mellitus, chronic respiratory disease (Rijken, van Kerkhof, Dekker, and Schellevis et al., 2005) and metabolic syndrome (Ylitalo et al., 2015).

Building off of the first aim, this study also sought to assess the role of independent self-construal in the stress to health pathway. This aim was contingent on cognitive vulnerability serving as an intermediary variable since the Transactional Model of Stress and Coping posits that the pathway between stress and health outcomes is mediated by cognitive appraisal processes. Accordingly, after establishing that cognitive vulnerability mediates this relationship, the results showed that the degree of mediation was contingent on the levels of independent self-construal. Specifically, individuals with lower independent self-construal were subject to greater cognitive vulnerability, which in turn contributed to poorer health perceptions and slightly raised odds of reporting impaired physical functioning. These findings provide initial evidence for the underlying



mechanisms that contribute to the elevated rates of poor physical functioning reported by racial/ethnic minorities (Ylitalo et al., 2013). To the best of my knowledge, this is the first study to examine the moderating capacity of independent self-construal in the context of stress and cognitive vulnerability.

Furthermore, interpreting these results within the context of the Transactional Model of Stress and Coping suggests that cultural factors play a crucial role in the pathway between stress and health outcomes. In particular, these findings suggest that racial/ethnic minorities who report low-independent self-construal may be culturally mismatched to their highly independent environments. This mismatch between the environment and self can be detrimental as previous work has demonstrated that a cultural mismatch may lead to an increase in health risk behaviors (Schwartz et al., 2014), reduced quality of life (Quinn, 2017), academic underperformance (Fryber et al., 2013), and cortisol imbalance (Stephens et al., 2012). Further, the current findings suggest that stressful situations work synergistically with cultural mismatch to maximize cognitive vulnerability to stress. It may be that ethnoracial minorities with low independent self-construal are burdened by culturally mismatched settings by having to produce socially accepted (but incongruent) behaviors that, over time, strain subsequent cognitive appraisals. Previous research corroborates such adverse effects of culturally mismatched environments on cognitive processes (Manly, 1998; Ardila, 2005). Overall, the present study supplements current models of stress and health perceptions by illustrating how cultural mismatch interacts with stress to shape intermediary cognitive processes that affect health outcomes.

Although the present study expands the current literature on stress and health perception among ethnoracial minorities, a few limitations warrant discussion. To begin, the research design was cross-sectional in nature, which limits causal modeling. Prospective studies would benefit from examining the association between stress and health perceptions in a longitudinal fashion. In doing so, future studies can examine if these health perceptions remain stable over time, if there are long term consequences in the interplay between stress and self-construal, and whether there are any trends or fluctuations in the appraisal processes. Next, the primary dependent variables in this study were restricted to subjective ratings of health. Future studies would benefit from using biological measures of health, in conjunction with subjective measures, in order to examine if the perception ratings correspond to object measures, such as blood pressure, heart rate, and frequency of medical visits. In addition, such work may also examine the role of chronic stressors as previous studies have shown the cascading biological effects of chronic stress on the immune system via the hypothalamic-pituitary-adrenal axis (Chen et al., 2017).

Furthermore, the primary independent variable in this study was assessed using a commonly used measure of stress. It is possible, however, that the more culturally-specific forms of stress and distress might also interact with self-construal, cognitive vulnerabilities, and health perceptions. For example, prospective studies may benefit from exploring how culturally variant types of stress specific to underrepresented groups, such as perceived racial stress and acculturative stress, add to the explanatory value of models investigating health perception. In addition, future studies may also explore how added dimensions of identity may intersect and affect the stress to health pathway by

incorporating measures that gauge racial identity and collective self-esteem. Finally, although the Transactional Model of Stress and Coping posits that analyzing one's own coping resources influences health outcomes, the current study did not include this second appraisal process. Future studies can expand the model used in this study by examining if assessing one's available coping resources influences the degree to which stress impacts health perceptions. Assessing one's available coping strategies may be particularly fruitful as studies have shown the differential effects for coping styles in relation to depression and physical health among unrepresented groups (Brondolo, Gallo, and Myers, 2009; Torres, 2010).

