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# Hypertension in Older African Americans: Testing Psychosocial Mediators

Taylor L. Draper

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LOMA LINDA UNIVERSITY  
School of Behavioral Health  
in conjunction with the  
Faculty of Graduate Studies

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Hypertension in  
Older African Americans: Testing Psychosocial Mediators

by

Taylor L. Draper

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A Dissertation submitted in partial satisfaction of  
the requirements for the degree  
Doctor of Philosophy in Clinical Psychology

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September 2016

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Each person whose signature appears below certifies that this dissertation in his/her opinion is adequate, in scope and quality, as a dissertation for the degree Doctor of Philosophy.

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## ABBREVIATIONS

RCM	Reserve Capacity Model
SES	Socioeconomic Status

## ABSTRACT OF THE DISSERTATION

### Hypertension in Older African Americans: Testing Psychosocial Mediators

by

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Doctor of Philosophy, Graduate Program in Clinical Psychology  
Loma Linda University, September 2016  
Dr. Kelly R. Morton, Chairperson

Past research has shown that low socioeconomic status (SES) and experiencing racial discrimination are both related to hypertension in African Americans. Further, low SES and racial discrimination have been found to affect hypertension indirectly through stress, low levels of psychosocial resources, and lifestyle risk factors in African American adults. Past studies have used the Reserve Capacity Model (RCM; Gallo & Matthews, 2003; 2005) to understand these relationships. The RCM asserts that stress can be mitigated by psychosocial resources (mastery, optimism, self-esteem) which lead to healthy lifestyle behaviors predictive of cardiac health. However, there are few studies that use the RCM to predict hypertension in African American adults. Additionally, the present investigation added discrimination along with low SES as an additional stressor that compounds the effects of poverty on health. We examined the mediational effects of RCM resources after low SES and discrimination experiences to predict health behavior (exercise) and hypertension in 1202 middle to older aged African Americans using structural equation modeling. Results showed that both low SES and perceived discrimination predicted a self-reported diagnosis of hypertension indirectly through levels of reserve capacity and exercise. These findings provide support for the Reserve

Capacity Model as an explanatory framework for how social stressors affect health through modifiable psychosocial resources and health behaviors in middle to older aged African Americans.

# **CHAPTER ONE**

## **INTRODUCTION**

### **Statement of the Problem**

The current investigation will build on past Reserve Capacity Model (RCM) studies by including self-reported low SES and perceived racial discrimination, as well as reserve capacity resources (mastery, optimism, self-esteem) to predict hypertension in African Americans. The reserve capacity model asserts that a set of psychosocial resources will buffer the effects of social stressors (e.g. socioeconomic status) on physical health by decreasing negative emotions believed to promote maladaptive health behaviors (e.g., sedentary lifestyle, less exercise, poor diet, approach coping). Another social stressor believed to be buffered by reserve capacity resources is perceived discrimination. Understanding how low SES is related to perceived discrimination, and whether these stressors are mitigated by reserve capacity believed to affect hypertension via healthy behaviors, is an important expansion to extant research on the RCM. In previous studies, SES was found to predict levels of reserve capacity resources, maladaptive lifestyle factors, and ultimately cardiac health. However, as of yet, no study has tested whether perceived racial discrimination operates similarly to SES or in addition to SES as a stressor within an RCM framework.

### **Racial Discrimination and SES**

Racial discrimination, defined as unfair treatment toward socially defined subordinate groups based on race occurs as both aggregate “day-to-day” or “lifetime” discrimination (Bryant-Davia & Ocampo, 2005; Feagin, 1991; Forman, Williams, &

Jackson, 1997; Fujishiro, 2009; Williams & Mohammed, 2009; Williams, Neighbors, & Jackson 2003). Both day-to-day and lifetime discrimination continue to be widespread in the United States (Aylon & Gum, 2011; Bobo & Fox, 2003; Feagin & McKinney 2003). For example, estimates are that between 60 and 90 percent of African American adults report perceiving discrimination during their lifetime (Brown et al., 2003; Kessler et al., 1999). Perceived racial discrimination is believed to operate similarly to low SES in African Americans, as a stressor. However, a unique relationship exists between perceived racial discrimination and low SES, in which racial discrimination confers social and economic disadvantages for African Americans living in the United States. Social and economic disadvantages can be operationally defined as SES (e.g., income, education, occupational status/prestige; Oakes & Rossi, 2003; U.S. Bureau of the Census, 2009). There are a number of ways in which perceived racial discrimination is believed to affect social and economic disadvantages for African Americans, which include: (1) limited employment opportunities, (2) discrimination in the occupational setting, and (3) residential segregation (Bertrand & Mullainathan, 2004; Borrell, Kiefe, Diez-Roux, Williams, & Gorden-Larsen, 2013; Entwisle, Alexander, & Olson, 2000; Fuligni & Hardaway, 2004; Hardaway & McLoyd, 2009; Hyllegard, 1996; Kessler, Mickelson, & Williams, 1999; Krieger & Sidney, 1996; Loury, 2005; Pager, 2003; Smith, 2002; Smith & Elliot, 2002; Son, 1989; Thomas, 2000; Williams, 1999; Williams & Williams-Morris, 2000; Wilson & McBrier, 2005). The literature in this area suggests that perceptions of racial discrimination affect African Americans' social and economic welfare; however, levels of SES can also confer levels of perceived racial discrimination.

Higher SES is related to more frequent perceptions of racial discrimination than lower SES among African Americans, higher SES neighborhoods/areas tend to have less racial diversity, and there is other evidence that African Americans will sometimes avoid living in mostly White residential areas for fear of greater racial discrimination (Borrell, Jacobs, Williams, Pletcher, Houston, et al., 2007; Borrell, Kiefe, Diez-Roux, Williams, & Gordon-Larsen, 2013; Borrell, Kiefe, Williams, Diez-Roux, & Larsen-Gorden, 2006; Dailey, Kasl, Holord, Lewis, & Jones, 2009; Feagin & Sykes, 1994; Hudson, et al., 2012; Hunt et al., 2007; Kessler et al. 1999; Krysan & Farley, 2003; Watson, Scarinci, Klesges, Slawson, & Beech, 2002). However, it is possible that African Americans occupying higher SES occupations (e.g., greater salaries, benefits, and more authority) may have greater legal knowledge, awareness of unfair treatment in their professional setting, expectations of appropriate treatment (e.g., expecting racial discrimination does not occur in the work setting), as well as more assertiveness within their professional setting, each of which is believed to influence greater reporting of potential racial discrimination (Brayboy-Jackson & Stewart, 2003; Hirsch & Lyons, 2010; Karlsen & Nazroo, 2002).

What remains to be evaluated is how perceived racial discrimination and low SES individually contribute to a greater hypertension risk for African Americans.

Hypertension is a well-established predictor of, and risk factor for, the development of many other cardiac diseases, such as coronary heart disease, heart failure, and stroke (Klag, Whelton, Randall, Neaton, Brancati, et al., 1996; Levy, Larson, Vasan, Kannel, & Ho, 1996; Slama, Susic, & Frohlich, 2002; Whelton, He, Appel, Cutler, Havas, et al., 2002). Recent estimates suggest that nearly 65 million U.S. adults suffer from hypertension (Fields et al., 2004). African Americans have an earlier onset and higher

prevalence of hypertension, and are more than twice as likely to experience hypertension-related complications leading to death than Whites (Colhoun, Hemingway, & Poulter, 1998; Hall, Ferrario, Moore, Hall, Flack, et al., 1997; Klag, Whelton, Randall, Neaton, Brancati, et al., 1997; Singh, Kochanek, & MacDorman, 1996; Thomas, Thomas, Pearson, Klag, & Mead, 1997). Hypertension is classified using cutoff points of systolic blood pressure (SBP) of 140mm Hg or higher or diastolic blood pressure (DBP) of 90 mm Hg or higher (Chobanian, Bakris, Black, Cushman, Green, et al., 2003).

### **Racial Discrimination, Low SES and Hypertension Risk**

There is consistent evidence that both racial discrimination and low SES are associated with hypertension risk for African Americans (Cozier et al., 2006; Davis et al., 2005; Guyll, Matthews, & Bromberger, 2001; Roberts et al., 2007; Sellers & Shelton, 2003; Steffen, McNeilly, Anderson, & Sherwood, 2003). Additionally, hypertension risk increases as a function of SES, with lower SES African Americans having a greater risk of developing hypertension than higher SES African Americans (Bell, Adair, & Popkin, 2004; Chaix, Bean, Leal, Thomas, Havard, et al., 2010; Diez-Roux, 2005; Kaplan & Keil, 1993; Sharma, Malarcher, Giles, & Myers, 2004). However, the mechanisms for understanding how racial discrimination and low SES contribute to hypertension risk remain less clear. Some studies have shown certain mechanisms partially explain this relationship, such as less access to quality healthcare and greater stress reactivity in African Americans who perceive racial discrimination or who are considered low SES (Adegbenbo, Tomar, & Logan, 2006; Armstead, Lawler, Gorden, Cross, & Gibbons, 1989; Benkert, Peters, Clark, & Keves-Foster, 2006; Brondolo, Rieppi, Kelly, & Gerin,

2003; Fang & Myers, 2001; Fowler-Brown, Ashkin, Corbie-Smith, Thaker, & Pathman, 2006; Kessler & Neighbors, 1986; Krieger, Rowley, Herman, Avery, & Phyllips, 1993).

Another explanatory mechanism is that of behavioral and lifestyle factors. A number of studies have found that low SES status is predictive of high rates of smoking tobacco, alcohol intake, hyperlipidemia, sodium intake, sedentary lifestyle, and BMI (Dyer, Liu, Walsh, Kiefe, Jacobs, et al., 1999; Ostrove & Adler, 1998; Pamuk, Makuc, Heck, Reuben, & Lochner, 1998; Winkleby, Cubbin, & Kraemer, 1999), which in turn lead to hypertension (Havas, 1997; He, Muntner, Chen, Rocella, Streifer, et al., 2002; Joint National Committee on detecting, evaluating, and treatment of Hypertension, 1997; Rocchini, 1998). Individuals in low SES neighborhoods have less access to gyms and workout facilities and less access to nutritious foods (Adler & Ostrove, 1999; Bhattacharya, Currie, & Haider, 2004; Lovasi, Hutson, Guerra, & Neckerman, 2009; Macintyre, MacIver, & Sooman, 1993; Matthews & Gallo, 2011).

