

ABSTRACT

Title of Document: TAKING RACISM TO HEART: THE EFFECTS OF RACE-RELATED STRESS ON CARDIOVASCULAR REACTIVITY FOR BLACK/WHITE BIRACIAL PEOPLE

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This within-groups experimental study examined whether two race-related stressors—social invalidation and discrimination from family—affect cardiovascular reactivity for Black/White Biracial adults ($N = 60$). This study also tested whether racial centrality moderates the link between race-related stress and cardiovascular reactivity. A mixed model was used to analyze differences in cardiovascular reactivity across control and racial stressor conditions. Findings revealed that discussing experiences of discrimination from family lowered systolic blood pressure. In contrast, in the recovery period following discussion of discrimination from family, systolic blood pressure increased. Social invalidation did not have any effects on cardiovascular reactivity. There was not support for the moderating role of racial centrality in the relationship between racial stress and cardiovascular reactivity.

TAKING RACISM TO HEART: THE EFFECTS OF RACE-RELATED STRESS ON
CARDIOVASCULAR REACTIVITY FOR BLACK/WHITE BIRACIAL PEOPLE

By

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Chapter 1

INTRODUCTION

In the year 2000, the U.S. census first allowed American citizens to claim more than one race. Since then, the Multiracial population (i.e., individuals claiming more than one race) has increased by 35% and in 2010, nine million people reported being more than one race (U.S. Census Bureau, 2010). The increasingly blended racial demographics of America make Multiracial people an important demographic group to investigate (Cheng & Lee, 2009). Even so, research on Multiracial people has been limited. Many researchers have noted the lack of empirical literature available on Multiracial people (Edwards & Pedrotti, 2008; Miville, Constantine, Baysden, & So-Lloyd, 2005; Shih & Sanchez, 2005). Furthermore, much of the literature is qualitative in nature and focuses on identity development (Miville et al., 2005). Moreover, research is needed that examines the relationship between Multiracial status and health outcomes, as Multiracial people experience an accumulation of race-related stress stemming from both their Multiracial and minority statuses (Shih & Sanchez, 2005). Additionally, having an identity that differs from the racial status quo is likely to exact a physiological and psychological toll on Multiracial individuals (Gillem & Thompson, 2004).

Although Multiracial people may be at risk for negative health outcomes related to their race, no physiological studies exist that investigate Multiracial status and health outcomes (Edwards & Pedrotti, 2008). The few studies examining the relationship between Multiracial-specific racial stressors and well-being have used self-report measures and correlated race-specific stressors with various psychological measures of adjustment, including self-esteem (Salahuddin & O'Brien, 2011), depression (Salahuddin

& O'Brien, 2011; Sanchez, Shih, & Garcia, 2009) and anxiety (Coleman & Carter, 2007). However, individuals completing self-report measures may not describe experiencing stress, even though their bodies are undergoing physiological responses to stressors (Jorgensen, Gelling, & Kliner, 1992; Peters, Butler, Gjini, Yeragani, & Boutrus, 2011). Additionally, on self-report measures, experiences of discrimination are often underreported (Clark, Anderson, Clark, & Williams, 1999). Last, self-report measures have less internal validity regarding the relationship between race-specific stressors and levels of stress.

To address these gaps in the literature, the present study examined whether race-specific stressors elicit physiological stress responses in a sample of Multiracial individuals, specifically Black/White Biracial¹ people. Furthermore, this study examined whether physiological stress persisted after race-related stressors were removed. Two race specific stressors were induced: social invalidation and racial discrimination from family. These race-specific stressors were chosen because they have a potent effect on the psychological and physiological well-being of Multiracial individuals (Miville et al., 2005; Rockquemore & Laszloffy, 2003; Salahuddin & O'Brien, 2011). Moreover, out of the various racial combinations that comprise the Multiracial category, Black/White Biracial people were chosen as participants in this study because these race-related stressors are particularly salient for this Multiracial subset (Khanna, 2010; Rockquemore & Laszloffy, 2003). Also examined was racial centrality as a possible moderator of the relationship between race-related stress and physiological stress responses.

¹ The term "Black/White Biracial" is used throughout this paper to refer to individuals who have one Black and one White biological parent, even though these individuals may claim various racial identifications.

Past Research Examining Experiences of Racism and Physiological Stress

Although the relationship between laboratory analogues of race-related stress and physiological distress has never been examined for Biracial people, this relationship has been investigated for Black people (Armstead, Lawler, Gordon, Cross & Gibbons, 1989; Guyll, Matthews, & Bromberger, 2001; Lepore et al., 2006; Merritt, Bennett, Williams, Edwards, & Sollers, 2006; Peters et al., 2011). To induce race-related stress, these studies employed various methods. Some studies have used racially controversial film clips or images (Armstead et al., 1989; Morris-Prather et al., 1996; Peters et al., 2011) while others have used racially-provocative speaking tasks (Lepore et al., 2006; Merritt et al., 2006). Physiological indices of stress included blood pressure, heart rate, heart rate variability, and cortisol levels (Peters et al., 2011; Richman & Jonassaint, 2008).

Many studies found relationships between laboratory induced race-related stressors and indices of physiological stress. For example, in one study, following a racial stressor, Black women had higher diastolic blood pressure reactivity than White women (Lepore et al., 2006). Another study found that blood pressure increased for Black participants viewing racist stimuli but not anger-provoking or neutral stimuli (Armstead et al., 1989). Similarly, cardiovascular and nervous system reactions for Black participants increased following images of racially noxious image (Peters et al., 2011). Last, subtle mistreatment ambiguously related to race was found to increase diastolic blood pressure for Black people but not for White people (Guyll, Matthews & Bromberger, 2001). Furthermore, Black participants who related mistreatment to race had higher cardiovascular reactivity. Moreover, many studies have found that physiological stress responses to race-related stressors persisted even when the race-related stressor is

removed (e.g., Fang & Meyers, 2001; Lepore et al., 2006; McNeilly et al., 1995).

Continued alterations in physiological stress response into a recovery period suggest that the effects of racism on health linger, indicating that racism may affect health in the long term.

Acute stress responses to race-related stressors in the laboratory are theorized to underlie long-term differences in rates of hypertension and cardiovascular disease between Blacks and Whites (Clark et al., 1999; Williams & Williams-Morris, 2000). Racism affects physiological reactivity and, over time, the accumulation of physiological stress responses leads to chronic health conditions (Clark et al., 1999; Gyll et al., 2001). Clark et al.'s (1999) biopsychosocial model (discussed later) explores the relationship between acute stress responses and physiological health conditions in more depth.

The relationship between race-related stressors and physiological distress has been supported for Black people, but not for Biracial people. The potential for Biracial people to experience long term health conditions due to experiences of race-related stress is feasible, as Biracial people experience an accumulation of race-related stress related to both their Multiracial and minority status and are susceptible to discrimination from both majority and minority groups (Shih & Sanchez, 2005). These layers of discrimination might result in chronic health conditions for Biracial individuals. The present study used a laboratory-experiment to investigate the relationship between race-related stressors and acute physiological stress responses for Biracial individuals to advance our understanding of racial stress and health disparities for Biracial people.

Theory

The current study is grounded in two theories: the multidimensional model of Biracial identity (Rockquemore & Brunsma, 2001), and the biopsychosocial model (Clark et al., 1999). The multidimensional model of Biracial identity indicates that experiences of social invalidation affect the health of Multiracial individuals. Various studies have supported the proposition that social invalidation affects psychological health for Multiracial individuals (e.g., Buckley & Carter, 2004; Coleman & Carter, 2007; Sanchez, 2010), yet no studies have examined how social invalidation influences physical health.

The biopsychosocial model links acute physiological stress experienced in the laboratory to real-life experiences of stress (Clark et al., 1999). Additionally, the accumulation of acute experiences of stress is linked to long-term health decline. In this way, acute laboratory stress responses are theorized to relate to long-term health problems, such as cardiovascular disease and hypertension. Additionally, the model dictates that various psychological and behavioral factors influence the relationship between experiences of race-related stress and health. Accordingly, in the current study, racial centrality is a psychological factor that was examined as a moderator in the relationship between race-related stressors and health.

Black/White Biracial People

Although a number of past studies have combined different Multiracial groups (Miville et al., 2005, Salahuddin & O'Brien, 2011), Multiracial individuals have different experiences depending on their specific racial combination (Ho, Sidanius, Levin, & Banaji, 2011; Khanna, 2011; Mihoko Doyle, & Kao, 2006). Multiracial people of certain

racial combinations face different challenges than others. Black/White Biracial people are a commonly investigated subset of the Multiracial population because this group is confronted with one of the most difficult challenges: integrating two socially and culturally distal racial groups (Root, 1992).

Of all Multiracial groups, Black/White Biracial people may face the most potent race-related stressors as they are judged against a historical context of racial tensions originating during slavery (Rockquemore & Laszloffy, 2003). As a result, they possess a racial combination that society deems most problematic (Gillem & Thompson, 2004). Because these individuals are a product of unions that continue to be viewed as wrong (O'Donoghue, 2004; Rockquemore & Laszloffy, 2003), they may face high amounts of stress pertaining to their racial heritage.

Additionally, Black/White Biracial people may experience significant stress related to the race-related stressors of interest, social invalidation and racial discrimination from family. As a result of the one-drop rule, which dictates that one-drop of Black blood makes one Black, Black/White Biracial people face overwhelming societal pressure to identify with their minority group and are particularly vulnerable to social invalidation (Coleman & Carter, 2007). Additionally, because Black/White mixed race individuals are the product of a union of two of the most socially and culturally distant racial groups, Black and/or White family members are likely to discriminate against a family member who partially identifies with the opposing racial group. Because of the vulnerability of Black/White Biracial people to an array of race-related stressors, it was important to identify the extent to which these race-related stressors produce physiological stress for this group.

Stress for Biracial People

Biracial people are subject to many race-related stressors, including obstacles in identity development, alienation, isolation, and discrimination from both minority and majority groups for both their minority and Multiracial statuses (Brackett et al., 2004; Miville et al., 2005; Salahuddin & O'Brien, 2011; Shih & Sanchez, 2005). Indeed, the multitude of stressors that Multiracial people face prompted early theorists to believe that Multiracial people are more vulnerable to psychological distress than their monoracial counterparts (Stonequist, 1937). Yet later theorists proposed that the Biracial identification is not inherently distressing, and is made so because of the essentialist and racialized society that Biracial people inhabit (Root, 1992; Rockquemore, Brunnsma, & Delgado, 2009). The racial status quo distances racial groups as separate and hierarchical, and being outside of the established norms poses an emotional and psychological toll on Biracial individuals (Gillem & Thompson, 2004).

Social invalidation. One harmful stressor that Biracial people experience is social invalidation. Social invalidation is defined as the invalidation of one's racial identity by others and applies to experiences in which others perceive one as a race of which they do not personally identify (Lou, Lalonde & Wilson, 2011; Rockquemore & Laszloffy, 2003). Social invalidation is characterized by conflict between self-definition and imposed definitions (Nakashima, 1992) and is common in a society that views racial groups as dichotomous (Rockquemore & Laszloffy, 2003; Miville et al., 2005). Social invalidation detrimentally affects perception of self, psychological well-being, and overall health (Nishimura, 2004; Rockquemore & Brunnsma, 2002; Rockquemore & Laszloffy, 2003). Some theorists have proposed that social invalidation is the most

difficult stressor faced by Multiracial individuals (Rockquemore & Laszloffy, 2003). Consequently, social invalidation was included as a stressor in this study.

Racial discrimination from family. Another deleterious source of race-related stress for Multiracial individuals is discrimination from family. Family can be an important source of strength for Multiracial individuals experiencing racial identity struggles (Miville et al., 2005); thus, when family members discriminate against Multiracial individuals, they not only fail to play their role in mitigating race-related struggles, but instead exacerbate these struggles. Miville et al. (2005) asserted that the most difficult type of racism that Multiracial people face is from family. Discrimination from family relates inversely to self-esteem and social connectedness, and positively to depression and social anxiety (Coleman & Carter, 2007; Salahuddin & O'Brien, 2011). Because of the potent effects of familial discrimination, it was included as a race-related stressor in this study to assess the degree to which discrimination from family produces physiological stress responses in Black/White Biracial people.

Racial Centrality

Past research examining the relationship between Multiracial background and health outcomes has disregarded factors that might influence the magnitude and strength of this relationship (Shih & Sanchez, 2005). Consequently, the present study investigated racial centrality as a possible moderator between Multiracial status and health outcomes. Racial centrality is defined as the importance one places on one's racial group membership; it is the degree to which one normatively defines one's self in terms of race (Sellers, Rowley, Chavous, Shelton, & Smith, 1997). Edwards and Pedrotti (2008) posited that the harmfulness of race-related stressors on Biracial individuals will depend

on the importance of one's racial identity. Accordingly, racial centrality is an important measure of within-group differences that might moderate the relationship between experience of race-related stressors and physiological distress for Biracial individuals.

Although racial centrality has never before been examined for Multiracial individuals, it has been used in examining the relationship between experiences of discrimination and health outcomes for Black people. When examining the role of racial centrality for Black people, research provides contradictory evidence. Some researchers suggested that high levels of racial centrality might make one more susceptible to experiences of discrimination (Burrow & Ong, 2010; Caldwell, Zimmerman, Bernat, Sellers, & Notaro, 2002; Sellers & Shelton, 2003), as aligning one's self with a stigmatized group can make an individual more vulnerable to discriminatory attacks. Other researchers, however, proposed that racial centrality may shield one from being affected by discrimination, as having high racial centrality may promote a strong sense of one's identity that protects from internalizing experiences of discrimination (Sellers, Caldwell, Schmeelk-Cone, & Zimmerman, 2003; Sellers & Shelton, 2003). For Multiracial people, who experience frequent invalidation of their racial identity, high racial centrality may not relate to a strong sense of one's racial identity, but may still relate to vulnerability to discrimination (Edwards & Pedrotti, 2008).

Summary

In sum, the present study had three aims. First, I examined whether race-specific stressors (i.e., social invalidation and discrimination from family) for Black/White Biracial people produced changes in cardiovascular reactivity. Second, I examined whether physiological responses to race-related stressors persisted after the stressor was

removed. Last, I investigated the degree to which racial centrality moderated the relationship between race-related stressors and physiological responses.

Chapter 2

LITERATURE REVIEW

The purpose of this study was to examine whether race specific stressors (i.e., social invalidation and discrimination from family) affect cardiovascular reactivity in Black/White Biracial individuals. The present study also examined whether changes in cardiovascular reactivity persisted when the race-related stressor was removed. Additionally, racial centrality was examined as a moderator in the relationship between experiences of race-related stressors and physiological responses.

This review summarizes two relevant theories: the multidimensional model of Biracial Identity and the biopsychosocial model. Second, an examination of past empirical research on experiences of racism and physiological stress responses is presented. After that, a short history of Black/White Biracial people in America is offered to provide context for the present sample. Next, empirical and theoretical research on race-related stressors for Biracial individuals, including social invalidation and discrimination from family, is presented. Empirical research on racial centrality and its relationship to discrimination and well-being are also described. The hypotheses for this study will be stated at the end of this chapter.

Several inclusion and exclusion criteria were used in the selection of empirical articles for this review. This review includes articles that examine race-related challenges for Black/White Biracial people. Studies that focused exclusively on race-related experiences of other Biracial groups were excluded, as race-related experiences differ across Biracial denominations (Khanna, 2011). Studies that examined the race-related experiences of a diverse group of Biracial individuals were included, including those

studies that did not include Black/White Biracial individuals, as these types of studies seek to assess commonalities across various Biracial groups.

Two sections of this review relied on research on Black people because of the lack of empirical research on Multiracial individuals. These sections include the “race-related stressors and physiological stress response” and “racial centrality” sections. Although Black/White Biracial people may have different experiences of discrimination than Black people (Brackett et al., 2006), because Black/White Biracial individuals often are perceived as Black (Khanna, 2010), their experiences of discrimination are more similar to those of Black people than of any other racial group. Any research examining physiological responses to race-related stressors and racial centrality for non-Blacks was excluded.

The review was limited to research on people in the continental United States because the meaning and significance of race differs across contexts. All studies were identified from computer searches on PsycINFO and JSTOR, which are comprehensive electronic databases including articles in the fields of psychology and sociology.

Theory

The current study was grounded in Rockquemore and Brunnsma’s (2001) multidimensional model of Biracial identity. According to this model, the most stressful aspect of Biracialism is being validated in one’s identity choice. Multiracial people experience much external pressure to racially identify in certain ways, and for some Multiracial people, there is a mismatch between racial identity, an individual’s understanding of their identity, and racial identification, how others racially categorize an individual (Rockquemore & Brunnsma, 2002; Rockquemore et al., 2009). Social

invalidation occurs when external forces label a Biracial person differently than how they identify (Rockquemore & Brunσμα, 2001; Rockquemore & Brunσμα, 2002). According to the multidimensional model of Biracial identity, one's experience of social invalidation will have implications for psychological well-being and overall health. The current study considered this relationship by examining whether acute social invalidation produces cardiovascular stress responses.

