Health Psychology
2006, Vol. 25, No. 3, 364–369

0278-6133/06/$12.00 DOI: 10.1037/0278-6133.25.3.364

Perceived Racism and Cardiovascular Reactivity and Recovery to Personally Relevant Stress

Marcellus M. Merritt, Gary G. Bennett, Jr., Redford B. Williams, and Christopher L. Edwards
Duke University Medical Center

John J. Sollers III
National Institute on Aging

This study evaluated cardiovascular responses (CVR) to an active speech task with blatantly discriminatory (BRC) versus neutral (NRC) stimuli and an anger recall task in a sample of Black men ($N = 73$; age 18 to 47). Diastolic blood pressure scores were higher for NRC versus BRC stimuli during anger recall ($p < .05$). Moreover, persons in the NRC group who perceived high levels of racism (vs. no racism or BRC group) during active speech showed larger increases in blood pressure across postspeech rest, anger recall, and subsequent rest ($p < .03$). The notable elevation in CVR in response to an ambiguous event extends current models of racism suggesting that subtle racism is a psychosocial stressor that erodes health through chronically elevated CVR.

Keywords: racism, cardiovascular reactivity, hypertension, anger, Blacks

A growing body of evidence suggests that exposure to racial discrimination is associated with elevated cardiovascular responses (CVR; Armstead, Lawler, Gordon, Cross, & Gibbons, 1989; Brondolo, Rieppi, Kelly, & Gerin, 2003; Clark, 2000, 2003a, 2003b; Clark & Anderson, 2001; Clark, Anderson, Clark, & Williams, 1999; Fang & Myers, 2001; Harrell, Hall, & Taliaferro, 2003; Jones, Harrell, Morris-Prather, Thomas, & Omowale, 1996; McNeilly et al., 1995; Steffen, McNeilly, Anderson, & Sherwood, 2003; Sutherland & Harrell, 1986) and increased hypertension risk (Brondolo et al., 2003; Kreiger & Sidney, 1996) among Black Americans. For example, Armstead et al. (1989) presented Black college students with one of three televised scenarios depicting blatantly racist, anger-provoking nonracist, and neutral content. Exposure to the racist stimulus was associated with significantly higher CVR compared with the other stressor types.

Taken together, these and other (Blascovich, Spencer, Quinn, & Steele, 2001; Brondolo et al., 2003; Guyll, Matthews, & Bromberger, 2001; Harrell et al., 2003) findings suggest (a) that the perception and interpretation of discriminatory stimuli matters as much as their objectivity and (b) that exposure to and attributions of racial discrimination may promote heightened and sustained CVR among Blacks. A majority of past studies have investigated CVR to depictions or recollections of overt racism but have not addressed the subtle expressions of racial discrimination (termed *aversive racism*) that are more commonly experienced by many Blacks (Dovidio, 2001).

The present study was designed to extend previous findings by examining CVR to stressor condition (blatantly racist vs. nonracist stimuli) in a healthy adult sample. We were also interested in determining whether participants' perceptions of racial discrimination in the stressor task influenced CVR.

Method

Sample

Participants included 73 healthy normotensive Black men aged 18 to 47 years ($M = 31.7 \pm 9.5$ years). Educational attainment among participants ranged from 9–21 years ($M = 14$ years). Recruitment strategies included announcements on local radio, notices at local organizations, and word of mouth.

Procedure

Lab visit. Participants completed a battery of psychosocial questionnaires that included questions about demographics and psychosocial factors. Participants then took part in three stimulus tasks interspersed with four resting periods. First, each participant rested for a 5-min baseline period. For Task 1, participants were asked to read aloud while alone a short neutral passage (instructions for washing clothes). The objectives of this neutral reading task were to obtain a prestressor, speaking measure of blood pressure (BP) and heart rate (HR) and to orient participants to the BP collection equipment. Consistently, recent research has demonstrated that speech content (neutral vs. affect related) has a major impact on CVR during laboratory-based speech tasks (Feldman, Cohen, Hamrick, Lepore, 2004; Linden, 1987; Prkachin,

Marcellus M. Merritt, Gary G. Bennett, Jr., Redford B. Williams, and Christopher L. Edwards, Department of Psychiatry, Duke University Medical Center; John J. Sollers III, Laboratory of Personality and Cognition, National Institute on Aging, Baltimore.