Similarly, perceiving racial discrimination also contributes to hypertension risk in African Americans through behavioral and lifestyle factors (Borrell et al., 2013). Perceived racial discrimination is associated with higher sedentary lifestyle rates, smoking rates, alcohol intake, illicit substance abuse, and eating high fat foods (Borrell et al. 2006, 2013; Bennett, Culhane, Webb, Coyne, Hogan, et al., 2010, Brondolo, et al., 2009; Kramer & Hogue, 2009; Krieger, Smith, Naishadham, Hartman, & Barbeau, 2005; Landrine, Klonoff, Corral, Fernandez, & Roesch, 2006; Lopez, 2006; Paradies, 2006; Terrell, Miller, Foster, & Watkins, 2006; Williams et al., 2009). Each of these lifestyle behaviors is associated with an increased hypertension risk (Havas, 1997; He, Muntner, Chen, Rocella, Streifer, et al., 2002; Joint National Committee on detecting, evaluating,

and treatment of Hypertension, 1997; Rocchini, 1998). It is hypothesized that these poor health behaviors result from lower levels of reserve capacity and the stress experienced from racial discrimination (Gallo, 2003). Consistent with the RCM, reserve resources (mastery, optimism, self-esteem, and social support) are positively associated with better lifestyle and health behaviors, such as exercise, that reduce hypertension risks.

### **Reserve Capacity Resources**

Reserve Capacity resources include mastery, optimism, and self-esteem. These are believed to improve stress perceptions and promote lifestyle factors predictive of good health (Gallo, 2003; Gallo, Bogart, Vranceanu, & Matthews, 2005; Gallo, Espinosa de los Monteros, Shivpuri, 2009; Matthews & Gallo, 2011). Similarly, the RCM authors have theorized that reserve capacity resources may also buffer the stress of racial discrimination (Gallo, Espinosa de los Monteros, & Shivpuri, 2009). The first of these resources is mastery, defined as the literature as the quality of believing that an individual's life circumstances are the consequence of his or her own actions (Midlarsky, 1991; Ross & Sastry, 1999; Wallhagen, Strawbridge, Kaplan, & Cohen, 1994). Another reserve capacity resource is optimism, which is defined as an expectation that good rather than bad things will happen (Scheier & Carver, 1985). Finally, self-esteem is a positive evaluation of one's self concept and a sense of confidence and self-acceptance (Rosenberg, 1978).

### **Purpose of the Study**

The present investigation will assess SES (education and income), perceived racial discrimination (e.g., every day and lifetime), reserve capacity (e.g., mastery,

optimism, self-esteem), exercise (e.g., “How many times per week do you usually engage in regular vigorous activities,” “On average, how many minutes do you exercise each session?” and having a regular exercise program), and self-reported hypertension to test the influence of reserve capacity on the relationships among perceived racial discrimination/SES, exercise and hypertension (see Figure 1). This research will build on past RCM studies by including low SES and perceived racial discrimination, as well as established reserve capacity resources (mastery, optimism, self-esteem) to predict hypertension as a cardiac health endpoint.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **Overview**

African Americans suffer from disproportionately higher prevalence and incidence of hypertension in the United States compared to other racial groups. The reasons for this health disparity are not immediately clear, however, the literature suggests that the chronic stress of low SES environments and racial discrimination, which are both uniquely common to African Americans, contribute to poor cardiac health. As a stress buffering explanatory framework, the Reserve Capacity Model (RCM; Gallo, 2003) will be used to understand and explore whether the disproportionately higher rates of hypertension in African Americans are due to (1) a lack of psychosocial resources needed to buffer the stressors of low SES and discrimination, and (2) a lack of pro-health behaviors, such as exercise, which is known to reduce hypertension risk.

The RCM was developed by Gallo and Matthews (2003; 2005) as a stress-coping framework to understand SES-related health disparities. The model proposes that the stress of low SES environments (e.g. threat of harm, damage to property, unemployment, threat of injury, threat of losing resources, and overcrowding) can be mitigated by psychosocial resources (e.g. mastery, optimism, self-esteem, and social support) known as reserve capacity. However, when these resources are lacking or under-developed, poor lifestyle behaviors used as maladaptive coping strategies with resulting negative effects on cardiac health can follow (Gallo & Matthews, 2003; Gallo, Espinosa de los Monteros, & Shivpuri, 2009; Gallo, Bogart, Vranceanu, & Matthews, 2005). Gallo and

Matthews (2003) have called for more RCM studies that examine other important stressors that contribute to health disparities.

Gallo and Matthews (2003) believe racial discrimination will operate similarly as an additional stressor believed to deplete reserve capacity. The authors contend that, like low-SES, racial discrimination can function as a powerful stressor affecting physical health (Gallo & Matthews, 2003). In terms of the RCM, racial discrimination has been found to be associated with lower levels of psychosocial resources (Broman, Mavaddat, & Hsu, 2000; Greene, Way, & Pahl, 2006; Jost & Hunyady, 2002; Williams & Mohammed, 2009). Further, racial discrimination also predicts lifestyle choices that may lead to cardiac risks such as hypertension (Banks et al., 2006; Brondolo et al., 2005; Williams & Mohammed, 2009). However, to date, no RCM study has incorporated racial discrimination as a stressor. Gallo, Penedo, Espinosa de los Monteros, and Arguelles (2009) review the relevance of racial discrimination as a stressor and conclude it is as important as low-SES when predicting health outcomes. Thus, it is feasible to include racial discrimination in the RCM along with low SES as an additional environmental stressor.

### **Hypertension in African Americans**

Hypertension was chosen as the cardiac health endpoint for the current study because it is not only a significant health problem in the United States, but because it is also disproportionately effects racial minority groups, such as African Americans (Hertz, Unger, Cornell, & Saunders, 2005; Morenoff, House, Hansen, Williams, Kaplan, et al., 2007). Hypertension in African Americans has an earlier age of onset, is more difficult

to treat, more damaging to organs, and believed to be more aggressive compared to hypertension in Whites (Gillum, 1996; Jamerson, 2004; Morenoff et al., 2007; Saunders, 1995; Weir & Hanes, 1996). African American adults have a higher prevalence of hypertension (42.1%) compared to non-Hispanic Whites (28%), Hispanics (26%), and non-Hispanic Asians (24.7%; Agency for Healthcare Research and Quality, 2013; Bleich, Jarlenski, Bell, and LaVeist, 2012; Centers for Disease Control and Prevention, 2013; Egan, Hutchison, & Ferdinand, 2014; Nwankwo, Yoon, Burt, & Gu, 2013).

Additionally, it is common for African Americans to be unaware that they have hypertension. Hyman and Pavlik (2001) found that up to 27% of hypertensive African Americans were unaware that they had hypertension. Further, hypertension risk is higher for African American women compared to men.

Additionally, a recent study found that African Americans were more likely to have hypertension than Whites, and specifically that African American women had the highest risk of having hypertension compared to any other group (Sampson, Edwards, Jahangir, Munro, Wariboko et al., 2014; Sowers, Epstein, & Frolich, 2001). In addition to women, other groups are particularly vulnerable to developing hypertension, such as older adults, especially for African Americans. One study showed that 60% of older African Americans have hypertension (Delgado, Jacobs, Lackland, Evans, & Mendes de Leon, 2012; Ostchega, Yoon, Hughes, & Louis, 2008; Rooks, Simonsick, Klesges, Newman, Ayonayon et al., 2008). Hypertension prevalence in older adults was found to be greatest in the sixth decade of life for African Americans (Okunofua, Cutler, Lackland, & Egan, 2005). Additionally, and particularly important for older adults, hypertension has been found to increase the risk of dementia, such as Alzheimer's disease

and physical disability (Faraco and Iadecola, 2013; Hajjar, Lackland, Cupple, and Lipsitz, 2007; Köhler, Baars, Spauwen, Schievink, Verhey, et al., 2014).

### **SES and Hypertension**

For African Americans, socioeconomic status is especially important for understanding cardiac health risks, especially because African Americans tend to be overrepresented in lower socioeconomic strata (Klag, Appel, et al., 1998; Sowers, Ferdinand, Bakris, & Douglas, 2002; Williams, 1999). Lower SES has been found to be associated with greater hypertension risk for African Americans living in the United States (Adler & Ostrove, 1999; Hertz, Unger, Cornell, & Saunders, 2005; Klag et al., 1998; Seeman & Crimmins, 2001). African-Americans in low resource communities experience greater difficulty achieving adequate blood pressure and successful hypertension control and treatment compared to other Americans (Bosworth, Posers, Grubber, Thorpe, Olsen et al., 2008; Kramer, Han, Post, Goff, Diez-Roux, et al., 2004; Lewington, Clarke, Oizilbash, Peto, & Collins, 2002; Schectman, Schorling, & Voss, 2008). These findings are consistent across different indices of SES, such as neighborhood gentrification and affluence. One study found that hypertension risk was inversely related to affluence/gentrification of neighborhood for African Americans (Morenoff, House, Hansen, Williams, Kaplan, and Hunte, 2007).

Some theories suggest that health disparities along the SES gradient may exist because of differential access to coping resources (e.g., having health insurance, being able to afford medical costs) that can act as buffers for stress, which is believed to contribute to hypertension risk in low SES African Americans (Bratter & Eschbach,

2006; George & Lynch 2003; Heller, Briones, & Roberts 2004; Horwitz, White, & Howell-White 1996; Karlsen & Nazroo 2002; Turner & Avison, 2003). Additionally, low SES neighborhoods usually have limited access to safe places for exercising (Lovasi et al., 2009). Lower-SES African Americans are also more vulnerable to stressors than their middle-class counterparts (Ulbrich, Warheit, & Zimmerman, 1989). Studies have shown that low-SES individuals tend to have higher blood pressure than those at higher SES levels (Gallo, Bogart, Vranceanu & Walt, 2004; Matthews, Rääkkönen, Everson, Flory, & Marco, 2000; Steptoe, Kunz-Ebrecht, Owen, Feldman, & Willemsen, 2003). Additionally, low SES individuals tend to not experience the typical nighttime fall in blood pressure that is a sign of healthy cardiac functioning (Campbell, Key, Ireland, Bacon, & Ditto, 2008). It is clearly documented in the literature that SES alone does not account for hypertension risk in African Americans and the RCM explores other mediating factors (Fang, Madhavan, & Alderman, 1996; MacFarlane, Banerji, & Sowers, 2001; Rahman, Douglas, and Wright Jr., 1997; Sowers et al., 2002).