Furthermore, in conceptualizing the implications of the study, the biopsychosocial model provided a useful framework. This model links experiences of race-related stressors, such as social invalidation and discrimination from family, with long-term health outcomes. The biopsychosocial model postulates that physiological stress responses to race-related stressors in the laboratory are linked to long-term health outcomes (Clark et al., 1999). Experiences of race-related stress produce exaggerated physiological responses, which, over time, influence long-term health, such as rates of hypertension and cardiovascular disease. Furthermore, the model proposes that psychological and behavioral factors influence the relationship between exposure to race-related stressors and experiencing stress. Racial centrality, which relates to one's psychological orientation to one's racial group, can be thought of as a potential psychological moderator based on the biopsychosocial model. Thus, the biopsychosocial model is an apt framework for the current study as findings of this study may have implications for long-term health outcomes of Black/White Biracial individuals.

Race-Related Stressors and Physiological Stress Response

Experiences of racism have a palpable effect on physical health (e.g., Armstead et al., 1989; Lepore et al., 1006; Sutherland & Harrell, 1986). Indeed, racist experiences

may partially underlie differences in rates of cardiovascular disease and hypertension between Blacks and Whites (Clark et al., 1999). Multiracial individuals evince higher rates of cardiovascular disease than Monoracial individuals (U.S. Department of Health and Human Services, 2010), and it is feasible that experiences of racism underlie health disparities for Multiracial individuals as well.

Although the relationship between experiences of racism and physiological stress has never been investigated for Multiracial individuals, an array of studies has illustrated the physical effects of racist experiences for Black people. These studies are included in the current section of the review. Specifically, this section includes all studies that employ analogues of race-related stressors in the laboratory and measure acute physiological responses, as these methods are parallel to methods utilized in the present study. In reviewed studies, race-related stressors are induced in some way (e.g., debating with a racist, evoking stereotype threat conditions, speech task involving experiences of discrimination, racially noxious film clips) and physiological stress responses (e.g., facial muscle reactivity, blood pressure, heart rate, heart rate variability) are measured. Physiological responses to race-related stressors are compared to physiological stress responses in a control condition (i.e., non-racial stressor) or to a control group (i.e., Whites) to determine whether race-related stressors produce changes in physiological stress responses for Black people.

Throughout the summary of the empirical research on racism and physiological stress (below), various measures of physiological reactivity are mentioned. Measures include facial muscle activity, systolic blood pressure, diastolic blood pressure, heart rate, digital blood flow, and heart rate variability. Facial muscle reactivity refers to activity in

the corrugator, which is a muscle group in the face that is associated with frowning. Increased corrugator activity indicates grief (Jones, Harrell, Morris-Prather, Thomas, & Omowale, 1996; Sutherland & Harrell, 1986). The term “cardiovascular reactivity” is used to refer to changes in systolic blood pressure, diastolic blood pressure, or heart rate. Systolic and diastolic are two components of blood pressure. Systolic and diastolic blood pressure both refer to the pressure exerted by blood on arteries, yet systolic blood pressure is measured when the heart is beating and diastolic blood pressure is measured when the heart is relaxing. Heart rate is the number of times the heart beats in a minute. Elevated blood pressure or heart rate can indicate stress, while attenuated heart rate or blood pressure in response to stressors can be indicative of cardiovascular health (American Heart Association, 2011; Kamarck, Manuck, & Jennings, 1990). Digital blood flow is a measure of the rate that blood flows through the heart and the body. As stress increases, blood flow decreases (Franklin Institute, 2004). Last, heart rate variability refers to changes in number of heartbeats over time. Heart rate variability underlies a person’s ability to adapt to stressful situations and adjust physiological response based on cues from a given situation. It relates to a person’s ability to cope with stress, and higher heart rate variability is associated with positive health outcomes (Appelhans & Luecken, 2006).

Empirical research examining race-related stressors and physiological stress responses for Black people. Sutherland and Harrell (1986) investigated the effects of neutral, racially noxious, and fearful imagery on physiological reactivity in Black women. Participants included sixty-two Black undergraduate women, with a mean age of 19.6 (SD not reported). Participants were instructed to imagine themselves in three

different scenes: one depicted a racially noxious event, the other, a fearful event, and the third, a neutral event. Findings revealed that racially noxious and fearful scenes elicited similar increases in heart rate and facial muscle tension, as compared to the neutral scene.

A quantitative study was conducted that examined the effect of racial stressors and anger-evoking stressors on blood pressure in Black college students (Armstead et al., 1989). Participants included 27 students recruited from a Midwestern university. Fifteen students were female and 12 were male. The mean age of participants was 21.41 (SD=2.62 years). In the anger-provoking condition, participants viewed anger-provoking film clips, while in the racist condition, participants viewed racist film clips. Findings indicated that both the anger-provoking and racist stressors produced increases in cardiovascular reactivity, yet the racial stressor increased blood pressure to a greater than degree than the anger-provoking stressor.

McNeilly et al. (1995) examined the effects of racial stressors and social support on cardiovascular reactivity in African American women. Participants included 30 African-American women, ranging in age from 18-33. All participants resided in North Carolina at the time of the study. In the racism condition, participants debated controversial racial material with a racist White confederate. In the non-racist condition, participants debated controversial non-race-related material with a White confederate. Participants in the racism condition displayed higher cardiovascular reactivity and reported a greater emotional response than those in the non-racist condition. Additionally, participants in the racial stressor condition displayed higher cardiovascular reactivity during the recovery period than those in the non-racial stressor condition.

A quantitative study was conducted that examined the effects of subtle and blatant racism on cardiovascular and facial muscle reactivity in Black women (Jones, Harrell, Morris-Prather, Thomas, & Omowale, 1996). Participants included 60 African-American women attending a predominately Black college in the Southeastern United States. Half of the participants were told to imagine both blatant and less-blatant racially noxious scenes, while the other half viewed clips of these blatant and less-blatant racist scenes. In the blatantly racist condition, participants imagined or watched an African-American woman get unjustly accused of shoplifting by a White security guard, while other White people made disparaging remarks. In the subtly racist condition, participants imagined or watched a White apartment owner steering two African-American students to lower quality units. Findings indicated that digital blood flow decreased and facial muscle activity increased during the blatant and less-blatant scenes for both the imagining and viewing conditions. An increase in pulse rate was found for only the blatantly racist condition, in both the imagining and viewing conditions.

Increases in blood pressure, following race-related stressors, may be associated with underperformance for Blacks. In one study, blood pressure was found to moderate the relationship between stereotype threat and underperformance (Blascovich, Spencer, Quinn, and Steele, 2001). Stereotype threat is when the fear of confirming negative stereotypes about one's race, such as intellectual inferiority, leads to underperformance. This race related stressor was induced by making race salient for participants before a test of intellectual ability. Participants included 20 African-American and 19 European-American students. Results indicated that Black participants in the stereotype threat condition exhibited higher blood pressure and lower performance than Blacks in the no

threat condition and Whites in both conditions. Furthermore, elevated blood pressure levels for Blacks in the threat condition persisted for five minutes after the task ended.

Fang and Meyers (2001) examined whether hostility moderated the effects of racial stressors on cardiovascular reactivity in African American and White men. Participants included 31 White and 31 African American male undergraduate students. Participants ranged in age from 18 to 25 ($M=19.7$). All participants were recruited from an introduction to psychology course. In the anger-provoking condition, participants viewed anger-provoking film clips, while in the racist condition, participants viewed racist film clips. Film clips were different for Black and White participants to ensure that participants could identify with the characters in the clips. Both White and Black participants exhibited increased diastolic blood pressure in response to anger-provoking and racist stimuli as compared to neutral stimuli, yet there was no difference in cardiovascular reactivity to the anger provoking and racist stimuli across White and African-American participants. During the recovery period following the racism stimuli, African-American participants exhibited greater elevations in diastolic blood pressure as compared with the recovery period during the neutral stimuli; White participants exhibited no such difference in reactivity during recovery. However, results should be interpreted with caution, as differences in reactivity scores between Whites and African-Americans viewing racist and anger-provoking clips may relate to members of each group viewing different clips.

A quantitative study was conducted that examined cardiovascular responses to a subtly racist stressor for African-American and White women (Guyll et al., 2001). Participants included 101 African-Americans and 262 European Americans, recruited

from Pittsburgh, Pennsylvania. Participants had a mean age of 45.5 (SD=2.4). In the subtly racist condition, participants discussed the thoughts and feelings they would have if they were singled out of a crowd and accused of shoplifting. While cardiovascular reactivity scores did not differ between African-American and White women in the subtly racist condition, those African-American women who attributed the subtly racist condition to racism displayed higher diastolic blood pressure than those who did not make this attribution.

A subtly racist stressor was also employed in Lepore et al. (2006) study, which examined the effects of this type of stressor on cardiovascular reactivity in Black and White women. Participants included 40 Black and 40 White women, with a mean age of 23.11 (SD=5.77). In the subtly racist condition, participants discussed the thoughts and feelings they would have if they were singled out of a crowd and accused of shoplifting. Findings indicated that Black women, as compared to Whites, displayed greater diastolic blood pressure reactivity to the subtly racist stressor. Additionally, Black women who made racial attributions during subtly racist stressor exhibited higher systolic blood pressure systolic blood pressure than those who did not make such attributions. Black women also exhibited a lower heart rate during the recovery phase following the racial stressor as compared to the nonracial stressor.

While Lepore et al.'s (2006) study employed only a subtly racist stressor, Merritt et al.'s (2006) study investigated the effects of both subtly and blatantly racist stimuli on cardiovascular reactivity in Black men. Participants included 73 Black men with a mean age of 31.7 (SD=9.5). On average, participants had 14 years of education. In the subtly racist condition, participants discussed their feelings and reactions in response to an

audiotaped scene of a person being treated unfairly in a shopping scenario. The blatantly racist condition was identical, except the scene contained blatant racially-discriminatory cues. Findings indicated that participants displayed greater reactivity to the subtly racist stressor than to the blatantly racist one. Additionally, during the subtly racist stressor, participants displayed higher diastolic blood pressure during the recovery period, as compared to the blatantly racist stressor. Participants who made racial attributions during the subtly racist stressor displayed higher systolic blood pressure and diastolic blood pressure during the recovery period of this condition than those who did not make racial attributions.

Peters et al. (2011) conducted a pilot study examining whether sensory gating—the brain's capacity to regulate its response to environmental stimuli—moderates the relationship between experiences of race-related stressors and physiological stress responses. Participants included 15 African Americans, with a mean age of 25.5 (SD=5.87). Nine participants were women and six were men. The racially aversive stimulus was an image of a lynching. Cardiovascular reactivity increased following the racially aversive stimulus, yet reactivity differed across genders. Women displayed increased heart rate and heart rate variability following the racial stressor. Thus, although women displayed a physiological stress response to the racial stressor, they also displayed an ability to cope with the stressor. Contrastingly, men displayed decreased heart rate variability following the racial stressor, indicating poorer coping responses. Interestingly, a difference was found between self-report of distress following the racial stressor and physiological stress response; while participants did not report experiencing distress following the racially aversive stimulus, their bodies exhibited stress reactions.

Summary of research on race-related stressors and physiological stress responses for Black people. In summary, ten quantitative studies examined the relationship between experiences of racism and physiological stress for Black people, with most studies indicating that racist events elicit physiological stress. A number of studies also found that changes in blood pressure—including systolic blood pressure, diastolic blood pressure, and heart rate—following race-related stressors, subsist even after the race-related stressor is over (Blascovich et al., 2001; Fang & Meyers, 2001; Lepore, 2006; McNeilly et al., 1995; Merritt et al., 2006). The perseverance of altered cardiovascular responses to race-related stressors during a recovery period provides support for race-related stressors having ongoing effects on the health of Black people (Clark et al., 1999).

Black/White Biracial People and the One-Drop Rule

Black/White Biracial people have a controversial history within the United States. During the era of slavery, Black/White Biracial children, called Mulattoes, were the product of exploitive sexual relationships between Black female slaves and their White slave masters (Nakashima, 1992). These mulatto children were cast as Black, so that rigid color boundaries would allow slave owners to maintain their hegemony (Khanna, 2010). Thus, economic incentive and sexual exploitation fueled the birth of Black/White children (Khanna, 2011). The dominant White group established the “one-drop” rule of hypodescent to retain power, which classified any non-purely White person as Black (Nakashima, 1992). Up until the civil rights era, all individuals of Black/White mixed race heritage were categorized as Black (Khanna, 2010; Khanna, 2011). Indeed, Black

was thought to be the only appropriate racial identity option for Biracial individuals of Black/White mixed race heritage (Rockquemore & Laszloffy, 2003).

Today, remnants of the one-drop rule are still prevalent for many reasons. One reason is that it is difficult to differentiate phenotypes of Black/White Biracial individuals and Black individuals. Due to centuries of racial mixing within the Black community, many Blacks possess some White phenotypic characteristics (Khanna, 2010). Thus, even though Biracial people might possess some White phenotypic characteristics, such as blonde hair, light eyes, or straight hair, this does not differentiate them from other Blacks. Khanna (2010) posited that often people, especially White people, cannot tell the difference between Black people and Biracial people.

Another reason why the one-drop rule continues to be upheld is because, even though the one-drop rule was developed by Whites to maintain power, the Black community has expressed strong support for the rule (Rockquemore & Laszloffy, 2003; Khanna, 2011). Although Black people may be more likely to recognize Multiracial ancestry than Whites—as Blacks are more sensitive to nuances in skin color and facial features because historically, lighter-skinned Blacks with more “White” facial features received more privilege, and continue to receive more privileges even today (Khanna, 2011)—Black people, nonetheless, label Black/White Biracial individuals as Black (Khanna, 2011).

Various reasons underlie the continued labeling of Biracial individuals as Black in the Black community. For African-Americans, Biracialism is nothing new, and it may not make sense to suddenly start differentiating between Black and Biracial, considering that most African-Americans are indeed Multiracial (Khanna, 2011). Since most Black people

have some White ancestry, there is a fear that, with the oncoming Biracial movement, Black people will start laying claim to their White ancestry and distance themselves from the race (Khanna, 2011). Furthermore, although the one-drop rule has historically excluded Blacks from accessing White privileges, the one-drop rule also had some advantages for the Black community, as it has allowed for an increase in numbers and political clout of the Black community (Ho et al., 2011; Rockquemore & Laszloffy, 2003). Therefore, because of the deep-rooted acceptance of the one drop-rule within the Black community, Biracial individuals who refuse to identify as Black may be perceived by other Blacks as considering themselves superior, fragmenting the Black community, and being disillusioned with the reality of their racial identity (Brackett et al., 2006; Khanna, 2011; Rockquemore & Laszloffy, 2003).

Interestingly, however, while many Black people may encourage Biracial individuals to identify as Black, others may question Multiracial individuals' Black identity; this is a more recent occurrence and may suggest a gradual waning of the one-drop rule (Khanna, 2011). Biracial individuals may have to prove their Blackness to fit in with the Black community. Darker-skinned Blacks may question Biracial people's authenticity because they may resent the privileges afforded to Biracial people because of their lighter complexions. The invalidation of Biracial people's Black racial identity and their Biracial racial identity leaves Multiracial people at risk for "cultural homelessness," characterized by rejection from multiple groups, feelings of isolation, and a struggle to find a cultural home (Navarrete & Jenkins, 2011, p. 795).

Social Invalidation

As a result of the one-drop rule, and its changing dynamics within American society, Biracial individuals are at high risk for social invalidation. Social invalidation is defined as the invalidation and/or imposition of a racial identity by external forces (Rockquemore & Laszloffy, 2003). Social invalidation can be perpetrated on an institutional level, when Multiracial-identifying individuals are forced to choose one racial category on forms, or by other people, when others perceive a Multiracial individual as a race of which he or she does not personally identify (Rockquemore & Laszloffy, 2003). Social invalidation is a common experience for Multiracial individuals, as they experience much pressure to conform to America's existing racial categorizations and identify as monoracial (Gillem & Thompson, 2004; Rockquemore & Laszloffy, 2003). Additionally Black/White Biracials who identify as Black also are subject to social invalidation, which occurs when other Blacks question their racial authenticity because of their White ancestry and more European phenotype. Multiracials facing social invalidation experience a disjuncture between external and personal perceptions of self, which negatively impacts well-being (Rockquemore & Brunnsma, 2002; Rockquemore & Laszloffy, 2003).

