

Racial identity and autonomic responses to racial discrimination

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Abstract

Several studies identify racial identity—the significance and meaning that individuals attribute to race—as a mitigating factor in the association between racial discrimination and adjustment. In this study, we employed a visual imagery paradigm to examine whether racial identity would moderate autonomic responses to blatant and subtle racial discrimination analogues with Black and White perpetrators. We recruited 105 African American young adults from a public, southeastern university in the United States. The personal significance of race as well as personal feelings about African Americans and feelings about how others view African Americans moderated autonomic responses to the vignettes. We use polyvagal theory and a stress, appraisal, and coping framework to interpret our results with an eye toward elucidating the ways in which racial identity may inform individual differences in physiological responses to racial discrimination.

Descriptors: Racial discrimination, Racial identity, Autonomic nervous system, African Americans

Numerous studies identify racial identity—defined as the significance and meaning that individuals attribute to race (Sellers, Smith, Shelton, Rowley, & Chavous, 1998)—as a salient mitigating factor in the relation between perceived racial discrimination and psychological adjustment (Bridges, 2010; Neblett, Shelton, & Sellers, 2004; Sellers & Shelton, 2003). Current racial identity research, however, pays scant attention to the mechanisms by which racial identity might convey its effects. One relatively unexplored possibility is that stress appraisal and coping mediate the impact of racial identity on adjustment (Pearlin, Schieman, Fazio, & Meersman, 2005; Williams & Mohammed, 2009). For example, racial identity might influence how an individual interprets and copes with a discriminatory event with implications for subsequent mental health (Sellers, Morgan, & Brown, 2001).

Examination of autonomic nervous system (ANS) reactivity in the context of discriminatory events affords a unique opportunity to examine mechanisms by which racial identity might impact adjustment. Several studies conceptualize ANS reactivity as an index of coping in the face of threat or environmental challenge (e.g., El-Sheikh, Keller, & Erath, 2007; El-Sheikh et al., 2009; Obradović, Bush, Stamperdahl, Adler, & Boyce, 2010) and as a marker of attentional and emotional processes, more broadly (Beauchaine, 2001). In this study, we employed a visual imagery paradigm to examine the moderating role of racial identity on ANS responses to racial discrimination analogues in hopes of gaining insight into how racial identity might influence responses to racial discrimination. This research builds on existing research demon-

strating the moderating influence of racial identity, provides important clues about intermediary mechanisms, and fits within the broader context of research examining individual differences in responses to racial discrimination.

Racial Discrimination, Racial Identity, and Psychological Adjustment

A strong corpus of research documents concurrent and prospective associations between racial discrimination experiences and a host of negative psychological adjustment outcomes such as psychological distress, low self-esteem, internalizing and externalizing symptoms, and even formal psychiatric diagnoses (e.g., Bynum, Burton, & Best, 2007; Gee & Walsemann, 2009; Lincoln, Chatters, Taylor, & Jackson, 2007; Soto, Dawson-Andoh, & BeLue, 2011). Although findings are mixed (see Brondolo, ver Halen, Pencille, Beatty, & Contrada, 2009, for a review), several studies offer evidence that racial identity moderates the association between racial discrimination and psychological adjustment (e.g., Banks & Kohn-Wood, 2007; Fuller-Rowell et al., 2012). In a group of 188 African American college students, Neblett et al. (2004) found that, whereas individuals who did not hold being Black as a central component of their identity experienced more stress, depressive symptoms, and anxiety as a response to daily racial hassles, individuals who reported high levels of racial centrality were unaffected. In a sample of 555 young adults, Sellers, Caldwell, Schmeelk-Cone, and Zimmerman (2003) reported that racial centrality mitigated the effects of discrimination on psychological distress such that racial discrimination predicted stress, which in turn predicted psychological distress, but only for individuals with low and medium centrality. A study by Sellers and Shelton (2003) reported that both public regard—views about how others see African Americans—and nationalist ideology—views endorsing the uniqueness of the African American experience—attenuated

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the relation between discrimination and distress. Finally, several studies report a strong protective effect of private regard—positive feelings towards African Americans—for psychological adjustment outcomes (e.g., Burrow & Ong, 2012; White-Johnson, 2012). Together, these studies highlight the potential protective nature of racial identity in the context of racially discriminatory events.

Racial Identity, Appraisal, and Coping

While several studies have evaluated the protective nature of racial identity, investigations of how racial identity conveys its effects are less common. Theoretical work by Sellers et al. (2001) suggests that racial identity moderates the relation between racial discrimination and adjustment via its influence on appraisal and coping. For example, African Americans who hold being Black as important (high racial centrality) and feel positively about being Black (high private regard) may be more likely to perceive racial discrimination (Sellers & Shelton, 2003; Sellers, Copeland-Linder, Martin, & Lewis, 2006), have more opportunities to hone their coping responses to discrimination, and be more prepared to deal with these experiences. Individuals who believe that others think positively about African Americans (high public regard), on the other hand, might perceive less discrimination (Sellers et al., 2006), be surprised by it, and appraise discrimination as novel and as a situation for which they are less prepared to cope. Sellers and colleagues also suggest that racial identity may affect appraisals of what is at stake in a specific discriminatory situation, with perceptions of threat or challenge occurring when events are construed as threatening to individuals' goals or sense of rights and opportunities. Whereas an individual who views commonalities between African Americans and the rest of American society may perceive a discriminatory infraction as threatening to their goals of integrating into mainstream society, individuals who endorse nationalist ideology may perceive the same discriminatory event as less threatening because it does not challenge their goals of building coalitions within the race (Sellers et al., 2001).

ANS Reactivity and Perceptions of Threat or Challenge

Measurement of ANS reactivity in the context of perceived racially discriminatory events represents an innovative approach to examining the mechanisms underlying the moderating effects of racial identity and individual differences in responses to racially discriminatory events. Several studies report associations between acute experiences of racism (either recalled or vicariously experienced) and cardiovascular reactivity (see Brondolo, Love, Pencille, Schoenthaler, & Ogedegbe, 2011; Harrell, Hall, & Taliaferro, 2003, for reviews). Theoretical formulations of racism and autonomic balance are consistent with this evidence (Harrell et al., 2011). For example, Thayer and Friedman's (2004) neurovisceral integration model of health disparities suggests that chronic threats and ensuing worry and rumination resulting from racism can disrupt the function of the parasympathetic nervous system in reducing stress responses to racism.