From a therapeutic perspective, these findings play an important role in establishing preventative health efforts aimed at mitigating the adverse effects of stress among ethnoracially diverse young adults. This is especially important as this population has shown to report higher levels of stress compared to White/European young adults (Olfert et al., 2016). Additionally, understanding how stress interacts with cultural variables, such as independent self-construal, to influence health perceptions is critical as poor health perception has been linked to a host of detrimental consequences among young adults. For example, studies have shown that poor health perception is implicated in anxious and depressive symptoms (Mokruue and Acri, 2015), suicide ideation (Oh, 2012), and other life threatening conditions (Saleh et al., 2012). Among young adults. Expanding current treatment models to include an examination of independent self-construal may therefore help offset relative risk for poor health perceptions in this population. Although no research to the best of my knowledge has investigated independent self-construal in the stress to health association, the model proposed in this

study may serve as a clinical heuristic for health providers working with young adult populations with elevated stress and concurrent culturally mismatched environments. From an intervention standpoint, clinicians treating young adult patients who present as culturally mismatched to their environment may benefit from integrating more specialized treatments that emphasize skills and techniques to minimize the effects of the cultural incongruence, such as identifying sources of support, fostering social relationships, and exploring ways to empower patients (Rogers-Sirin, Ryce, and Sirin, 2014).

The overarching goal of the current study was to assess the moderated mediated effects of stress on health among racially/ethnically diverse minority sample of young adults. In general, the study provides initial evidence suggesting that current theoretical models of stress and health would benefit from integrating cultural factors, such as self-construal, in predicting health perceptions. Further, the prevailing body of research suggests that an individual's context is critical in shaping and influencing health perceptions; this literature, however, falls short of including such contextual factors in risk models and extending the research to unrepresented groups. The contributions of the current study address these shortcomings by providing empirical evidence for the role of culturally driven factors, such as independent self-construal, and cognitive vulnerabilities, in the form of dysfunctional attitude, in forming health perceptions among underserved populations.

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Table 1

*Intercorrelations, Means, and Standard Deviations for Independent and Dependent Measures*

<b>Measure</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Mean</b>	<b>SD</b>
1. MOS-Health Perception	-					73.22	19.85
2. MOS-Physical Functioning	.326**	-				89.86	20.92
3. Independent Self- Construal	.295**	.216**	-			5.04	.753
4. PSS	-.473**	-.064	-.262**	-		17.95	6.45
5. DAS	-.364**	-.102*	-.476*	.524**	-	130.47	32.05

*Note.* DAS= Dysfunctional Attitude Scale; PSS = Perceived Stress; \* $p < .05$ ; \*\* $p < .01$ .



Table 2

*Tukey HSD Post-hoc Test Results Comparing Ethnoracial Groups on the DAS and Independent Self-Construal*

Dependent Variable	Factor		Mean Difference (I-J)	SE	p	95% Confidence Interval	
	Race/Ethnicity (I)	Race/Ethnicity (J)				LLCI	ULCI
DAS	Asian American	Latino	18.79	3.41	.000**	9.03	28.54
Independent Self-Construal	Asian American	Unknown	-.583	.183	.019*	-1.11	-.0585

*Note.* DAS= Dysfunctional Attitude Scale; \* $p < .05$ ; \*\* $p < .01$ .