Empirical research on social invalidation for Black/White Biracial

individuals. A qualitative study was conducted on racial identity development in Biracial sibling pairs (Root, 1998). Participants included 20 sibling pairs. Pairs ranged in age from 18-40. Ten were same-sex pairs and ten were brother-sister pairs. Nine sibling pairs were Black/White Biracial. Participants reported having to go through demeaning processes of racial authenticity testing to be accepted into monoracial groups. This "hazing" process

often required “submission of the self” to avoid cruel rejection (p. 243). Biracial individuals had to prove their authenticity by conforming to exaggerated stereotypes about one of their racial groups. Sometimes, Biracial individuals had to commit deviant acts, like stealing, rejecting all Whites, or having sex to gain acceptance. This hazing process was most pronounced for African-descended Biracials.

Rockquemore (2002) employed qualitative methods to investigate how gender influences racial identity construction among Black/White Biracial people. Participants included 16 Black/White Biracial people recruited from educational institutions around the country. Twelve participants were women and four were men, ranging in age from 18-46. Biracial women cited experiences of social invalidation and rejection from Black women based on their physical appearance (lighter skin, lighter eyes, curly hair). From the perspective of the participants, Black women were envious of the advantage that their phenotype gave them with Black men and retaliated by calling their Blackness into question. This invalidation engendered feelings of discomfort and psychological distress in Biracial women. Contrastingly, Biracial men experienced validation from both Black men and women and gained status because of their more European features.

Similarly, another qualitative study investigated racial identity construction in Biracial adults (Tashiro, 2002). Participant included 20 Biracial adults from Northern California. Participants’ families were working class or from midlevel professional backgrounds. Eleven participants were women and nine were men. Thirteen participants were mixed Asian/White and seven were African/White. Participants ranged in age from 45-94. Participants reported a disconnect between their personal perception of their cultural or racial identities and the racial identities that they were ascribed. For the

Black/White participants, the effects of being perceived as Black were so potent that it led them to perceive themselves as such. Compared to the Asian/White participants, Black/White participants were more likely to be defined by their minority racial group. Black/White participants felt that they were constantly being reminded of their Blackness by Whites but also experienced having their Blackness called into question by other Blacks.

Qualitative methodologies were used to investigate racial identity in Black/White Biracial children between the ages of 5 and 16 (Kerwin, Ponterotto, Jackson, & Harris, 1993). Nine Black/White Biracial children and their parents took part in semi-structured interviews relating to their racial identity development. All participants lived within 75 miles of New York City. One stressor that emerged from interviews was pressure to identify monoracially, which stemmed, in part, from the lack of a legitimate label for the Biracial racial group. Additionally, Biracial adolescents felt pressure to identify with only one of their racial groups so that they could connect with a peer network. Pressure to identify monoracially was more pronounced for the older children.

Mixed-method methodologies were used to investigate racial identity development of Black/White Biracial individuals (Rockquemore & Brunsma, 2002). For the qualitative component of the study, interviews were conducted with 14 students (no gender specifications) at a Midwestern University. Participants were between the ages of 14-22. For the quantitative component, questionnaires were given to 177 students, 107 of which were women and 70 of which were men, who ranged in age from 18-58. All participants were recruited from educational institutions in the Midwest. Of the participants who identified as Biracial, more reported being chronically racially

invalidated (approximately 63%) than validated in their racial identity choice.

Participants reported experiencing invalidation of their Black identity by Blacks and negativity from Whites.

Buckley and Carter (2004) conducted a qualitative study of five Black/White Biracial women's attitudes and beliefs about their racial identity. All participants resided in New York City at the time of the study. Participants ranged in age from 18-28 with an average of 25 years old. One theme that emerged was pressure to identify monoracially. All participants reported being coerced to choose a monoracial identity by external forces, as being a member of both groups did not seem like an option. One participant stated that her racial identity decision was more for other's comfort than her own. Participants asserted that their racial identification was often up for public consensus and based on their desire to fit in and their context. External pressure to identify with one race had a profound effect on the participants and resulted in confusion and distress.

A quantitative study examined whether racial identity and social invalidation status (i.e., identifying as Biracial, but perceiving the world as Black) influenced anxiety and depression scores (Coleman & Carter, 2007). Participants included 61 Biracial individuals with one Black and one White parent, including 34 females, 16 males, and one participant who did not identify gender. Mean age was 28.47(SD=8.66). Thirty-three participants were recruited from the community, while the remaining participants were recruited from three universities: Howard University, American University, and The University of Georgia. Findings indicated that invalidated Biracial participants had higher depression and anxiety scores than validated Biracial individuals.

In a two part study, Townsend, Markus, and Bergsieker (2009) investigated the consequences of identity denial for Multiracial individuals. Identity denial occurs when Multiracial individuals are not permitted to identify as Multiracial. In the first study, 59 mixed race undergraduates, seven of whom were Black/White Biracial, were recruited. Thirty-six participants were women and 23 were men. Participants were asked to describe experiences they had where their Biracial identity has caused tension, or where they felt pressure to identify in a certain way. Of relevance to social invalidation, 28.7% of participants described experiences where others misperceived them; 23.7% of participants described experiences where demographic forms did not permit them to claim their racial identity.

Townsend et al.'s (2009) second study examined the consequences of social invalidation. Participants included 52 mixed race undergraduate students, of various racial compositions, none of which were Black/White. Thirty-two participants were female and 20 were male. Participants were randomly assigned to an identity denial condition or a control condition. Participants in the identity denial condition were less likely to evince positive views of themselves (i.e., less likely to see themselves as creative or good looking). Additionally, participants in the identity denial condition displayed decreased self-esteem and motivation.

Quantitative methodologies were employed to examine how forced choice dilemmas predict depressive symptoms (Sanchez, 2010). Forced choice dilemmas occur when individuals are not permitted to identify as Multiracial but must instead chose a single racial identity. Participants included 317 Multiracial individuals, 69 of which were Black/White. Two hundred and sixty participants were female and 57 were male. Mean

age was 29.1(SD=9.2). Findings indicated that forced choice dilemmas related to depressive symptoms. Additionally, forced choice dilemmas predicted lower identity autonomy, which was defined as the extent to which Multiracial people feel that they can chose their racial identity freely, and lower public regard, defined as perceptions of how others view Multiracial individuals. Additionally, findings revealed that Black Multiracial individuals were more likely to encounter forced choice dilemmas than Asian Multiracial individuals.

Lou et al. (2011) examined how social invalidation influences identity integration—the degree to which one perceives one’s racial groups as harmonious—and self-concept clarity—the extent to which perceptions of self are clearly defined and internally consistent. Participants included 122 Biracial individuals, 38 of which were Black/White. Mean age was 26.1 (SD=9.1). Eighty-six participants were women and 36 were men. Seventy-one participants were Canadian and 45 were American. Validated Biracial individuals scored higher on self-concept clarity and identity integration: meaning that validated individuals experienced their racial groups as less conflicting and had a clearer and more consistent self-concept. Validated individuals also were less likely to experience discrimination from Whites.

Summary of research on social invalidation for Black/White Biracial individuals. To summarize, nine studies examined social invalidation for Biracial individuals. Four studies employed qualitative methodologies, one study incorporated mixed methods, and four studies employed quantitative methodologies. Importantly, social invalidation was operationalized differently across studies. In the quantitative studies, social invalidation was operationalized only to affect Multiracial individuals who

identify as such. Yet, the qualitative literature revealed that Multiracial individuals who identify as Black also experience social invalidation of their Blackness. The present study included Multiracial individuals who identify in various ways (e.g., White, Black, Multiracial), as qualitative research has found that the stressor of social invalidation is relevant to Multiracial individuals of various identities.

Overall, the literature suggested that social invalidation is pervasive: it occurs for Multiracial individuals who identify in different ways (i.e., as Multiracial and as Black) and is perpetrated by both Whites and minorities. White people perceive Biracial-identifying individuals as solely Black, while Black people attempt to undermine Biracial people's sense of their Blackness. Experiences of social invalidation are associated with feelings of isolation, rejection, alienation, depression, anxiety, lack of identity integration, low self-esteem, negative self-perceptions, confusion, and distress. While social invalidation is associated with a variety of negative outcomes, its physiological effects have never before been examined. Social invalidation has the potential to increase physiological stress, and thus, influence health outcomes for Multiracial individuals. The current study, which investigated social invalidation and its physiological consequences, enhances the current literature by providing a more complete picture of the effects of social invalidation of Black/White Biracial individuals.

Racial Discrimination from Family

Biracial individuals are susceptible to racial discrimination from family members. Because Blacks and Whites are the two most culturally and racially distanced groups in America (Gillem & Thompson, 2004), Biracial children who are the product of a Black-White union are the most susceptible to experiencing racial discrimination from family.

While racial discrimination from individuals outside of one's family is so harmful as to detrimentally affect physical and psychological well-being (e.g., Burrow & Ong, 2010; Guyll, et al., 2001; Lepore et al., 2006; Merritt et al., 2006), racial discrimination from family members is likely to have an even more profound and detrimental effect on health (Salahuddin & O'Brien, 2011). For many Multiracial individuals, family members are looked to as a resource or safe place when dealing with racial identity struggles and experiences of racism (Miville et al., 2005; Jourdan, 2006). Yet, when family members act discriminatory, Multiracial individuals lose this resource and experience another layer of discrimination.

Racial discrimination from family members can take a variety of forms and can be perpetrated by immediate and extended family members. Family members can coerce Biracial individuals into identifying with one of their racial groups and become dissatisfied when the Biracial individual does not seem to fit into racial group norms. Biracial individuals may experience this coercion as invalidation, rejection, or as a lack of acceptance of their other racial group. Discrepant racial group membership expectations by parents send conflicting messages to the Biracial child, resulting in distress, feelings of isolation and a fragmented sense of self (Shih & Sanchez, 2005).

Another form of racial discrimination from family occurs when parents make openly discriminatory comments towards the other parent because of their race, which may then be internalized by the Biracial individual as rejection, depending on the extent to which the Biracial person identifies with the race under attack. Furthermore, when parents separate from each other, because of race, the White partner may associate their Biracial child with their past partner and project feelings of anger or bitterness onto the

child. Parents also may make derogatory racial comments towards their Biracial children. Racial discrimination perpetrated by extended family members is likely to occur more often than that from parents, as extended family members are more removed from the child. Extended family members can denigrate, exclude, and disown Biracial children.

Empirical research examining racial discrimination from family. In Root's (1998) qualitative examination of the racial identity process in Biracial siblings, she found that Biracial participants who experienced problems with parents in the home would attribute parent's misdeeds to their racial group, and attempt to "exorcise what went wrong" by avoiding people of the perpetrating parent's racial group (p. 244). Biracial participants may perceive their parent's psychological or physical abuse as a result of the parent's racial prejudices towards them; this prejudice was then internalized by the child, leading them to avoid racial groups in fear of mistreatment.

One study found that Biracial women deal with explicit racism from their White parent, with one participant recollecting having been called a "nigger" by her White mother (Rockquemore, 2002). Biracial participants also dealt with negativity from their White parent towards their Black parent. Relationship issues between the White parent and Black parent became racialized as the White parent perceived any flaws that they found with their partner as reflecting their partner's racial group. As the White partner denigrates the Black partner, along with their partner's racial group, the Biracial child may feel rejected by their White parent because of their Black racial heritage.

Two studies have found that parents pressure their Biracial children to identify with one group. Kerwin et al. (1993) investigated racial identity development in Black/White Biracial children. None of the participants reported alienation from extended

family from the interracial union. While children tended to view themselves along a continuum between Black and White, with connections to both groups, parents tended to view their child as belonging to one racial group more than the other. Additionally, in a qualitative study, Buckley and Carter (2004) found that some Black/White Biracial participants' Black parents denigrated their own racial group, which led the Biracial participant to denigrate their Black racial group. Additionally, some participants asserted that their parents imposed a racial category on them. For Biracial individuals in both the Kerwin et al. (1993) and Buckley and Carter (2004) studies, parents' expectations for the monoracial racial identification of their children might be experienced as a lack of acceptance of their dual racial heritages.

Jourdan (2006) conducted a qualitative study of the role of family on Multiracial and Multiethnic identity development. Participants included five Multiethnic-identifying individuals from different colleges on the East Coast. Four participants were women and one was a man. Three participants were undergraduate students and two were graduate students. Participants ranged in age from 21-24. One participant was Black/White Biracial and another was Black/White/Asian Multiracial. Both of the Black/White Multiracial participants indicated experiencing discrimination from family members based of their ethnic backgrounds. The Black/White/Asian Multiracial participant reported receiving messages from his Asian mother that all Black/White Biracial people were the product of a rape. Additionally, this participant's maternal grandmother was racist against Black people. The other Black/White participant was raised by her mother and claimed that her mother's side of the family was openly prejudiced against Black people.

Chronically invalidated Biracial individuals are more likely to report pressure from family to identify as Monoracial (Coleman & Carter, 2007). Thus, familial pressures to identify as monoracial related to uncomfortable feelings of disconnect between personal and external racial identifications. Additionally, family pressure to identify as monoracial was associated with social anxiety for Multiracial participants.

Qualitative methodologies were employed to investigate the various facets of Multiracial identity (Jackson, 2009). Participants included ten Multiracial individuals from Western New York. Seven participants were female and three were male. Participants ranged in age from 21 to 37, with a mean age was of 25.7. Two participants were Black/White Biracial and an additional four participants were Black/White and some other race(s). Participants described their parents as having a significant influence on their racial identity development. Some participants, particularly African-descended Multiracials, reported experiencing both covert and overt racism from their immediate and extended family members. Participant's experiences of discrimination from family left them feeling ashamed, confused, and disconnected from their parents and culture(s).

Salahuddin and O'Brien (2011) constructed a scale to measure challenges and resilience factors in the lives of Multiracial individuals. A relevant factor that emerged was lack of family acceptance. Participants included 317 Multiracial individuals, 16.7% of which were Black/White, from metropolitan areas of the US. Seventy-one percent of participants were women, 28.4% were men, and .6% were transgendered. All participants were recruited from the Internet. Mean age was 22 (SD=5.21). Lack of family acceptance negatively correlated with self-esteem and social connectedness, and positively correlated

with depression. Invalidation from family was more salient than invalidation from non-family members.

Summary of research on racial discrimination from family. In summary, eight studies examined discrimination from family for Multiracial individuals. Six of these studies were qualitative and two were quantitative. These studies found that Biracial individuals experience covert and overt discrimination, pressure to identify in certain ways, and a lack of acceptance, from both immediate and extended family members. Experiences of discrimination from family members were associated with feelings of shame, confusion, distress, disconnect, rejection, anxiety, low-self esteem, and poor social-connectedness. Although it is apparent that racial discrimination from family negatively influences well-being, no studies have examined whether this type of discrimination negatively influences physical health indices.

Racial Centrality

Racial centrality refers to the importance one places on racial group membership; it is the extent to which one considers race as a core part of one's identity (Sellers et al., 1997). Sellers et al. (1997) originally conceptualized racial centrality as one of many components of racial identity.

While no research has been done examining the correlates of racial centrality for Multiracial individuals, a few studies have examined the centrality of racial identity for Multiracial individuals. One study examined Multiracial racial centrality using an adolescent sample and found that Multiracial individuals had lower centrality compared to other ethnic minority groups (i.e., monoracial Black, Latino, and Asian; Charmaraman & Grossman, 2010). Yet, centrality may depend on racial identification, as Black-

identifying Black/White Biracial people rated their ethnic background as more significant than White-identifying Biracial individuals (Herman, 2004).

Individuals low in racial centrality may racially disengage. Racial disengagement is characterized by a diminished sense of importance in racial group membership. Multiracial individuals experience higher levels of racial/ethnic disengagement than do Monoracial individuals, with 30 percent of Black/White Biracial individuals reporting disengagement (Charmaraman & Grossman, 2010).

There are many reasons why Multiracial-identifying individuals may have exhibited lower racial centrality: 1) to mitigate the stress of racial exclusion by both majority and minority groups, 2) because of the difficulty in developing a shared sense of racial identity in a community that is sparse and spread-out, and 3) because parents of Multiracial individuals sometimes claim that race is unimportant to minimize the sense of difference between parent and child (Samuels, 2009).

The relationship between racial centrality and responses to racism has not been examined for Multiracial individuals. Thus, the next section reviews past research that has examined how racial centrality moderates the relationship between experiences of racism and health for Black people.

Empirical research examining the relationship between discrimination, racial centrality, and psychological well-being. Sellers and Shelton (2003) examined the relationship between racial identity, perceived discrimination, and psychological distress. Participants included 267 African-American college students, 75% of which were female, from three predominately White universities. Results indicated that racial centrality related to increased perceptions of subsequent discrimination, and increased perceptions

of discrimination led to psychological distress. These findings suggested that, in an indirect way, individuals higher in racial centrality were more likely to experience race-related psychological distress.

