NICE DISSERTATION, FOR A GIRL: CARDIOVASCULAR AND EMOTIONAL REACTIVITY TO GENDER MICROAGGRESSIONS.

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Gender microaggressions are normative messages that communicate harmful stereotypes or attitudes towards women. Research suggests that being the target of microaggresions may contribute to negative mental and physical health outcomes. The current study examined how gender microaggressions affect emotional and physiological reactivity as well as performance on a working memory task. Results indicated condition (i.e., control vs. sexual objectification microaggression vs. denial of sexism microaggression) did not have a significant effect on reactivity or performance. Issues of population bias and essentialism may have played an important role in study findings. Future directions are discussed.

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INTRODUCTION

Microaggressions are common, and frequently unnoticed, messages that communicate harmful stereotypes or attitudes towards minority groups (Sue, Capdilupo, Torino et al., 2007). Sexist microaggressive messages, including objectification, stereotyping, and use of sexist language, may be experienced as daily stressors for women (Klonoff & Landrine, 1995). Research suggests that more frequent experiences of microaggresions, and associated psychological and physiological reactivity (Matheson, Gill, Kelly & Anisman, 2008; Utsey & Hook, 2007), compound over time to negatively impact physical health and psychological well-being (Swim, Hyers, Cohen & Ferguson, 2001). The current study seeks to understand how gender microaggressions affect women's physiological reactivity, affect, and performance on a subsequent task.

Subtle Sexism and Gender Microaggressions

Following the civil rights movement in the United States, the face of prejudice and discrimination against minority groups drastically changed. Equality and tolerance grew as cultural values, and overt acts of repression and discrimination became less tolerated. Sexism was no exception, and both men's and women's endorsement of overt sexist beliefs and attitudes significantly decreased following the 1970's (Twenge, 1997). Despite the apparent dissolution of sexism, ninety-nine percent of women continue to report having experienced a sexist event in their lifetime (Klonoff & Landrine, 1995), and most women experience a sexist event one to two times a week (Swim et al., 2001). Subtle sexism is embedded in the everyday, normative experiences of women and thus may even occur even more frequently than anecdotal estimates. Although significant exceptions exist, less obvious forms of sexist attitudes and behaviors preponderate these experiences (Benokraitis & Feagin, 1986). This modern, or subtle, sexism is often unintentional and frequently unnoticed by both the perpetrator and target.

Microaggressions are channeled through individual interactions, institutions and the cultural fabric, and thus send pervasive messages about a minority's role in society (Sue et al., 2007). They are frequently in contrast to the microaggressor's overt identification with egalitarian values, but nevertheless undermine the autonomy and security of target minorities. Microaggressive messages can be divided into three broad categories. Microassaults are conscious and intentional prejudiced messages. These can either be explicit or subversive, but are purposefully aimed to damage the targeted individual or group. In contrast, microinsults and microinvadliations are unintentional and frequently unconscious. Microinvalidations are words or actions that deny or demean the psychological and environmental experience of minorities, such as denying the reality of discrimination. Microinsults are similarly insidious, but refer to messages communicating insensitivity and rejection of minority culture. These may include environments or interactions that debase minority values or perpetuate group stereotypes, such as messages that encourage minorities to assimilate to dominant culture. When these messages are aimed at women, they are referred to collectively as gender microaggressions.

Microaggressions are frequently embedded in commonplace and seemingly benign interactions, perhaps leaving those involved confused as to what has occurred. The development of a taxonomy of microaggressions is therefore useful to expose otherwise ambiguous or unapparent incidents. Categories were originally conceptualized by Sue, Nadal, Capdilupo and colleagues (2008) and based on the theoretical themes of microaggressions against the range of minority groups (e.g., racial/ethnic minorities). Empirical investigation of women's subjective experience of microaggressions refined and adapted these categories into 10 specific types of gender microaggressions: sexual objectification, second-class citizenship, use of sexist language, assumption of inferiority, restrictive gender roles, denial of the reality of sexism, denial of

individual sexism, invisibility, environmental microaggressions, and sexist humor/jokes (Capodilupo et al., 2010; Nadal, 2010; Sue & Capodilupo, 2008). These categories are not always discrete, and multiple kinds of microaggressions may be communicated in a single message. Although a single microaggressive message may be seemingly innocuous, the chronic and interactive nature of microaggressions make them a harmful aspect of women's and other minorities' lives.

Sex Disparities in Experiences of Stress

Women face a disproportionate risk of a range of psychiatric symptoms and mental health issues. Compared to men, women are twice as likely as men to experience mood and anxiety disorders (Kessler, Mcgonagle, Zhao, et al., 1994; Wittchen, Zhao, Kessler & Eaton, 1994), face a higher rate of comorbid disorders (Linzer, Spitzer, Kroenke et al., 1996), remain depressed longer (Bracke, 2000), and have higher rates of suicide attempts (Weissman, Bland, Canino et al., 1999). Although biological differences account for a portion of these disparities (Angold, Costello, Erkanli & Worthman, 1999; Kendler, Gardner, Neale et al., 2001), research indicates gender differences in stress and coping also play an important role in mental and physical well-being (Davis & Matthews, 1996; Dennerstein, 1996; Hankin & Abramson, 2001; Lazarus & Folkman, 1984).

Women tend to experience major life stressors as relatively more stressful, negative and uncontrollable than men (Matud, 2004; Ptacek, Smith & Zanas, 1992). Although women and men experience similar levels of major stressful life events such as divorce and bereavement (Kessler & McLeod, 1984; Matud, 2004), women experience a disproportionate burden of chronic and minor daily stressors (Kessler & McLeod, 1984; Matud, 2004; McDonough & Walters, 2001). Many of these ongoing stressors and daily hassles are the result of experiences

unique to women in a male-dominant society, such as experiences of gender prejudice and microaggressions (Russo, 1990).

Women's minority status exposes them to a unique set of gender-specific stressors, or "negative events…that happen to women, because they are women" (Klonoff & Landrine, 1995). These stressors can include work/familial role conflicts (Reifman, Biernat & Lang, 1991; Stambor, 2006), domestic violence and rape (Russo, 1995), and perceived unfair treatment based on gender (Landrine, Klonoff & Gibbs, 1995). Evidence suggests that the effects of gender-specific stress may be more important in understanding the psychological health of women than more generic stressful events (Landrine et al., 1995; Utsey et al., 2008). Conceptualizing sexist events as negative life stressors and daily hassles also allows the application of traditional stress models to understanding the mental and physical health of women (Lazarus & Folkman, 1986; Blascovich & Tomaka, 1996).

The Reactivity Hypothesis

Experiences of stress result in adaptive changes throughout body systems, including cardiovascular, metabolic, immune and central nervous systems (Cacioppo, Bernston, Malarkey et al., 1998; McEwen, 1998; Seeman, Singer, Rowe, Horwitz & Mcewen, 1997). This physiological reactivity across systems has been found to contribute to a multitude of disease outcomes including infectious diseases (Cohen, Hamrick, Rodriguez et al., 2002), cancer (Sklar & Anisman, 1981), HIV (Leserman, 2003), and coronary heart disease (CHD; Lovallo & Gerin, 2003; Treiber, Kamarck, Schneiderman et al., 2003). Stress is an established risk factor for CHD morbidity and mortality (Greenwood, Muir, Pakcham & Madeley, 1996; Rozanski, Blumenthal, Kaplan, 1999).