### **Discrimination and Hypertension**

Racial discrimination can be thought of as a chronic race-specific stressor that is widely believed to affect health for African Americans. Racial discrimination is believed to affect health similarly to other stressors, including increasing biologic stress-responses (e.g. blood pressure and stress hormones, such as cortisol and norepinephrine), increasing maladaptive health behaviors (e.g. smoking, substance use), and decreasing positive health behaviors such as physical activity (Bennett, Wolin, Robinson, Fowler, & Edwards, 2005; Dailey, Kasi, Holford, & Jones, 2007; Gibbons, Gerrard, Cleveland,

Wills, & Brody, 2004; Paradies, 2006; Shariff-Marco, Klassen, & Bowie, 2010). The experience of discrimination can cause physiological responses involving the hypothalamic-pituitary-adrenal axis and the sympathetic-parasympathetic systems, which are related to hypertension risk (Albert, Ravenell, Glynn, Khera, Halevy et al., 2008; Aldo Ferrara, Guida, Ferrara, et al., 2007). These findings may explain some health disparities in African Americans, such as high rates of hypertension. A number of studies have found positive relationships between experiencing perceived racial discrimination and the presence of hypertension (Brondolo, Love, Pencille, Schoenthaler, & Ogedegbe, 2011; Brondolo, Rieppi, Kelly, & Gerin, 2003; Cuffee, Hargraves, & Allison, 2012; Dolezsar, McGrath, Herzig, & Miller, 2014).

### **SES and Racial Discrimination**

Levels of SES can relate to, and predict, perceived racial discrimination among African Americans. For example, a preponderance of studies show that higher SES is related to more frequent perceptions of racial discrimination than lower SES among African Americans (Dailey, Kasl, Holord, Lewis, & Jones, 2009; Feagin & Sykes, 1994; Watson, Scarinci, Klesges, Slawson, & Beech, 2002; Kessler et al. 1999; Borrell et al., 2006, 2007). For example, Hudson, Bullard, Neighbors, Geronimus, Yang, et al. (2012) report evidence that education and income were positively related to perceived racial discrimination.

Other studies have examined residential characteristics in relation to racial discrimination. Because higher SES neighborhoods tend to have less racial diversity, some use this as a measure of neighborhood-level SES. For example, Hunt et al. (2007)

found that the African Americans living in neighborhoods with a more diverse racial composition reported less perceived racial discrimination. There is other evidence that African Americans will sometimes avoid living in mostly White residential areas for fear of greater racial discrimination (Krysan & Farley, 2003). It is posited that African Americans occupying higher SES occupations (e.g. greater salaries, benefits, and more authority) may have greater legal knowledge, awareness of unfair treatment in their professional setting, greater sense of entitlement, as well as more assertiveness within their professional setting, each believed to influence greater reporting of potential racial discrimination (Brayboy-Jackson & Stewart, 2003; Hirsch & Lyons, 2010; Karlsen & Nazroo, 2002).

### **Racial Discrimination, Low SES and Hypertension Risk**

It is well established that perceived racial discrimination predicts hypertension risk in African Americans (Cozier et al., 2006; Davis et al., 2005; Guyll, Matthews, & Bromberger, 2001; Roberts et al., 2007; Sellers & Shelton, 2003; Steffen, McNeilly, Anderson, & Sherwood, 2003). Additionally, hypertension risk increases as a function of SES, with lower SES African Americans having a greater risk of developing hypertension than higher SES African Americans (Bell, Adair, & Popkin, 2004; Chaix, Bean, Leal, Thomas, Havard, et al., 2010; Diez-Roux, 2005; Kaplan & Keil, 1993; Sharma, Malarcher, Giles, & Myers, 2004). There is consistent evidence that both racial discrimination and low SES are associated with hypertension risk for African Americans. However, the mechanisms for understanding how racial discrimination and low SES contribute to hypertension risk remain less clear.

A number of studies have examined factors and mechanisms that help explain how racial discrimination and low SES contribute to hypertension risk in African Americans. First, access to quality healthcare can be compromised by both racial discrimination and low SES. Greater levels of racial discrimination are related to less access to medical care, greater delay of medical care, greater delay filling prescriptions, less adherence to medical treatments, alternative medicine use, less trust in healthcare services, and lower likelihood of receiving traditional medical tests (Adegbenbo, Tomar, & Logan, 2006; Bazargan, Norris, Bazargan-Hejazi, Akhanje, Calderoon, et al., 2005; Etowa, Weins, Bernard, & Clow, 2007; Hoyo, Yarnall, Skinner, Moorman Sellers, et al., 2005; Trivedi & Ayanian, 2006; Van Houtven, Voils, Oddone, Weinfurt, Friedman, et al., 2005). Low SES also affects African Americans access to adequate healthcare. For example, low SES is positively related to less satisfaction with and trust of health care as well as perceptions of lower quality medical encounters (Benkert, Peters, Clark, & Keves-Foster, 2006; Fowler-Brown, Ashkin, Corbie-Smith, Thaker, & Pathman, 2006; Napoles-Springer, Santoyo, Houston, Perez-Stable, & Stewart, 2005). Racial discrimination and low SES can limit access to and quality of healthcare for African Americans, which may contribute to under diagnosing and under treating of hypertension.

The stress reactivity pathway may also explain how racial discrimination and low SES affect hypertension risk (Myers, 2009; Myers, Lewis, Parker-Dominguez, 2003). For African Americans, racial discrimination is considered a significant interpersonal stressor (Anderson, 2013; Clark, 2006; Guthrie, Young, Williams, Boyd, & Kinter, 2002; Kwate, Valdimarsdottir, Guevarra, & Bovbjerg, 2003; Williams & Mohammed, 2009;

Sellers, Bonham, Neighbors, & Amell, 2009). African Americans experience perceived racial discrimination more intensely and with more physiological reactivity (higher blood pressure responses, slower recovery to baseline blood pressure) than non-racially based stressors (Armstead, Lawler, Gordon, Cross, & Gibbons, 1989; Brondolo, Rieppi, Kelly, & Gerin, 2003; Fang & Myers, 2001; Harrell, 2000; McNeilly, Robinson, Anderson, Pieper, Shah, et al., 1995). For example, African Americans assigned to a racial stress group (e.g., instructed to debate a set of racist viewpoints against a White confederate) exhibited greater cardiovascular reactivity (a known physiological precursor to increased blood pressure) than a control group of African Americans (McNeilly et al., 1995). These findings comport with other evidence suggesting that perceived racial discrimination contributes to greater cardiovascular reactivity, which is a risk factor for hypertension (Anderson, Williams, Lane, Haney, Simpson, et al., 1986; Cohen, Janicki-Deverts, & Miller, 2007; Gyll et al., 2001;).

Those living in low SES environs experience more stressors than those at any other level on the SES strata (Cooper, 1991; Kessler & Neighbors, 1986; Krieger, Rowley, Herman, Avery, and Phyllips, 1993). These stressors include overcrowding, higher unemployment rates, financial difficulties, familial instability, and exposure to violence (Adler & Ostrove, 1999; Grotto, 2008; Harburg, Gleiberman, Russell, & Cooper, 1991; Pickering, 1999) that over time lead to greater cardiovascular reactivity and higher rates of hypertension (Anderson, Williams, Lane, Haney, Simpson, et al., 1986; Williams & Mohammed, 2009; Williams, Jackson, & Anderson, 1997).

For both racial discrimination and low SES, the stress reactivity is explained by activation of the HPA axis and SNS activity, which lead to cardiovascular reactivity and

hypertension in humans and animals (Anderson, McNeilly, & Myers, 1992; Fredrikson, Robson, & Ljungdell, 1991). HPA axis activity is associated with cortisol release, and SNS activity with the release of norepinephrine; activity of both systems is associated with attenuated excretion of sodium leading to vasoconstriction, and ultimately hypertension (Anderson, McNeilly, & Myers, 1991; 1992). Studies have also shown that levels of cortisol and norepinephrine are positively associated with hypertension (al'Absi, Lovallo, McKey, & Pincomb, 1994; Kapuku, Treiber, & Davis, 2002; McCann, Carter, Vaughan, Soro, Ingram et al., 1995).

A third SES-racial discrimination pathway is through behavioral and lifestyle factors. A number of studies have found that low SES status is predictive of high rates of smoking tobacco, alcohol intake, hyperlipidemia, sodium intake, sedentary lifestyle, and BMI (Dyer, Liu, Walsh, Kiefe, Jacobs, et al., 1999; Ostrove & Adler, 1998; Pamuk, Makuc, Heck, Reuben, & Lochner, 1998; Winkleby, Cubbin, & Kraemer, 1999) which in turn lead to hypertension (Havas, 1997; He, Muntner, Chen, Rocella, Streifer, et al., 2002; Joint National Committee on detecting, evaluating, and treatment of Hypertension, 1997; Rocchini, 1998). Low SES neighborhoods have less access to gyms and workout facilities and less access to nutritious foods (Adler & Ostrove, 1999; Bhattacharya, Currie, & Haider, 2004; Macintyre, MacIver, & Sooman, 1993). This last point, regarding access to nutritious food, is especially problematic because prices for nutritionally poor and calorie-dense foods have decreased substantially (Drewnowski & Specter, 2004; Nestle & Jacobson, 2000), leading to the least nutritious diet at the low SES stratum (Bhattacharya et al., 2004; Drewnowski & Specter, 2004), such as less fruit

and vegetables per serving and poorer quality meats (Blisard et al., 2004; Chung & Meyers, 1999; Drewnowski & Specter, 2004; Kaufman, 1997).