Quantitative methods were used to investigate the relationship between experiences of discrimination, racial centrality, and psychological distress (Sellers et al., 2003). Participants included 555 African American academically at-risk students from an urban school district in Michigan, 54% of which were female and 46% of which were male. Mean age was 17.8 (SD=.65). Results indicated that the relationship between perceived discrimination and psychological distress was moderated by racial centrality; there was a significant relationship between perceived discrimination and psychological distress (anxiety and depression) for those who scored lower in racial centrality, but no such relationship for those scoring higher in racial centrality. However, those scoring higher in racial centrality were more likely to indicate experiences of discrimination. In sum, being higher in racial centrality makes one more likely to perceive discrimination but less likely to exhibit psychological distress in response to these experiences of discrimination.

Similar to Sellers et al.'s (2003) study, Sellers, Copeland-Linder, Martin, and Lewis (2006) examined how racial identity, including racial centrality, influences the relationship between racial discrimination and psychological functioning. Participants included 314 African-American adolescents, 192 of which were females, from a school in the Midwest. Mean age was 13.8 (SD=1.21). Participants were enrolled in the seventh (24%), eighth (36%), ninth (22%), and tenth (18%) grades. Findings indicated that racial

centrality was related positively to perceptions of discrimination, yet racial centrality failed to moderate the relationship between experiences of discrimination and well-being.

Contrastingly, Burrow and Ong (2010) found evidence that racial centrality moderated the relationship between discrimination and well-being. The researchers investigated the relationship between racial centrality, racial discrimination, and psychological distress, including negative affect, depression, and anxiety. Participants included 174 African American doctoral students (68%) and graduates (32%) from over 70 US colleges. One hundred and forty one participants were women and 33 were men. Results indicated that individuals higher in racial centrality reported more discrimination and exhibited a stronger association between racial discrimination and psychological distress. Thus, racial centrality seemed to intensify the effects of racial discrimination on psychological distress.

A quantitative study investigated the relationship between racial centrality, perceptions of discrimination, belongingness, and life satisfaction in a community sample of African-Americans (Yap, Settles, & Pratt-Hyatt, 2011). Participants included 161 African American participants, 56.5% of which were female, and 43.5% of which were male. Average age was 48.8 (SD=16.9). Findings differed according to gender. For men, there was a relationship between racial centrality and belongingness, but no relationship between belongingness and life satisfaction. For women, there was a positive relationship between racial centrality and life satisfaction, but this relationship was fully mediated by perceptions of belongingness. For both genders, no relationship was found between racial centrality and perceptions of discrimination. In sum, findings suggested that, at least for

women, racial centrality may increase life satisfaction by creating a sense of belongingness with other members of one's racial group.

Seaton, Neblett, Upton, Powell Hammond, and Sellers (2011) examined the moderating role of racial identity, including racial centrality, on the longitudinal relationship between perceptions of discrimination and psychological well-being for African-American youth. At Time 1, 572 African-American adolescents were recruited from middle and high schools in the Midwest. Fifty-nine percent of participants were female and 31% were male. Two hundred and sixty of these participants were assessed at the third time point. Mean age was 13.82 (SD=1.11). At Time 3, 61% of the sample was female, and 39% was male. Mean age was 15.78 (SD=1.20). Average household income across time points was between \$40,000 and \$49,000. An inverse relationship was found between racial discrimination and well-being, yet perceptions of discrimination did not relate to changes in well-being. Additionally, racial centrality did not moderate the relationship between perceptions of discrimination and changes in well-being. However, it is important to note that the racial centrality scale consisted of only two items.

Empirical research on racial identity profiles, racial discrimination, and well-being. Various studies have examined the relationship between racial identity profiles, racial discrimination, and well-being. Racial identity profiles are comprised of various dimensions of racial identity (conceptualized using the multidimensional inventory of Black identity; MIBI). Components of racial identity include racial centrality, ideology, private regard, and public regard. Ideology refers to an individual's beliefs about how racial group members should behave and interact with society. Private regard refers to how one feels towards one's racial group and public regard refers to how

one believes others perceive one's racial group. Individuals who have the same racial identity profile exhibit similar scores on the various components of racial identity. For example, one racial identity profile might include all individuals who are high in centrality, possess an assimilationist ideology, and are high in both public and private regard. Racial identity profiles allow for an examination of how racial centrality interacts with other facets of racial identity in determining its relationship with perceived discrimination and well-being.

Empirical research examining the relationship between racial identity profiles, perceived discrimination, and psychological well-being. Racial identity profiles were used in a quantitative study that examined whether racial identity profiles moderated the relationship between racial discrimination and depressive symptoms (Banks & Kohn-Wood, 2007). Participants included 194 African-American US born students from a large Midwestern University. One hundred and twenty-eight participants were female and 66 were male. Participants were mostly sophomores (32%) and juniors (20%) and most students were between 18 and 20 years of age (65%). The most commonly reported level of family income was between \$21,000 and \$41,000.

Participants were placed into profiles based on combinations of the various components of their racial identity. The integrationist cluster was characterized by low centrality, moderate private regard, and an ideology that reflects mainstream beliefs of racial assimilation. The Multiculturalist cluster exhibited high private regard, high public regard, high centrality, and an ideology that emphasized commonalities amongst African-Americans and other oppressed groups. The undifferentiated cluster had average levels of public regard, average to low levels of private regard, low centrality, and an ideology that

emphasized human commonalities and downplayed racial differences. The last cluster, the race-focused cluster, exhibited high centrality, high private regard, low public regard, and an ideology that emphasized the uniqueness of being Black.

Findings revealed that all clusters exhibited a positive relationship between racial discrimination and depressive symptoms. Moreover, members of the integrationist cluster displayed a stronger relationship between discrimination and depressive symptoms, as compared to the other clusters. These results do not suggest a clear role for racial centrality in moderating the relationship between discrimination and depression. The undifferentiated profile, like the integrationist profile, exhibited low centrality, yet this profile did not differ from other profiles—profiles that displayed higher centrality—in predicting depression scores. Overall, results suggested that racial centrality may interact with other dimensions of racial identity in moderating the relationships between discrimination and depression.

Seaton (2009) investigated the moderating role of racial identity profiles in the relationship between perceived discrimination and psychological well-being. Participants included 322 urban African American adolescents from a large Northeastern city. One hundred and seventy-one participants were female, and 151 participants were male. Age of participants ranged from 13-18. Participants reported the following education levels for their parent/guardian: less than high school (8%), high school diploma (44%), one year of college or associate's degree (27%), bachelor's degree (12%) and a graduate degree (6%).

A cluster analysis was performed on responses on the various dimensions of racial identity; three profiles emerged. Members of the buffering/defensive profile displayed

high centrality, high private regard and low public regard. The idealized group, similar to the buffering/defensive group, delineated high centrality and private regard, but also high public regard. Contrastingly, the alienated group exhibited low centrality, low private regard, and low public regard.

Findings indicate that perceptions of racism were correlated positively with depressive symptoms for the alienated group, but not for the buffering/defensive and idealized group. In light of racial centrality, it is important to note that the two groups that were high in racial centrality were buffered against the effects of perceived discrimination on psychological health.

Summary of research on racial centrality. In summary, eight quantitative studies assessed how racial centrality related to discrimination and well-being. Two of these studies examined how racial identity profiles, which include a racial centrality component, related to discrimination and well-being. Overall, racial centrality related to increased perceptions of discrimination (Burrow & Ong, 2010; Sellers & Shelton, 2003; Sellers et al., 2003; Sellers et al., 2006). Two studies found that racial centrality directly moderated the relationship between discrimination and well being, with one study finding that racial centrality fosters a stronger relationship between discrimination and well-being (Burrow & Ong, 2010), and the other finding that racial centrality fosters a weaker relationship between discrimination and well-being (Sellers et al., 2003). One study found that racial centrality was related indirectly to poorer health outcomes, yet only because of associations with increased perceptions of discrimination (Sellers & Shelton, 2003). Two studies found that racial identity profiles moderated the relationship between discrimination and well-being; in one of these studies, the racial identity profile

characterized by lower scores on racial centrality delineated a stronger relationship between discrimination and depression than profiles that exhibited higher racial centrality (Seaton, 2009). Three studies found that racial centrality did not moderate the relationship between discrimination and well-being (Sellers et al., 2006; Sellers et al., 2011; Yap et al., 2011).

Overall, the research provides mixed results on whether racial centrality buffers or exacerbates the effects of discrimination on well-being. On the one hand, racial centrality may exacerbate the effects of discrimination because individuals for whom race is important may be more affected by racially discriminatory experiences. Additionally, individuals high in racial centrality may be likely to view an ambiguous experience as racist and to experience subsequent stress (Burrow & Ong, 2010). Repeated perceptions of discrimination may lead to increased sensitivity toward discriminatory events (Burrow & Ong, 2010) and may leave one “on guard,” in a state of hyper vigilance for future mistreatment, which may increase levels of stress (Richman, Pek, Bennett, Siegler, & Williams, 2007).

However, other studies have found support for the protective benefits of racial centrality in mitigating the negative effects of discriminatory experiences. Racial centrality may have protective benefits because individuals higher in racial centrality may be more likely to seek others who have similarly adverse experiences, creating a network of individuals that may help in coping processes following discriminatory experiences (Burrow & Ong, 2010; Sellers et al., 2003; Yap et al., 2011). Additionally, racial centrality may promote a sense of security in one’s Black identity that may buffer against the internalization of discriminatory experiences (Sellers et al., 2003).

It is difficult to reconcile the conflicting findings on the moderating role of racial centrality. The discrepancy in findings between studies may relate to the surrounding racial community of each study's participants. Two of the studies that found evidence for the role of racial centrality in exacerbating experiences of discrimination were conducted on Black people who were racially isolated, including PhD students (Burrow & Ong, 2010) and college students in predominantly White colleges (Sellers & Shelton, 2003). For Black people who inhabit isolated racial contexts, racial centrality may cease to offer the protective benefits of a sense of belongingness and community with other Blacks but may instead only make experiences of discrimination more salient and in turn, more harmful. For Multiracial-identifying individuals, who likely inhabit racially isolated contexts due to the dispersed and relatively minute population of Multiracial individuals, racial centrality may act in a similar way. Multiracial racial centrality may not translate into security in one's racial identity; instead, racial centrality may lead to a heightened awareness of racial discrimination and of one's isolation in one's racial group.

Yet, what of Black/White Biracial individuals who identify as Black, who are less likely to inhabit racially isolated contexts? These individuals are vulnerable to a lack of acceptance by other Blacks because of their Biracial ancestry (Rockquemore, 2002; Root, 1998). Therefore, racial centrality's protective benefits, in allowing for a racial social support system in the face of discrimination, may be less prevalent for Black-identifying Biracials than it is for Black people. Furthermore, another protective benefit of racial centrality is that it fosters a strong sense of one's racial identity that may shield one from the negative effects of discrimination. Yet for both Black-identifying and Biracial-identifying Biracial individuals, who experience frequent invalidation of their racial

group membership by others and by larger society, and experience a lack of acceptance by majority and minority races because of their racial ancestry, racial centrality may be less likely to foster a strong sense of one's identity. Thus, for Biracial individuals, racial centrality may lose its protective benefits.

Aligning oneself with a denigrated group can make one more vulnerable to discriminatory attacks. Racial centrality increases the perceived importance or personal relevance of stressful race related events, and when a stressor is personally relevant, its effects on physiological stress response are exacerbated (King, 2005; Sutherland & Harrell, 1987). Therefore, for the present study, racial centrality was hypothesized to have a significant moderating role in the relationship between discrimination and physiological stress responses, such that individuals who are higher in racial centrality were expected to exhibit a stronger relationship between discrimination and physiological stress.

Conclusion

A comprehensive review of the literature on race-related challenges faced by Biracial individuals, and racism and physiological stress, revealed that Biracial individuals face potent stressors, including social invalidation and racial discrimination from family, of which the physiological effects remain unknown. Additionally, because of their unique history, Black/White Biracial individuals seem to be most vulnerable to these stressors. Biracial people have heightened rates of cardiovascular disease, when compared to Monoracial people (American Heart Association, 2011), and findings of this study could be used to explain health disparities for Black/White Biracial people, support interventions to help Biracial people cope with race-related stressors, and to improve

mental and physical health for Biracial people. Thus, the present study sought to uncover the relationship between race-related stressors and cardiovascular reactivity. This relationship was predicted to be moderated by racial centrality, which is the importance one places on one's racial group membership.

Purpose 1

The first purpose of the study was to evaluate whether imagining or discussing social invalidation and racial discrimination experiences from family affects cardiovascular reactivity for Black/White Biracial people.

Hypothesis 1. Imagining or discussing an experience of social invalidation will produce an increase in systolic blood pressure, diastolic blood pressure, and heart rate for Black/White Biracial people. Specifically, systolic blood pressure, diastolic blood pressure, and heart rate scores during the social invalidation condition (imagination or discussion) will be higher than those of the control condition.

Hypothesis 2. Imagining or discussing an experience of racial discrimination from family will produce an increase in cardiovascular stress response for Black/White Biracial people. Specifically, systolic blood pressure, diastolic blood pressure, and heart rate scores during the racial discrimination from family condition (imagination or discussion) will be higher than those of the control condition.

Purpose 2

The second purpose of the study was to assess whether cardiovascular reactivity to discussing experiences of social invalidation and racial discrimination from family persists into the recovery period, when the race-related stressors are removed.

Hypothesis 1. Cardiovascular reactivity during the discussion of an experience of social invalidation will persist into the recovery period following the removal of the social invalidation stressor. Specifically, the systolic blood pressure, diastolic blood pressure, and heart rate scores during the recovery period of the social invalidation condition will be higher than those of the recovery period of the control condition.

Hypothesis 2. Cardiovascular reactivity during the discussion of an experience of racial discrimination from family will persist into the recovery period following the removal of the racial discrimination from family stressor. Specifically, the systolic blood pressure, diastolic blood pressure, and heart rate scores during the recovery period of the racial discrimination from family condition will be higher than those of the recovery period of the control condition.

Purpose 3

The third purpose of the study was to assess whether racial centrality moderates the relationship between experiences of social invalidation and racial discrimination from family and cardiovascular reactivity.

Hypothesis 1. Racial centrality will moderate the relationship between social invalidation and cardiovascular reactivity. Specifically, those scoring higher in racial centrality will have higher systolic blood pressure, diastolic blood pressure, and heart rate scores during the social invalidation threat conditions (imagination and discussion) than those scoring lower in centrality.

Hypothesis 2. Racial centrality will moderate the relationship between racial discrimination from family and cardiovascular reactivity. Specifically, those scoring higher in racial centrality will have higher systolic blood pressure, diastolic blood

pressure, and heart rate scores during the discrimination from family threat (imagination and discussion) condition than those scoring lower in centrality.

Both of the hypotheses concerning racial centrality were exploratory in nature, as the relationship between responses to racial-stressors and racial centrality has not been examined for Black/White Biracial people, and the research on racial centrality and responses to racism for Black people has mixed results.

Chapter 3

METHOD

The present study employed a within-subjects quasi-experimental design; each participant took part in three conditions, with each condition having three phases (i.e., imagination, discussion, and recovery; see Figure 1). The independent variable was race-related stress, including experiences of social invalidation and discrimination from family, and the dependent variable was cardiovascular response, including systolic blood pressure, diastolic blood pressure, and pulse rate.

Procedure

Participants were recruited through word-of mouth, personal and research team connections, advertisements on online groups catering to Multiracial individuals, a registrar listserv, and fliers distributed throughout The University of Maryland College Park. The recruitment materials read, “Do you have one Black parent and one White parent?” and avoided terms such as “Biracial” and “Multiracial” as to not exclude individuals who do not identify as such. Additionally, specific recruitment requests were made to Multiracial student organizations. Similar to other studies on Multiracial individuals, participants were asked to contact others who might be interested in participating in this study; these methods were necessary because of the challenges associated with recruiting this population (Khanna, 2010; Miville et al., 2005; Rockquemore & Brunσμα, 2001). Participants were given a flier at the end of their participation and asked to disseminate the study’s information to others who might be interested and eligible.

All experimenters were trained before running participants for the study. The primary investigator, consulted with a representative from BIOPAC software, where the blood pressure equipment was purchased, prior to running the experiment. During this consultation, the software was installed on a computer, and the primary investigator was instructed on how to use the software via a Biopac training session. The primary investigator reviewed the manual that comes with the blood pressure monitor and trained all research assistants regarding using the blood pressure equipment. The primary investigator did not interact with any participants in this study.

The research assistants, who conducted the study with the participants, were Asian and Asian American graduate and undergraduate students. Asian experimenters were chosen because the researchers thought that Asian individuals would be least likely to be perceived as Black, White, or Biracial by participants. An experimenter who was perceived as Black, White, or Biracial might have primed participants' Black, White, or Biracial identity as they participated in the study. Thus, having an experimenter who was not visibly Black, White, or Biracial, may have reduced the likelihood that the experimenter's presence would bias participants. All experimenters were given copies of the automated blood pressure manual to read and attended multiple training sessions that were run by the primary investigator. Experimenters were permitted to run participants only after they had been observed facilitating the study multiple times on volunteers.