A second theory that may be instructive in unpacking the associations among racial identity and responses to racial discrimination is polyvagal theory (Porges, 2007). Polyvagal theory predicts that when individuals are confronted with a challenge or threat, withdrawal of the parasympathetic branch (PNS) of the ANS occurs as individuals engage attention, gather information about the threat, and/or use appropriate social strategies (such as emotional responses) to ameliorate threat. If the challenge diminishes,

the vagal brake or PNS re-engages, reduces arousal, and minimizes metabolic expenditure. If the challenge does not diminish, the individual engages the threat with a fight-flight response, the sympathetic branch of the nervous system (SNS) is activated, intense emotions (e.g., rage, panic) ensue, and metabolic expenditure increases. Further augmentation of the PNS can occur if the challenge still is unmet, resulting in an immobilization or freezing response. Although Porges (2007) is careful to note that the polyvagal framework should be used as a general guideline (the activation of the ANS does not occur in simple discrete steps but rather as a series of transitional blends), polyvagal theory provides a possible lens through which one might be able to examine the links among racial identity and perceptions of threat and coping with racial discrimination. Moreover, patterns of ANS reactivity have been linked with emotional experiences, self-regulatory efforts, social engagement and communication, awareness of the environment, attentional and motivational states, and numerous psychological adjustment outcomes (Beauchaine, 2001; Bush, Alkon, Obradović, Stamperdahl, & Boyce, 2011; El-Sheikh et al., 2009; Mendes, Major, McCoy, & Blascovich, 2008). Thus, the study of racial identity in the context of ANS reactivity may provide important clues regarding underlying mechanisms in individuals' responses to racial discrimination and changes in adjustment following exposure to such experiences.

The Moderated Psychophysiology Paradigm

Few studies have examined physiological responses to discrete racially discriminatory events. Harrell et al. (2003) described "moderated psychophysiology" as an underutilized methodological approach which assesses the effects of racism by creating racism analogues in the laboratory while simultaneously recording physiological reactivity and examining the role of moderators that may change the relationship between racism and physiological reactivity. In a study of African American female college students, Jones, Harrell, Morris-Prather, Thomas, and Omowale (1996) presented laboratory analogues of racism using videos as well as imagery (participants were asked to imagine various racism vignettes) to examine the effect of blatant and subtle racism on mood and physiological responses. They found that participants showed heightened physiological responses (muscle activity, heart rate, and digital blood flow) in the blatant racism condition (e.g., an African American woman being unjustly accused of shoplifting by a hostile White security guard). In this study, racial identity was related to affective but not physiological responses following the vignettes. In another study by Morris-Prather and colleagues (1996), the investigators found that Black freshmen experienced more negative moods (e.g., fear) when viewing racism vignettes in which the perpetrator was White, but only if a vignette with a Black perpetrator had been viewed before the White perpetrator. Although this study did not examine racial identity, it highlights the complexity with which situational characteristics of discriminatory events like race of the perpetrator also might play a role in individual differences in responses to racial discrimination.

The Present Study

This study built on the "moderated psychophysiology" paradigm (Jones et al., 1996; Morris-Prather et al., 1996) by using visual imagery to examine the relations among racial discrimination, four specific dimensions of racial identity that have been highlighted theoretically and empirically as protective in the context of racial

discrimination—racial centrality, private regard, public regard, and nationalist ideology—and psychophysiological outcomes (e.g., SNS and PNS reactivity) at the event level. Unlike prior studies, which examine physiological outcomes dually influenced by the PNS and SNS branches of the ANS (e.g., blood pressure, heart rate) and fail to distinguish between the two, we independently examined the contribution of each branch of the ANS. This distinction was particularly important given our interest in a more fine-grained evaluation of the mechanisms underlying the effects of racial identity on responses to racial discrimination. Moreover, we measured two widely used indices of reactivity to social stressors in the literature, respiratory sinus arrhythmia (RSA) and pre-ejection period (PEP) (e.g., Bush et al., 2011; Mendes et al., 2008). Increases in RSA (or PNS augmentation) have been implicated in social engagement behaviors (Porges, 2001), while decreases in RSA (or RSA withdrawal) are thought to reflect perceptions of challenge or threat and/or attention to environmental stimuli in preparation for matching behavior and emotional responses with the situation at hand (i.e., coping). PEP, on the other hand, is a general index of ventricular contractility and a commonly accepted indicator of challenge or threat appraisals (e.g., Blascovich & Mendes, 2000). Although we are unaware of any studies to date to examine racial identity and these specific physiological indicators, we reasoned that RSA and PEP would be informative measures in light of the established use of RSA and PEP in studies of environmental stress as markers of engagement, attention, and coping and in light of the theoretical (Porges, 2007; Thayer & Friedman, 2004) and empirical implication of autonomic functioning in perceptions of threat and responses to racism and stress more generally. Changes in RSA or PEP as a function of the experimental manipulation might provide important clues about the links between specific dimensions of racial identity and attention, coping, and mobilization following exposure to a racial discrimination event.

Capitalizing on the design of prior moderated psychophysiology studies (Jones et al., 1996; Morris-Prather et al., 1996) as well as studies that have examined intraracial interactions or intragroup racism (e.g., Clark, 2004; Mendes et al., 2008) and the role of blatant versus subtle discrimination experiences (e.g., Salvatore & Shelton, 2007), we simultaneously examined the extent to which racial identity interacted with race of the perpetrator and the type of racism (i.e., subtle vs. blatant) to influence physiological responses to discrimination. This latter (exploratory) aim made it possible to examine how racial identity and situational cues, together, might influence how individuals interpret situations or perceive threat or challenge following exposure to racism.

We used prior empirical studies examining racism or racial discrimination in the context of ANS activity (e.g., Armstead, Lawler, Gordon, Cross, & Gibbons, 1989; Jones et al., 1996; Morris-Prather et al., 1996), and Sellers and colleagues' (2001) conceptual framework for racial identity, appraisal, and coping to guide our hypotheses. We predicted that racial identity scores characterized by high race centrality and positive feelings towards African Americans (i.e., private regard) would lead to the appraisal of race-related events as ones for which there was a great deal at stake. This appraisal would be reflected by greater perceived threat or challenge and indexed by either PNS withdrawal or SNS activation following exposure to the racism vignettes. Second, we predicted that individuals with low public regard (and who believe that others have relatively negative opinions of African Americans) would not show a challenge response in the racism condition because racism is consistent with their worldview. Finally, consistent with Sellers' prediction that perceptions of threat might depend

on the extent to which discriminatory events challenge individuals' goals, we predicted that individuals endorsing nationalist ideology would not exhibit threat or challenge responses since racially discriminatory events do not challenge their goals of building coalitions within the race (Sellers et al., 2001). Because of the dearth of research and conceptualizations with regard to racial identity and situational characteristics of racial discriminatory events, examinations of interactions between racial identity and subtle versus blatant racism and race of the perpetrator were exploratory.