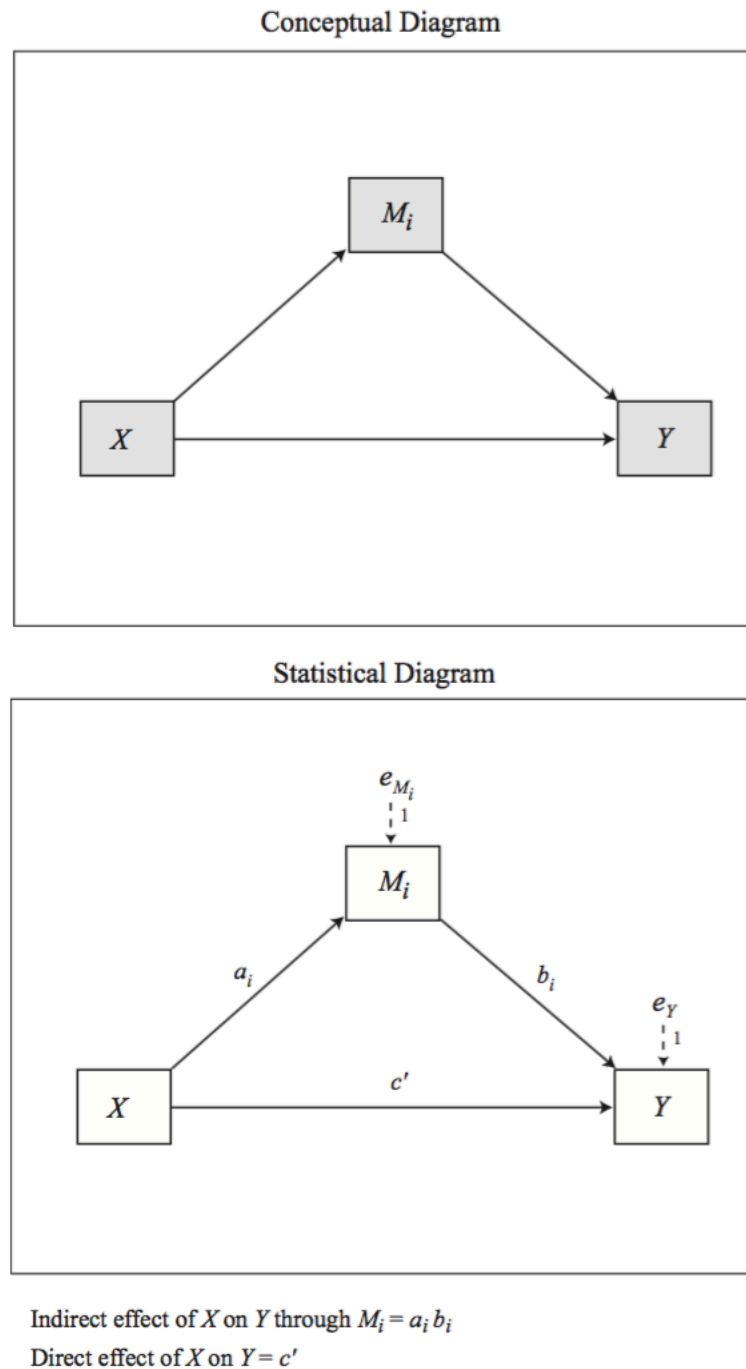
Table 3

*Mediation and Moderated Mediation Model Results*

<b>Hypothesis 1a</b>	<b>b</b>	<b>SE</b>	<b>t</b>	<b>p</b>	<b>LLCI</b>	<b>ULCI</b>
PSS → DAS (a)	2.57	.191	13.41	.000**	2.19	2.94
DAS → MOS-HP (b)	-.121	.031	-3.97	.000**	-.181	-.061
PSS → MOS-HP (c)	-1.45	.127	-11.41	.000**	-1.70	-1.20
PSS → MOS-HP (c')	-1.14	.148	-7.73	.000*	-1.43	-.853
PSS → DAS → MOS-HP (a1*b1)	-.3106	.0817	-	-	-.478	-.152*
<b>Hypothesis 1b</b>	<b>b</b>	<b>SE</b>	<b>t</b>	<b>p</b>	<b>LLCI</b>	<b>ULCI</b>
PSS → DAS (a)	2.57	.191	13.41	.000**	2.19	2.94
DAS → MOS-PF (b)	.008	.004	(2.05)	.039*	.000	.016
PSS → MOS-PF (c)	-	-	-	-	-	-
PSS → MOS-PF (c')	.028	.019	(1.44)	.151	-.01	.066
PSS → DAS → MOS-PF (a1*b1)	.021	.011	-	-	.001	.044
<b>Hypothesis 2a</b>	<b>b</b>	<b>SE</b>	<b>t</b>	<b>p</b>	<b>LLCI</b>	<b>ULCI</b>
PSS → DAS (a)	2.21	.184	11.98	.000**	1.85	2.57
DAS → MOS-HP (b)	-.122	.03	-4.07	.000**	-.182	-.063
PSS → MOS-HP (c')	-1.14	.1475	-7.73	.000**	-1.43	-.850
PSS*Independent SC → DAS	-.472	.226	-2.09	.037*	-.916	-.028
Index of Moderated Mediation	.058	.036	-	-	.003	.142*
<b>Hypothesis 2b</b>	<b>b</b>	<b>SE</b>	<b>t</b>	<b>p</b>	<b>LLCI</b>	<b>ULCI</b>
PSS → DAS (a)	4.69	1.17	11.98	.000**	2.28	6.99
DAS → MOS-PF (b)	.008	.004	(2.05)	.039*	.000	.016
PSS → MOS-PF (c')	.028	.019	(1.44)	.151	-.01	.066
PSS*Independent SC → DAS	-.492	.224	-2.18	.029*	-.934	-.051
Index of Moderated Mediation	-.004	.003	-	-	-.013	-.000