After learning about the study, individuals who were interested in participating were asked to contact the principal investigator through e-mail. The principal investigator arranged for a time for the participant to come to the lab. Participants were told to refrain from using their cell phones throughout the length of the experiment. The length of the

experiment was approximately 60 minutes. Participants were compensated with ten dollars or sona credits, which can be used as extra credit in psychology courses.

When the participant arrived in the laboratory, she or he filled out an informed consent document on the computer screen and indicated to the experimenter when they had finished reading through the document. The experimenter then attached the sensor, comprised of two finger cuffs and an arm cuff, to the nondominant arm. The cuffs allowed for systolic blood pressure, diastolic blood pressure, and pulse rate readings to be taken continuously throughout the experiment.

After the experimenter placed the sensor on the participant, participants were told to refer to the computer screen for all further instructions. The experimenter left the room. In line with other experimental studies investigating cardiovascular reactivity (e.g., Fang & Myers, 2001; Kamarck et al., 1990; Merritt et al., 2006), baseline measures of heart rate and blood pressure were taken continuously for five minutes. This was indicated to the participant via the computer screen. All baseline measures of cardiovascular responses were averaged to form a mean baseline score.

The participant then moved on to a condition. The experiment included three conditions, which were counterbalanced to control for order effects: leisurely activity (control), social invalidation, and racial discrimination from family. Each condition had three phases: imagination, discussion, and recovery.

The order of conditions may matter for participant's cardiovascular response. Remembering and discussing an experience of one race-related stressor may either exacerbate or mitigate the effects of remembering or discussing another. Specifically, in having to discuss multiple racially-stressful experiences, the stress of one condition may

compound the stress of the other. On the other hand, remembering one highly stressful racial experience may make the other seem comparatively less stressful. Thus, to ensure that the data was not confounded by the order of conditions, counterbalancing was used.

Cardiovascular responses were measured continuously during all phases. These responses were averaged for each phase of each condition (3 conditions X 3 phases), for a total of nine sets of scores (1 set = systolic blood pressure, diastolic blood pressure, and heart rate scores within a phase of a particular condition; e.g., 1 set for leisurely activity imagination, 1 set for leisurely activity discussion, 1 set for leisurely activity recovery, 1 set for invalidation imagination....), and 27 individual mean cardiovascular response scores (not including mean scores at baseline): nine for systolic blood pressure scores, nine for diastolic blood pressure scores, and nine for pulse rates.

For each condition, the participant was given three minutes for the imagination phase. During the imagination period, participants were prompted to recall an experience. In the control, social invalidation, and racial discrimination from family imagination phases, participants recalled engaging in a leisure activity, an experience of social invalidation, and an experience of racial discrimination from a family member, respectively. The participant then moved on to the four-minute long discussion phase, which prompted the participant to discuss the experience that they recalled during the imagination phase. During the discussion phase of each condition, a video camera recorded participant responses. In the recovery phase of each condition, participants were instructed to rest for three minutes before moving forward. Cardiovascular reactivity continued to be assessed during this recovery period to investigate whether the discussion

phase continued to affect cardiovascular reactivity after the participant has finished the discussion task.

Control Condition. To control for the effects of imagining and discussing on cardiovascular reactivity, participants were asked to complete a control condition, in which they were prompted to reexperience a time when they engaged in a leisure activity. The control condition imagination prompt stated the following:

For the next three minutes, please think about and attempt to re-experience, as best as you can, the last time that you **engaged in a leisure activity**.

Examples might include cooking, attending an event, or playing a sport.

Try to remember the details of the experience. Get involved in the feelings associated with this experience. Relive the experience as vividly as you can. Think about what you remember seeing, hearing, thinking, and, most importantly, feeling.

Although it may be difficult, it is crucial that you immerse yourself in this situation as deeply as possible. Continue to think about this experience for the next three minutes, after which, you will be asked to discuss this experience.

After three minutes, the participant moved on to the control discussion task. A video camera recorded participant responses during this task. The next prompt requested that the participant actually discuss the leisure event:

Now, talk about what you imagined and recalled about **engaging in a leisurely activity**.

To help you discuss the experience, you may want to consider the following questions:

- 1) What are some of the details of the experience?
 - i. What activity did you engage in?
 - ii. What materials were involved in taking part in this activity?
 - iii. How long did you engage in this activity?
 - iv. What made you engage in this activity?
- 2) How did this experience make you feel?
- 3) What were the thoughts you had before, during, and after engaging in this activity?
- 4) How does engaging in this activity affect how you perceive yourself?

Please continue to talk about and experience this event and your reactions to it for the next four minutes. Your response will be recorded through a video camera.

Social Invalidation. In the “social invalidation” threat condition, the participant received the following prompt, requesting that they imagine and/or re-experience an occurrence of social invalidation:

For the next three minutes, please think about and attempt to re-experience, as best as you can, the most stressful experience you have had where others have

attempted to **impose a racial group** upon you that you do not identify with and/or have **invalidated or denied** the way that you racially identify yourself.

Try to remember the details of the experience. Get involved in the feelings associated with this experience. Relive the experience as vividly as you can.

Think about what you remember seeing, hearing, thinking, and, most importantly, feeling.

Although it may be difficult, it is crucial that you immerse yourself in this situation as deeply as possible. Continue to think about this experience for the next three minutes, after which, you will be asked to talk about this experience

After three minutes, the participant moved on to the social invalidation discussion task. A video camera recorded participant responses during this task. The next prompt requested that the participant actually talk about the experience of social invalidation:

Now, talk about what you imagined and recalled about your experience of being racially invalidated.

To help you talk about the experience, you may want to consider the following questions:

- 1) What are some of the details of the experience?
 - i. Who tried to impose a racial group onto you, or invalidated your racial group membership(s)?

- ii. What did the person say or do to impose a racial group on you or invalidate your racial group membership(s)?
 - iii. What might the intentions have been of the person who tried to impose a racial group onto you, or invalidated your racial group membership(s)?
- 2) How did this experience make you feel?
 - 3) What were the thoughts you had before, during, and after this act of invalidation happened?
 - 4) How did this event affect how you perceive yourself?

Please continue to talk about and experience this event and your reactions to it for the next four minutes. Your response will be recorded through a video camera.

Racial discrimination from family condition. During the “racial discrimination from family” imagination period, the participant received the following prompt, requesting that they imagine and/or re-experience an occurrence of familial discrimination:

For the next three minutes, please think about and attempt to re-experience, as best as you can, the most stressful experience of **racial discrimination** that you may have experienced from a **family member**. This experience may be related to one or both of your racial groups.

Try to remember the details of the experience. Get involved in the feelings associated with this experience. Relive the experience as vividly as you can.

Think about what you remember seeing, hearing, thinking, and, most importantly, feeling.

Although it may be difficult, it is crucial that you immerse yourself in this situation as deeply as possible. Continue to think about this experience for the next three minutes, after which you will be asked to talk about this experience

After three minutes the participant moved on to the discussion task of the racial discrimination from family condition. A video camera recorded participant responses during this task. The next prompt requested that the participant actually talk about the experience of familial discrimination:

Now, talk about what you imagined or recalled about this experience of racial discrimination from a family member.

To help you discuss this experience, you may want to consider the following questions:

- 1) How would you describe the event?
 - i. Who discriminated against you?
 - ii. What was the discriminatory act that was said or done?
 - iii. What might have the intentions been of the person who discriminated against you?

- 2) How did this experience make you feel?
- 3) What did you think about before, during, and after this act of discrimination happened?
- 4) How did this event affect how you perceive yourself?

Please continue to talk about and experience this event and your reactions to it for the next four minutes. Your response will be recorded through a video camera.

All conditions were counterbalanced to control for order effects. After the participant engaged in all of the conditions, they were given the demographic questionnaire, and racial centrality questionnaire to fill out (in random order) via computer. The experimenter then debriefed the participant about the purpose of the experiment and provided referrals for counseling services in case the experiment caused stress.

Participants

Qualifying participants had one parent who identifies as White and one who identifies as Black and were over the age of 18. Approximately 82 participants expressed interest in participating in the study. Three were disqualified because they did not fit criteria. Out of the remaining 79, five did not confirm appointment times, leaving 74. Two participants canceled their appointments, and 10 did not show up, leaving 62 participants. One participant's data was deleted due to abnormal blood pressure patterns, which were indicative of errors in measurement. The blood pressure software did not work during the collection of another participant's data.

The sample consisted of 60 participants. If participants indicated that they had not experienced invalidation or discrimination from family, their blood pressure data in the respective conditions were deleted, leaving 57 participants in the invalidation and 49 in the discrimination conditions.

Measures

Cardiovascular Reactivity. Measures of systolic blood pressure, diastolic blood pressure, and heart rate were taken continuously using the NIBP100D. The NIBP100D is a noninvasive continuous blood pressure system, which provides beat-to-beat readings collected through the middle and index finger of the subject. Continuous noninvasive blood pressure monitors have been shown to have good convergent validity with other more invasive measures of blood pressure (Sackl-Pietsch, 2008).

The NIBP100D used a double finger cuff that attached to a larger arm cuff. The cuff sensor was connected to the MP150, a data acquisition system, which digitized blood pressure data so that it was readable on a computer. The cuff sensor, data acquisition system, and modem of the computer that records readings were all located in the same room as the subject. The monitor that complemented this modem recorded blood pressure scores and displayed them in real time. This monitor was located in another room, in front of the experimenter, so that the experimenter could ensure that readings were being taken throughout the length of the experiment.

Imagination scores were formed by subtracting the mean systolic blood pressure, diastolic blood pressure, and heart rate at baseline from the mean systolic blood pressure, diastolic blood pressure, and heart rate during the imagination phase for each of the conditions (e.g., mean blood pressure and heart rate during imagination for family

discrimination discussion- mean blood pressure and heart rate during baseline).

Discussion scores were formed by subtracting the mean blood pressure or heart rate at baseline from respective mean blood pressure or heart rate during each of the three discussion tasks (e.g., mean blood pressure or heart rate during family discrimination task – mean blood pressure or heart rate during baseline). Recovery scores were calculated by subtracting the mean blood pressure or heart rate scores at baseline from the respective blood pressure or heart rate during each recovery period (e.g., mean blood pressure or heart rate during recovery phase of family discrimination task – mean blood pressure or heart rate during baseline).

Research software. The research software Medialab was used to display the informed consent, timed prompts associated with each phase of each condition, and the racial centrality and demographic questionnaires. Medialab ran on the subject's computer, while another computer that takes blood pressure readings via an Acknowledge blood pressure recording file ran simultaneously. Medialab recorded time stamps at the start and the end of each phase. These time stamps were then corroborated with manual time stamps entered by the experimenter on the Acknowledge blood pressure file, throughout the experiment, to ensure their accuracy.

Video recording. A webcam was used to record participant responses in the discussion phase to ensure that participants were following condition prompts. Experimenters watched participants as they engaged in conditions. Some participants were prompted by the experimenter to ensure that they were adhering to prompts.

Racial Centrality. The racial centrality scale was used to measure the degree to which one's race is a core part of one's identity (Sellers et al., 1997). The scale originally

was created as a component of Seller et al.'s (1997) multidimensional inventory of Black identity, which attempts to capture Black people's subjective experience of their racial identity.

The racial centrality scale has eight items, three of which are reverse scored (see Appendix B). Each item is measured on a 7-point Likert-scale ranging from 1 (strongly disagree) to 7 (strongly agree). After the relevant items are reverse coded, scores on each of the items are averaged to create a mean score on racial centrality. High scores are indicative of high racial centrality. Example items include "Being Black is a central part of my self image," "Being Black is an important reflection of who I am," and "My destiny is tied to the destiny of other Black people."

Reliabilities of the racial centrality scale were calculated across several studies. When the scale was originally constructed and employed, its alpha rate was .77 (Sellers et al., 1997). Since, the MIBI has exhibited alpha rates between .66 (Sellers et al., 2003) and .75 (Sellers & Shelton, 2003). The scale was demonstrated to have convergent validity with other measures of race-related behaviors, such that those who scored higher in racial centrality were more likely to report more frequent contact with Blacks and to enroll in Black studies courses (Sellers et al., 1997).

While the racial centrality scale has been predominantly used on Black people, it has also been used on ethnic groups, including Chinese and Mexican people (Kiang, Yip, Gonzales-Backen, Witkow & Fuligni, 2006). The scale displayed adequate reliability across these groups (Mexican $\alpha=.64$; Chinese $\alpha=.76$). The scale has not been used on Multiracial individuals. To adapt the scale for Multiracial individuals, the scale was altered to be relevant to people across varying racial identities, as Multiracial people may

identify in numerous ways. For example, the item “Overall, being Black has very little to do with how I feel about myself (reverse scored)” was adapted to “Overall, being a member of my racial group has very little to do with how I feel about myself,” and the item “In general, being Black is an important part of my self-image” was adapted to say “In general, being a member of my racial group is an important part of my self image.” This manner of adaptation is similar to that of other studies (Kiang et al., 2006).

Because the racial centrality was not created for usage with Multiracial individuals, items on the scale that had item-total correlations below .4 were deleted from the scale, leaving six items (see Table 1). The racial centrality scores for this study were calculated by averaging values for the remaining items. The reliability for this sample was .80.

Demographics. A demographic questionnaire was included in the study. Questions assessed age, gender, racial identification, primary racial group, race of biological parents, adoption status, race of adopted parents (if applicable), city and state, occupation, year in school (if applicable), education level, income, sexual orientation, neighborhood racial composition, and experience with Black or Biracial organizations.

Manipulation check. To ensure that participants followed the prompts for each condition, the principal investigator and her advisor watched videos of participants in the discussion phase of the various conditions and answered questions relating to participant’s speech content (see Appendix A). Questions were rated on a Likert scale from 0 (not at all) to 4 (completely) and included: 1) To what degree did the participant talk about a situation where a family member discriminated against them? 2) To what degree did the participant talk about an experience where others have denied the way in

which they racially identify themselves? 3) To what degree did the participant talk about engaging in a leisure activity? 4) To what degree did the participant discuss concerns about their grades in one of their classes?

Results

Preliminary Analyses

A total of 62 participants were recruited. After consultation with BIOPAC software specialists, it was concluded that one participant's data were unusable due to issues with the NIBP100D software that resulted in outlier scores on 13 out of the 27 blood pressure measures. These data were removed from subsequent analyses. The blood pressure software did not work during the collection of another participants' data. The final sample was composed of 60 participants.

To test the assumption of normality, skewness statistics were calculated on the residuals of all dependent variables. Skewness statistics for all residual distributions were less than one (systolic blood pressure = $-.54$, SE = $.11$; diastolic blood pressure = $.32$, SE = $.11$; pulse = $-.07$, SE = $.11$), indicating sufficient normality.

Manipulation Check

To determine whether participants appropriately engaged in condition prompts, the principal investigator and her advisor separately watched videos of most participants ($N = 57$) to assess whether prompts solicited appropriate data. Three videos were not assessed because recordings failed due to technical errors. Recording errors also occurred during parts of other videos. In total, videos from 55 participants engaging in the leisurely activity and discrimination conditions, and 53 participants engaging in the invalidation condition were reviewed. The principal investigator and her advisor rated each manipulation check question from 1 (not at all) to 4 (completely). See Table 2.

The interrater reliability for the raters was found to be moderate Kapa = $.47$ ($p < .001$). Videos rated differently by each rater were re-watched and discussed until a

consensus score was reached. Following are the mean scores and standard deviations for the responses to each question: 1) To what degree did the participant talk about engaging in a leisure activity? ($M = 3.56$; $SD = .86$). 2) To what degree did the participant talk about an experience where others have denied the way in which they racially identify themselves? ($M = 3.64$; $SD = .92$). 3) To what degree did the participant talk about a situation where a family member discriminated against them? ($M = 2.79$; $SD = 1.52$). 4) To what degree did the participant discuss concerns about their grades in one of their classes? ($M = 0$; $SD = 0$).

Video reviews also were used to determine which data should be deleted because of lack of adherence to prompts. The principal investigator reviewed those videos rated a “0” (not at all) in reference to adherence to condition prompts. Data from participants who could not come up with experiences relevant to the prompt were deleted. It was concluded that nine participants did not report any experience discrimination from family and three did not experience invalidation.

For participants who were missing a video because they did not respond to a prompt, the principal investigator reviewed experimenter logs, which included descriptions of issues while running participants, to determine if participants did not engage in any condition during the study. From the video content and logs, it was determined that three participants indicated that they did not experience social invalidation (remaining $N = 57$), and 11 indicated that they did not experience discrimination from family members (remaining $N = 49$).