Cardiovascular reactivity (CVR) is hypothesized to be a pathway through which psychosocial risk factors, and specifically stressors, contribute to CHD development (Treiber et al., 2003). Cardiovascular reactivity refers to acute hemodynamic changes, including heart rate (HR) and blood pressure (BP), mediated by the autonomic nervous system in response to psychological stress (Manuck, 1994). Individual variability in the tendency to exhibit these changes to a greater or lesser degree has been found to be relatively stable when measured across contexts (Manuck, Kaplan, Adams et al, 1989; Sherwood & Turner, 1995). These patterns of CVR in response to various life stressors and challenges are thought to compound over time, with individuals experiencing more frequent, larger and longer CVR being more likely to later present with preclinical indicators of CHD, development of CHD, cardiac events and CHD-related mortality (Treiber et al., 2003).

Gender, Discrimination, and Cardiovascular Health

Cardiovascular disease is the number one cause of death in the United States for women of every ethnicity (Thom, Haase, Rosamond et al., 2005), and women have exceeded the CVD-related death rate for men since 1984 (Lloyd-Jones, et al., 2010). Although few studies directly examine the negative effects of gender-specific stress on physical health, multiple comprehensive reviews of the literature have established high levels of racial/ethnic discrimination as a risk factor for negative health outcomes, including mortality (Barnes, Mendes de Leon, Lewis et al., 2008; Krieger, Rowley, Hermann et al., 1993; Krieger, Smith, Naishadham et al., 2005; Paradies, 2006; Williams, Neighbors & Jackson, 2003).

A recent meta-analysis identified a small but consistent negative association between discrimination and risk factors such as blood pressure, general indicators of health (e.g., pain, general self-reported health), as well ass diseases including diabetes, respiratory conditions, pain,

and CVD (Pascoe & Richman, 2009). Racial/ethnic discrimination has also been associated with pre-clinical CVD states such as increased intima-media thickness (Troxel, Matthews, Bromberger & Sutton-Tyrrell, 2003), the presence of coronary artery calcification (Lewis, Everson-Rose & Powell, 2006), increased blood pressure (James, Lavato & Khoo, 1994; Kriger & Sidney, 1996), and hypertension (Cozier et al., 2006; Davis, 2005). Although it should be noted these findings have not been universal (Friedman, Williams, Singer & Ryff, 2009; James, LaCroix, Kleinbaum & Strogatz), they suggest that experiences of discrimination may be important for understanding minority health, including women.

Although fewer studies examine the health effects of sexism, preliminary results indicate it negatively affects women's health. For instance, in a large Spanish study of women aged 20 to 64 years old, perceived sexism was associated with consistent decreases in perceived health and increases in injuries in the last 12 months, although report of sexism in this sample was remarkably low (3.4%; Borrell, Artazcoz, Gil-Gonzalez et al., 2010). In a separate study, gender discrimination was associated with hypertension for black women, although there was no association among white women (Krieger, 1990). If sexism is associated with negative health outcomes, it is likely that acute incidents of sexism, including micoraggressions, will be associated with physiological reactivity that contribute to disease processes.

Microaggressions and Cardiovascular Reactivity

Although a multitude of studies have demonstrated increased cardiovascular reactivity in the laboratory in response to experimentally manipulated racial/ethnic microaggressions (Clark, 2006; Clark, Cobb, Hopkins et al., 2006; Lepore, Revenson, Weinberger et al., 2006; Merritt, Bennett, Williams et al., 2006), research related to gender microaggresions is, again, relatively lacking. To the author's knowledge there are only three studies that examine cardiovascular

reactivity in relation to sexism or gender microaggressions. Although these studies frequently employ terms such as sexism (Eliezer, Major & Medes, 2010), harassment (Schenider, Tomaka & Palacios, 2001), and gender discrimination (Matheson & Anisman, 2008) to describe the nature of their experimental manipulations, close examination reveals that these studies are actually using microaggressions to activate their construct of choice. Accurately identifying events in experiments as well as in women's anecdotal or self-report as microaggressions is important for two reasons. First, it allows the effects of gender microaggressions on physiological reactivity and health to be more easily compared to the growing literature on microaggressions against other types of minorities. Second, using the term microaggressions emphasizes the cultural endorsement and ubiquitous experience of these messages in ways that terms such as "harassment" and "sexism" tend to obscure due to cultural values of egalitarianism and frequent denial of individual sexism. For this purpose, the limited studies employing laboratory models of various themes of sexism were analyzed from a microaggression model.

In a study by Schenider and colleagues (2001), female participants worked "collaboratively" with a male confederate on a word association task. In the "harassment" condition, the confederate remarked, "Girls aren't very good at this. I'll do it all and get a good score for us." This manipulation again corresponds to a microaggressive message assuming the inferiority of women. Participants exposed to this message exhibited larger changes in heart rate (HR), preejection period (PEP), mean arterial pressure (MAP) and systolic blood pressure (SBP) during the task relative to an egalitarian condition. Moreover, this comment carried over to a subsequent speech task, where women exposed to the microaggression continued to exhibit increased reactivity and experienced more sadness, anger, envy, and disgust during the task.

A separate group (Elizer, Major & Mendes, 2010) provided participants with an article from which to prepare a speech describing sexism as either prevalent or rare (e.g., describing 80 to 85% versus 7% of males as having sexist attitudes, respectively). The *rare sexism* condition can be conceptualized as reflecting the theorized microaggressive theme *denial of sexism* (Sue et al., 2007). Results indicated women exhibited a pattern of threat CVR when exposed to material describing sexism as prevalent, but not rare. Women in this group with a high level of gender identification also maintained this threat pattern of CVR throughout recovery, and reported higher levels of anxiety. These findings seem to indicate that women may not experience denial of sexism as stressful and, in contrast, may actually benefit from this belief. In a qualitative study of experiences of subtle sexism and microaggressions (Capodilupo et al., 2010), denial of the reality of sexism emerged as an underdeveloped theme, only cited by a single participant. It is possible the effects of subtle sexism and the cultural myth of gender equality predispose women to also overlook or deny their experiences of prejudice, thereby buffering them from stressful responses when others express similar denial. As such, it becomes clear that the context and theme of microaggressive messages are likely important moderators of the relative impact on victims.

Lastly, Matheson and colleagues (2008) provided a gender discrimination paradigm in which, following a writing task, women in an experimental condition were notified their work had been judged negatively by a group of male students, presumably because "these guys never pass any of the women." Women who were primed to feel angry before the microaggression exhibited an increase in systolic blood pressure (SBP) and diastolic blood pressure (DBP), and DBP continued to remain elevated at least 30 minutes after the event, relative to those primed to feel sad. While this particular manipulation does not seem to exemplify any one

microaggressive category, it does reflect messages of assumption of inferiority and second class citizenship. The results of this study indicate that initial mood or feelings about sexism may moderate responses to a microaggression experience. However, this study failed to include a control group, which would have allowed assessment of overall reactivity to the microaggression independent of primed affect. Additionally, the clear operationalization of microaggressive themes is important for systematic examination of the physiological effect of these messages.

Current Study

The above findings from both large-scale epidemiological as well as acute, laboratory studies provide preliminary evidence that microaggressive messages may affect women's physiological and psychological reactivity and health to varying degrees. However, the evidence base is limited by a lack of deliberate operationalization of microaggresive themes, scarcity of empirical studies, and information on the relative performance effects these messages may have on different forms of subsequent tasks. The goal of the current study is to address the limitations in the literature by examining the effect of sexual objectification and denial of sexism microaggressive messages delivered in the laboratory on cardiovascular reactivity, acute mood states, and subsequent task performance in women.

METHOD

Participants and Design

Eighty-one female participants aged 18 to 23 (M = 19.63, SD = 2.07) were recruited from undergraduate psychology courses at the University of North Texas (UNT) and received course credit for their participation. Racial/ethnic composition of the sample was 43% Non-Hispanic White, 28% Non-Hispanic Black, 13% Non-Hispanic Asian, 7% Hispanic White, and 10% Other.