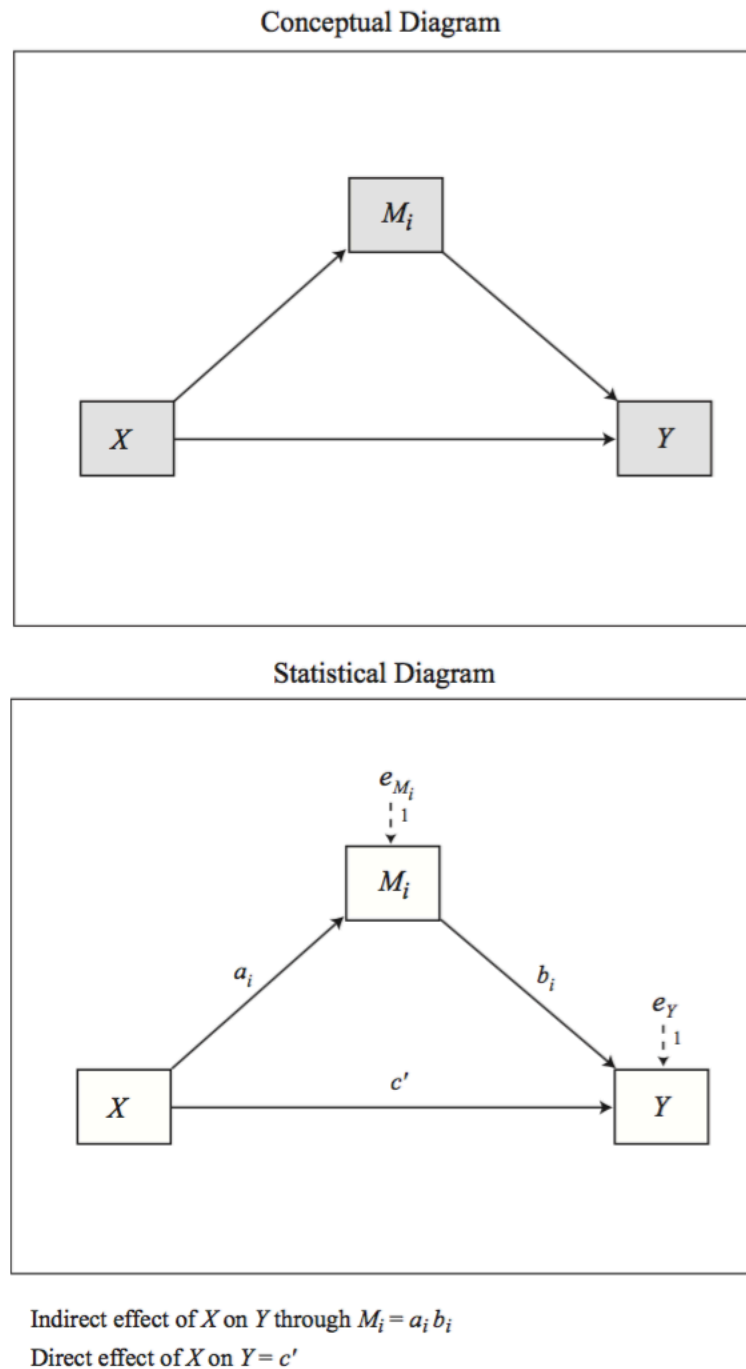
*Note.* For all models, covariates included age, sex, and race/ethnicity; PSS = Perceived Stress Scale; DAS = Dysfunctional Attitude Scale; MOS-HP = Medical Outcomes Study - Health Perceptions subscale; MOS-PF = Medical Outcomes Study - Physical Functioning subscale; Z-scores in parentheses; \*  $p < 0.05$ ; \*\*  $p < 0.01$