Analyses were re-run with data from participants who highly adhered to prompts (scores of 3 or 4 on manipulation check). These participants focused on their racial stress

experience for the length of the video and talked about experiences that fully fit with the intended definition of the stressors. All participants included in this sub-analysis were rated a value of 3 or 4 on the manipulation check rating: social invalidation ($M = 3.92$; $SD = .28$), discrimination from family ($M = 3.71$; $SD = .61$).

Some examples of leisurely activities participants discussed included doing yoga, spending time with family, and cooking. For invalidation, participants discussed being told that they weren't "Black" enough, and being invalidated because their phenotype did not match their racial identity. For discrimination from family, participants discussed family members excluding them at functions because of their race and being called racially charged words.

Descriptive Statistics

Descriptive statistics were calculated for all variables (see tables 3 and 4). The average age was 22.25 ($SD = 4.51$). Most participants were female (70.0%), and the remaining were male (30%). The majority of participants identified as heterosexual (88.3%). The education level varied: 13.3% completed high school, 51.7% completed some college, 3.3% completed an associate's degree, 25.0% completed a bachelors degree, and 6.7% completed a masters degree. Most participants were students (85.2%). With regard to average household income, 33.3% had incomes below \$49,000, 28.3% between \$50,000 and \$99,999, 16.7% between \$100,000 and \$149, 999, 11.7% between \$150,000 and \$199,999, 6.7% between \$200,000 and \$249,000 and 3.3% above \$250,000. The most frequently reported state of residence was Maryland (90.2%).

The majority of the participants had White mothers (56.7%) while some had Biracial mothers (26.7%), and a few had Black mothers (16.7%). The majority of

participants had Black fathers (63.3%), while some had White fathers (26.7%), and a few had Biracial fathers (8.3%) with one participant not reporting father's race. A prerequisite for participation was having one self-identified White and one self-identified Black biological parent, so the presence of Biracial parents could represent classification of parents based on ancestry rather than self-identification, parent's fluid racial identity, or else parent's double identity as Biracial and something else (Brusma & Rockquemore, 2001; Rockquemore et al., 2009).

Three participants were adopted, and all reported having a White adoptive mother. One reported having a White adoptive father, and the other two did not report a race for their father. Because items requested that participants list the race of their adopted mother and father, it is possible that some adopted participants did not report the race of both parents because they came from same-sex households.

As for participants' neighborhood racial composition while growing up, 48.3% reported mostly White, 23.3% reported mostly Black, 23.3% reported mixed racial composition, and 3 (5.0%) did not answer. Some participants reported having been a member of a Black organization (41.7%), while a smaller percentage reported having been a member of a Biracial organization (28.3%). Most participants identified as Biracial (81.7%), while some identified as Black (15.0%), and a few as White (3.3%). Participants reported moderately high levels of racial centrality ($M = 4.88$; $SD = 1.17$). While they were not used in analyses, baseline scores, blood pressure mean scores and standard deviations in each condition and phase are reported in Table 5. Baseline scores indicate that the sample was healthy.

Order Effects

Participants were presented with one of three potential orders of presentation for conditions: order 1 = leisurely activity, invalidation, and discrimination from family (N = 20), order 2 = discrimination from family, leisurely activity, and invalidation conditions (N = 23), and order 3 = invalidation, discrimination from family, and leisurely activity conditions (N = 17). A series of ANOVAs were run to test whether order of conditions affected blood pressure scores.

Order effects for conditions were insignificant for all outcome measures (see Table 6). Specifically, order did not affect systolic blood pressures scores for the imagination phase in the leisurely activity $F(2, 57) = 1.48, p > .05$, invalidation $F(2, 54) = 2.87, p > .05$, and discrimination from family $F(2, 46) = 2.77, p > .05$ conditions, nor did it affect diastolic blood pressure scores in the leisurely activity $F(2, 57) = .25, p > .05$, invalidation $F(2, 54) = .48, p > .05$, and discrimination from family $F(2, 46) = 2.09, p > .05$ conditions, nor did it affect pulse scores for the leisurely activity $F(2, 57) = .71, p > .05$, invalidation $F(2, 54) = 1.21, p > .05$, and discrimination from family conditions $F(2,46) = 2.95, p < .05$.

As for the discussion phase, order did not affect systolic blood pressures scores in the leisurely activity $F(2, 57) = .76, p > .05$, invalidation $F(2, 54) = 2.26, p > .05$, and discrimination from family $F(2, 46) = 1.26, p > .05$ conditions, nor did it affect diastolic blood pressure scores in the leisurely activity $F(2, 57) = .19, p > .05$, invalidation $F(2, 54) = .24, p > .16$, and discrimination from family $F(2, 46) = .63, p > .05$ conditions, nor did it affect pulse scores for the leisurely activity $F(2, 57) = .06, p > .05$,

invalidation $F(2, 54) = .69, p > .05$, and discrimination from family $F(2, 46) = .38, p > .05$ conditions.

Last, in the recovery phase, order did not affect systolic blood pressures scores in the leisurely activity $F(2, 57) = .67, p > .05$, invalidation $F(2, 54) = .23, p > .05$, and discrimination from family $F(2, 46) = 1.39, p > .05$ conditions, nor did it affect diastolic blood pressure scores in the leisurely activity $F(2, 57) = .05, p > .05$, invalidation $F(2, 54) = .24, p > .05$, and discrimination from family $F(2, 46) = 1.0, p > .05$ conditions, nor did it affect pulse scores for the leisurely activity $F(2, 57) = .03, p > .05$, invalidation $F(2, 54) = .20, p > .05$, and discrimination from family $F(2, 46) = 1.08, p > .05$ conditions.

Mixed Model Analyses with Repeated Measures

Mixed model analyses with repeated measures were used to test effects of condition and phase on blood pressure (See Table 7). Mixed model analyses were chosen, instead of the traditional repeated-measures ANOVA, because they utilize all available data, carry fewer assumptions, and are more accurate at predicting error, creating a less biased statistic (Judd, Westfall, & Kenny, 2005; Quene' & van den Bergh, 2004). Multilevel models are recommended for physiological data because this analysis effectively navigates autocorrelations between multiple time points (Zanstra & Johnston, 2011).

Two fixed-factors were included in each model: condition and phase. An autoregressive covariance structure was used. Maximum likelihood estimation was utilized to compare models with and without centrality. Analyses were undertaken using the mixed procedure in SPSS. A total of six mixed models were run: three models for

each outcome variable, followed by three that also included racial centrality as an interaction term. To control for the effects of discussion blood pressure values on those of the recovery phase, discussion blood pressure values were subtracted from those of the recovery phase.

The first model (See Table 7) examined whether systolic blood pressure varied across conditions (i.e., leisurely activity, invalidation, discrimination) for each phase (imagination, discussion, and recovery). Condition did not predict systolic blood pressure $F(2, 342.59) = .52, p > .05$, which indicates that systolic blood pressure scores did not differ across leisurely activity, invalidation, and discrimination conditions. The interaction of condition and phase predicted systolic blood pressure, $F(4, 400.45) = 2.70, p < .05$, indicating that systolic blood pressure values in some phases differed across levels of conditions. Post hoc pairwise analyses revealed that there was a difference ($p < .05$) between leisurely activity ($M = 5.22; SE = 1.35$) and discrimination from family ($M = .67; SE = 1.46$) conditions within the discussion phase, indicating that in the discussion phase, systolic blood pressure was higher for participants in the leisurely activity condition than in discrimination (see Figure 2). This effect was moderate ($d = .44$), as defined by Cohen (1992). There also was a difference ($p < .05$) between the leisurely activity ($M = -6.14; SE = 1.35$) and discrimination from family ($M = -1.84; SE = 1.48$) conditions in the recovery phase, indicating that in the recovery phase, systolic blood pressure was higher for participants in the discrimination condition than in leisurely activity (after controlling for discussion phase systolic blood pressure; see Figure 3). This effect was moderate ($d = .40$). Post hoc analyses comparing conditions within a phase are presented in Table 8.

The second model examined whether diastolic blood pressure varied across conditions for each phase. Condition did not predict diastolic blood pressure $F(2, 376.58) = .56, p > .05$, which indicated that diastolic blood pressure scores did not differ across leisurely activity, invalidation, and discrimination conditions. The interaction of condition and phase did not predict diastolic blood pressure, $F(4, 412.15) = .47, p > .05$, indicating that diastolic blood pressure in each phase did not differ across levels of conditions.

The third model examined whether pulse rate varied across conditions, for each phase. Condition did not predict pulse rate $F(2, 361.01) = .80, p > .05$, which indicates that pulse rate scores did not differ across leisurely activity, invalidation, and discrimination conditions. The interaction of condition and phase did not predict pulse rate, $F(4, 408.33) = 1.13, p > .05$, indicating that pulse rate in each phase did not differ across levels of conditions.

Mixed Models With Racial Centrality. Three additional multilevel modeling analyses (see Table 9) were calculated to determine whether racial centrality moderated the impact of race-related stress on cardiovascular reactivity.

The three-way interaction between condition, phase, and racial centrality (see Table 10) was not significant for systolic blood pressure $F(4, 413.67) = .33, p > .05$, diastolic blood pressure $F(4, 419.68) = .51, p > .05$, or pulse rate $F(4, 417.46) = .81, p > .05$.

Manipulation Check Post Hoc Analyses. Original analyses were run with blood pressure data from all participants who attempted to answer the prompt; blood pressure scores were included from participants with low adherence to prompt (ratings of 1 or 2).

Individuals with low adherence to prompt may have discussed experiences that deviated from intended definitions of racial stressors. Thus, to ensure that hypotheses were being soundly tested, post hoc analyses were run with blood pressure data from those participants who were rated either a “3” or “4” in adherence to prompts for their respective condition. This left blood pressure data from 36 participants in the discrimination from family condition, and 48 in the social invalidation condition.

The only model that was significant (See Table 10) examined whether systolic blood pressure varied across conditions (i.e., leisurely activity, invalidation, discrimination) for each phase (imagination, discussion, and recovery). The interaction of condition and phase predicted systolic blood pressure, $F(4, 330.50) = 3.02, p < .05$, indicating that systolic blood pressure values in some phases differed across levels of conditions. Post hoc pairwise analyses revealed that there was a difference ($p < .05$) between leisurely activity ($M = 5.34; SE = 1.47$) and discrimination from family ($M = .79; SE = 1.72$) conditions within the discussion phase, indicating that in the discussion phase, systolic blood pressure was higher for participants in the leisurely activity condition than in discrimination. This effect was moderate ($d = .44$), as defined by Cohen (1992). There also was a difference ($p < .05$) between the leisurely activity ($M = -6.89; SE = 1.47$) and discrimination from family ($M = -1.29; SE = 1.74$) conditions in the recovery phase, indicating that in the recovery phase, systolic blood pressure was higher for participants in the discrimination condition than in leisurely activity (after controlling for discussion phase systolic blood pressure scores). This effect was moderate ($d = .54$).

Post hoc analyses examining the significance of the condition by phase interaction in predicting diastolic blood pressure $F(4, 338.73) = .64, p < .05$ and pulse rate scores $F(4, 335.92) = 1.70, p < .05$ with the subsample were not significant.

Discussion

The purpose of this laboratory experiment was to examine the physiological reactivity associated with two race-related stressors—social invalidation and discrimination from family—for Black/White Biracial individuals. Results indicated that discrimination from family—and not social invalidation—affected cardiovascular reactivity. Racial centrality did not moderate the relationship between racial stress and cardiovascular stress response.

Counter to hypotheses and to past research on race-related stressors and physiological stress (e.g., Armstead et al., 1989; McNeilly et al., 1995; Fang & Myers, 2001), in the discussion phase, systolic blood pressure was higher in the control phase than in the discrimination from family phase.

This discrepant finding may have arisen because of the unique manipulation of “racial stress” used in the present study. Past studies operationalized racial stressors by asking participants to imagine or discuss a hypothetical racial stress scenario (Guyll et al., 2001; Merritt et al., 2006; Lepore et al., 2006), while this study involved participants discussing personal experiences of racial stress. Discussing personal experiences of racial stress might have had cathartic, rather than aggravating, effects on participants’ cardiovascular reactivity.

Alternatively, findings might signify that discussing personal experiences of discrimination from family was too threatening for participants, leading to disengagement during this racial stress prompt. Zanna and Johnston (2001) highlighted the mediating role of participant engagement in experimental cardiovascular reactivity studies. Participants who disengage may have blunted cardiovascular reactivity scores. Moreover, their awareness of an experimenter observing them may have contributed to a sense of

discomfort with revealing personal experiences, thus leading to disengagement. In addition, the nature of the “discussion” phase might promote disengagement as participants may be more focused on recounting a story than reliving past experiences.

Disengagement might be less likely to occur during the recovery phase—when participants do not have to actively disclose to an onlooker. In this phase, consistent with research on racism and physiological stress (Fang & Myers, 2001; McNeilly et al., 1995; Lepore et al., 2006; Merritt et al., 2006), systolic blood pressure scores were higher in the discrimination from family condition than in the leisure activity control condition. The magnitude of this effect was moderate.

Blood pressures alterations during the recovery phase are important because recovery blood pressure scores from a stressor are a better predictor of long-term health than reactance (Stephoe & Marmot, 2005). Cardiovascular reactivity during a stressor is expected, but continued reactivity following the stressor may be more representative of physiological dysregulation. In support of this, Steptoe and Marmot (2005) found that cardiovascular reactivity during a recovery period predicted cardiovascular health three years later. While blood pressure baseline scores indicated that the sample had healthy blood pressure scores at the time of the experiment, over time, the accumulation of racial stress related to discrimination from family members could influence long-term health outcomes, and ultimately contribute to heightened rates of cardiovascular disease characteristic of the Biracial population (Clark et al., 1996; U.S. Department of Health and Human Services, 2010).

The discrepancy in direction of findings between the discussion and recovery phase is interesting; the recovery phase may be more likely to cultivate rumination as

scholars have posited that the active discussion of a stressor may precede rumination and perseveration that arises once recounting is finished (Lepore et al., 2006; Merritt et al., 2006). Rumination is defined as “repetitive, intrusive, and negative cognitions about past stressors” (Radstaak, Geurts, Brosschot, Cillessen, & Kompier, 2011, p.238). Laboratory analogue studies have found that rumination relates to poorer cardiovascular outcomes following stressors (Larsen et al., 2012; Radstaak et al., 2011). Though the current study did not actively measure rumination in the recovery phase, rumination has been found to arise in periods directly following stressful events (Radstaak et al, 2011). Thus, it is possible that rumination played a mediating role in negative outcomes related to discrimination from family.

It is worth noting that results changed in magnitude when analyses were re-run with data from participants who highly adhered to condition prompts. These participants experiences were most valid for the purposes of the research questions: their experiences were clearly subjectively defined as discrimination from family and fit completely with the intended definition of the stressor. For them, the harmful effects of discrimination from family on blood pressure in the period after the stressor were more pronounced. Their results might most accurately reflect on the true effects of discrimination from family members on physical health.

Results of the current study indicate that racial stressors affect systolic blood pressure, but not diastolic blood pressure or pulse rates. While this finding may seem incongruent, considering that both systolic and diastolic blood pressure and heart rate increases are indicative of stress responses (American Heart Association, 2012), it is not necessarily so. The American Heart Association (2012) differentiates between blood

pressure and heart rate, stating that the two are separate and exclusive. Past research on cardiovascular response to racial stress also has found that racial stressors affect cardiovascular reactivity within particular domains (Fang & Myers, 2001; Guyll et al., 2001; Jones et al., 1996; Lepore et al., 2006; Merritt et al., 2006).

Further, it is relatively common for individuals to have heightened systolic blood pressure and normal diastolic blood pressure, a condition called “isolated systolic hypertension;” systolic blood pressure, in particular, has been found to predict long term heart health (National Heart, Lung, and Blood Institute, 2012). The substantial health implications of systolic blood pressure highlight the potential for discrimination from family to impact Biracial individual’s cardiovascular health.

Though there were some significant findings related to the initial hypotheses, the majority of cardiovascular reactivity measures did not differ across conditions, and no differences existed between blood pressure scores in the control and social invalidation conditions. Various reasons might explain these non significant-findings. First, results depended heavily on participant’s level of engagement (Zanstra & Johnston, 2011). The tasks requested that participants work hard to reengage in racial stressors, yet those who where most threatened by these stressors might be most likely to disengage from imagining and recalling these experiences. It is possible that participants’ disengagement in this laboratory analogue might reflect disengagement from these stressors in real-life, indicating that blunted physiological responses in the laboratory are representative of real life responses. However, it is likely that the ability to disengage is maximized in this laboratory analogue, where situational determinants (e.g., instigator of stressor) relating to stressors are minimized (Zanstra & Johnston, 2011). Thus, non-significant findings

across conditions may be explained by participants' disengagement from racial-stress conditions.