Method

Participants

One hundred and five self-identified African American college students from a southeastern university participated in this study. The sample consisted of 59 females (57%) and 45 males. Participants ranged in age from 18 to 29 ($M = 20.69$, $SD = 1.81$). The student population at this university was comprised primarily of White students (67%) followed by African American students (9%). The median family socioeconomic status was "middle class" (46%). Ninety-seven and 82% of participants reported at least "good" mental and physical health, respectively. Sociodemographic characteristics of the sample are summarized in Table 1.

Materials

Materials consisted of six racism analogues, which were adapted from Vrana and Rollock (2002) and Jones et al. (1996). These audio vignettes consisted of two scenarios for each of the three racism conditions: *blatant* racism (e.g., a police officer unjustly pulls someone aside and uses a racial slur to denigrate the individual's race); *neutral* racism (e.g., an individual asks a police officer for directions to a restaurant); and *subtle* racism (e.g., a security guard suspiciously follows an individual around a bookstore). Each vignette had other actors who were described as either "Black" or "White." Scenarios lasted about 60 s, were 100 ± 10 words long, and contained the same number and similar intensity of

Table 1. Summary of Sociodemographic Characteristics ($n = 105$)

Variable	
Age, M (SD), yr	20.69 (1.81)
Sex (male), n (%)	45 (42.9)
Family SES, n (%)	
Poor	1 (1)
Working class	33 (31.4)
Middle class	47 (44.8)
Upper middle class	22 (21)
Wealthy	1 (1)
Self-reported physical health status	
Poor	1 (1)
Fair	17 (16.2)
Good	42 (40)
Very good	38 (36.2)
Excellent	6 (5.7)
Self-reported mental health status	
Fair	3 (2.9)
Good	27 (25.7)
Very good	45 (42.9)
Excellent	29 (27.6)
BMI, M (SD), kg/m ²	26.20 (4.5)

Note. M = mean; SD = standard deviation; yr = years; SES = socioeconomic status; BMI = body mass index.

descriptions of physiological and behavioral responding in the situation (e.g., “muscles tensing,” “your stomach tightens”). Actor race was balanced across participants so that it was not confounded with the content of the scenario.

Procedure

The current study was approved by the appropriate Institutional Review Board at the institution where the research was conducted. Participants were recruited via flier and LISTSERV advertisements to Black college organizations to participate in a study examining “how African Americans respond to challenging situations.” Data were collected across two 1-h sessions. Session one was used to obtain sociodemographic information, measure race-related beliefs and attitudes, and prepare participants for the second session. Session two consisted of the experimental portion of the study in which racism analogues were administered and psychophysiological data were obtained.

At the start of the experimental session, the research assistant placed spot electrodes on participants and then explained to the participants that they would be asked to imagine a series of scenarios presented over the speakers. Participants were instructed to “imagine the scene as if it was happening to them.” In the second session, there was one practice trial with a nonracial scenario to help reacquaint participants with the procedure they had practiced in the first session. Each trial consisted of an initial rest period (i.e., the participant sat quietly without stimuli present), a present period (i.e., the vignette was presented audibly through a speaker), an imagine period (i.e., the participant imagined themselves as the target of discrimination), and a recovery period (i.e., the participant stopped imagining the scene and concentrated on relaxing). Consistent with prior work using similar designs (Jones et al., 1996; Morris-Prather et al., 1996; Vrana & Rollock, 2002) and recommendations for the necessary amount of time to obtain reliable physiological estimates for the parameters assessed in this study (Berntson et al., 1997), each period lasted 60 s. The presentation of vignettes was randomized with the constraint that one scenario in each of the three racism conditions (blatant, neutral, subtle) appeared in the first three scenarios and one appeared in the second three scenarios. Approximately 4 min after the end of the recovery period, participants began the next trial, repeating the process until all six trials had been completed.

Measures

Demographics. Participants completed a questionnaire during the first session in which they provided information about their age, gender, race, ethnicity, physical and mental health status, diet, exercise habits, and their family health, educational, immigration, and socioeconomic status.

Racial identity. The Multidimensional Inventory of Black Identity–Short Form (MIBI-S; Martin, Wout, Nguyen, Gonzalez, & Sellers, 2010) was used to assess four of the eight dimensions of racial identity proposed by the Multidimensional Model of Racial Identity (Sellers, et al., 1998). These dimensions were chosen on the basis of empirical evidence suggesting moderating effects in the context of racial discrimination and psychological adjustment. Participants were asked to respond to each of the items using a 7-point Likert-type rating scale (1 = *strongly disagree* to 7 = *strongly agree*) indicating the degree to which they agreed with each statement. *Racial centrality* assesses the degree to which race

was a central aspect of the individual’s identity (e.g., “Being Black is an important reflection of who I am”) (4 items; $\alpha = .72$). *Racial regard* assesses the degree of positive feelings towards one’s racial group (e.g., “I’m happy that I am Black”; *private regard*) (3 items; $\alpha = .85$) and how individuals feel others view Blacks (e.g., “Overall, Blacks are considered good by others”; *public regard*) (4 items; $\alpha = .84$). *Nationalist ideology* highlights the uniqueness of Blacks’ experiences as an oppressed group in the United States (e.g., “Whenever possible, Blacks should buy from other Black businesses”) (4 items; $\alpha = .63$). The mean interitem correlations for the nationalist ideology subscale was .32, suggesting adequate internal consistency despite the marginal scale reliability (Briggs & Cheek, 1986).

Apparatus and Physiological Measures

Cardiovascular psychophysiology data were acquired via electrocardiographic (ECG) and impedance cardiography (ICG) signals captured by a Bionex Impedance Cardiograph amplifier from Mindware Technologies (Gahanna, OH) yoked to a laboratory PC. We used the spot electrode configuration described by the Sherwood SPR Committee Report (Sherwood, Allen et al., 1990) to capture the ICG signal and a modified lead II configuration to capture the ECG signal. The sampling frequency was 1 kHz, and ECG and ICG waveforms were ensemble-averaged in 30-s epochs using the Heart Rate Variability and Impedance Cardiography applications (Mindware Technologies). Prior to analysis, interbeat intervals of each waveform were visually inspected, evaluated by an artifact detection algorithm implemented in the MindWare software, and edited for artifacts. Approximately 10% of study participants had data that required editing, but 94.3% of the sample had scorable ANS data.