As gender microaggressions have been identified as manifesting in up to ten different themes, empirical parsimony requires that the effects of individual themes be explored in a systematic manner. Although any form of sexist microaggression can be common and harmful, sexual objectification is one of the most frequent and destructive sexist messages (Swim et al., 2001), and is associated with harmful effects such as self-objectification (Moradi, Dirks & Matteson, 2005; Noll & Fredrickson, 1998), depression (Muehlenkamp & Saris-Baglama, 2002; Tiggemann & Kuring, 2004), and decreased performance (Fredrickson & Harrison, 2005; Fredrickson, Roberts, Noll, Quinn & Twenge, 1998). Given the frequency and severity of sexual objectification, this microaggression category has the potential for contributing the most to negative health outcomes in women, and thus is a good candidate for initial examination of microaggression categories and reactivity. In addition, the themes of gender microaggressions have been developed both through theoretical deduction (Sue and Capdilupo, 2008) and empirical investigation (Capdilupo et al., 2010), and these methods of knowledge do not always converge. Specifically, preliminary evidence suggests that denial of sexism may not be widely recognized by women (Capdilupo et al., 2010) nor elicit significant changes in physiological reactivity (Matheson et al., 2008). For these reasons, further research is warranted to address the

denial of sexism microaggresion directly. Participants were randomly assigned to either one of the microaggresion experimental conditions (i.e., sexual objectification or denial of sexism), or a neutral condition that served as a control. The final participant break for conditions was 27 in the sexual objectification condition, 27 in the denial of sexism condition, and 27 in the control condition.

Procedure

Baseline

Upon arrival to the laboratory, participants were escorted to an experimental room, separated from physiological monitors and observed via audio and visual recording equipment. Participants read and sign an informed consent. Electrodes and an occluding cuff were applied as described below and consistent with manufacturers' recommendations.

It was critical to the study that participants perceive the experimental microaggresion as an authentic, spontaneous event in order to approximate women's everyday experience of microaggresions in their social environment. As a result, it was necessary to deceive participants as to the identity of a male research assistant (RA) who behaved as a "confederate" in the study. The confederate was seated in the laboratory waiting room and signed an informed consent at the same time as the female participant. He was later escorted into the experimental room, ostensibly having had electrodes applied in a separate area. The confederate's electrode leads were connected to the impedance cardiograph, and he was seated across the table from the participant. In order to limit the variance due to individual RA differences, the confederate role was limited to and balanced across two RA's.

Baseline measures of resting cardiovascular activity were collected during a ten-minute minimally demanding task (i.e., "vanilla" baseline period; Jennings, Kamarck, Stewart, et al.,

1992). Participants viewed 10 pairs of nature scenes for one-minute each. At the end of each minute, participants selected their preferred scene for each pair. Impedance cardiograph physiological data was collected throughout this 10-minute period. Blood pressure readings were assessed at 300, 420, 480, and 540 seconds. Although initial inflation of BP occluding cuffs has been shown to produce no physiologically significant alarm responses (Parati, Pomidossi, Casedei & Mancia, 1985), the reading taken at 300 seconds was discarded as an extra precaution. Self-reported state anger, anxiety, and shame were assessed at the end of the baseline period using the State Affect adjectives.

Microaggression Manipulation

Following the baseline period, the RA returned to the room to explain the purpose of the study as an examination of gender differences in basic math proficiency and physiological reactivity to simple math problems. Immediately afterward, the RA instructed the participant and confederate to sit quietly and wait for instructions and exited the room. A moment after the RA departed, the confederate made one of three condition-specific comments to the participant:

1. Neutral: "Well these results won't matter. We're psychology students, not math majors."
2. Sexually objectifying: "Well these results won't matter. If a girl's hot, who cares if she's good at math."
3. Denial of Sexism: "Well these results won't matter. It's not like women are treated differently these days."

Victims' responses to incidents of discrimination can moderate an individual's emotional and physiological reaction to the event, potentially reducing or increasing the impact of the insult (Schneider, Tomaka & Palacios, 2001). In order to prevent spontaneous participant responses (e.g., verbal retort), immediately after the confederate's comment was delivered, the RA came

over the microphone to remind the participants to please sit silently until they heard further instructions. In order to capture the participant's physiological response to the microaggression, the participant and confederate remain seated for an additional 3 minutes. During this time impedance cardiography measures were collected continuously and BP was collected at 60, 120 and 180 seconds.

Mental Arithmetic Task

At the end of the 3-minute period, the RA re-entered the room in order to administer the post-Microaggression affect assessment and provide an instruction sheet the Paced Auditory Serial Addition Test (PASAT). The confederate was instructed to remain seated quietly during the administration of the PASAT, presumably to complete the task second. Women are likely to frequently encounter environments in which they are expected to perform in some way (e.g., educational environments, sport environments) in or around microaggressors. As such, including the confederate during the arithmetic task was expected to increase the ecological validity of the task. Additionally, it seems women would be most likely to experience task interference following a sexist microaggression when the microaggressor is still present, thereby maximizing the likelihood of capturing an effect of this kind in the current study.

The RA introduced the task as a "difficult mental arithmetic task" and proceeded to administer the PASAT according to standardized administration guidelines, with clarification as needed for understanding. After the participant demonstrated understanding of the task, an audio recording presented a series of single digit numbers. The participant added consecutive numbers together and provide verbal answers within the allotted response time. The RA simultaneously recorded and scored responses. Two trials were administered, lasting a total of 7 minutes.

Impedance cardiography measures were collected continuously throughout the math task and BP was taken in 120-second intervals.

Recovery

Following the mental arithmetic task, the RA explained there was an issue with the male participant's lead connections and it was necessary to take him to another room to adjust the electrodes. The confederate's leads were then disconnected from the impedance cardiograph unit, and the RA escorted him from the room. Shortly after, the RA informed the participant via speaker she would be moved to the next phase of the experiment and requested her to please sit quietly for approximately 10 minutes.

Independent of the magnitude and frequency of CVR, individual differences in recovery from stressful events are also associated with important health outcomes such as high BP (Moseley & Linden, 2006). Larger increases in negative affect and rumination can prolong CVR (Earle, Linden & Weinberg, 1999; Glynn, Christenfeld & Gerin, 2002), and current field recommendations dictate inclusion of cardiovascular recovery periods to examine the slope or recovery (Kamarck & Lovallo, 2003; Linden, Earle, Gerin & Christenfeld, 1997). Therefore, impedance cardiography measures were collected continuously during this 10-minute recovery period and BP was collected in 120-second intervals.

Questionnaires and Debriefing

The RA reentered the room at the conclusion of the recovery period. The participant was instructed to complete a packet of demographic and self-report questionnaires as the final phase of the study. Included in the questionnaire packet was a final state affect assessment, the perception of discrimination items, and the IMI-C, which are described below and served as manipulation checks.

When all forms are completed, the RA reentered the room with the confederate and debriefing statement. The RA verbally explained the debriefing form, assured understanding, introduced the confederate, and answered any questions the participant may have had. Finally, the participant was asked to indicate on a 1 (not at all) to 7 (extremely) scale the degree to which they felt personally discriminated against by the confederate (Matheson et al., 2008; Taylor, Wright, Ruggiero, 1991) and the degree to which they perceived the confederate to be a real participant. If the participant indicated they had suspected deception in the study, the RA asked what experiences or qualities of the study indicated this. These served as manipulation checks for the success of delivering the microaggression in an ecologically valid manner.