Similarly, perceiving racial discrimination also contributes to hypertension risk in African Americans through behavioral and lifestyle factors. Perceived racial discrimination is also associated with higher sedentary lifestyle rates, smoking rates, alcohol intake, illicit substance abuse, and high fat foods (Borrell et al. 2006; Bennett, Culhane, Webb, Coyne, Hogan, et al., 2010, Brondolo, et al., 2009; Krieger, Smith, Naishadham, Hartman, & Barbeau, 2005; Landrine, Klonoff, Corral, Fernandez, & Roesch, 2006; Paradies, 2006; Terrell, Miller, Foster, & Watkins, 2006; Williams et al., 2009). Each of these lifestyle behaviors are associated with an increased hypertension risk (Havas, 1997; He, Muntner, Chen, Rocella, Streifer, et al., 2002; Joint National Committee on detecting, evaluating, and treatment of Hypertension, 1997; Rocchini, 1998). It is hypothesized that these poor health behaviors result from lower levels of reserve capacity after exposure to stress from racial discrimination (Gallo, 2003). Consistent with the RCM, reserve resources (mastery, optimism, self-esteem) are positively associated with better lifestyle and health behaviors that reduce hypertension risks.

### **Reserve Capacity Resources**

The RCM proposes that psychosocial resources (mastery, optimism, self-esteem) known as reserve capacity buffer the stress of low-SES (e.g., unemployment, threat of injury, and threat of losing resources). The reserve capacity resources are believed to improve stress perceptions, and reduce lifestyle risk factors predictive of poor cardiac

health (Gallo, 2003; Gallo, Bogart, Vranceanu, & Matthews, 2005; Gallo, Espinosa de los Monteros, Shivpuri, 2009). Similarly, the RCM authors have theorized that reserve capacity resources may also buffer the stress of racial discrimination (Gallo, Espinosa de los Monteros, & Shivpuri, 2009). The following section will discuss mastery, optimism and self-esteem reserve capacity resources and the relation of each to negative emotions, behavioral/lifestyle factors, and hypertension risk in African Americans.

Mastery is the degree to which a person believes that his or her life circumstances are the consequence of his or her own actions (Midlarsky, 1991; Ross & Sastry, 1999; Wallhagen, Strawbridge, Kaplan, & Cohen, 1994). Broman, Mavaddat, and Hsu (2000) found that more perceived racial discrimination was related to lower levels of mastery and higher levels of distress in African Americans from Detroit. African Americans tend to have lower mastery scores than Whites, though this may be an artifact of SES (Chiriboga, & Small, 2008; Kiecolt & Hughes, 2009; Jang, Borenstein-Graves, Haley, Small, & Mortimer, 2003; Lachman & Weaver, 1999; Pearlin et al., 1981). Low-SES individuals and those experiencing racial discrimination are less likely to believe that they have a sense of mastery over events in their lives (Bailis, Segall, Mahon, Chipperfield, & Dunn, 2001; Galanos, Strauss, & Pieper, 1994; Thoits, 1995). This is of concern because mastery mediates the association between SES and health (Bailis et al., 2001; Benassi, Sweeney, & Dufour, 1988; Bobak, Pikhart, Hertzman, Rose, & Marmot, 1998).

Mastery has consistently been understood as an important stress buffer (Mirowsky & Ross, 1990; Pierce et al., 1996). Mastery is believed to give individuals a sense that they can control problems by taking action and predicts active coping and better health

(Grote, Ross & Mirowsky, 1989; Thompson, et al., 2007). Few studies have examined the relationship between mastery and hypertension in African Americans, though mastery does predict better cardiac health (Bledsoe, Larkin, Lemay, & Brown, 2007; Gallo, Espinosa de los Monteros, & Shivpuri, 2009; Karasek et al., 1981; Keith, Lincoln, Taylor, Jackson, & Jackson, 2010).

Dispositional optimism, or the expectation that good rather than bad things will occur, has been related to better psychological and physical health, especially during times of elevated stress (Scheier & Carver, 1985). Optimism is related to less psychological distress and a greater sense of resilience when dealing with life stressors in older African American men and women (Baldwin, Ill, Okoh, & Cannon, 2011). One way in which dispositional optimism benefits health is by increasing approach coping and decreasing avoidance coping such as ignoring, or withdrawal (Carver et al., 1992; Scott, 2003; Taylor, Kemeny, Aspinwall, Schneider, Rodriguez, et al., 1992). In addition, optimists may adjust their coping strategies to meet the demands of specific stressors, resulting in more successful adjustment (Nes & Segerstrom, 2006; Taylor & Stanton, 2007). For African Americans, greater levels of optimism are associated with less depression and hostility (Baldwin, Chambliss, & Towler, 2003; Williams et al., 2009). Lower optimism relates to elevated ambulatory BP (Raikkonen, Matthews, Flory, Owens, & Gump, 2000; Williams, Riels, & Roper, 1990).

Self-esteem is a positive evaluation of one's self-concept and a sense of confidence and self-acceptance. Similar to the resources described above, self-esteem is positively associated with psychological health (Schmit & Allik, 2005) and problem solving (Baumiester, Campbell, Krueger, & Vohs, 2003; Crocker & Park, 2004).

Researchers have found that African Americans report greater levels of self-esteem compared to other ethnic groups, and for African Americans, greater levels of self-esteem are related to less emotional distress, such as depression and hostility (Gray-Little & Hafdahl, 2000; Twenge & Crocker, 2002; Williams et al., 2009).

Crocker and Major (1989) find low-SES individuals protect self-esteem by ascribing their status to prejudice, or by devaluing the metrics in which the group performs poorly (e.g., education level, job prestige). These self-protective strategies explain why low-SES predicts higher levels of self-esteem than high SES (Gray-Little & Hafdahl, 2000; Twenge & Crocker, 2002). However, perceived racial discrimination is associated with an internalization of the unfair treatment and social devaluation contributing to lower self-esteem (Jost & Hunyady, 2002). Other studies have found positive associations between racial discrimination and levels of self-esteem (Greene et al., 2006). Increased levels of self-esteem can protect psychological health with a self-serving bias (Campbell & Sedikides, 1999), which includes a tendency to ascribe low-SES or discrimination to external forces, not internal ones, thereby removing any feelings of personal responsibility for SES or discrimination.

### **Hypotheses**

1. SES will be positively associated with Reserve Capacity which will negatively associated with hypertension.
2. Perceived discrimination will be negatively associated with Reserve Capacity which will be negatively associated with hypertension.

3. Reserve Capacity will be negatively associated with exercise and exercise will be positively associated with hypertension.
4. SES and perceived discrimination will be indirectly related to hypertension through Reserve Capacity and exercise.

## CHAPTER THREE

### METHODS

#### Participants and Procedures

The data were gathered in the Biopsychosocial Religion and Health Study (BRHS), a substudy of the Adventist Health Study – 2 cohort study on lifestyle and cancer in 97,000 Seventh day Adventists to examine stress, religion and health outcomes (Lee, Morton, Walters, Bellinger, Butler, et al., 2009). All individuals for the current archival, secondary data analysis were those who completed usable questionnaires on relevant variables. They were a random sample of 21,000 AHS-2 participants (Butler et al., 2008). 10,988 responded; thirty-one percent ( $n = 3,754$ ) self-identified as African American for inclusion in this study.

Participants missing data on any single item indicator variable, or two or more items on a multi-item scale, were excluded from the sample. For cases where there was missing data for one item on a multi-item scale, missing values were imputed in SPSS using expectation-maximization (EM). EM is an alternative form of maximum-likelihood that can be used for imputing missing data via an iterative algorithm that is based on the available data (Enders, 2003). EM is often used when the amount of missing data in a dataset is limited (< 5% of the dataset has missing data). Based on the EM algorithm, Little's MCAR test is used to determine if variables are missing data completely at random. A non-significant Little's MCAR test indicates that data is missing completely at random. This approach assumes that data are missing at random and this was supported by Little's MCAR test Chi-Square = 8.64,  $df = 9$ ,  $p = .471$ . After

the EM algorithm was executed, a new SPSS dataset was created that contained the imputed values to test the proposed model.

## **Measures**

### ***Socioeconomic Status***

SES was assessed using income and education. Income was measured by the item; “Think about all possible sources of income (wages, social security payments, pensions, rent, dividends, unemployment or disability compensation, child support, government housing assistance, etc.). Mark the response below that comes closest to your personal total income (before tax), during the last year.” This variable has a 7-point rating; “Less than \$10,000, \$11,000-20,000, \$21,000-30,000, \$31,000-50,000, \$51,000-75,000, \$76,000-100,000, and More than \$100,000.” Education was measured using the following categories: “Grade school, some high school, High school diploma, Trade school diploma, Some college, Associates degree, Bachelor’s degree, Master’s degree, and Doctoral degree.”

### ***Perceived Discrimination***

Perceived lifetime discrimination was measured using the six-items suggested in a work by Kessler, Mickelson, and Williams (1999; see Appendix A). Items include: (1) At any time in your life, have you ever been unfairly fired from a job or unfairly denied a promotion? (2) For unfair reasons, have you ever not been hired for a job? (3) Have you ever been unfairly stopped, searched, questioned, physically threatened or abused by the police? (4) Have you ever been unfairly discouraged by a teacher or advisor from

continuing your education? (5) Have you ever been unfairly prevented from *moving* into a neighbor-hood because the land-lord or a realtor refused to sell or rent you a house or apartment? And (6) Have you ever been unfairly denied a bank loan? ( $\alpha = .76$ ).

Additionally, perceived everyday discrimination was measured using the five-item Everyday Discrimination Scale (Forman, Williams, & Jackson, 1997; see Appendix B). Sample items include: (1) they were treated with less respect, (2) people acted as if they were afraid of them, and (3) they were threatened or harassed in their day-to-day life. Responses were rated on a 6 point scale from “never” to “almost every day.” Reliability in the current sample was strong ( $\alpha = .84$ ).

### *Reserve Capacity*

Mastery was assessed with the four-item version of the Self-Mastery Scale (SMS; Pearlin & Schooler, 1978; Pudrovskaja et al., 2005; see Appendix C). The SMS is a measure of personal control and how one deals with, and manages, problems. Items on the scale include: “I have little control over the things that happen to me” and “I often feel helpless in dealing with the problems of life.” SMS items are rated on a seven-point scale ranging from 1 (not true) to 7 (very true). The SMS is a widely used measure and has shown good reliability and validity in studies of health and wellbeing (Marshall & Lang, 1990; Pearlin & Schooler, 1978) and demonstrated adequate reliability in the present sample ( $\alpha = .74$ ).