Respiratory sinus arrhythmia (RSA). RSA was indexed by extracting the high frequency component (> 0.12 Hz) of the R-R time series using spectral analysis. High-frequency spectral densities were normalized through natural log transformations; thus, RSA was estimated as the natural logarithm of the variance of heart period ($\ln \text{ms}^2$) with the frequency band-pass associated with respiration at this age (i.e., .12–.4 Hz) (Berntson, Quigley, & Lozano, 2007). RSA is a well-validated measure of PNS activity (Berntson et al., 1997). Higher scores reflect greater PNS activity.

Cardiac pre-ejection period (PEP). PEP is indexed as the time (in milliseconds) between left-ventricular depolarization, indicated by onset of the ECG Q-wave (Berntson, Lozano, Chen, & Cacioppo, 2004), and the initiation of ejection of blood into the aorta, indicated by the ICG B-wave (Lozano et al., 2007). PEP is a validated measure of beta-adrenergically mediated SNS-linked cardiac activity (Sherwood, Turner, Light, & Blumenthal, 1990). Decreases in PEP (or PEP shortening) indicated increased sympathetic activation.

Statistical Analysis

Mean RSA and PEP scores for each condition were calculated for the 60-s intervals of the initial rest (treated as baseline), present, imagine, and recovery periods within each task. Three difference scores were calculated for each of the six conditions: present reactivity (present—initial rest), imagine reactivity (imagine—initial rest), and recovery reactivity (recovery—initial rest). Negative RSA and PEP difference scores reflect PNS withdrawal and SNS

activation, respectively, while positive RSA and PEP difference scores reflect PNS activation and SNS withdrawal, respectively.

To evaluate changes in RSA and PEP (i.e., reactivity) across the six experimental conditions, physiological data were analyzed using a hierarchical/multilevel repeated measures analysis of variance (RMANOVA) model. Mixed-effects models confer several advantages over traditional RMANOVA such as relaxing assumptions of independence, minimizing the effects of incomplete data over occasions, providing the ability to test individual differences in patterns of responses over the repeated measure and to generalize findings to the larger population, as well as allowing for the inclusion of time-varying covariates (Tabachnick & Fidell, 2007). This approach has been touted as a more efficient, parsimonious, and flexible approach to analyzing physiological data (Bagiella, Sloan, & Heitjan, 2000; Kristjansson, Kircher, & Webb, 2007; Schwartz, Warren, & Pickering, 1994). Dependent (repeated) measures were RSA and PEP change scores. Four multivariate models each for RSA and PEP (one for each of the four dimensions of racial identity, eight total) tested whether type of racism (blatant, neutral, subtle), actor race (Black/White), period (instructions, imagine, recovery), racial identity, including all main effects and two-, three-, and four-way interactions, were associated with changes in RSA and PEP, controlling for baseline (i.e., the initial rest period) of each of the six vignettes. In other words, baseline was treated as a time-varying covariate. This approach can be shown to yield the same results as using the raw scores and controlling for the baseline; however, change scores were used as the dependent variable for sake of interpretation (see also Vrana & Rollock, 2002, who used the same analytic strategy). Analyses for RSA also controlled for participant body mass index (BMI) as these two variables have been found to be correlated in other studies (e.g., El-Sheikh et al., 2009). Subject was also modeled as a random effect to account for individual differences in the effects of type of racism, actor race, and racial identity on levels of RSA and PEP and patterns of responses for these variables across the periods. Significant main effects and interactions were followed by examination of simple interaction and main effects as required. Where racial identity moderated reactivity, we used tercile values to create low, moderate, and high racial identity groupings and illustrate the interaction effects. Given the number of analyses conducted, we used a software-generated Bonferroni adjustment to correct for multiple comparisons and to reduce the chance of Type I error. Analyses were conducted using the SPSS Mixed Module of IBM SPSS Statistics, Version 20.

Results

Preliminary Analyses: Racial Identity Variables and Physiological Baseline

Preliminary analyses focused on descriptive statistics and correlations among racial identity variables (Table 2) and physiological baseline values. The sample endorsed high levels of private regard ($M = 6.12$, $SD = .97$) and racial centrality ($M = 5.10$, $SD = 1.07$) at slightly lower levels. Nationalist ideology was endorsed at modest levels relative to racial centrality and private regard ($M = 3.96$, $SD = .93$), and respondents scored below the midpoint on public regard ($M = 3.27$, $SD = 1.05$). There were also significant bivariate relations between certain racial identity variables. For example, racial centrality was positively correlated with private regard and nationalist ideology.

We also evaluated mean HR, RSA, and PEP baseline levels (across conditions and actor races). There was a main effect of

Table 2. Bivariate Correlations of Demographic and Racial Identity Variables

	1	2	3	4	5	6	7
1. Sex	–						
2. Age	.15	–					
3. Family SES	–.11	–.01	–				
4. Centrality	–.00	.01	.02	–			
5. Private regard	–.02	–.05	.18*	.52**	–		
6. Public regard	.15	–.07	.18*	.08	.18**	–	
7. Nationalist	–.07	.03	–.01	.42**	.21**	–.10	–

Note. SES = socioeconomic status.

* $p < .05$. ** $p < .01$.

gender for baseline HR, but not for RSA ($M = 6.53$, $SE = .03$) or PEP ($M = 134.15$, $SE = .47$). Women had greater baseline HR ($M = 76.98$, $SE = 1.31$) than men ($M = 70.62$, $SE = 1.13$), $F(1,102.92) = 13.49$, $p < .0005$. The main effects of all racial identity variables were nonsignificant suggesting no association between racial identity and any of the physiological parameters at baseline.

Racial Identity and Physiological Responses to Racial Discrimination

Respiratory sinus arrhythmia (RSA)

Main effects of racial identity. The main effects of racial centrality, private regard, public regard, and nationalist ideology were nonsignificant for RSA reactivity, ($ps = .503$, $.812$, $.972$, $.405$, respectively); however, several higher-order interactions emerged from the data for private regard, public regard, and nationalist ideology.