Measures

State Affect Assessment

Affect was assessed at baseline, following the microaggression manipulation, arithmetic task and recovery period using 18 Likert-type items ranging from 1(*very slightly or not at all*) to 5(*extremely*). This scale is comprised of positively and negatively worded adjectives assessing anger (e.g., annoyed, angry, calm), anxiety (e.g., tense, nervous, relaxed), and shame (e.g., humiliated, ashamed, unashamed). The six items assessing anxiety were selected for content validity from the State Anxiety scale of the State-Trait Personality Inventory (STPI; Smith & Ruiz, 2004; Spielberger, 1980). The six items assessing anger consist of two negatively worded adjectives added to items from the State Anger scale of the STPI (Smith & Ruiz, 2004). Cronbach's alpha coefficients for these scales range from .69 to .89. In addition, six items adjectives have been added to assess shame reactions. This scale served as a manipulation check for the "vanilla" baseline period, the microaggression, and the arithmetic task to assess affective responses to the main manipulation and stress task. Change scores were calculated for the

microaggresion and arithmetic periods by subtracting average baseline scores for anger, anxiety and shame from reported affect at each period.

Paced Auditory Serial Addition Test (PASAT)

The PASAT (Gronwall, 1977) is a continuous performance test of attention and processing speed. The task consists of the presentation of single digit numbers ranging from 1 to 9 at specified time intervals. The examinee is to add each consecutive number to the number preceding it and respond with the sum while maintaining the most recent number in working memory. Two trials are administered with interval times of 2 and 3 seconds. Each trial consists of 60 addition pairs. Correct responses for each trial served as outcome variables for performance effects.

The PASAT was selected as a well-established task for eliciting autonomic stress responses and assessing CVR (Mathias, Stanford & Houston, 2004). An arithmetic based stress task was chosen, as men have traditionally been reported to out perform women in mathematics (Frost, Hyde & Fennema, 1994). Although new evidence suggests gender differences in mathematics may not exist, men's superiority in math and science remains a cultural stereotype. According to literature on stereotype threat, activation of in-group stereotypes can create self-fulfilling prophecies that impair minority performance, including women's math performance (O'Brien & Crandall, 2003). Although performance on the PASAT is not significantly affected by gender (Diehr, Heaton, Miller & Grant, 1998), it was hypothesized microaggressions may activate latent stereotypes, negative mood, or performance anxiety that would interfere with task performance, particularly on tasks relevant to gender stereotypes such as math.

Perceptions of Discrimination

Characteristically, microaggressions are subtle and common messages and, as such, may not always be noticed by individuals involved in the experience (Sue et al., 2007). Although the comments delivered by the confederate in the current study were expected to be appraised negatively, it was possible that participants would have a range of reactions. As a manipulation check, participants rated from 1 (*not at all*) to 7 (*extremely*) the "extent [they] were personally discriminated against in the context of this experiment" and "extent [they] feel that women as a group were discriminated against in the context of this experiment" (Matheson et al., 2008; Taylor, Wright & Ruggiero, 1991). Consistent with recommendations, these responses were averaged with higher scores reflecting greater perceived discrimination (Matheson et al., 2008).

Impact Message Inventory-Circumplex (IMI-C)

The IMI-C (Kiesler, Schmidt & Wagner, 1997) is a 32-item self-report survey providing a measure of interpersonal dynamics based on the interpersonal circumplex. It is a transactional measure in that it provides information on the interactive style of a target individual based on the respondents' subjective report of evoked actions and feelings. It consists of eight factors (i.e., Dominant, Hostile-Dominant, Hostile, Hostile-Submissive, Submissive, Friendly-Submissive, Friendly, and Friendly-Dominant) corresponding to the octants of the interpersonal circumplex (Kiesler, 1983). Reliability coefficients across 16 independent studies produced median Cronbach's Alphas ranging from .69 to .85.

The IMI-C served as a manipulation check for the appraisal of the confederate in the study. Participants were asked to answer each item based on their impressions of the confederate. Scores for each factor were used as dependent variables in the manipulation check model.

Physiological Measures

The unidimensional conceptualization of CVR using HR and blood pressure as analogues for sympathetic activity fails to provide a comprehensive understanding of physiological stress responses (Uchino, Cacioppo & Kiecolt-Glaser, 1996). The end-point measurements of blood pressure and HR result from several underlying factors controlled by both the sympathetic (SNS) and parasympathetic (PNS) branches of the autonomic nervous system. These branches function autonomously, and thus changes in physiological activity can be determined reciprocally (i.e., one branch activates while the other withdrawals), coactively (i.e., both branches are activated), or independently (i.e., change in activity of only one branch). Heart rate is a measure of cardiac chronotropy referring to the number of heart beats per minute. Heart rate is primarily controlled by the PNS through the vagus nerve, but is also indirectly influenced by SNS activity. An increase in HR, therefore, may reflect an increase in SNS activity, withdrawal of PNS activity, or a combination thereof. Additionally, HR varies with respiration, increasing during inspiration and decreasing during expiration. Respiratory sinus arrhythmia (RSA) accounts for this variability in HR and represents a pure measure of PNS innervation at the sinoatrial node. Similar to HR, blood pressure is a multidimensional measure, reflecting changes in both the vasculature and hemodynamics. Stroke volume (SV) is measured in milliliters (ml) and represents the amount of blood pumped from the heart in one beat, while cardiac output (CO) is an aggregate of SV providing a measurement of volume pumped in liters per minute (l/m). Total peripheral resistance (TPR) is a measure of the amount of resistance in the vasculature as a function of vasoconstriction/vasodilation. Increases in blood pressure may be a function of increased CO, increased TPR, or both, and including these measurements provides information on the determinants of observed changes. While the PNS is the dominant regulator of HR, the SNS controls contractility of the heart. Sympathetic nervous system activity is reflected in

systolic measurements of preejection period (PEP). Preejection period refers to the time between the depolarization of the ventricle and opening of the left ventricular valve, with decreased PEP reflecting an increase in SNS activation. Acquiring these more direct measures of autonomic activity allows for delineation of the underlying physiological activity manifesting in more traditional measures of CVR (i.e., HR and blood pressure), and provides a more nuanced understanding of the reactivity patterns associated with the manipulations.

A Bionex Impedance Cardiograph (Mindwave Technologies, Ltd.) was used to assess the electrocardiogram (ECG), basal thoracic impedance (Z_0) and first derivative of the impedance signal (dZ/dt). ECG was collected through electrodes placed on the right collar bone (-), left lower rib (+) and right lower rib (ground). Additional electrodes were placed on the suprasternal notch, ziphosternal junction and corresponding locations on the back 1.5 inches above and below these, respectively. A 4mA AC current passes through these electrodes allowing for the collection of impedance and the derivation of Z_0 and dZ/dt. An ensemble average using the ECG and impedance waveforms was created in 1-minute epochs to derive PEP. Stroke volume was derived through the Kubicek equation. Cardiac output was estimated in l/m using the equation HR x (SV/1000). Total peripheral resistance was calculated in resistance units (dynes-s X cm^{-5}) by applying the equation mean arterial pressure (MAP)/CO X 80. Respiratory sinus arrhythmia was derived through digitized interbeat intervals (IBI). Very large ultralow frequency trends were removed from the input signal via a high pass filter by fitting and subtracting a first order linear polynomial from the heart period time series (Litvack, Oberlander, Carney, et al., 1995). Following linear detrending, an interpolated finite impulse response filter band-pass filters the heart period time series from 0.12 to 0.40 (Neuvo, Cheng-Yu & Mitra, 1984). Fast Fourier transform was used to calculate the power spectrum of the heart period time series scaled to

msec²/Hz. Respiratory sinus arrhythmia was averaged for each minute and calculated as the natural log of the area under the heart period power spectrum within the corner frequencies of the band-pass filter (Litvack, et al., 1995). A GE Carescape V100 was used to collect an oscillometric measure of SBP, DBP and MAP through an occluding cuff on the participants' upper nondominant arm throughout the procedure.