Second, this study relied on comparisons of racial-stress conditions to a "neutral" condition to demonstrate stress responses, yet the leisurely activity condition was an imperfect representation of neutrality. A cursory thematic investigation of content in the leisurely activity condition suggests that, at least for some participants, imagining and discussing leisurely activities might have produced excitement or even nervousness, forms of emotional arousal that affect cardiovascular reactivity. For example, in the leisurely activity condition, participants discussed attending concerts, playing sports, traveling, singing karaoke, and going dancing. If the leisurely activity condition did increase emotional arousal, then discrimination from family might be even more harmful than current findings suggest.

One last interpretation is that race-related stress, and in particular, social invalidation, has no physiological impact on participants. This interpretation seems inconsistent with past research (e.g., Campbell & Troyer, 2007; Coleman & Carter, 2007; Lou et al., 2011; Miville et al., 2005; Rockquemore & Laszloffy, 2003; Salauddin & O'Brien, 2011) that demonstrated the effect of race-related stressors on Biracial individuals; yet, past studies have all relied on self-report measures, which may not correspond with physiological indices (Lepore et al., 2006; Peters et al., 2011). It is possible that invalidation has psychological effects that do not manifest physiologically.

Another reason why social invalidation may have been found to have no physiological effects is because participants might have recalled invalidating experiences that they have already worked through. Thus, even though these experiences may have

been stressful when they initially occurred, they may have ceased to be stressful by the time the participant engaged in the study.

Contrary to expectations, racial centrality did not moderate the relationship between race-related stress and cardiovascular reactivity. Research examining whether racial centrality buffers or exacerbates racial stressors has been mixed. In some studies, racial centrality is protective against racial stressors (Sellers et al., 2003; Sellers et al., 2011; Yap et al., 2011), as individuals whose race is important to them might be more likely to seek out resources to help with racial stress and have more sophisticated coping responses. In contrast, racial centrality may exacerbate racial stress (Burrow & Ong, 2010; Richman et al., 2007; Sellers & Shelton, 2003), as the importance of racial identity may lead to increased vulnerability to racial stressors. Perhaps, the protective and aggravating effects of racial centrality on racial stress might cancel themselves out, making individuals with high racial centrality no more or less suited to deal with racial stress than individuals with low racial centrality.

Mixed findings on racial centrality, and the dearth of research on this concept for Biracial individuals confirm the need for caution in interpreting the non-significant moderating role of racial centrality in the relationship between racial stress and cardiovascular response. Multiracial research, in general, faces the limitation of relying on Monoracial methodologies and terminology to elucidate a Multiracial experience (Rockquemore, Brunson, & Delgado, 2009), although many factors differentiate racialized meanings for the Multiracial people.

Multiracial individuals' fluid, varying, and evolving racial identities complicate the meaning of racial centrality for this group. For example, Herman (2004) found that

centrality for Multiracial individuals depends on identity: minority-aligned Multiracial people evince higher centrality than those who are majority identified. Results from other studies, taken together, indicate that level of centrality may depend on age. Young Multiracial individuals have been found to have lower levels of racial centrality (Charmaran & Grossman, 2003) compared to monoracial minorities. This may be because some Multiracial parents socialize their children to place less importance on race to normalize the existence of their family (Samuels, 2009), or, alternatively, because Monoracial parents racial experience may not necessarily map onto those of the Multiracial child, leaving Multiracial children to deflect parents' racial messages. Yet, as Multiracial individuals age, their own stigmatized racial experiences compels them to place higher importance on race, and their levels of racial centrality increase (Samuels, 2009), although research is unclear regarding which racial identities, in particular, become more central.

Many Multiracial individuals possess a fluid sense of their racial identity that shifts depending on context (Mihoko Doyle & Kao, 2007; Rockquemore, Brunisma, & Delgado, 2009); does high centrality for these individuals indicate that one or each of their racial identities is central? What of individuals who possess a static "Multiracial" identity— does racial centrality indicate the importance placed on a unique "Multiracial" identity, or on each respective monoracial identity? There is no one "right" identity for Multiracial individuals and no correct path for successful racial identity development (Rockquemore, Brunisma, & Delgado, 2009), making it difficult to define the construct of racial centrality for Multiracial individuals.

In addition to conceptual issues contributing to null findings related to racial centrality, statistical issues also may explain these results. The current study used a multilevel model with a three-way interaction to examine how the relationship between racial stressors and cardiovascular reactivity differs depending on racial identity. This type of complex analysis places demands on power that may have rendered it ineffectual for the current sample size. All of the nuances of racial identity, and, subsequently, racial centrality for Multiracial individuals, along with issues of power makes it difficult to understand the lack of significance of racial centrality in predicting cardiovascular response to racial stressors in the current study.

Limitations

There were several limitations of the current study. One of the major limitations relates to external validity. Discussing and imagining experiences of racism will not fully reflect actual experiences of racism. Indeed, actual experiences of racism are more harmful for cardiovascular health than laboratory-analogues (Zanstra & Johnston, 2011). It is possible that discussing these stressful past experiences may have been cathartic for some participants, confounding possible physiological stress signals.

Another limitation is that the process of recalling racial stress experiences is vulnerable to issues of memory and cognitive bias. In recalling racial stress experiences that happened previously, emotional response to initial experiences may be forgotten—or else distorted. Stone and Shiffman (1994) discuss various cognitive heuristics that bias recall. One example that may be relevant to the present study is retroactive reconstruction, which is when individuals alter their memory of events based on their understanding of what happened afterwards.

Additionally, this study is limited in external generalizability for various reasons. The sample consisted of mostly females and college students. Also, most of the participants inhabited the DC Metropolitan area. Outcomes for Biracial people in America depend on their particular context (Brunsma & Rockquemore, 2001; Harris & Sim, 2002); in northern urban areas, it is less probable that participants had cumulative experiences of social invalidation or racial discrimination from family members. Experiences of these race-related stressors may be more harmful for Biracial individuals living in Southern states, where the racial history is more tumultuous and the one-drop rule is more engrained (Harris & Sim, 2002). Further, participants in the current study were self-selected, which might have biased the participant pool. Individuals who feel apathetic towards their Biracial identity, or else highly stressed by it may feel too disinterested or fearful (respectively) to volunteer to participate.

Further, characteristics of participant demographics may have influenced outcomes. Unexpectedly, many participants reported having Biracial parents. Participants with Biracial parents may be less susceptible to discrimination from family members, as their family may have already become used to familial racial mixing. Compared to Monoracial parents, Biracial parents may be able to better understand their Biracial child's experiences and offer advice and coping strategies for dealing with race-related stressors. Additionally, participants from adopted families inhabit a unique racial milieu that may make their racial experiences different than those of non-adoptive individuals. The current study might warrant replication with more stringent restrictions for demographic characteristics.

Another limitation is that the present study's racial centrality measure has never before been used on Biracial individuals. Thus, there is a possibility that the measure is not valid for Biracial individuals. Nonetheless, the racial centrality measure was chosen because it investigates how central racial group membership is to sense of self, which is relevant to how one internalizes experiences of discrimination. Additionally, the racial centrality measure has been used on other groups, including Mexican and Chinese individuals, and has been shown to have adequate validity (Kiang et al., 2006).

Last, limited power, due to sample size, could have contributed to null findings. The within-groups design substantively increased the number of data points used for analyses, yet, interaction analyses in particular, place large demands on power. It is possible that the current participant pool may not have sufficed for examining true population effects.

Strengths

The current study possesses various strengths. The effects of racial stressors on physical health for Biracial people have not been studied before; thus, this study advances research on racial stress and its implications for this group. The experimental within-group design allowed for tight control of extraneous variables. The manipulations further preserved internal validity, as condition prompts were identical, aside from key differences related to manipulations. The inclusion of a recovery period allowed for a more realistic examination of racial stress, by acknowledging that stress effects extend beyond the period in which the stressor occurs.

Past research has grouped Biracial individuals across denominations (e.g., Salahuddin & O'Brien, 2011; Jackson, Yoo, Guevarra & Harrington, 2012), even though

experiences may differ across specific backgrounds. Black/White Biracial individuals face specific obstacles in light of the tense racial history between Blacks and Whites and the strict enforcing of the one-drop rule for this group (Gillem & Thompson, 2004; Rockquemore & Laszloffy, 2003). This study's specific focus on Black/White Biracial individuals contributes to scholarship on the uniqueness of this experience.

Future Directions

Additional research is needed to further understand how racial stress affects Biracial individuals. The present study proposed no hypotheses for whether Black/White Biracial individuals of varied racial identities (i.e., Black, White, Biracial) will be differentially susceptible to racism; yet, beyond racial ancestry, self-proclaimed racial identity may be associated with different experiences of discrimination and varying ways of managing these experiences (Lou et al., 2011). Future studies might examine whether racial identity influences vulnerability to discrimination for Black/White Biracial individuals. Furthermore, future research should examine whether discrimination might affect physical health for other Biracial groups (e.g., Black and Asian, Asian and White).

Because this study was limited in its external generalizability, future research might attempt to expand research on Multiracial individuals by capturing the experiences of subsets of this population not typically examined. Although traditionally Biracial individuals are assumed to be the product of an interracial union, in the current study, a number of participants reported having a Biracial parent. Because parents are agents for children's racial socialization, racial identity of parents may be an important indicator for how Biracial individuals manage race-related stress. Future research might tease apart the

experiences of individuals with Biracial parents and investigate their susceptibility to racial stress.

Additionally, the review of the literature suggests that research on Biracial individuals (including the present study) tends to ignore the experiences of older Biracial individuals and Biracial males. As research on Biracial individuals increases, it should more fully acknowledge how other identities and characteristics (i.e., gender, parental racial composition, age) intersect with Biracial identity in influencing vulnerability to racial stress.

According to the biopsychosocial model, utilized to frame the present study, coping responses may be an important factor in mitigating racial stress (Clark et al., 1999). Black people's coping mechanisms include addressing, reinterpreting and walking away from instances of discrimination (O'Brien, Franco, & Dunn, in press), yet little research has been done on coping mechanisms specific to Biracial people (Salahuddin & O'Brien, 2011). It may be important to include coping factors when determining the severity of racial-stress response (Clark et al., 1999). More research should be done on Biracial coping mechanisms and the role they play in physiological and psychological vulnerability to racial stress.

The current study sought to examine the effects of two potent racial stressors on Biracial individuals' cardiovascular health. Yet past research on cardiovascular health and race has illustrated that subtle racial stressors may be more insidious for cardiovascular health (Guyll et al., 2001; Lepore et al., 2006; Merritt et al., 2006), perhaps because the ambiguity of the racist queue does not allow for justified recourse. These subtly racist experiences can be characterized as "microaggressions:" subtle

unconscious messages that communicate racial inferiority (Sue et al., 2007; Nadal, 2011). Nadal, Sricken, Davidoff, Wong, and McLean (2013) uncovered various types of microaggressions for Multiracial individuals that relate to racial stressors examined in the present study: isolation within families, favoritism within families, and denial of Multiracial identity and experiences. The physical health implications of these stressors should be examined.

In reference to a limitation of the current study, future physiological investigations of responses to race-related stress might employ visceral analogues of stress to examine physiological reactivity that are not confounded by thought, time, or level of engagement. For example, Fang and Myers (2001), Armstead et al. (1989), and Sutherland and Harrell (1986) utilized racially provocative film clips, while Peters et al., (2011) employed an image of a lynching. For Biracial individuals, a more visceral and externally valid racial stress simulation might involve actual racial invalidation by a confederate.

More recently, physiological research has begun to investigate reactivity to real life stressors using an ecological momentary assessment (EMA). This involves gauging stress response while individuals are actually undergoing stressors in everyday life (Stone & Shiffman, 1994; Zanstra & Johnston, 2011). Using this approach, research can be developed that examines real-life occurrences of invalidation and discrimination from family for Biracial individuals and the resulting stress response. The benefit of this approach is in its ecological validity and predictive ability for long-term cardiovascular health (Zanstra & Johnston, 2011).

Implications for Practitioners

Practitioners should recognize that after discussing experiences of discrimination from family, Biracial clients may feel stressed. Clients might ruminate on the negative experience of discrimination from family, and therapists could offer strategies to inhibit rumination. Therapists should recognize that Biracial client's reaction to experiences of discrimination from family may change within and between sessions and the therapist should be open to processing actual discriminatory experiences, as well as residual feelings that occur afterwards.

Therapists should be aware that different race-related stressors may have differential effects on Biracial clients, and should strategically cultivate interventions depending on the type of health implications for particular types of racial stressors. Past research illustrates that both social invalidation and discrimination from family have effects on psychological well-being. Should the preliminary findings of this study be replicated, therapists should be aware that discrimination from family seems to affect cardiovascular health. In light of this finding, in discussing client's experiences of discrimination from family members, therapists could go beyond exploring only psychological reactions to this stressor and explore physiological reactions as well. Therapists can provide strategies to regulate heart rate when this stressor arises and when clients think about the stressor after the occurrence.

Conclusion

This study was the first to examine the physiological effects of racial stressors on Biracial individuals. Findings suggest that discrimination from family members affects physiological health, yet not necessarily in the hypothesized direction. Talking about

personal experiences of discrimination from family decreased cardiovascular reactivity scores. In contrast, cardiovascular reactivity increased in the period directly after talking about these experiences. Future research is needed to understand the complex interplay between racial stress experiences and physiological health for the Biracial population. Despite Biracial people's vulnerability to racial stress, the discriminatory experiences of Biracial individuals have long gone unrecognized. It is hoped that this study will catalyze researchers and practitioners alike to utilize their skills in the pursuit of physical health and racial justice for the Biracial population.

Appendix A

Manipulation Check

Please answer questions below pertaining to each condition.

Not at All

Completely

0

1

2

3

4

- | | |
|--|-----------|
| 1) To what degree did the participant talk about engaging in a leisure activity? | 0 1 2 3 4 |
| 2) To what degree does the participant talk about an experience where others have denied the way in which they racial identify themselves? | 0 1 2 3 4 |
| 3) To what degree did the participant talk about a situation where a family member discriminated against them? | 0 1 2 3 4 |
| 4) To what degree did the participant discuss concerns about their grades in one of their classes? | 0 1 2 3 4 |

Appendix B

Racial Centrality Scale

Racial Centrality Scale (Adapted for Multiracial Individuals)

Below is a list of statements regarding the significance of racial group membership. Indicate your agreement with each of the following statements. As you complete the scale, please reference the racial group that you identify with the most (i.e., Black, White, Biracial, or Other).

Strongly Disagree

Strongly Agree

1 2 3 4 5 6 7

- | | |
|--|---------------|
| 1. Overall, being a member of my racial group has little to do with how I feel about myself* | 1 2 3 4 5 6 7 |
| 2. In general, being a member of my racial group is an important part of my self-image | 1 2 3 4 5 6 7 |
| 3. My destiny is tied to the destiny of others in my racial group | 1 2 3 4 5 6 7 |
| 4. Being a member of my racial group is unimportant to my sense of what kind of person I am* | 1 2 3 4 5 6 7 |
| 5. I have a strong sense of belonging to my racial group | 1 2 3 4 5 6 7 |
| 6. I have a strong attachment to others in my racial group | 1 2 3 4 5 6 7 |
| 7. Being a member of my racial group is an important reflection of who I am | 1 2 3 4 5 6 7 |
| 8. Being a member of my racial group(s) is not a major factor in my social relationships* | 1 2 3 4 5 6 7 |

Note: Statements with asterisks are reverse scored. A total score should be calculated by averaging all of the items (1-8).

Appendix C

Demographic Questionnaire

- 1) Age _____
- 2) Height _____
- 3) Weight _____
- 4) Do you smoke (Yes/No)
- 5) City _____
- 6) State _____
- 7) Occupation _____

If you are a student, please indicate your year in school

- Freshman
- Sophomore
- Junior
- Senior

- 8) Gender
- Female
- Male
- Transgendered
- Other _____

- 9) Race/ Ethnicity or Biological Mother
- Black or African-American
- White
- Hispanic/ Latina/Latino
- American Indian or Alaska Native
- Native Hawaiian or Other Pacific Islander
- Asian
- Biracial/Multiracial

Other _____

6) Race/Ethnicity of Biological Father

- Black or African-American
- White
- Hispanic/ Latina/Latino
- American Indian or Alaska Native
- Native Hawaiian or Other Pacific Islander
- Asian
- Biracial/Multiracial
- Other _____

7) Were you adopted?

- Yes
- No

If so, please indicate the race of your adopted parents:

Parent 1:

- Black or African-American
- White
- Hispanic/ Latina/Latino
- American Indian or Alaska Native
- Native Hawaiian or Other Pacific Islander
- Asian
- Biracial/Multiracial
- Other _____

Parent 2:

- Black or African-American
- White
- Hispanic/ Latina/Latino
- American Indian or Alaska Native
- Native Hawaiian or Other Pacific Islander
- Asian
- Biracial/Multiracial
- Other _____

10) Please select the box that corresponds to your (before tax) household income.