Private regard. First, we found a significant Condition \times Actor Race \times Period \times Private Regard interaction, $F(4,1721.37) = 2.478$, $p = .042$. Post hoc analyses revealed group differences within condition, actor race, and level of private regard among the listening, imagine, and recovery periods (Figures 1a–3b). For example, participants with moderate levels of private regard evidenced parasympathetic withdrawal ($M = -.23$) while listening to the blatant racism vignette as compared to parasympathetic augmentation ($M = .25$) during the recovery period when the perpetrator was Black ($p = .001$). Individuals with high levels of private regard

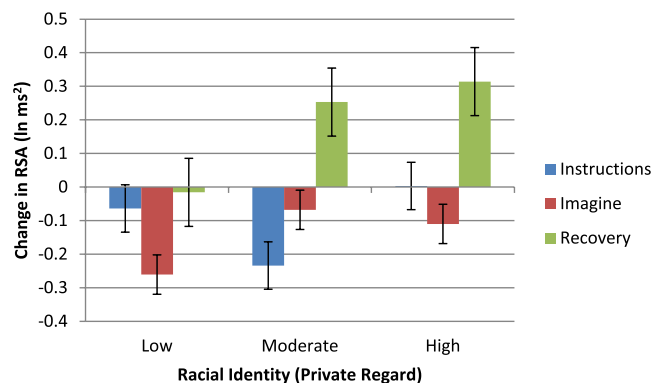


Figure 1a. RSA reactivity for blatant racism with Black perpetrator presented separately by level of private regard and period.

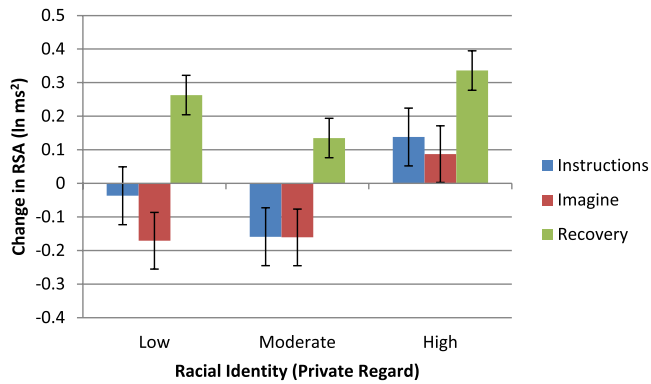


Figure 1b. RSA reactivity for blatant racism with White perpetrator presented separately by level of private regard and period.

experienced parasympathetic withdrawal while imagining the blatant racism vignette ($M = -.11$) as compared to an increase in PNS activity during the recovery period ($M = .31$) when the perpetrator was Black ($p = .044$) (Figure 1a). When the perpetrator was White (Figure 1b), individuals with low private regard experienced parasympathetic withdrawal during the imagine period ($M = -.17$) as compared to augmentation during the recovery period ($M = .26$, $p = .003$), while individuals with moderate and high levels of

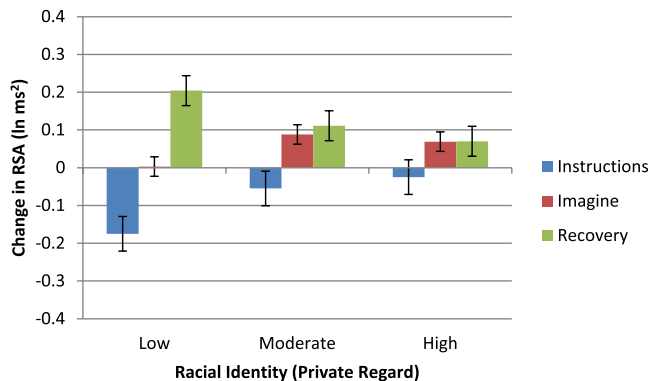


Figure 2a. RSA reactivity for neutral condition with Black actors presented separately by level of private regard and period.

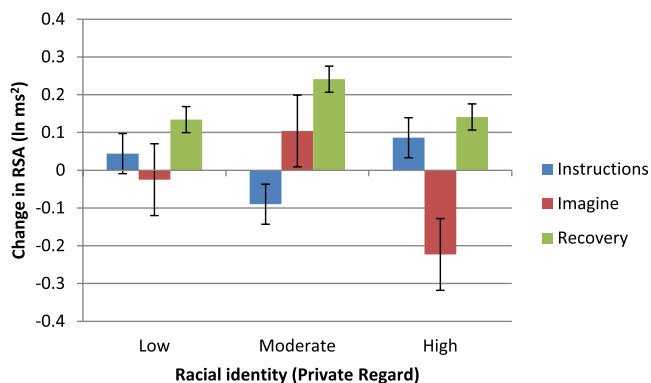


Figure 2b. RSA reactivity for neutral condition with White actors presented separately by level of private regard and period.

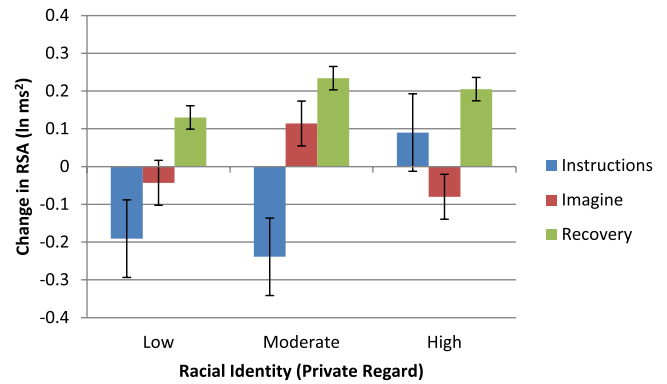


Figure 3a. RSA reactivity for subtle racism with Black perpetrator presented separately by level of private regard and period.

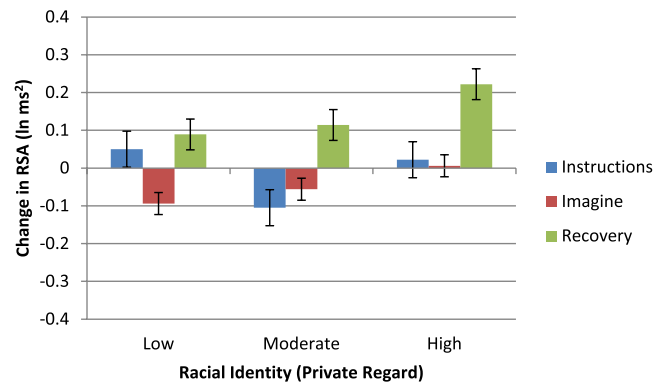


Figure 3b. RSA reactivity for subtle racism with White perpetrator presented separately by level of private regard and period.

public regard did not experience significant differences in RSA reactivity between periods under the same conditions (i.e., blatant racism, White perpetrator).

Group differences also emerged in the neutral and subtle conditions. In the neutral condition, individuals who endorsed low levels of public regard evidenced parasympathetic withdrawal while listening to the vignette with Black actors ($M = -.18$) as compared to parasympathetic augmentation during the recovery period ($M = .20$, $p = .013$) (Figure 2a). When the other actors in the scene were White (Figure 2b), individuals with moderate levels of private regard showed a very modest decrease in parasympathetic activity relative to baseline while listening to the vignette ($M = -.09$) as compared to an increase in PNS activity during the recovery period ($M = .24$, $p = .046$). Individuals with low and high levels of private regard did not show significant group differences in RSA between periods in the neutral condition when the other actors in the scene were White.