As outlined above in the procedure section, impedance cardiography measures were taken continuously throughout baseline, microaggression, mental arithmetic, and recovery periods. Continuous data was averaged over one-minute epochs for each period and these points of data were used for subsequent analyses. Baseline BP readings were assessed beginning at 300, 420, 480, and 540 seconds. During the microaggression period BP readings were collected every 60 seconds. During the PASAT stressor and recovery period, blood pressure was taken every 120 seconds. Tonic cardiovascular levels potentially affect cardiovascular reactivity (Benjamin, 1967) and thus baseline parameter estimates of the dependent variable were entered as covariates in each model. Baseline estimates of impedance cardiography cardiovascular parameters were calculated by averaging data points from the last three minutes of the baseline period. Baseline BP was calculated using the average of the last three readings for each given parameter (i.e., SBP, DBP, and MAP). Change scores were calculated for participants by subtracting baseline cardiovascular measures from the value of the target cardiovascular measurement epoch or task-average (Llabre, Spitzer, Saab et al., 1991). These scores were used in all subsequent analyses as dependent variables.

Data Analysis

Analysis of Variance (ANOVA) was conducted on age, body mass index, and baseline cardiovascular measures to assess equality of randomized conditions. A manipulation check of

the stress task was analyzed using a repeated measures ANOVA with four-levels (i.e., baseline, microaggresion period, arithmetic task, recovery). Greenhouse and Geisser (1959) correction was used to adjust for colinearity of repeated observations. Participants were expected to exhibit increases in SBP, DBP, MAP, and HR eflecting physiologic reactivity to the stressor. The opposite pattern was expected during the recovery period, during which participants will show a pattern towards return to baseline resting measures.

Manipulation checks for the microaggression were performed using a series of one-way ANOVAs with condition predicting level of perceived discrimination and scores on the factors of the IMI-C. Participants in the sexual objectification microaggression condition were expected to exhibit significantly higher levels of perceive discrimination than the control condition. Additionally, it was expected that the confederate will be described as significantly higher in dominance and hostility and significantly lower in friendliness and submissiveness than confederates in the control condition. Effects of the denial of sexism condition were considered exploratory.

The main effect of condition on cardiovascular and affect measures during the microaggression, arithmetic, and recovery periods was analyzed using a series of repeated measures General Linear Models (GLM) adjusting for baseline measures, with condition entered as the predictor variable. Separate models were conducted for each dependent variable (i.e., SBP, DBP, MAP, HR, PEP, RSA, CO, CO, TPR; anger, anxiety, and shame) for each task.

The main effect of condition on performance on the mental arithmetic task was analyzed using ANOVA, with condition predicting scores on the individual trials of the PASAT. The experimental methods and data analysis strategy described above were utilized to test the following hypotheses:

Hypothesis 1: The sexually objectifying microaggressive comment was expected to be associated with increased CVR (i.e., increases in SBP, DBP, MAP, HR, CO, SV, and TPR; decreases in RSA, PEP) in the 3-minute period following the manipulation, compared to the control condition.

Hypothesis 2: Participants in the sexual objectification microaggression condition were expected to show CVR patterns consistent with an appraisal of increased threat during the stress task (i.e., significantly larger increases in SBP, DBP, MAP, and TPR; larger decreases in RSA; smaller increases in CO, PEP), in comparison to the control condition.

Hypothesis 3: Additionally, participants in the sexual objectification microaggression condition were expected to have significantly higher levels of anger, anxiety, and shame following the microaggression manipulation and stress task than the control condition.

Hypothesis 4: The sexual objectification condition was hypothesized to be associated with significantly lower trial and total scores on the PASAT than the control condition.

Hypothesis 5: Finally, the sexual objectification condition was hypothesized to be associated with slower recovery from the mental arithmetic task, evidenced by smaller decreases in SBP, DBP, MAP, HR, TPR, CO, PEP and smaller increases in RSA compared to the control condition.

Exploratory Analyses: Based on previous evidence (Capdilupo et al., 2010; Matheson et al., 2008) it was unclear whether the denial of sexism microaggressive comment was likely to be perceived as a threat or evoke physiological responses in participants. As such, hypotheses for this condition were exploratory, and thus non-directional, for cardiovascular measures and affect during the period following the microaggression, the

mental arithmetic task, and the recovery period. Denial of sexism micoraggression effects on performance for the mental arithmetic task were also explored.

RESULTS

Baseline Equivalence of Conditions

Separate one-way ANOVA's were conducted to examine differences between conditions of age, height, weight, race, marital status, and current year in school, with no significant differences observed, all F's ≤ 2.83, $p = n.s.$ Similarly, ANOVA was utilized to examine condition effects on baseline affect. No differences were found for baseline state anger, anxiety, or shame, all F's ≤ 1.33, $p = n.s.$

One-way ANOVA with condition as the predictor variable assessed baseline equivalence of resting cardiovascular activity, including SBP, DBP, MAP, HR, PEP, LVET, CO, TPR, and RSA. Table 1 presents the means and standard deviations of baseline BP for each condition as well as omnibus *F*-statistics and *p*-values for each model. As expected, no differences were observed for SBP, DBP, or MAP, all F's ≤ 1.07, $p = n.s.$ No significant differences existed between condition in determinants of blood pressure (i.e., CO, SV, TPR), all F's $\leq .74$, $p = n.s.$ Similarly, no significant differences were evident between conditions for HR, RSA, or PEP, $F \leq 1.76$, $p = n.s.$

Condition Validity Checks

As the goal of the current study was to elicit responses to microaggressions analogous to those in the environment, it was crucial to our manipulation that participants viewed the confederate as an actual research participant and did not suspect deception. Results of the believability assessment of the confederate are presented in Table 2 with results on the perceptions of discrimination. No significant difference was found between groups on ratings of confederate believability, $F(2, 68) = 1.42$, $p = n.s.$ Across conditions, the overall mean rating for believability was 4.01 ($SD = 2.08$) on a Likert-type scale of 1 to 7. Qualitative analysis of

participant report of confederate identity revealed that all but 2 participants who suspected deception in the study suspected so only after the confederate was removed from the room, which occurred between the PASAT task and recovery period. Due to limited research time and resources, and as the primary hypotheses concerned the microaggression period and stress task, a compromise was reached which allowed possible validity issues with the recovery period. Although, nevertheless, participant ratings of confederate believability were relatively high, recovery results reported below are viewed as ancillary and should be interpreted with caution.

It was expected that conditions would vary in the degree to which they perceived discrimination against women as a group and individually in the study, according with assigned condition. No significant difference between conditions was observed for the single items assessing group, $F(2, 68) = .30$, $p = n.s.$, $\eta^2 = .01$, or individual, $F(2, 68) = .19$, $p = n.s.$, $\eta^2 = .01$, discrimination. In general, a floor effect was observed where all conditions rated perceptions of discrimination relatively low (means and standard deviations available in Table 2). Although we expected to find differences in perceived discrimination based on condition, it is not necessarily problematic that participants did not find confederate remarks discriminatory. The nature of microaggressions is that they are culturally endorsed, common, and often overlooked both by aggressors and minorities alike (Sue et al., 2002). As such it is likely that, although confederate remarks in the objectification and denial of sexism conditions fit the conceptual definition of microaggression, they were not identified as such by participants.

Differences between conditions were examined on the two primary factors of the IMI-C, dominance and affiliation. No significant differences were found between the objectification, denial of sexism or control conditions for dominance, $F(2, 68) = .32$, $p = n.s.$, $\eta^2 = .01$, or affiliation, $F(2, 67) = .61$, $p = n.s.$, $\eta^2 = .02$, (.01 vs. .12 vs. -.06, *SD*s = .99, .42, .78, and -.05 vs.