Optimism was measured with the Life Orientation Test, revised (LOT-R; Scheier & Carver, 1994; see Appendix D). The LOT-R is an eight-item self-report of expectancies for positive and negative outcomes. Sample items include “in uncertain

times, I usually expect the best” and “I’m always optimistic about my future.” The LOT is rated on a seven-point scale ranging from 1 (not true) to 7 (very true;  $\alpha = .71$ ).

Self-esteem was measured with the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965; see Appendix E). Four items from the RSES were used as a measure of global attitudes about the self, each are rated on a seven-point scale ranging from 1 (not true) to 7 (very true). Items include: “I take a positive attitude toward myself” and “on the whole I am satisfied with myself.” The RSES is a widely used measure of self-esteem, and has demonstrated good reliability and validity in other studies of health and wellbeing (Crandall, 1973; Rosenberg, 1965;  $\alpha = .70$ ).

### *Exercise*

Lifestyle factors were measured using two items (see Appendix F). The first item is; “How many times per week do you usually engage in regular vigorous activities, such as brisk walking, jogging, bicycling, etc.; long enough or with enough intensity to work up a sweat, get your heart thumping, or get out of breath? This variable was rated on an 8-point scale, including; “Never engage in activities this vigorous, Less than once per week, 1 time per week, 2 times per week, 3 times per week, 4 times per week, 5 times per week, and 6 or more times per week.” The second variable is; “On average, how many minutes do you exercise each session? The 8-point scale for this includes; “None, 10 minutes or less, 11-20 minutes, 21-30 minutes, 31-40 minutes, 41-50 minutes, 51-60 minutes, and More than 1 hour.”

### ***Hypertension***

Self-reported diagnosis of hypertension was assessed with a single item (e.g., “mark the bubbles below to show which conditions/diseases you have ever had diagnosed by a physician. *If yes*, note whether you have been treated for the condition/disease in the last 12 months”). Participants’ responses were coded as either “yes” or “no” to having hypertension.

### **Data Analyses**

Preliminary analyses will be performed using the Statistical Package for the Social Sciences (SPSS 22 for Windows, Chicago IL, USA) and structural equation models were tested in EQS 6.1 (Bentler, 2012) using the maximum likelihood method of estimation. Prior to analysis, normality and outliers will be examined. Scores were deemed to be outliers if they were three and one-half or more standard deviations from the mean. Structural equation modeling was conducted using EQS 6.1. Structural equation modeling will be conducted to test a model including SES (e.g., income and education), perceived racial discrimination (e.g., lifetime and everyday discrimination), reserve capacity (e.g., mastery, optimism and self-esteem), exercise (e.g., exercise frequency and exercise duration), and a self-reported diagnosis of hypertension. Structural equation modeling was performed to test potential direct and indirect pathways among the model variables.

Model fit will be assessed using multiple criteria. A nonsignificant  $\chi^2$  ( $p > .05$ ) is suggestive of good fit; however, since the  $\chi^2$  goodness-of-fit statistic is sensitive to large sample size, other fit indices were also used. These included the Comparative Fit Index

(CFI), the Root Mean Square Error of Approximation (RMSEA) along with its 90% confidence interval (CI) and the standardized root mean residual (SRMR). A CFI value > .95 is evidence of a good fitting model. For RMSEA and SRMR and RMSEA, values < .08 are considered indicators of good fit. Post hoc modifications of the hypothesized model will be performed on the basis of theoretical considerations and results from the Wald Test (for dropping parameters) and the Lagrange Multiplier (LM) test (for adding parameters) if theoretically appropriate.

Mediational analyses will be performed to examine the hypothesized associations between relevant variables and reserve capacity and hypertension. Statistical significance of the indirect effect, reflective of a significant decrease in the direct influence of the independent variable (e.g., discrimination) on a dependent variable (e.g., exercise) when the hypothesized mediator is in the model (e.g., reserve capacity), will be calculated using EQS based on the Sobel method (Sobel, 1982). Full mediation was indicated if the indirect effect of the independent variable on the dependent variable, but not the direct effect, was significant.

**CHAPTER FOUR**  
**PUBLISHABLE PAPER**

**Cover Letter**

August 26, 2016

Richard M. Lee, Ph.D.  
Editor, *Cultural Diversity & Ethnic Minority Psychology*

Dear Dr. Lee:

Attached please find the manuscript “Social Stressors and Hypertension in Older African Americans: The Role of Psychosocial Factors,” which I am submitting for publication in *Culture Diversity & Ethnic Minority Psychology* as a full-length article. The aim of this research was to use structural equation modeling to evaluate perceived racial discrimination, socioeconomic status, psychosocial resources and exercise as determinants of self-reported hypertension in older African Americans, which I believe fits well given the aim and scope of your journal.

The results reported in this article have not been previously published and this manuscript has not been simultaneously submitted elsewhere. The authors of this manuscript have full control of all primary data and agree to allow the journal to review these data if requested. Furthermore, all co-authors have seen and approved this manuscript and agree with its submission to *Culture Diversity and Ethnic Minority Psychology*. In addition, we have no conflicts of interest to disclose. Thank you for considering this article and we look forward to hearing from you.

Sincerely,

Taylor L. Draper, M.A.  
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**Social Stressors and Hypertension in  
Older African Americans: The Role of Psychosocial Factors**

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Correspondence concerning this article should be addressed to Kelly R. Morton, Department of Family Medicine, Loma Linda University School of Medicine, 25455 Barton Road, 209B, Loma Linda, CA 92354. Tel.: +1 909 558 8577; Fax: +1 909 558 0971; E-mail: kmorton@llu.edu.

Abstract word count:  $\leq$ 250

Total word count: 4000-6000

*Short Title:* Social Stressors and Hypertension

*Keywords:* SES, perceived discrimination, reserve capacity, exercise, hypertension

## **Abstract**

### ***Objectives***

Past research has shown that low socioeconomic status (SES) and perceived discrimination are related to hypertension in African Americans. Past studies have used the Reserve Capacity Model (RCM; Gallo & Matthews, 2003; 2005; 2011) to understand these relationships which posits that stress can be mitigated by psychosocial resources which lead to healthy lifestyle behaviors predictive of cardiac health. However, few studies have examined the RCM resources to predict hypertension in African Americans and none have included discrimination as a stressor in the model.

### ***Methods***

We examined the mediational effects of RCM resources after low SES and discrimination experiences to predict health behavior (exercise) and hypertension in 1202 middle to older aged African Americans using structural equation modeling.

### ***Results***

Both low SES and perceived racial discrimination predicted a diagnosis of hypertension indirectly through levels of reserve capacity and exercise.

### ***Conclusions***

These findings provide support for the RCM as an explanatory framework for how social stressors affect health through modifiable psychosocial resources and health behaviors in middle to older aged African Americans.

## **Introduction**

The current investigation extends work on reserve capacity by including both SES and perceived discrimination as stressors that impact hypertension risk but that can be mediated by psychosocial factors (reserve capacity) and health behaviors in African Americans. The purpose here is to determine whether perceived discrimination operates similarly to SES or whether it exacerbates SES effects on hypertension risk. SES predicts levels of reserve capacity resources, health behaviors, and ultimately cardiac health. The objective is to examine whether reserve capacity can mediate the risk (SES, perceived discrimination) and health disparity (self-reported hypertension diagnosis) outcome, and, further whether health behavior (exercise) mediates the reserve capacity and health disparity outcome.

## **Background**

### ***Discrimination***

Discrimination can be conceptualized as unfair treatment toward socially defined subordinate groups (Bryant-Davia & Ocampo, 2005; Feagin, 1991; Fujishiro, 2009; Williams & Mohammed, 2009), and can be perceived and/or experienced as “day-to-day” or “lifetime” discrimination (Forman, Williams, & Jackson, 1997; Williams, Neighbors, & Jackson 2003). Day-to-day discrimination is conceptualized as acute experiences (e.g., receiving poorer service, treated as less intelligent or with less respect, experiencing verbal/physical attacks or threats; Clark, Coleman, & Novak, 2004; Feagin, 1991; Shavers & Shavers 2006; Sims, Wyatt, Gutierrez, Taylor, & Williams, 2009). Lifetime discrimination is conceptualized as long-term or chronic discrimination and is generally the product of socio-structural mechanisms (e.g., residential segregation, mortgage and

lending policies, and hiring and employment policies trends in the criminal justice system; Kessler, Mickelson, & Williams, 1999; Krieger, 2000; Krieger, Smith, Naishadham, Hartman, & Barbeau, 2005; Mendez, Hogan, & Culhane, 2011; Shavers & Shavers 2006). Both day-to-day and lifetime discrimination continue to be widespread in the United States (Aylon & Gum, 2011; Bobo & Fox, 2003; Feagin & McKinney 2003). For example, estimates are that between 60 to 90 percent of African American adults report perceiving discrimination during their lifetime (Brown et al., 2003; Kessler et al., 1999). It is well established that discrimination confers social and economic disadvantages for African Americans living in the United States. (Bertrand & Mullainathan, 2004; Fuligni & Hardaway, 2004; Kessler, Mickelson, & Williams, 1999; Linnehan & Konrad, 1999; Williams, 2009). Social and economic disadvantages can be operationally defined as SES (e.g., income, education, occupational status/prestige; Oakes & Rossi, 2003; U.S. Bureau of the Census, 2009).