Gary G. Bennett, Jr., is now at the Harvard School of Public Health and the Dana-Farber Cancer Institute, Boston.

This article is based on a paper presented at the April 2002 annual meeting of the Society of Behavioral Medicine, in Nashville, Tennessee. The study was supported by Training Research Grant 5T32MH19109 from the National Institute on Mental Health. We thank those who thoughtfully participated in the study as well as James Lane for use of his laboratory space. We also thank Julian F. Thayer for his helpful comments on drafts of this article.

Correspondence concerning this article should be addressed to Marcellus M. Merritt, who is now at Department of Psychology, Cleveland State University, Chester Building, Room 109, Cleveland, OH 44115-2214. E-mail: m.merritt04@csuohio.edu

Mills, Zwaal, & Husted, 2001). After the reading task, participants rested for 3 min (Rest 1).

For Task 2, participants took part in a 10-min active speech task. Each participant was randomly assigned to either a 2-min audiotaped nonracist (NRC) or blatantly racist (BRC) stressor condition. The NRC depicted the unfair treatment of a customer in a shopping scenario without discriminatory cues. The BRC was a nearly identical stimulus; however, it contained blatant racially discriminatory references. Thus, the only difference in the scenarios was inclusion of blatantly racist statements in the BRC. Participants listened to the tape and immediately afterward took 5 min to prepare a 5-min presentation that described (a) their thoughts and feelings about the scenario and (b) how they would react to the situation if they were the target of the unfair treatment. Thus, the active speech task comprised a 5-min speech preparation period and a 5-min presentation period. After the active speech task and a manipulation checklist, participants rested for 10 min (Rest 2).

Following Rest 2, participants completed a 5-min anger recall task, in which each was asked to recall and discuss a previous experience in which someone made them angry. After anger recall, participants rested for 3 min (Rest 3).

Perceptions of racism. Immediately following the presentation, participants rated the degree (on a 4-point scale from *none* to *an extreme amount*) to which they perceived racism as a motivating factor in the unfair treatment depicted in the shopping scenario (see Figure 1). Specifically, the item read, "How much of a role did you think racism played in the unfair treatment of the first customer in the shopping scenario?" The perceived racism (PR) question followed the presentation because we wanted to maximize participants' ruminative responses to the audiotaped scenarios.

Cardiovascular measures. Measures of systolic and diastolic blood pressure (SBP and DBP) and HR were collected continuously throughout the experimental protocol with an Ohmeda 2300 Finapres BP monitor (Ohmeda, Madison, WI). The measures for each task and rest period were averaged. Mean cardiovascular levels during Rest 2 were only analyzed from Minutes 3 to 8 to allow participants adequate time to ruminate about the preceding active speech task. CVR were not analyzed during the playing of the audiotape or during the PR question.

Plan for statistical analysis. The present study used repeated measures analysis of variance (with age, smoking status, and BMI as covariates) generated with SPSS-PC software to examine the interactive relationships of stressor condition (2: BRC vs. NRC), PR (2: no PR vs. "a great deal" or more), and period (8: mean cardiovascular score for each period as a within-group dependent measure). Independent sample *t* tests were run to find the location of significant omnibus tests for stressor condition and PR on the basis of a priori hypotheses. It was hypothesized that the BRC would predict higher CVR during and after the speech tasks and that high PR would predict even larger increases in CVR.

Results

Thirty-six participants received the BRC, and 37 received the NRC. As shown in Figure 1, the manipulation check for PR in the shopping scenario showed that participants who received the BRC perceived higher, and less variable, levels of racism ($M = 3.47$, $SD = 0.77$) than did those in the NRC ($M = 1.22$,