.14 vs. -.25, *SD*s = 1.31, 1.29, 1.08, respectively). Similar to perceptions of discrimination, a floor effect was observed in the data. The observed distribution of scores and general low rating on both dominance and affiliation of the confederate are, again, reflective of the lack of identification of the confederate's remarks as discriminatory as well as a probable lack of strong feelings towards the confederate as an acquaintance with little interaction. Based on this data, it is unclear if the conditions were operationally valid, despite fitting theoretical conceptualization of microaggressions.

Effectiveness of the Stress Task

One-way repeated measures ANOVA revealed significant task period differences for SBP, $F(2.44, 168.15) = 100.02$, $p < .001$, $\eta^2 = .59$; DBP, $F(1.89, 130.21) = 107.58$, $p < .001$, $\eta^2 = .61$; MAP, $F(2.06, 141.83) = 169.90$, $p < .001$, $\eta^2 = .71$, and HR, $F(2.25, 155.49) = 60.24$, $p < .001$, $\eta^2 = .47$. Mean BP values and standard deviations are represented in Table 3. Paired samples T-tests were employed to contrast cardiovascular reactivity between specific task periods. Systolic blood pressure, DBP, MAP and HR for the microaggression period were not significantly elevated above baseline, *t's*$(70) \leq |1.82|$, $p = n.s.$ In contrast, a significant difference between baseline and the PASAT stressor task was observed for SBP, DBP, MAP, and HR, all *t*'s$(69) \leq -8.65$, $p < .001$. Systolic BP did not significantly differ from baseline to recovery, $t(69) = -1.56$, $p = n.s.$; however, DBP, $t(69) = -3.23$, $p \leq .01$, and MAP, $t(69) = -3.20$, $p \leq .01$., remained significantly elevated above baseline. No significant difference was observed between baseline and recovery HR, $t(69) = 1.35$, $p = n.s.$

Significant differences were also observed between individual task periods. Significant increases in SBP, DBP, MAP, and HR were found to occur between the microaggression and PASAT tasks, all *t*'s$(69) \leq -11.17$, $p < .001$. For SBP, DBP, and MAP,

levels remained significantly elevated during recovery compared to the microaggresion period, all *t*'s(69) ≤ -1.97, $p \leq .05$.

Follow the PASAT stress task, SBP, DBP, MAP, and HR all significantly decreased during the recovery period, all *t*'s(69) ≥ 9.05, $p < .001$. In general, blood pressure and HR tended to remain the same from baseline through the microaggression period. Significant CVR was evidenced by increases in BP and HR from the baseline and microaggression periods to the PASAT stressor. These increases were maintained throughout the recovery period, where BP and HR significantly decreased from the PASAT but remained elevated above baseline and microaggression period levels. Together, these results support the validity of the stressor and recovery tasks employed in the current study.

Main analyses

Condition effects on CVR to Microaggression Period

Separate one-way repeated measures ANCOVA models, as described earlier, were utilized to analyze the effect of condition on BP, HR and their impedance-derived determinants during the microaggresion task. Means and standard deviations for BP are available in Table 4 for reference. No main effect of condition was found for SBP, DBP or MAP during this period, all *F*'s ≤ .86, *p = n.s.* No significant differences existed between condition in determinants of blood pressure (i.e., CO, SV, TPR), all *F*'s ≤ 1.48, *p = n.s.* Similarly, no significant differences were evident between conditions for HR and RSA, *F*'s ≤ 1.76, *p = n.s.*, or PEP and LVET, *F*'s ≤ 1.05, *p = n.s.* These results generally mirror findings indicating a lack of perception of discrimination during the microaggression task.

Condition Effects on CVR to PASAT Stressor

The primary hypothesis was that condition would predict CVR to a subsequent stressor. Results of BP responses are available for reference in Table 5. Repeated measures ANCOVA was again utilized to examine condition and sex effects on CVR during the PASAT task. Again, no significant difference between conditions was found for SBP, DBP, or MAP, all *F*'s ≤ 1.05, *p* = *n.s.*, or determinants of BP: CO, SV, and TPR, all *F*'s ≤ 2.07, *p* = *n.s.* Likewise and consistent with the microaggression task, findings for HR and RSA were also nonsignificant, *F*'s ≤ 1.57, *p* = *n.s.*, as were results for PEP and LVET, all *F*'s ≤ .31, *p* = *n.s.* These findings are inconsistent with hypotheses and generally indicate that the sexist microaggressions did not have an effect on subsequent CVR to the stress task.

Condition Effects on Recovery

It was hypothesized that condition would influence the rate of cardiovascular recovery following the PASAT task. Given the possible invalidation of the recovery period due to confederate detection by participants following the PASAT, these results are viewed as ancillary and presented here for exploratory purposes only. Repeated measures ANCOVA's revealed no significant differences by condition for SBP or MAP, all *F*'s ≤1.99, p = *n.s.* Findings were also null for HR, $F(5.97, 178.99) = .80$, p = *n.s.* In contrast to other findings, a significant condition by time effect was found for DBP during the recovery period, $F(6.96, 205.30) = 2.08$, $p < .05$, $\eta^2 = .07$. Follow up analyses indicated a significant difference occurred between the objectification and control conditions, $F(3.39, 142.36) = 2.97$, $p < .05$, $\eta^2 = .07$. Analysis of the recovery period by epoch revealed only a significant difference between these conditions between minutes 2 and 4. However, the ecological significance of these findings is unclear given the possible invalidation of the microaggression manipulation (i.e., identification of confederate) immediately

before the recovery period, as well as the isolated nature of these findings amongst an array of variables and time points.

Emotional Reactivity Effects

Change in affect from baseline was evaluated following the microaggression, PASAT, and recovery task periods and analyzed for main effects of condition using Univariate Analysis of Variance. Results for anger, anxiety, and shame during the microaggression period were nonsignificant, all F's $\leq .94$, $p = n.s.$ (see Figure 1). Similarly, condition was not found to have a significant effect on anger, anxiety, or shame following the PASAT stressor, all F's ≤ 1.05, $p = n.s.$ (see Figure 2). For the recovery period, condition did not significantly predict anger or shame reactivity, F's $\leq .41$, $p = n.s.$ In contrast, a main effect of condition was found for anxiety during the recovery period, $F(2, 67) = 3.44$, $p < .05$, $\eta^2 = .10$. Similar to DBP recovery effects, a significant difference was found between the objectification and control conditions (12.33 vs. 10.62, SDs = 3.82, 3.69).

Condition Effects on PASAT Performance

Consistent with results from emotional and physiological reactivity of condition, no significant difference was found between condition performance on trial 1 of the PASAT, $F(2, 66) = .40$, $p > .05$. Similarly, no significant effect of condition was observed for trial 2 of the PASAT, $F(2, 67) = .02$, $p > .05$.

DISCUSSION

Modern societal milieu in the United States dictate that prejudiced attitudes and stereotypes are manifested in primarily subtle and, at times, invisible messages. These messages are termed microaggresions (Sue et al., 2002), and when directed towards women are referred to as gender microagressions (Nadal, 2010). The current study examined the effect of laboratory manipulation of gender microaggressions on cardiovascular reactivity to a stressor and performance on a gender-relevant working memory task. In general, no significant differences were found between the sexual objectification microaggression condition, the denial of sexism microaggression condition, and controls on measures of emotional or cardiovascular reactivity to the microaggression period, the PASAT stressor task, or the recovery period.

The study relied on the validity of two manipulations to examine the research question. The PASAT stressor produced a significant and reliable increase in CVR from baseline, as evidenced by increases in BP and HR. The task was followed by a recovery period in which CVR significantly decreased, indicating the current protocol did produce an observable stress effect.