Finally, in the subtle condition, participants who endorsed low levels of private regard evidenced parasympathetic withdrawal while listening to the vignette ($M = -.19$) as compared to parasympathetic augmentation ($M = .13$, $p = .048$) during the recovery period when the perpetrator was Black (Figure 3a). Participants in this condition who endorsed moderate levels of private regard evidenced parasympathetic withdrawal while listening to the vignettes ($M = -.24$) as compared to increased PNS activity during the imagine ($M = .11$) and recovery periods ($M = .23$). PNS

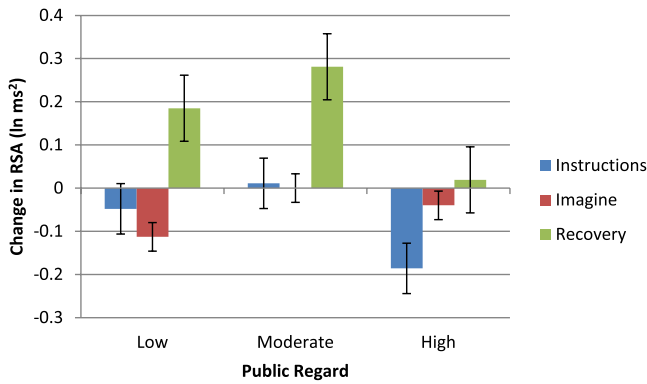


Figure 4. RSA reactivity presented separately by level of public regard and period.

reactivity while listening to the vignettes was significantly different from reactivity during the other two periods ($ps = .029, .002$). There were no group differences in this condition for the White perpetrator (Figure 3b).

Public regard. We found a significant Public Regard \times Period interaction for RSA, $F(2,1721.36) = 3.43, p = .033$ (Figure 4). For individuals who endorsed low levels of public regard, PNS reactivity was significantly different while listening to the vignettes ($M = -.05$) as compared to reactivity in the imagine ($M = -.11$) and recovery periods ($M = .19$) (both $ps < .001$). Whereas participants in this group evidenced parasympathetic withdrawal while listening to and imagining the vignettes, they demonstrated parasympathetic augmentation during the recovery period. At moderate levels of public regard, PNS reactivity was significantly greater in the recovery period ($M = .28$) as compared to both the instructions ($M = .01$) and imagine periods ($M = .00$) (both $ps < .001$). At high levels of public regard, participants evidenced parasympathetic withdrawal while listening to the vignette ($M = -.19$), but a modest parasympathetic augmentation during the recovery period ($M = .02, p = .003$). There were no significant group differences among the levels of public regard within the instructions, imagine, and recovery periods.

Nationalist ideology. The Nationalist Ideology \times Actor Race interaction was significant, $F(1,1721.27) = 5.05, p = .025$; however, group differences between Black and White actors failed to meet the .05 level of significance when corrected for multiple comparisons.

Pre-ejection period

Main effects of racial identity. The main effects of racial centrality, private regard, public regard, and nationalist ideology were nonsignificant for PEP reactivity, ($ps = .138, .051, .352, .677$, respectively); however, several higher-order interactions emerged from the data for racial centrality and private regard.

Racial centrality. The data revealed a significant Actor Race \times Racial Centrality interaction, $F(1,1652.49) = 6.27, p = .012$ (Figure 5). Post hoc tests indicated that at high levels of racial centrality, individuals experienced greater sympathetic activation (or PEP shortening) ($M = -3.59$) when the other actors in the vignette were White as compared to when the other actors in the scene were Black ($M = -.59$) ($p = .008$). There were no differences

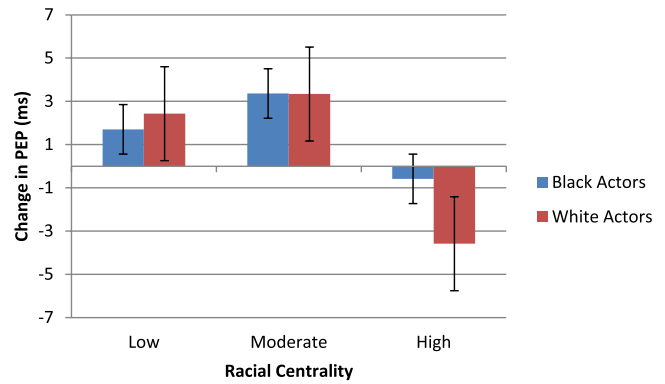


Figure 5. PEP reactivity presented separately by level of racial centrality and actor race.

in PEP reactivity between Black and White actors at low or moderate levels of racial centrality or within actor race between levels of racial centrality.

Private regard. The Actor Race \times Private Regard interaction was significant, $F(1,1652.15) = 4.44, p = .035$. At high levels of private regard, individuals exhibited significantly greater SNS activation (or PEP shortening) when the other actors in the scenarios were White ($M = -4.19$) as compared to Black ($M = -.24$) ($p = .001$). There were no group differences between Black and White actors at low and moderate levels of private regard or between levels of private regard within actor race (Figure 6).

Nationalist ideology. Interaction terms consisting of nationalist ideology failed to meet the criterion for statistical significance; of note, however, the Actor Race \times Nationalist Ideology \times Condition interaction approached significance, $F(2,1652.67) = 2.55, p = .079$ (not depicted). Post hoc tests within condition and level of nationalist ideology revealed that, in the blatant racism condition, individuals who endorsed high levels of nationalist ideology exhibited SNS activation when the perpetrator was White ($M = -1.80$) as compared to SNS withdrawal (or PEP lengthening) when the perpetrator was Black ($M = 3.54, p = .011$). Group differences also emerged within level of nationalist ideology and actor race (i.e., between conditions). For participants who endorsed low levels of nationalist ideology, SNS reactivity was greater during the

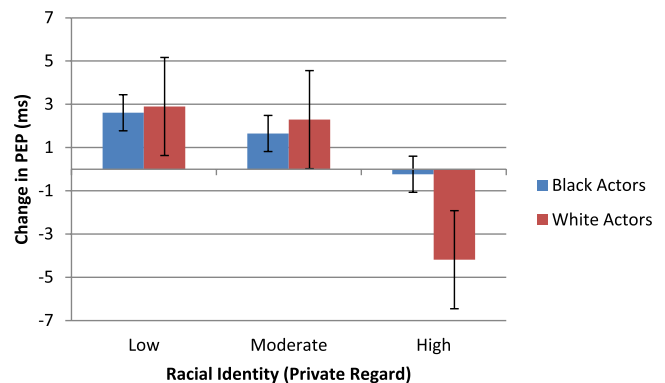


Figure 6. PEP reactivity presented separately by level of private regard and actor race.

neutral condition ($M = 5.68$) than the subtle condition ($M = .30$) when the other actors in the vignette were Black. Individuals with high nationalist ideology exhibited SNS activation (or PEP shortening) during the subtle racism condition ($M = -1.73$) as compared to SNS withdrawal (i.e., PEP lengthening) ($M = 3.54$) during the blatant condition ($p = .036$) when the perpetrator was Black. There were no group differences when the other actors in the vignettes were White.