### *Discrimination, Low SES and Hypertension*

Low SES and perceived discrimination may both contribute to health disparities like greater hypertension risk in African Americans. Hypertension is a significant health problem in the United States and, disproportionately effects African Americans (Hertz, Unger, Cornell, & Saunders, 2005; Morenoff, House, Hansen, Williams, Kaplan, et al., 2007). Hypertension in African Americans has an earlier age of onset, is more difficult to treat, and is more aggressive in leading to further cardiac disease and complications than in Whites (Gillum, 1996; Jamerson, 2004; Morenoff et al., 2007; Weir & Hanes, 1996). African Americans have a higher prevalence of hypertension (42.1%) compared

to non-Hispanic Whites (28%), Hispanics (26%), and non-Hispanic Asians (24.7%; Agency for Healthcare Research and Quality, 2013; Centers for Disease Control and Prevention, 2013; Egan, Hutchison, and Ferdinand, 2014, Nwankwo, Yoon, Burt, & Gu, 2013). Hypertension is assessed using cutoff points of systolic blood pressure (SBP) of 140mm Hg or higher or diastolic blood pressure (DBP) of 90 mm Hg or higher (Chobanian, Bakris, Black, Cushman, Green, et al., 2003). Social stressors such as SES do not fully explain racial health disparities in hypertension as the disparities remain even after controlling for SES (Cornoni-Huntley, LaCroix, & Havlik, 1989; Hayward, Crimmins, Miles, & Yang, 2000). However, there is a relationship between perceived discrimination and increased blood pressure; a precursor and defining feature of hypertension (Dolezsar, McGrath, Herzig, & Miller, 2014). For example, studies exposing participants to scenes/vignettes of racial discrimination show increased blood pressure and greater cardiac reactivity in African Americans (Armstead, Lawler, Gordon, Cross, & Gibbons, 1989; Clark, 2000; Jones, Harrell, Morris-Prather, Thomas, & Omowale, 1996). Further, community based studies also find a relationship between perceived racial discrimination and hypertension risk in African Americans (Cozier, Palmer, Horton, Fredman, Wise, et al., 2006; Gyll, Matthews, and Bromberger, 2001; Roberts, Vines, Kaufman, & James, 2007).

Both lower SES and discrimination likely play a role in hypertension risk disparities in African Americans (Crimmins, Kim, Alley, Karlamangla, & Seeman, 2007; Dolezsar et al., 2014; Williams, 1999; Williams & Neighbors, 1997). Hypertension risk increases as a function of SES, with lower SES Blacks having a greater risk of developing hypertension than higher SES African Americans (Chaix, Bean, Leal,

Thomas, Havard, et al., 2010; Diez-Roux, 2005; Subramanyam, James, Diez-Roux, Hickson, Sarpong, et al., 2013).

There is consistent evidence that both discrimination and low SES are associated with hypertension risk for African Americans. However, the mechanisms for understanding how racial discrimination and low SES contribute to hypertension risk remain less clear. Some studies show certain mechanisms partially explain this relationship, such as less access to quality healthcare and greater stress reactivity (Adegbenbo, Tomar, & Logan, 2006; Armstead, Lawler, Gorden, Benkert, Peters, Clark, & Keves-Foster, 2006; Brondolo, Rieppi, Kelly, & Gerin, 2003; Fang & Myers, 2001). However, psychosocial and lifestyle factors, such as exercise may also explain this relationship. Low SES is predictive of less exercise, smoking tobacco, alcohol intake, hyperlipidemia, sodium intake, and greater BMI (Dyer, Liu, Walsh, Kiefe, Jacobs, et al., 1999; Ostrove & Adler, 1998; Winkleby, Cubbin, & Kraemer, 1999), which in turn lead to hypertension (He, Muntner, Chen, Rocella, Streifer, et al., 2002; Joint National Committee on detecting, evaluating, and treatment of Hypertension, 1997). With respect to exercise, low SES neighborhoods have less access to gyms and workout facilities (Bhattacharya, Currie, & Haider, 2004). Therefore, low SES status is believed to be related to less exercise, which is related to increased hypertension risk.

Similarly, perceiving discrimination contributes to hypertension risk via higher sedentary lifestyle rates, smoking rates, alcohol intake, illicit substance abuse, and higher rates of eating high fat foods (Bennett, Culhane, Webb, Coyne, Hogan, et al., 2010; Brondolo, et al., 2009; Paradies, 2006). Each of these health behaviors is associated with an increased hypertension risk (He et al., 2002; Joint National Committee on detecting,

evaluating, and treatment of Hypertension, 1997). It is hypothesized that these poor health behaviors result from lower levels of reserve capacity after exposure to the stress of low SES and perceived discrimination (Gallo, 2003). Psychosocial reserve capacity resources (mastery, optimism, self-esteem) are positively associated with health behaviors, such as exercise, that reduce hypertension risks.

### ***Reserve Capacity Resources***

The Reserve Capacity Model (RCM; Gallo, 2003) proposes that psychosocial resources (mastery, optimism, self-esteem), known as reserve capacity, buffer the effects of stress associated with low SES (e.g., unemployment, threat of injury and loss of resources). Gallo and colleagues indicate that reserve capacity resources improve stress perceptions and promote healthy lifestyle choices that promote health (Gallo, 2003; Gallo, Bogart, Vranceanu, & Matthews, 2005; Gallo, Espinosa de los Monteros, Shivpuri, 2009). Similarly, RCM researchers theorize that reserve capacity resources may also buffer against the effects of stress from discrimination (Gallo, Espinosa de los Monteros, & Shivpuri, 2009). Each of these reserve capacity resources do have known relationships with SES and perceived discrimination.

Mastery is the belief that life circumstances are the consequence of one's own actions (Ross & Sastry, 1999; Wallhagen, Strawbridge, Kaplan, & Cohen, 1994) and is negatively related to perceived racial discrimination (Broman, Mavaddat, & Hsu, 2000). Additionally, mastery is positively related to SES in African Americans (Chiriboga, & Small, 2008; Kiecolt & Hughes, 2009). Mastery has consistently been understood as an important stress buffer by creating a sense of control over stressors leading to problem

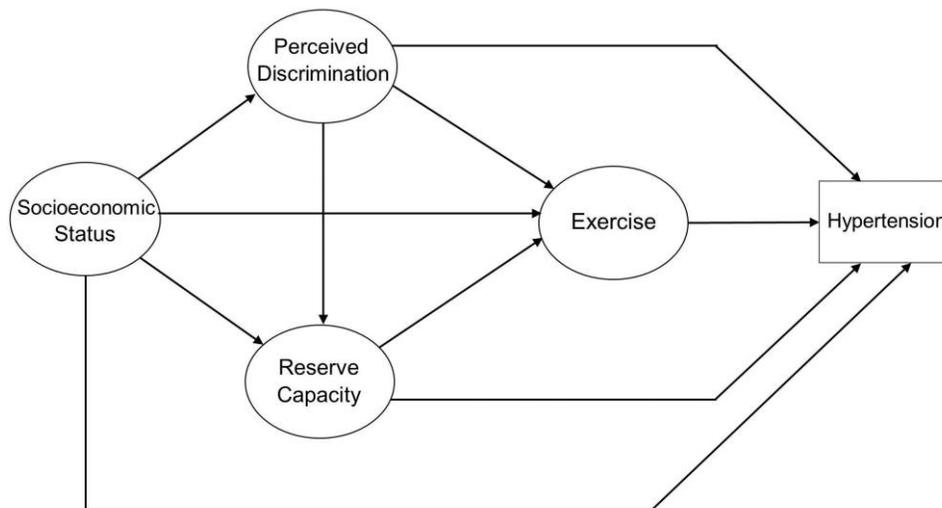
solving and action leading to better health outcomes (Mirowsky & Ross, 1990; Thompson, et al., 2007).

Optimism, the expectation that good rather than bad things will occur, is related to better psychological and physical health, especially during times of elevated stress (Scheier & Carver, 1985). Optimism is related to less distress and more resilience when dealing with life stressors in older African Americans (Baldwin, III, Okoh, & Cannon, 2011), as well as less withdrawal and more problem solving (Carver et al., 1992; Nes & Segerstrom, 2006; Taylor & Stanton, 2007). Lower optimism relates to poorer cardiovascular health (Raikkonen, Matthews, Flory, Owens, & Gump, 2000).

Self-esteem is a positive evaluation of one's self, confidence and self-acceptance and is associated with mental health (Schmit & Allik, 2005) and problem solving (Baumeister, Campbell, Krueger, & Vohs, 2003; Crocker & Park, 2004). Researchers have found that Blacks report higher self-esteem than other ethnic groups (Twenge & Crocker, 2002; Williams et al., 2009). Crocker and Major (1989) find low-SES individuals protect self-esteem by ascribing their status to prejudice, or by devaluing the metrics in which the group performs poorly (e.g., education level, job prestige). These self-protective strategies explain why low-SES predicts higher levels of self-esteem than high SES (Gray-Little & Hafdahl, 2000). However, perceived racial discrimination is associated with an internalization of the unfair treatment and social devaluation contributing to lower self-esteem (Jost & Hunyady, 2002). Self-esteem may be one reserve capacity resource that has a complex relationship with the two stressors of low SES and perceived discrimination.

### *The Present Investigation*

The purpose of the present study is to assess a RCM in older African Americans, as defined by interrelationships among SES, perceived discrimination, reserve capacity resources (mastery, optimism, self-esteem), health behavior (frequency and amount of exercise) to predict a self-reported hypertension diagnosis (see Figure 1). The proposed model will test whether exposure to low SES and perceived discrimination effects on hypertension occur indirectly through reserve capacity resources and health behavior rather than directly to explain health disparities in African Americans.



*Figure 1.* Direct and indirect pathways described in the Reserve Capacity Model.

### **Method**

#### *Participants and Procedures*

The data were collected in the Biopsychosocial Religion and Health Study (BRHS), a substudy of the Adventist Health Study – 2 (AHS-2) to assess the effects of

stress and religion on health in 10,988 Seventh-day Adventists (SDA; Lee, Morton, Walters, Bellinger, Butler, et al., 2009). Participants were initially a random sample of 21,000 individuals from AHS-2, a cohort study of 97,000 participants on lifestyle and health recruited from SDA churches (Butler et al., 2008). Participants were included if they were African American, 50 years of age or older and had data for all variables of interest. Of the 10,988 BRHS participants, 31% ( $N = 2467$ ) were African American. Based on the age criterion, participants were excluded because they were less than 50 years old ( $N = 569$  excluded), and if they were not active Seventh-day Adventists ( $N = 124$  excluded). Scores that were three and one-half or more standard deviations from the mean were deemed to be outliers, and removed ( $N = 98$  excluded). Lastly, after excluding cases with missing data on any single item indicator variable, or two or more items on a multi-item scale ( $N = 474$  excluded), the final sample size was 1202.