The success of the microaggression manipulation depended on 1) the believability of the confederate and his remarks, and, 2) the receipt of the microaggressive comments as expressing sexist stereotypes or prejudiced attitudes. Believability of the confederate was assessed using one-item at the conclusion of study protocol, immediately before debriefing. Based on this data, participants, in general, slightly more than half-believed our study deception and confederate presentation. However, qualitative assessment revealed that all but 2 participants suspected this deceit only following the removal of the confederate, which occurred between the PASAT task

and recovery period. As such, it is reasonable to conclude that the deceptive aspect of the study manipulation was valid during all study tasks except the recovery period.

The second aspect of microaggression validity concerned participant perception of the microaggressive comments. According to two items, assessing the degree to which the participants felt 1) they individually were discriminated against, and, 2) women in general were discriminated against, there was no difference between conditions on the relative rating of discrimination. Overall, a floor effect was observed whereby all participants perceived low levels of discrimination. Similarly, no condition differences were found on participant rating of the dominance and friendliness of the confederate.

Although we expected to find differences in perceptions of discrimination and confederate behavior based on condition, it is not necessarily problematic that participants did not find confederate remarks discriminatory. The nature of microaggressions is that they are culturally-endorsed, common, and often overlooked both by aggressors and minorities alike (Sue et al., 2002). As such, it is likely that although confederate remarks in the objectification and denial of sexism conditions fit the conceptual definition of microaggressions, they were not identified as such by participants.

It is particularly surprising the sexual objectification microaggression (i.e. "…if a woman is hot who cares if she is good at math") was not identified by participants as communicating sexist attitudes. One explanation for this effect may lie in the distinction between benevolent and hostile sexism (Glick & Fiske, 1996). Hostile sexism refers to more overt messages of antagonistic and denigrating attitudes towards women. This kind of sexism is associated with traditional manifestations of sexisms and is more readily identified as sexist (Barreto & Ellemers, 2005). In contrast, benevolent sexism may appear as warm and positive attitudes or behavior

towards women that camouflage covert messages that patronize, assume inferiority or dependency, or rigidly assume traditional gender roles. Benevolent sexism has been associated with a range of negative consequences including increased self-objectification (Calogero & Jost, 2011), perceived incompetence (Dardenne, Dumont & Bollier, 2007), and hostile sexism (see: ambivalent sexism; Glick & Fisk, 1996). Despite these negative effects, benevolent sexism is often not perceived by women to be sexist or harmful and may even be viewed as desirable (Barreto & Ellemers, 2005). It is possible that the comments employed in the current study mirrored benevolent sexism and thus were not labeled as sexist by participants.

Another possible issue in the current study is the idea referred to as essentialism, which generally refers to the lumping together of experience. When referring specifically to gender essentialism, this idea criticizes the tendency to universalize women's experience as gender minorities while ignoring other aspects of identity such as race, class, and sexual orientation (Harris, 1990). Western feminism has been the subject of criticism for this kind of essentialism, with a historical tendency to focus on women's issues that disproportionately affect higher socioeconomic status, white women. This perspective ignores the relative privilege of these women relative to women of racial/ethnic minority, social class minority, sexual minority and/or other minority status (Dhruvarajan & Vickers, 2002).

In the current study, the sample consisted of predominately white females, all of whom were attending a university. As such, only a certain kind of female was represented in our study; specifically, women living in the United States who had access to resources and cultural values that facilitated their entry into a four-year university, most of whom were also White. It is possible that this subpopulation is more resilient to gender microaggressions and prejudice attitudes. Perhaps sufficient privilege in society and social resources help to buffer the otherwise

harmful effects of microaggressions or prejudice messages. This idea is supported by data from a study conducted by Lepore and colleagues (2006) in which an increase in CVR was observed in Black, but not Non-Hispanic White, women in response to subtle sexism. The idea of being a "double minority" may be particularly salient when examining subtle forms of discrimination. Moreover, evidence suggests that perceptions of racism and sexism may not represent distinct experiences for African American women (Moradi & Subich, 2003). By artificially isolating these experiences in research we are, in effect, invalidating the experience of minority women, thus committing microaggressions ourselves.

Essentialism may also refer to inappropriate generalization of one minority group's experience to another group's experience. The analogy of sexism to racism has been accused of being a manifestation of microaggressions in and of itself, invalidating the unique experience of racial/ethnic minorities and inadvertently recentering dialogues of discrimination back onto White issues. Although the goal of the current study was not to analogize racial/ethnic minority experiences to gender minorities, but to explore possible application of the microaggression model, it is possible that that the observed effects of racial/ethnic minorities simply do not transfer in equitable ways to gender minorities.

Finally, it is possible that the kind of manipulation employed in the current study (i.e., a single, off-hand, ambiguous comment) was not salient enough to elicit significant emotional or physiological reaction from the participants in the current study. Perhaps subsamples with relatively less social resources or double minority status may be more sensitive to perceptions and responses to singular microaggressions.

General Limitations

While the present study had many positive qualities, including an experimental design and assessment of blood pressure determinants, several limitations are noteworthy. The sample consisted of predominantly young, white, middle and upper SES undergraduate females from the Southwest region of the United States. This sample does not accurately reflect the diversity of the United States or global population. As such, the results found here do not represent how other subpopulations may experience gender microaggression. The procedure also included a single standardized laboratory stressor with experimentally operationalized microaggressions that cannot be assumed to generalize to environmental stressors, *in vivo* microaggressions, or other standardized stress tasks. Additionally, it is necessary to consider that perhaps the microaggression manipulation was invalid. Although, in the author's opinion, the selected microaggression comments reflected the conceptual definitions of their respective categories, it is possible the study protocol did not sufficiently capture the essence or delivery of these messages in a way that is ecologically meaningful. Lastly, due to limited resources it was only possible to include two conditions reflecting microaggression categories. Furthermore, the messages were delivered in a standardized manner prioritizing comparability of groups over ecological manifestation of different categories. It may be that certain microaggression messages are better suited for some mediums rather than other (e.g., visual representation of sexual objectification). Despite these limitations, the current study serves as a useful foundation for future investigation.

Future Directions

A primary limitation of the current study was the biased and nongeneralizable sample. A major goal of future research should be to address this issue by examining these factors in samples of diverse racial/ethnic background, age ranges, and socioeconomic statuses. As noted

above, future studies should also seek to diversify representation of microaggression categories and delivery medium. Lastly, it will be important to investigate potential moderators of physiological, emotional, and performance responses to gender microaggressions. For instance, racial identification has been shown to be positively associated with both perception of discrimination and associated distress (Sellers & Shelton, 2003). It is possible gender identification may also moderate perceptions and responses to gender microaggressions and/or sexism. Likewise, womanism, or a construct acknowledging the interaction of racial and gender identity in racial/ethnic minority women, has also been shown moderate perceptions of sexism (DeBlaere & Bertsch, 2013), and thus may represent an important factor in perception and impact of gender micoraggresions as well. Most importantly, it will be important to continue to apply scientific methods and empirical data to explore the effects of gender discrimination, in its' many forms, as culture and population changes fluidly and unceasingly occur.