- Below \$49,999
- \$50,000-\$99,999
- \$100,000-\$149,999
- \$150,000-\$199,999
- \$200,000-\$249,999
- \$250,000-\$299,999
- More than \$300,000

11) Highest level of education that you completed

- Middle School
- Some High School
- High School/ GED
- Trade/ Vocational
- Some College
- Associates

- Bachelors
- Masters
- Doctorate
- Other (if applicable) _____

12) Sexual Orientation

- Heterosexual
- Lesbian or Gay
- Bisexual
- Something else
Please indicate _____
- Don't Know

13) What was the racial composition of your neighborhood while you were growing up?

- Mostly Black
- Mostly White
- Mostly some other race
Please indicate _____
- Mixed

14) Have you participated in any groups focusing on a particular racial group? (Check all that apply)

- Black or African-American
- White
- Hispanic/ Latina/Latino
- American Indian or Alaska Native
- Native Hawaiian or Other Pacific Islander

- Asian
- Biracial/Multiracial
- Other _____

Appendix D

Fliers

IS THIS YOU?



Research Study!

If you have **1 Black parent and 1 White parent**, we invite you to volunteer to be a part of our research.

- Earn **SONA Course Credit or \$10** in exchange for 45 minutes of your time.
- Your personal experience can **help us understand an understudied population.**
- Blood pressure and heart rate will be taken as part of the study.

Interested? Contact the following e-mail address:
MFresearchstudy@gmail.com

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Figure 1

Experimental Design

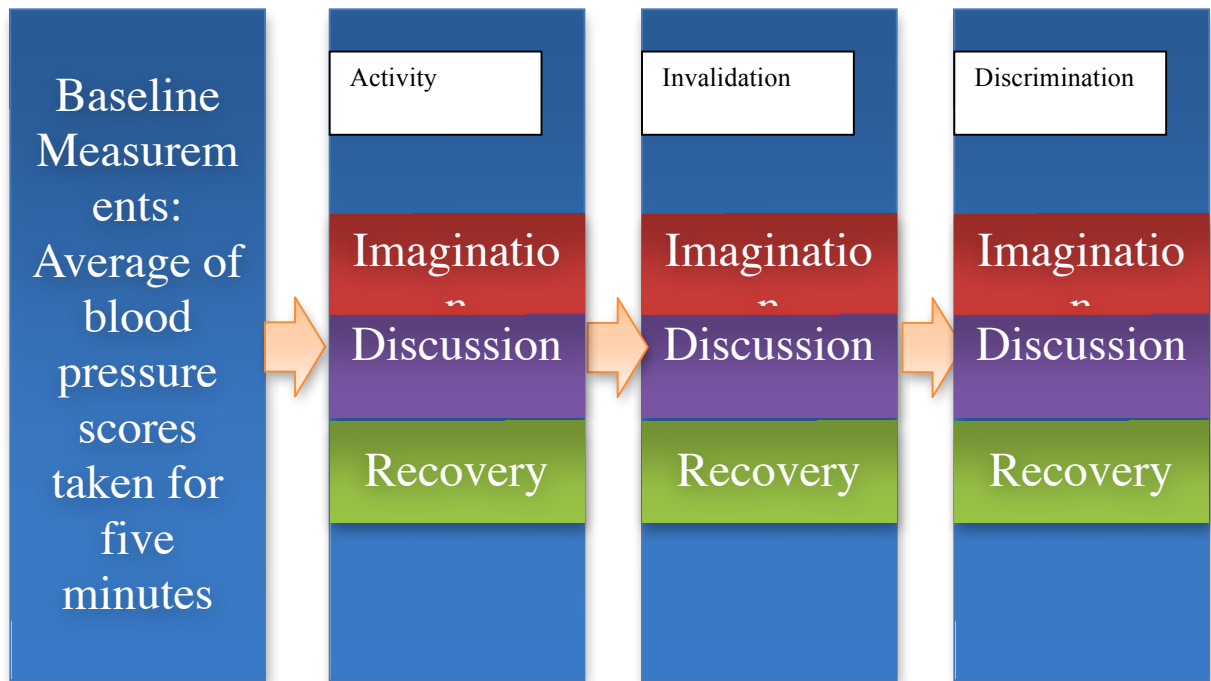


Figure 1. Overview of Procedures. For data analyses, the following will be compared: 1) imagination phase across conditions, 2) discussion phase across conditions, and 3) recovery phase across conditions.

Figure 2

Post Hoc Analyses for Discussion Phase

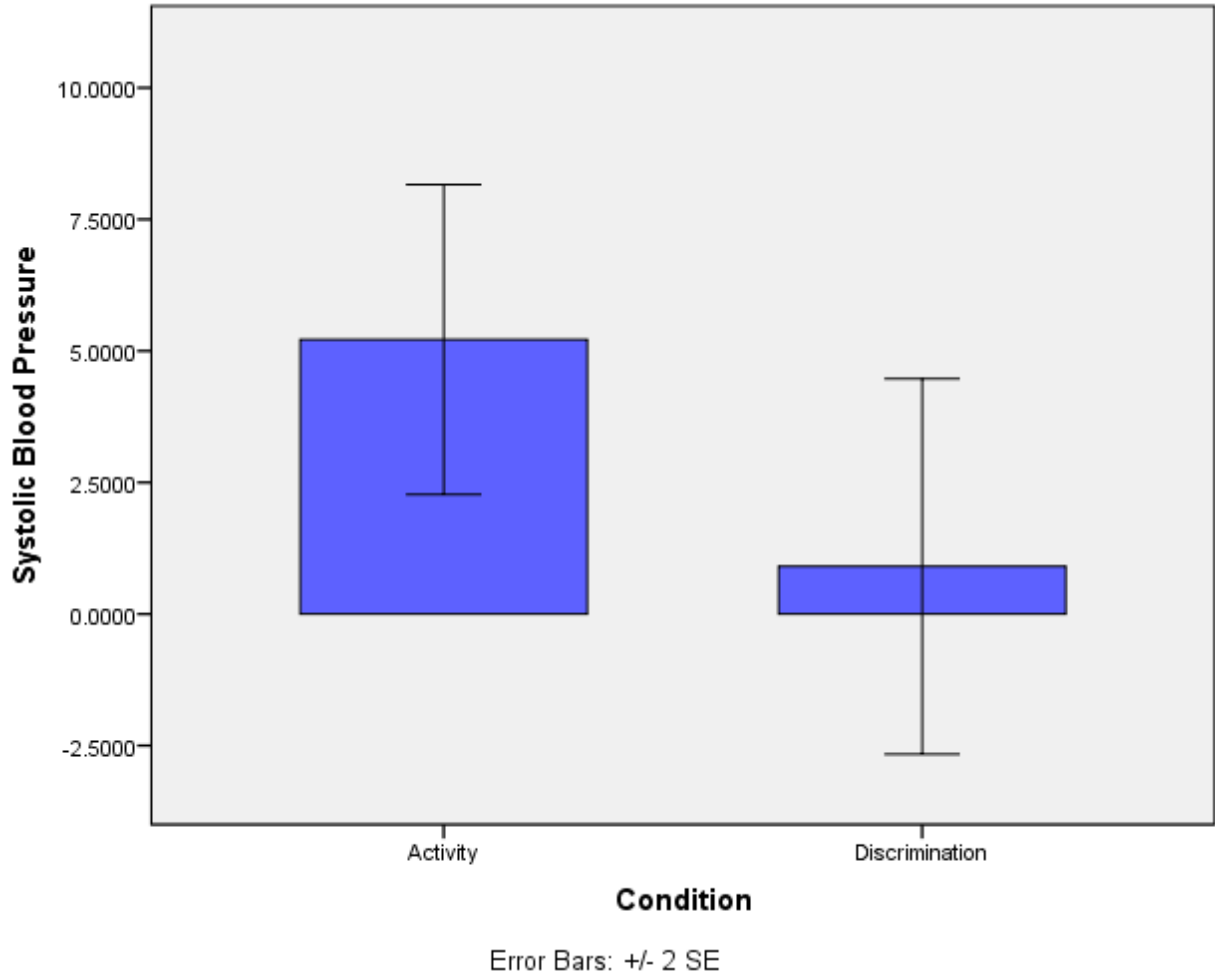


Figure 3
Post Hoc Analyses for Recovery Phase

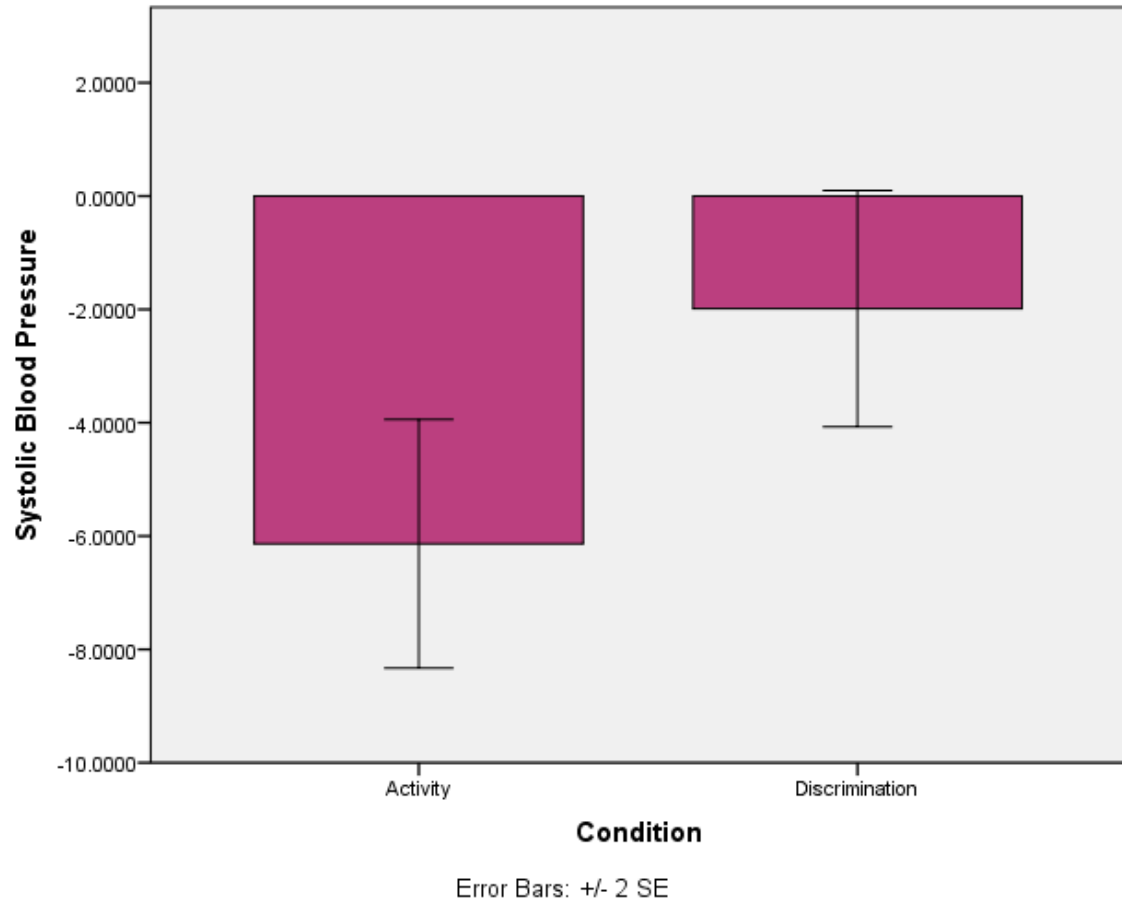


Table 1
Items retained in racial centrality scale

Item	Item-total Correlations
Overall, being a member of my racial group has little to do with how I feel about myself	.58
In general, being a member of my racial group is an important part of my self-image	.62
Being a member of my racial group is unimportant to my sense of what kind of person I am	.50
I have a strong sense of belonging to my racial group	.59
I have a strong attachment to others in my racial group	.49
Being a member of my racial group is an important reflection of who I am	.63

Table 2
Manipulation Check

	Condition			
	Leisurely Activity	Invalidation	Discrimination	Across Conditions
Mean	3.56	2.80	2.23	0
SD	.86	1.02	1.14	0
N	55	51	46	

Table 3
Demographic characteristics of participants (N=60)

Variable	N	%
Gender		
Female	42	70%
Male	18	30%
Sexual orientation		
Heterosexual	53	88.3%
Gay/lesbian	2	3.3%
Bisexual	2	3.3%
Don't know	2	3.3%
No answer	1	1.7%
Educational level		
High school/GED	8	13.3%
Some college	31	51.7%
Associates degree	2	3.3%
Bachelors degree	15	25.0%
Masters degree	4	6.7%
Student		
Yes	51	85.0%
No	9	15.0%
Student Year		
First year	10	16.7%
Second year	13	21.7%
Third year	8	13.3%
Fourth year	7	11.7%
Five or more years	13	21.7%
State of Residence		
Maryland	54	90.0%
Washington DC	4	6.7%
Other	2	3.3%
Household Income		
Below \$49,000	20	33.3%
\$50,000 - \$99,999	17	28.3%
\$100,000 - \$149,999	10	16.7%
\$150,000 - \$199,999	7	11.7%
\$200 - \$249,999	4	6.7%
Above \$250,000	2	3.3%
Race of mother		
Black	10	16.7%
White	34	56.7%
Biracial	16	26.7%
Race of father		
Black	38	63.3%
White	16	26.7%

Biracial	5	8.3%
No answer	1	1.7%
Adoption status		
Yes	3	5.0%
No	58	95.0%
Race of adopted mother		
White	3	5.0%
Race of adopted father		
White	1	1.7%
No answer	2	3.3%
Neighborhood racial composition		
Mostly Black	14	23.3%
Mostly White	29	48.3%
Mixed racial composition	14	23.3%
Missing	3	5.0%
Member of a Black organization		
Yes	25	41.7%
No	35	58.3%
Member of a Biracial organization		
Yes	17	28.3%
No	43	71.7%
Racial identity		
Biracial	49	81.7%
Black	9	15.0%
White	2	3.3%

Table 4

Demographic characteristics of participants, continued (N = 60)

Variable	Minimum	Maximum	Mean	SD
Age	18	41	22.25	4.51

Table 6
Significance of order for conditions and phases

Phase	Condition	Outcome Measure	Numerator df	Denominator df	F
Imagination	Leisurely Activity	SYS	2	57	1.48
		DYS			.25
		Pulse			.71
	Invalidation	SYS	2	54	2.87
		DYS			.48
		Pulse			1.21
	Discrimination	SYS	2	46	2.77
		DYS			2.09
		Pulse			2.95
Discussion	Leisurely Activity	SYS	2	57	.76
		DYS			.19
		Pulse			.06
	Invalidation	SYS	2	54	2.26
		DYS			.16
		Pulse			.69
	Discrimination	SYS	2	46	1.26
		DYS			.63
		Pulse			.38
Recovery	Leisurely Activity	SYS	2	57	.67
		DYS			.05
		Pulse			.03
	Invalidation	SYS	2	54	.23
		DYS			.24
		Pulse			.20
	Discrimination	SYS	2	46	1.39
		DYS			1.00
		Pulse			1.08

Table 7
Mixed model analysis of main variables

Variable	<i>F</i>	<i>Df_n</i>	<i>Df_d</i>
Systolic Blood Pressure			
Phase	16.69**	2	298.46
Condition	.52	2	342.59
Phase X Condition	2.70*	4	400.45
Diastolic Blood Pressure			
Phase	72.10**	2	326.14
Condition	.56	2	376.58
Phase X Condition	.47	4	412.45
Pulse Rate			
Phase	88.96**	2	312.72
Condition	.80	2	361.01
Phase X Condition	1.13	4	408.33

Note. * $p < .05$ ** $p < .001$

Table 8
Post hoc analyses

Phase	Leisurely Activity		Discrimination from Family		Effect Size
	Mean	SE	Mean	SE	
Discussion	5.22	1.35	.67	1.46	.44
Recovery	-6.14	1.35	-1.84	1.48	.41

Table 9
Mixed models with racial centrality

Dependent Variable	<i>F</i>	<i>Df_n</i>	<i>Df_d</i>
Systolic Blood Pressure	.33	4	413.67
Diastolic Blood Pressure	.51	4	419.68
Pulse Rate	.81	4	417.46

Note. All models include condition x phase x racial centrality as the independent variable

Table 10

Post hoc analyses using participants with high adherence to prompts

Phase	Leisurely Activity		Discrimination from Family		Effect Size
	Mean	SE	Mean	SE	
Discussion	5.34	1.47	.79	1.72	.44
Recovery	-6.89	1.47	-1.29	1.74	.54

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