For those cases with missing data for just one item on a multi-item scale, these missing values were imputed in SPSS using expectation-maximization (EM) and kept as part of the final sample size of 1202. EM is an alternative form of maximum-likelihood that can be used for imputing missing data via an iterative algorithm that is based on the available data (Enders, 2003). EM is often used when the amount of missing data in a dataset is limited (< 5% of the dataset has missing data). Based on the EM algorithm, Little's MCAR test is used to determine if variables are missing data completely at random. The non-significant Little's MCAR test indicated the data was missing at random, Chi-Square = 9.21,  $df = 8$ ,  $p = .491$ . After the EM algorithm was executed, a new SPSS dataset was created that contained the imputed data for the final sample size of 1202.

### *Measures*

The hypothesized model included four latent constructs formed from two to three indicator variables. For all multi-item scales, scores represent the average of the respective items.

#### *Socioeconomic Status*

Educational attainment and annual income served as indicators for SES. Participants indicated their personal total pretax income during the last year on a seven-point scale ranging from less than \$10,000 to more than \$100,000 a year. Education was measured on a nine-point scale from grade school to doctoral degree.

#### *Discrimination*

Perceived discrimination was considered in terms of everyday and lifetime discrimination. Everyday discrimination was measured using the five-item Everyday Discrimination Scale (Forman, Williams, & Jackson, 1997). Respondents indicated how often they “were treated with less respect,” “were threatened or harassed in day-to-day life” or felt “people acted as if they were afraid of them.” Items were rated on a seven-point scale from “never” to “almost every day.” Reliability was good in the present sample ( $\alpha = .84$ ). For lifetime discrimination, participants indicated how many times (from 0 to 5 or more) they ever faced six common types of discrimination, such as being “unfairly fired from a job or unfairly denied a promotion?” Scale items were derived from the work of Kessler, Mickelson, and Williams (1999) and showed acceptable reliability ( $\alpha = .76$ ). Higher scores on both discrimination scales represent more perceived discrimination.

The reserve capacity latent factor was comprised of three indicator variables. *Mastery* was assessed with the four-item version of the Self-Mastery Scale (SMS; Pearlin & Schooler, 1978; Pudrovska et al., 2005). The SMS assesses personal control and how one deals with, and manages problems and items were rated on a seven-point scale ranging from 1 (not true) to 7 (very true). The SMS is a widely used measure and has shown good reliability and validity in studies of health and wellbeing (Marshall & Lang, 1990; Pearlin & Schooler, 1978;  $\alpha = .74$ ). *Optimism* was measured with the Life Orientation Test, revised (LOT-R; Scheier & Carver, 1994). The LOT is a six-item self-report of expectancies for positive and negative outcomes and items are rated on a seven-point scale ranging from 1 (not true) to 7 (very true). The LOT is also a widely used measure and with good reliability ( $\alpha = .71$ ). *Self-esteem* was measured with the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965). The RSES is a reliable and valid measure of global attitudes about the self that is widely used in studies of health and well-being ( $\alpha = .70$ ). It includes four items that were rated on a seven-point scale ranging from 1 (not true) to 7 (very true).

### ***Exercise***

The exercise health behavior latent factor was comprised of two indicators: exercise frequency and exercise duration. For exercise frequency, participants answered how many times a week they engage in vigorous physical activity on a seven-point scale (from never to six or more times per week). To assess exercise duration, participants indicated the average number of minutes they exercise each session on an eight-point scale (from none to more than one hour).

## *Hypertension*

Self-reported hypertension diagnosis was based on participant self-report. Specifically, participants responded yes or no to a question asking whether they have ever been diagnosed with hypertension by a physician.

## **Statistical Analyses**

Preliminary analyses were performed using the Statistical Package for the Social Sciences (SPSS 22 for Windows, Chicago IL, USA) and structural equation models were tested in EQS 6.1 (Bentler, 2012) using the maximum likelihood method of estimation. Structural equation modeling was conducted to test the study hypotheses based on a model including SES, perceived discrimination, reserve capacity, exercise health behavior and self-reported hypertension (see Figure 1). Model fit was assessed using multiple criteria. A nonsignificant  $\chi^2$  ( $p > .05$ ) is suggestive of good fit; however, since the  $\chi^2$  goodness-of-fit statistic is sensitive to large sample sizes, other fit indices were also used. These included the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA) along with its 90% confidence interval (CI) and the standardized root mean residual (SRMR). A CFI value  $> .95$  is evidence of a good fitting model. For RMSEA and SRMR and RMSEA, values  $< .08$  are considered indicators of good fit. Post hoc modifications of the hypothesized model were performed on the basis of results from the Wald Test (for dropping parameters) and the Lagrange Multiplier (LM) test (for adding parameters) if theoretically reasonable.

Direct and indirect effects were assessed through examination of standardized direct and indirect effect estimates, calculated using EQS based on the Sobel method (Sobel, 1982). Specifically, the statistical significance of the indirect effect, reflective of

a significant decrease in the direct influence of a predictor (e.g., SES) on an outcome (e.g., hypertension) in the presence of the hypothesized mediator(s), was evidence of mediation (MacKinnon et al., 2002). Given an initially significant path in a direct effect model, full mediation was established if the indirect effect of a predictor on an outcome, but not the direct effect, was significant. Partial mediation was indicated if both the indirect and direct effects were significant (Baron & Kenny, 1986).

## **Results**

### ***Sample Characteristics***

A total of 1202 participants were included in the study. The sample was mostly female (73.5%), with an average age of 63.71 years. Less than half the sample (41.02%) completed a college degree. Most participants were married or partnered (55%).

Based on a review of descriptive statistics for all variables, the data generally approximated a normal distribution (see Table 1). However, the two perceived racial discrimination variables were log-transformed to correct for kurtosis and positive skew. Prior to SEM analyses, the measurement model was examined via a confirmatory factor analysis (CFA) in EQS and results from the CFA suggested that the indicators used in the model are representative of their respective constructs. Intercorrelations among model variables are shown in Table 2.

Table 1. *Descriptive data for model variables (N = 1,202)*

	<i>M (SD)</i>	Min	Max	Skew	Kurtosis
Annual income	3.25 (1.53)	1.00	7.00	0.24	-0.60
Education	5.70 (1.94)	1.00	9.00	-0.39	-0.66
Everyday discrimination	1.86 (0.85)	1.00	6.00	1.53	3.14
Lifetime discrimination	0.51 (0.68)	0.00	5.00	2.25	6.57
Mastery	5.71 (1.25)	1.00	7.00	-1.02	0.64
Optimism	5.50 (1.27)	1.00	7.00	-0.64	-0.19
Self-esteem	5.93 (1.11)	1.00	7.00	-1.26	1.45
Frequency of vigorous activity	4.02 (2.10)	1.00	8.00	0.23	-0.94
Duration of vigorous activity	4.00 (2.22)	1.00	8.00	0.22	-1.03
	<i>N (%)</i>				
Hypertension	724 (60.23)				

Table 2. *Correlations among variables of interest (N = 1,202)*

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Education	—								
2. Annual income	.492***	—							
3. Everyday discrimination	.108***	.123***	—						
4. Lifetime discrimination	.183***	.188***	.399***	—					
5. Mastery	.125***	.136***	-.170***	-.069*	—				
6. Optimism	.135***	.093**	-.088**	.009	.271***	—			
7. Self-esteem	.085**	.044	-.196***	-.087**	.406***	.478***	—		
8. Frequency of vigorous activity	.141***	.136***	.005	.054	.100***	.081**	.092**	—	
9. Duration of vigorous activity	.153***	.169***	.066*	.088**	.096**	.088**	.055	.501***	—
10. Hypertension (diagnosed)	-.148***	-.166***	-.041	-.029	-.066*	-.073*	-.009	-.162***	-.150***

*Notes.* Hypertension coded 1 = diagnosed and 0 = not diagnosed. All coefficients involving hypertension are point biserial correlations.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

### *SEM Results*

Preliminary data screening revealed a violation of multivariate normality.

Therefore, the ML robust test statistics are reported, which correct for non-normal data. SEM results demonstrate that the hypothesized model provides an adequate fit to the data, robust CFI = .959, S-B $\chi^2$ (27) = 93.39,  $p < .001$ , robust RMSEA = .045, 90% CI (.035, .055), SRMR = .037. However, the Wald test indicated that the impact of deleting the non-significant paths from discrimination to exercise improved the overall fit CFI = .959, S-B $\chi^2$ (28) = 94.37,  $p < .001$ , robust RMSEA = .044, 90% CI = .035, .054), SRMR = .037. Further, Wald indicated that reserve capacity to hypertension be dropped to improve the overall fit CFI = .959, S-B $\chi^2$ (29) = 95.83,  $p < .001$ , robust RMSEA = .044, 90% CI = .034, .054), SRMR = .039. Additionally, Wald indicated that the path from discrimination to hypertension be dropped, CFI = .958, S-B $\chi^2$ (30) = 98.11,  $p < .001$ , robust RMSEA = .43, 90% CI = .034, .053), SRMR = .040.

Furthermore, results of the Lagrange multiplier test indicated that the model fit would be improved if SES was specified to have a direct effect on hypertension though the RCM proposes that SES does not directly operate on health but only operates through reserve capacity mediators. However, the path was added and the re-estimated model showed a significantly improved fit, robust CFI = .970, S-B $\chi^2$ (29) = 77.99,  $p < .001$ , robust RMSEA = .038, 90% CI (.028, .048), SRMR = .034. Final model with path standardized path coefficients is shown in Figure 2.

Examination of path coefficients in the final model (see Figure 2) yields general support to the hypotheses. SES was positively related to reserve capacity ( $\beta = .303$ ,  $p < .001$ ) and exercise health behavior ( $\beta = .289$ ,  $p < .001$ ). Further, perceived discrimination

was negatively related to reserve capacity ( $\beta = -.369, p < .001$ ), but not exercise health behavior ( $\beta = .056, p = .878$ ). However, the indirect effect from SES to hypertension through reserve capacity and exercise was significant ( $\beta_{\text{indirect}} = -.052, p = .001$ ), and the indirect effect from perceived discrimination through reserve capacity and exercise to hypertension was also significant ( $\beta_{\text{indirect}} = .007, p = .039$ ). Standardized and unstandardized coefficients for all direct and indirect effects are shown in Table 3.