Discussion

Racial Identity and Autonomic Responses to Racial Discrimination

The primary purpose of this study was to examine the moderating role of racial identity on physiological responses to the racism vignettes. We found that various dimensions of racial identity moderated autonomic responses to the analogues. With regard to PNS reactivity, individuals with relatively higher levels of private regard in the sample exhibited PNS withdrawal—a pattern consistent with perceptions of challenge in Porges' (2007) polyvagal theory—while listening to and imagining the blatant racism vignette (as compared to parasympathetic augmentation during the recovery period) when the perpetrator was Black. Theory and prior studies guiding specific predictions about ingroup racism or ingroup rejection are limited (e.g., Clark, Anderson, Clark, & Williams, 1999; Jones, 2000; Vrana & Rollock, 2002); however, our findings are consistent with findings by Mendes et al., (2008), who reported deleterious autonomic responses consistent with threat states (i.e., increased total peripheral resistance and cardiac output) under conditions of ingroup rejection. Moreover, our findings make sense inasmuch as individuals who feel positively about being African American or about African Americans, in general, might experience challenge or threat responses and prepare to mobilize coping efforts when individuals they hold in high esteem engage in racist behavior (e.g., a Black police officer using a racial epithet). In other words, such an infraction may be perceived as an affront because such behavior is at odds with or challenges their favorable and positive feelings about their group.

In the case of the White perpetrator in the blatant racism condition, it was individuals with low private regard—or individuals with less positive feelings about African Americans—who exhibited parasympathetic withdrawal while imagining the blatant racism scene (as compared to the expected RSA augmentation during the recovery period). In contrast to findings for the vignettes in the blatant racism condition with a Black perpetrator, individuals with relatively higher levels of private regard showed no differences in reactivity across periods (relative to the initial rest period). Sellers et al. (2001) predicted that private regard might buffer the impact of racism such that individuals who view their racial group positively might be less susceptible to the negative impact of racism-related events. Our findings would seem to offer preliminary support for this contention at the physiological level, in that individuals with higher levels of private regard exhibited less reactivity following exposure to the blatant racism vignette. As suggested in the literature examining psychological outcomes, perhaps positive group feelings insulate against physiological challenge or threat responses in the face of racial adversity.

The findings for the neutral condition were relatively unremarkable, though we were surprised that individuals with low private regard evidenced parasympathetic withdrawal while listening to the vignette with Black actors. It is possible that less positive views

about African Americans translate into perceptions of challenge or threat or marshal the need for greater attentional capacity even when the other actors (who are seen unfavorably) are exhibiting innocuous behavior (e.g., shopping in a grocery store). Consistent with this view, individuals with low levels of private regard also exhibited PNS withdrawal while listening to a subtle racism vignette (as compared to augmentation during the recovery period) when the perpetrator was Black. Individuals with moderate levels of private regard evidenced parasympathetic withdrawal while listening to the subtle racism vignette with the Black perpetrator, but exhibited augmentation while imagining the scene and during recovery. This physiological pattern is consistent with Porges' (2007) suggestion that the vagal brake can quickly reengage to reduce arousal and minimize metabolic expenditure following an initial orienting response characterized by PNS withdrawal. Taken together, our findings provide preliminary evidence that individuals' positive or negative feelings about African Americans may shape how they attend, perceive, respond, and/or cope with the environment even when the stimulus is not of a discriminatory nature.

Public regard also moderated PNS responses to the vignettes across conditions and actor races. Individuals who endorsed low levels of public regard exhibited parasympathetic withdrawal—again, consistent with a stress or challenge response—while listening to and imagining the vignettes (as compared to PNS augmentation during the recovery period). At moderate levels of public regard, there was almost no change in PNS reactivity relative to baseline until the expected increase in the recovery period, whereas at high levels of public regard, participants exhibited a similar pattern to individuals with low levels of public regard (i.e., PNS withdrawal while listening to the vignettes and expected return to baseline or PNS augmentation during recovery). In accordance with Sellers et al. (2001), we predicted that (a) individuals with low public regard might be less affected by racism because such experiences are consistent with their worldview that others do not see African Americans favorably, and (b) individuals endorsing high public regard beliefs (i.e., individuals who believe others view African Americans favorably) might be surprised by racism-related experiences since the experience of racism is not consistent with their view of others seeing Blacks favorably—and consequently might appraise such experiences as more challenging. Our results are inconsistent with the former but consistent with the latter, in that individuals with low and high public regard did evidence challenge responses to all of the vignettes across conditions. The observation that moderate levels of public regard evidence less reactivity relative to baseline (and no evidence of PNS withdrawal or mobilization) raises interesting questions about whether this middling level of public regard might in some way convey a protective physiological effect. At the very least, however, our results suggest differential patterns of responding not only as a function of favorable (or unfavorable) views about African Americans but also as a function of one's views about how others view African Americans.

Racial identity also moderated PEP responses to the racial discrimination vignettes in ways that were consistent with theoretical predictions and prior empirical evidence. For example, we found that individuals with higher levels of racial centrality and private regard evidenced greater sympathetic activation when the other actors in the vignette were White (i.e., across all conditions). With respect to theoretical predictions implicating racial identity and stress appraisals, Sellers et al. (2001) predicted that high race central individuals may be more likely than low central individuals

to appraise a racism-related event as one for which a great deal is at stake because these individuals internalize experiences of racism-related stress as a personal threat. Similarly, they argued that private regard is likely to predict the perception that more is at stake because these events challenge their positive feelings and beliefs about their group.