Table 1

Baseline Cardiovascular Values by Condition

	Objectification	**Denial of Sexism**	**Control**	***F***	***p***
SBP	105.27 (8.33)	110.06 (14.44)	106.49 (10.59)	1.07	.35
DBP	64.18 (7.47)	64.73 (5.96)	64.51 (7.07)	.04	.97
MAP	79.61 (7.60)	80.91 (5.87)	80.11 (8.21)	.18	.84
HR	76.83 (10.16)	75.18 (11.09)	81.01 (12.02)	1.76	.18

Table 2

Ratings of Perceived Discrimination by Condition

	Objectification	**Denial of Sexism**	**Control**	***F***	*p*
Believability of Confederate	3.38 (1.99)	4.32 (2.12)	4.27 (2.08)	1.42	.74
Individual Discrimination	1.62 (1.02)	1.86 (1.32)	1.62 (1.30)	.30	.83
Group Discrimination	1.86 (1.06)	2.05 (1.05)	2.08 (1.57)	.19	.25

Table 3

Average BP and HR Values by Task Period

	Baseline	**Microaggresion**	**PASAT**	**Recovery**
SBP	107.23 (11.37)	107.55 (9.18)	121.76 (12.59)	108.72 (10.01)
DBP	64.47 (6.78)	65.04 (8.13)	75.20 (9.56)	65.94 (7.11)
MAP	80.20 (7.26)	80.63 (7.93)	92.67 (9.81)	81.82 (7.99)
HR	77.87 (11.29)	76.59 (10.10)	89.19 (13.47)	76.62 (12.07)

Table 4

Condition Effects of Microaggression Period on BP Reactivity

	Objectification	**Denial of Sexism**	**Control**	***F***	***p***
SBP	1.67 (5.69)	.33 (3.43)	1.36 (4.67)	.39	.68
DBP	1.08 (4.06)	-.27 (3.56)	.83 (4.04)	.66	.42
MAP	16.21 (4.26)	15.67(3.08)	16.52 (4.10)	.38	.68
HR	-1.85 (4.46)	-.10 (3.20)	-1.79 (3.20)	.42	.66

Table 5

Condition effect of PASAT stressor on BP Reactivity

	Objectification	**Denial of Sexism**	**Control**	***F***	***p***
SBP	15.75 (2.12)	12.32 (2.18)	15.49 (1.94)	.79	.46
DBP	10.80 (1.48)	10.63 (1.51)	10.59 (1.36)	.01	.99
MAP	12.93 (1.52)	11.54 (1.55)	12.86 (1.39)	.27	.77
HR	9.43 (2.24)	9.89 (2.09)	13.82 (2.09)	1.13	.33

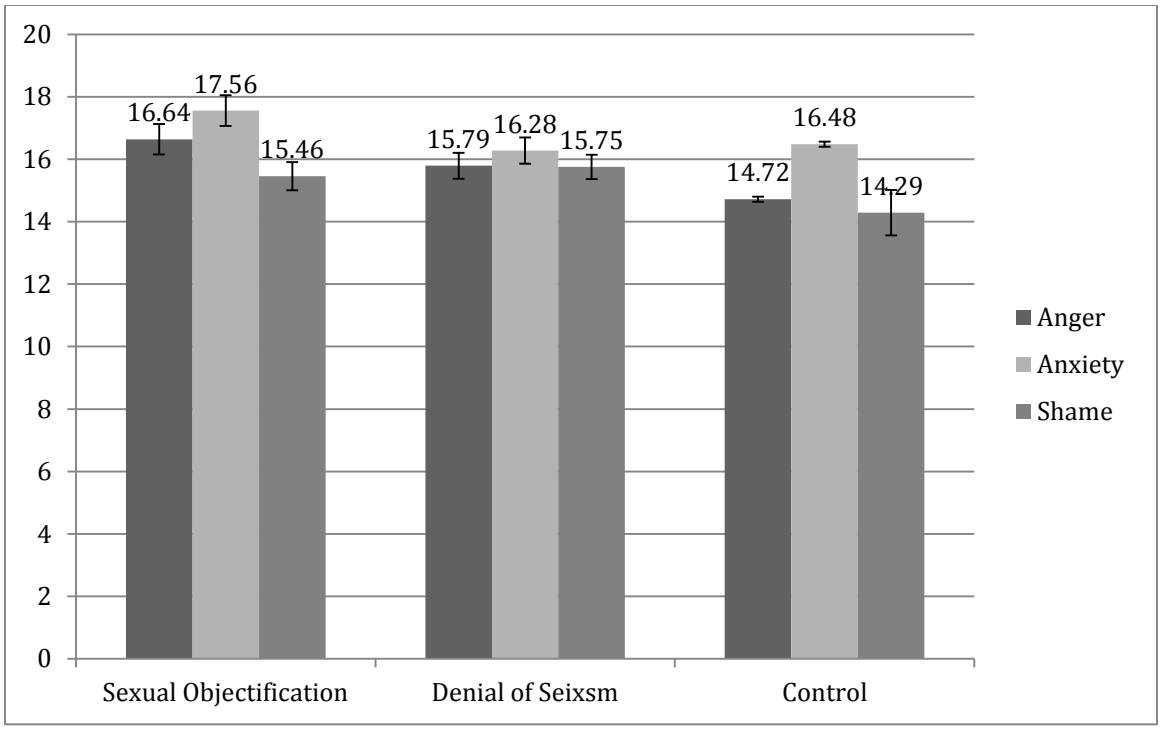

Figure 1. Emotional reactivity to the microaggression period by condition.

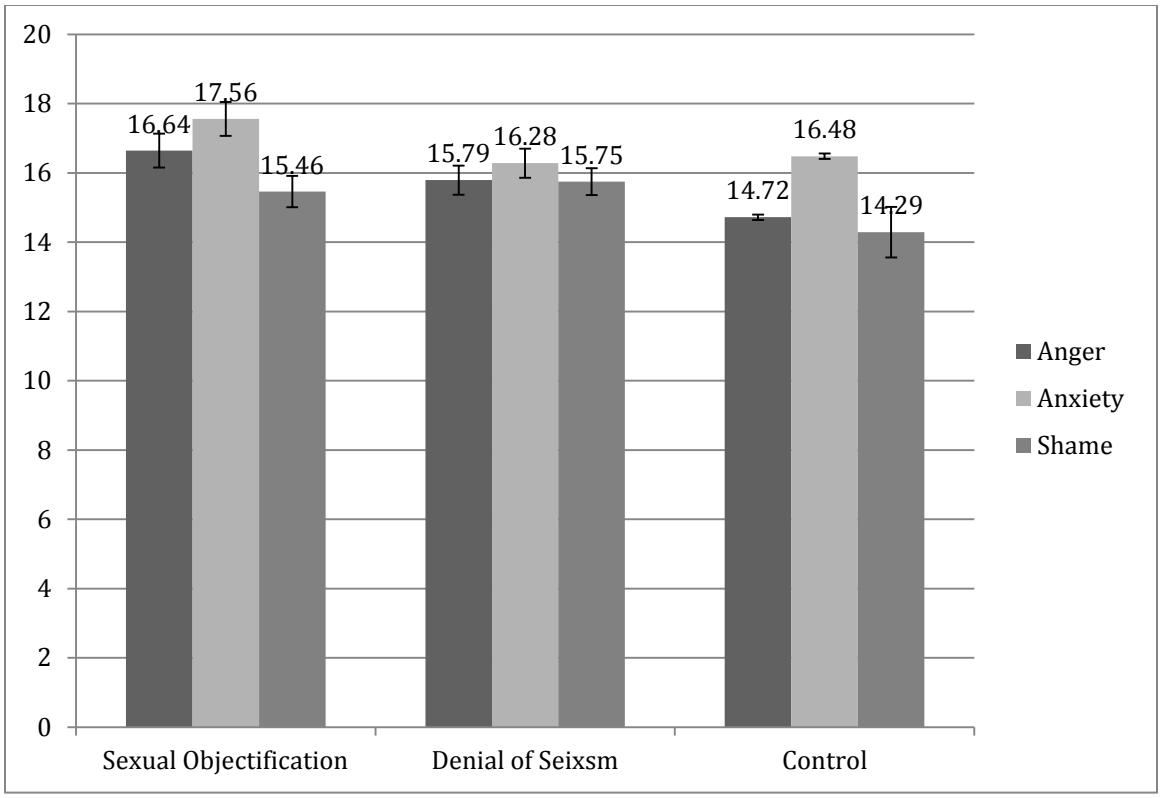

Figure 2. Emotional reactivity to the PASAT condition by condition.

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