Table 3. *Path coefficients from final revised structural equation model*

	Unstandardized	SE	Standardized
Direct effects			
SES → Discrimination	0.07***	0.01	.333
SES → Reserve Capacity	0.20***	0.03	.303
Discrimination → Reserve Capacity	-1.20***	0.21	-.369
SES → Exercise	0.34***	0.06	.289
Reserve Capacity → Exercise	0.19*	0.08	.107
SES → Hypertension	-0.06***	0.01	-.170
Exercise → Hypertension	-0.05***	0.01	-.167
Indirect effect			
SES → Reserve Capacity	-0.08***	0.02	-.123
SES → Exercise	0.02*	0.01	.019
Discrimination → Exercise	-0.23*	0.10	-.039
SES → Hypertension	-0.02**	0.01	-.052
Discrimination → Hypertension	0.01*	0.01	.007
Reserve Capacity → Hypertension	-0.01*	0.01	-.018

\*  $p < .05$ ;  $< p < .01$ ; \*\*\*  $p < .001$ .

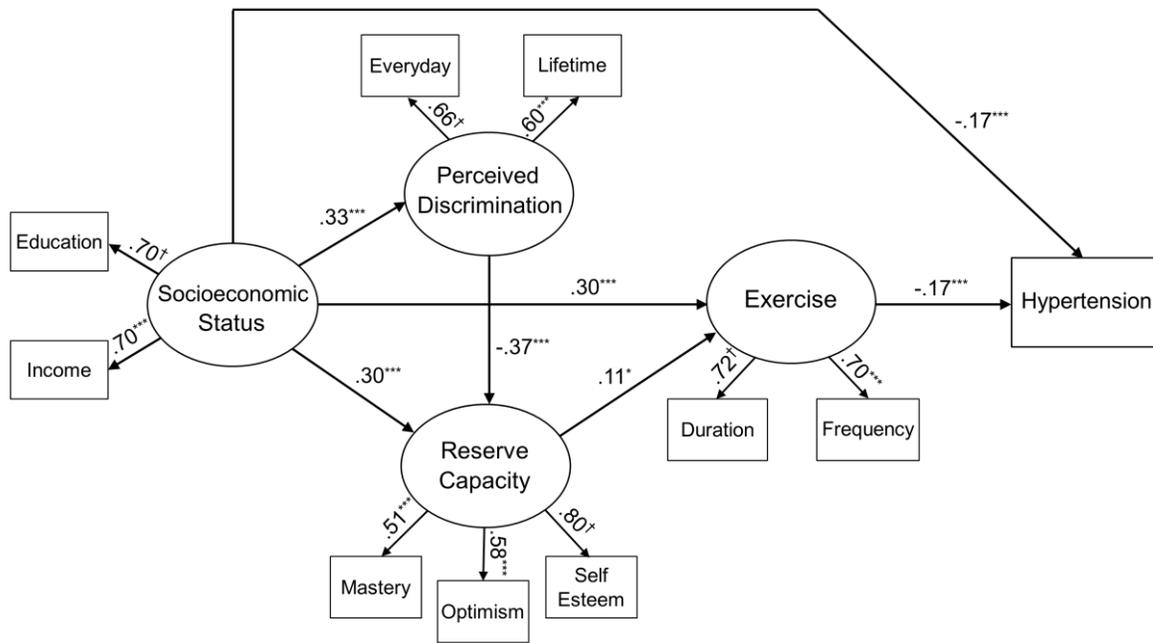


Figure 2. Final model with standardized path coefficients.

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ ; † pathway set to 1.0.

## Discussion

The current study tested the RCM (Gallo & Matthews, 2003) in older African Americans as a framework for understanding how social stressors predict cardiac health via a health behavior pathway. This study adds to and is consistent with other literature on the RCM (Gallo, 2009; Gallo, Bogart, Vranceanu, & Matthews, 2005; Gallo, Espinosa de los Monteros, Ferent, Urbina, & Talavera, 2007; Gallo, Espinosa de los Monteros, & Shivpuri, 2009; Gallo & Matthews, 2003; Gallo, Penedo, Espinosa de los Monteros, & Arguelles, 2009; Matthews & Gallo, 2011; Matthews & Gallo, 2011; Matthews, Räikkönen, Gallo, & Kuller, 2008). Specifically, this is the first study examining the RCM with a large sample of older African Americans. This is important because it adds generalizability to the model and tests the model in African Americans who have been

historically underrepresented in health psychology research (Myers, 2009, Williams, 1999). Further, this study tested the RCM using two social stressors believed to be uniquely important to African Americans. African Americans tend to report the highest levels of perceived discrimination and are also more likely to have lower SES than other groups (Williams, 1999; Ostrove & Feldman, 1999; Scuteri, Vuga, Najjar, Mehta, Everson-Rose, et al., 2008). Further, including perceived discrimination as a stressor in RCM studies has been suggested by Gallo (Gallo, 2009; Matthews & Gallo, 2011).

Most importantly, this study demonstrated that modifiable psychosocial factors (e.g., reserve capacity) that can be improved, buffer the effects of social stressors on cardiac health. This is very important because modifiable factors are amenable to treatments and/or interventions that can focus on improving effect modifiers to alleviate health disparities. Additionally, modifiable factors can be a focus of primary, secondary, and tertiary levels of prevention to improve health in African Americans.

### **Implications, Limitations, and Future Research**

Hypertension is a problem in African Americans and it has been linked to discrimination and low SES. The current study examined this health disparity to determine whether the intrapersonal factors in the RCM are the underlying mechanism that explains the health disparity via psychosocial and health behavior pathways. Findings from the current study support a health behavior pathway from low SES to hypertension, and partially support a health behavior pathway from perceived discrimination to hypertension. These findings provide support for the RCM as an explanatory model for predicting hypertension from social stressors via a health behavior

framework. Additionally, perceived discrimination does add to the stress of poverty to reduce reserve capacity leading to worse health outcomes in middle to late life African Americans.

Despite the significance of the findings of this study, some limitations should be noted. The cross-sectional design of this research disallows inferences regarding the nature of the cause and effect relationship of reserve capacity and hypertension. Additionally, the study included a dichotomous and self-reported cardiac health endpoint, which is limited in explaining the degree of hypertension risk. Further, the current study assessed a subset of reserve capacity resources, compared to past RCM studies which included interpersonal resources (e.g., social support).

Future studies should include longitudinal models testing the RCM. Studies using this design could offer support for the RCM as a stress-buffering mechanism that can potentially operate over time. Future studies might also consider additional or different reserve capacity resources at the interpersonal or community support level. Further, studies testing the RCM would add to the extant literature by including years of perceived discrimination, years of low-SES, and years of hypertension, in order to further establish the utility of the RCM so that interventions can be developed and tested.

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**APPENDIX A**

**LIFETIME DISCRIMINATION SCALE**

In the following questions, we are interested in the way other people have treated you or your beliefs about how other people have treated you. Can you tell us if any of the following has ever happened to you:

	How many times has this happened during your lifetime?					
	Never	1	2	3	4	5+
1. At any time in your life, have you ever been <u>unfairly</u> fired from a job or unfairly denied a promotion?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. For <u>unfair</u> reasons, have you ever not been hired for a job?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Have you ever been unfairly stopped, searched, questioned, physically threatened or abused by the police?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Have you ever been <u>unfairly</u> discouraged by a teacher or advisor from continuing your education?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Have you ever been <u>unfairly</u> prevented from moving into a neighborhood because the land-lord or a realtor refused to sell or rent you a house or apartment?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Have you ever been <u>unfairly</u> denied a bank loan?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## APPENDIX B

### EVERYDAY DISCRIMINATION SCALE

In your day-to-day life, how often do any of the following things happen to you?

---

	Almost Every Day	At Least Once A Week	A Few Times A Month	A Few Times A Year	Less Than Once A Year	Never
1. You are treated with less courtesy or respect than other people.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. You receive poorer service than other people at restaurants or stores.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. People act as if they think you are not smart.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. People act as if they are afraid of you.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. You are threatened or harassed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

---

## APPENDIX C

### SELF-MASTERY SCALE

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is True or False as it pertains to you personally. Some of the items are very similar—by intention—so your answers can be compared to people in other studies who are answering the same questions.

	Not True		Somewhat True		Very True		
	↓		↓		↓		
1. I have little control over the things that happen to me.	<input type="radio"/>						
2. I There is really no way I can solve some of the problems I have.	<input type="radio"/>						
3. I often feel helpless in dealing with the problems of life.	<input type="radio"/>						
4. Sometimes I feel that I am being pushed around in life.	<input type="radio"/>						

## APPENDIX D

### LIFE ORIENTATION TEST, REVISED

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is True or False as it pertains to you personally. Some of the items are very similar—by intention—so your answers can be compared to people in other studies who are answering the same questions.

	Not true		Somewhat true			Very True	
	↓		↓			↓	
1. In uncertain times, I usually expect the best.	<input type="radio"/>						
2. If something can go wrong for me, it will.	<input type="radio"/>						
3. I'm always optimistic about my future.	<input type="radio"/>						
4. I hardly ever expect things to go my way.	<input type="radio"/>						
5. I rarely count on good things happening to me.	<input type="radio"/>						
6. Overall, I expect more good things to happen to me than bad.	<input type="radio"/>						

## APPENDIX E

### ROSENBERG SELF-ESTEEM SCALE

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is True or False as it pertains to you personally. Some of the items are very similar—by intention—so your answers can be compared to people in other studies who are answering the same questions.

	Not true		Somewhat true				Very True
	↓		↓				↓
1. I take a positive attitude toward myself.	<input type="radio"/>						
2. On the whole I am satisfied with myself.	<input type="radio"/>						
3. I certainly feel useless at times.	<input type="radio"/>						
4. At times I think I am no good at all.	<input type="radio"/>						

**APPENDIX F**  
**EXERCISE ITEMS**

**Exercise Frequency**

How many times per week do you usually engage in regular **vigorous** activities, such as brisk walking, jogging, bicycling, etc.; long enough or with enough intensity to work up a **sweat**, get your **heart thumping**, or get **out of breath**?

- Never engage in activities this vigorous
- Less than once per week
- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 or more times per week

**Exercise Duration**

On average, how many minutes do you exercise each session? Choose the best answer.

- None
- 10 minutes or less
- 11-20 minutes
- 21-30 minutes
- 31-40 minutes
- 41-50 minutes
- 51-60 minutes
- More than 1 hour