The moderating effect of racial centrality and private regard is interesting for at least two reasons. First, racial centrality has been found to predict greater perceptions of racial discrimination in prior studies (e.g., Sellers et al., 2003). Findings by Shelton and Sellers (2000) suggest that high race-central individuals may even be more likely to attribute ambiguous discriminatory events to race than individuals for whom race is less central. Although our findings were across all three conditions, the pattern of findings raises the intriguing possibility that dimensions of racial identity influence dimensions of physiological responding (with SNS activation in some cases) to White perpetrators in racist interactions as well as nonracist ones. Porges' (2007) polyvagal theory suggests that SNS activation occurs when the stressor is intense or chronic (less intense stressors are negotiated with PNS withdrawal and engagement of the stimulus); thus, the pattern of findings in our study suggests that individuals with high centrality and private regard may experience racist encounters and even nonracial interactions with outgroup members as a chronic stressor. A second reason the findings are noteworthy is that, despite being linked to SNS activation in our study, racial centrality and private regard have both been identified as protective factors in the context of racial discrimination in the psychological research literature. Although speculative, it could be that physiological motivation and activation translates into a positive psychological effect (e.g., prior repeat experiences with racial discrimination lead to the development of skills to cope with discrimination and a greater sense of efficacy in negotiating such events; Sellers et al., 2001).

A trend-level interaction involving nationalist ideology failed to reach statistical significance (at the omnibus level) but deserves mention. We found statistically significant group differences—specifically increases in sympathetic activation—for individuals who endorsed high levels of nationalist ideology during the blatant condition when the perpetrator was White (as compared to SNS withdrawal when the perpetrator was Black). Contrary to our prediction that individuals with relatively higher levels of identity might not experience racism as a challenge or threat because such events do not challenge their goals of building within race coalitions, our results suggest that individuals who endorse nationalist ideology did experience some degree of challenge, threat, or attentional mobilization in the blatant racism condition when the perpetrator was White (relative to when the perpetrator was Black). We also found when examining group differences within levels of nationalist ideology that at high levels of nationalist ideology, individuals evidenced SNS activation during the subtle racism condition as compared to SNS withdrawal during the blatant condition when the perpetrator was Black. These results suggest a difference in orienting to subtle racism versus blatant racism with Black perpetrators as a function of nationalist ideology and highlight the importance of situational characteristics such as the blatant or subtle nature of a discriminatory act in understanding the role of racial identity in shaping responses to discrimination.

Although there are several ways of interpreting the pattern of results given the numerous correlates and multiple interpretations of autonomic reactivity in the literature (e.g., attention, threat,

challenge, effort, etc.), our results show compelling evidence of different physiological response or reactivity patterns as a function of the significance and meaning that individuals attribute to race. Although racial identity has been shown to mitigate the effects of racism and discrimination on psychological adjustment and mental health status, and a handful of studies suggest buffering properties of racial identity on the association between discrimination and physical health indices such as blood pressure (e.g., Clark & Gochett, 2006; Neblett & Carter, 2012; Thompson, Kamrack, & Manuck, 2002), our results are among the first to demonstrate the moderating properties of racial identity on parasympathetic and sympathetic response patterns to racism analogues. Although the precise meaning of different patterns of reactivity in the context of psychosocial stressors is an evolving science, these results have the potential to inform our thinking and advance both our understanding and theory regarding underlying mechanisms in the association between racial identity and mental health outcomes. At the very least, our pattern of results lends credence to the as yet untested proposition that the moderating impact of racial identity may be mediated by appraisal and attentional and coping responses to racial discrimination. In light of numerous studies linking autonomic reactivity and RSA and PEP in particular with risk stratification in cardiac disorders and a host of negative health correlates such as compromised immune function (Berntson et al., 2007), atherosclerosis and cardiovascular disease (e.g., Heponiemi et al., 2006), and mental disorder (Rottenberg, Salomon, Gross, & Gotlib, 2005), and in light of the implication of changes in physiological systems as an underlying mechanism in the association between racial discrimination and health (Williams & Mohammed, 2009), this study and line of research may yet elucidate the complex role of racial identity in shaping the health consequences of racial discrimination.

Limitations and Future Directions

Although there are several strengths of the present study, a few limitations should be noted. First, although the interitem correlation suggests adequate internal consistency, the reliability for the nationalist ideology subscale was fair and may have resulted in increased measurement error, and thus decreased power. Second, although we used similar published studies as models in the design of our own study (e.g., Vrana & Rollock, 2002), execution of future studies might benefit from using a true stand-alone baseline (i.e., prior to the experimental manipulation) and/or lengthening of the intertask periods to 8 to 10 min, as baseline values were based upon initial rest period values in each condition and these values may have been influenced by carryover effects from preceding trials. Third, we examined the independent contribution of the PNS and SNS branches of the ANS in this study; however, consistent with the doctrine of autonomic space (Berntson & Cacioppo, 2004)—the idea that both branches interact to influence autonomic control—an important next step would be to examine the joint action of the two systems to determine the significance and meaning of particular patterns of autonomic response in the context of racial discrimination. Fourth, although we used patterns of ANS reactivity to infer the mediating role of appraisal and coping, we did not actually measure appraisal or coping or any of the other reported correlates of ANS reactivity (e.g., attention or effort) in this study. It may be that individuals' reactivity reflected active coping or engagement and not necessarily threat, but without additional measures, we are limited in the extent to which we can draw definitive conclusions about underlying mechanisms. Future

studies would benefit from the direct measurement of vignette appraisals and participants' views of effort and engagement with the actual vignettes they imagined. Another promising future direction would be the application of challenge and threat theory (Blascovich & Mendes, 2010) to gain further insight into motivational states associated with various racial identity profiles in the context of discrimination. Whereas Porges (2007) and others (e.g., Sellers et al., 2001) discuss perceptions of challenge or threat more broadly, Mendes and colleagues (2008) have suggested that the examination of several cardiovascular parameters beyond the ones measured in this study (e.g., cardiac output, total peripheral resistance, etc.) might be used by researchers to distinguish between challenge (i.e., the appraisal that available resources exceed demands) and threat (i.e., when demand exceeds available resources) appraisals. Finally, despite the benefits of using imagery to examine the effects of racial discrimination, more research is needed that examines actual instances of racial discrimination. Though studies that examine actual racism raise a number of ethical and methodological challenges, such studies will surely be

needed to further ascertain the impact of racial discrimination on its targets.

Conclusion

The results of our study suggest that the significance and meaning that individuals ascribe to race in their self-concepts may play a role in their physiological responses to racial discrimination. Although racial identity scholars have speculated that the impact of racial identity on adjustment might be mediated by stress appraisals and coping, supporting data are limited. Through examination of ANS reactivity in the context of racism vignettes, our data lay the foundation for the further exploration of the impact of racial identity on how people actively cope with experiences of different types of discrimination and the implications of these coping responses for adjustment and health over time. We urge scholars to pursue this important line of work as the field seeks to understand the influence of race-related attitudes and beliefs on how individuals negotiate day-to-day experiences with racial discrimination.

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