Figure 1. Indirect Effects of Perceived Stress on Health Perception through Dysfunctional Attitude Scale



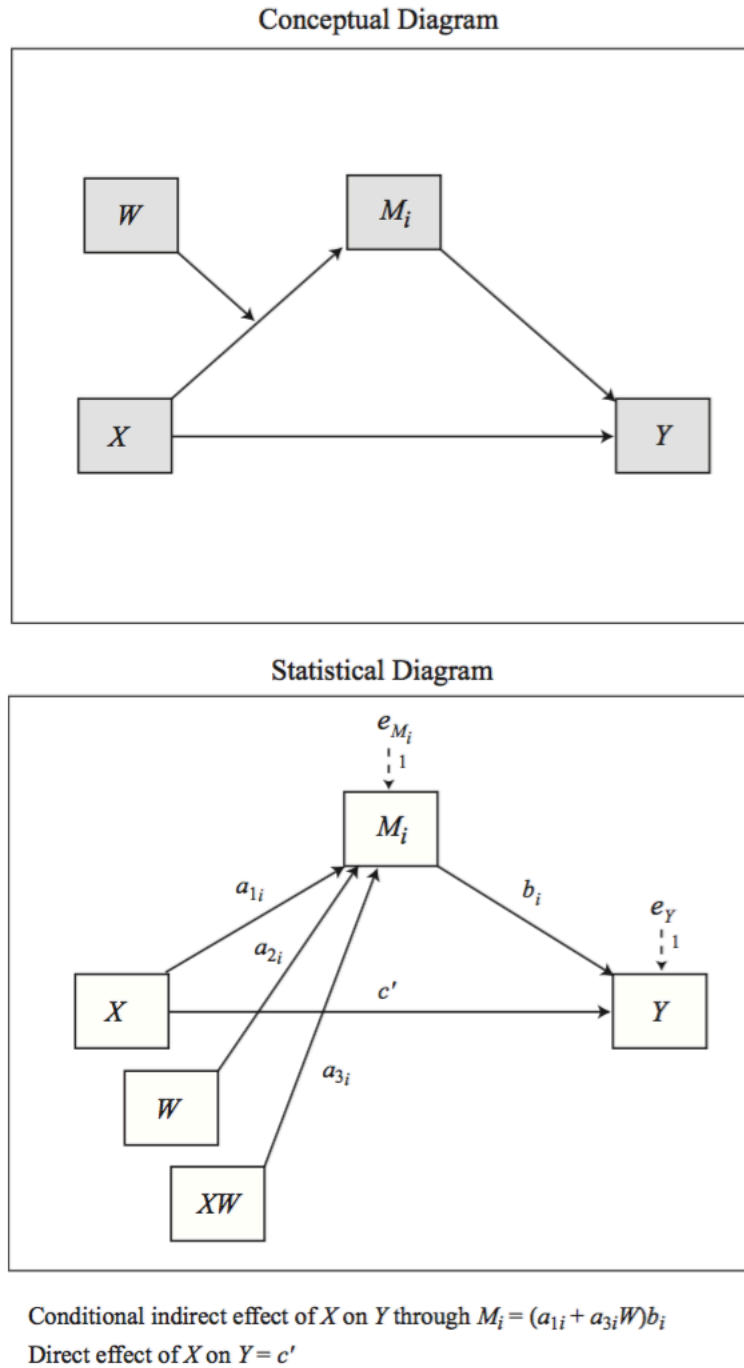
Note:  $X$ = Perceived Stress Scale,  $M_i$ = Dysfunctional Attitude Scale,  $Y$ = MOS Health Perception

Figure 2. Indirect Effects of Perceived Stress on Physical Functioning through Dysfunctional Attitude



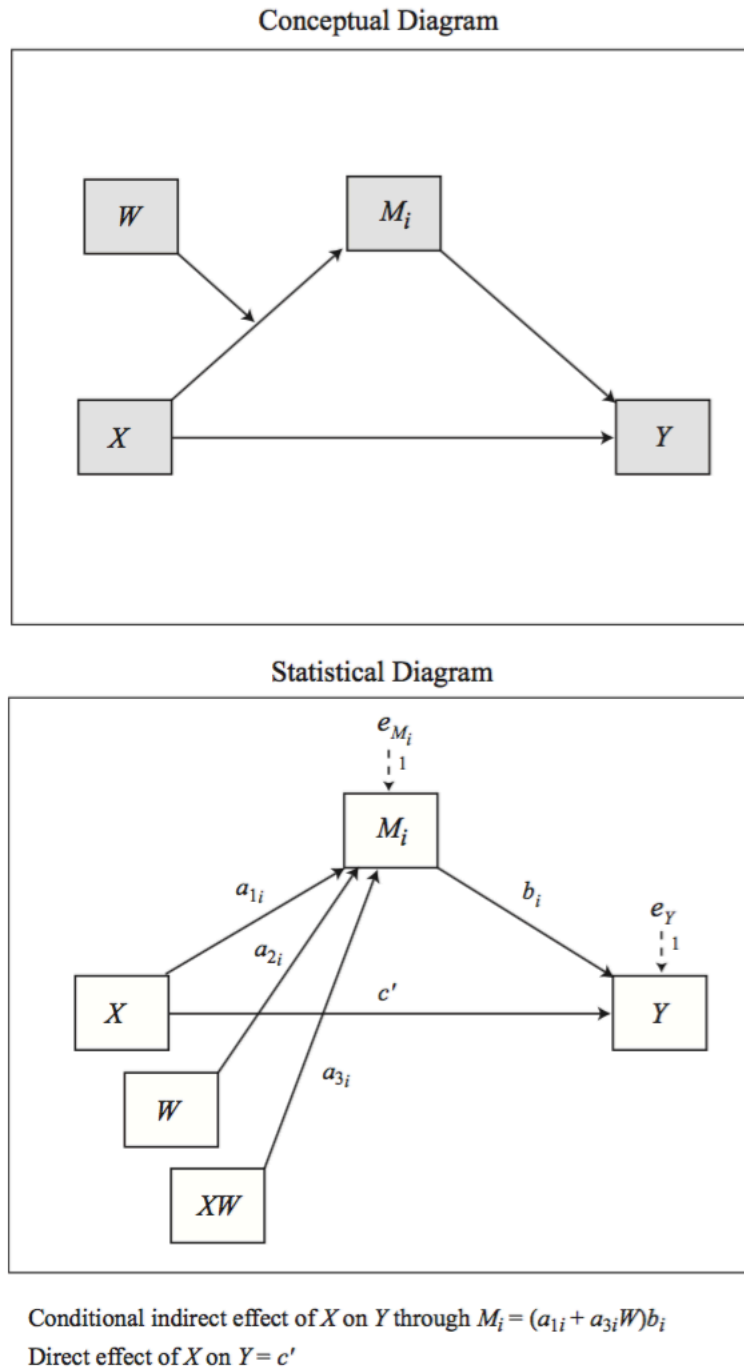
Note:  $X$ = Perceived Stress Scale,  $M_i$ = Dysfunctional Attitude Scale,  $Y$ = MOS Physical Functioning

Figure 3. Indirect Effects of Perceived Stress on Health Perception through Dysfunctional Attitude with Independent Self-Constraint as a First Stage Moderator



Note:  $X$ = Perceived Stress Scale,  $M_i$ = Dysfunctional Attitude Scale,  $Y$ = MOS SF-20 (Health Perception subscale),  $W$ = SCS-Independent,  $X_iW$ = Interaction of Perceived Stress and SCS-Independent

Figure 4. Indirect Effects of Stress on Physical Functioning through Dysfunctional Attitude with SCS-Independent as a First Stage Moderator



Note:  $X$ = Perceived Stress Scale,  $M_i$ = Dysfunctional Attitude Scale,  $Y$ = MOS SF-20 (Physical Functioning subscale),  $W$ = SCS-Independent,  $X_iW$ = Interaction of Perceived Stress and SCS-Independent

Figure 5. Simple Slopes Analysis on the Interaction Between Perceived Stress and Independent Self-Construal in Predicting Cognitive Vulnerability