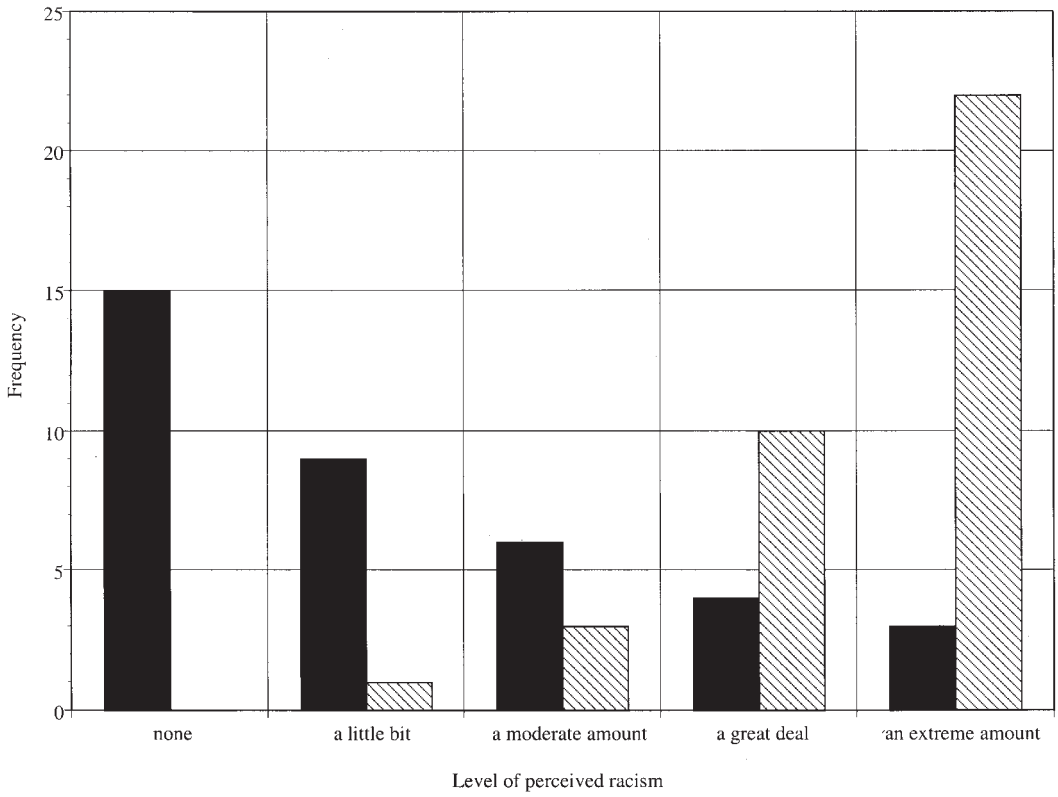

Figure 1. Frequency of perceived racism in shopping scenario by stressor condition. Solid bars represent the nonracist condition; hatched bars represent the blatantly racist condition.

SD = 1.32). It is important to note that none of the participants who received the BRC reported perceiving "no racism" in the scenario (32 of 36 reported either "a great deal" or "an extreme amount" of PR). A relatively large number of persons in the NRC (22 out of 37 persons) perceived at least "a little bit" of racism, suggesting a high level of unexpected variability in PR for the NRC.

Stressor Condition × Period on Cardiovascular Levels

There were significant period effects for mean DBP, $F(7, 62) = 2.57$, $p = .02$; SBP, $F(7, 62) = 2.10$, $p = .05$; and HR, $F(7, 62) = 3.01$, $p < .01$, levels. The reading task produced significant increases in SBP, DBP, and HR ($p < .01$). The Period × Stressor effect was not significant for mean SBP, $F(7, 62) = 1.66$, $p = .13$, or HR, $F(7, 62) = 1.72$, $p = .12$, levels. As shown in Figure 2, the Period × Stressor effect was significant for mean DBP levels, $F(7, 62) = 3.13$, $p < .01$. Although there were no significant contrasts, DBP levels for the BRC and NRC were similar from neutral reading to presentation and then diverged, with the NRC showing higher DBP levels during Rest 2, anger recall, and Rest 3. This result led us to undertake exploratory analyses using PR ratings to determine if PR in the NRC could account for the unexpected finding of higher DBP in the periods following presentation in the NRC. Also, we adopted a conservative approach to calculating reactivity scores (task value minus baseline value) and used the values from the reading task for each dependent variable as the baseline (task value minus reading value). Reactivity (CVR) scores were constructed for speech preparation, presentation, post-presentation rest (Rest 2), anger recall, and postanger recall rest (Rest 3).

Stressor Condition × Period on CVR Scores

As shown in Table 1, and paralleling the results in the analysis using cardiovascular levels, the Stressor Condition × Period effect was significant for DBP CVR scores, $F(4, 65) = 2.58$, $p = .04$. The NRC, compared with BRC, was associated with higher DBP CVR during anger recall, $t(71) = 2.12$, $p = .03$. Although the Stressor × Period effect was not significant for HR CVR, there was a significant between-groups stressor effect for HR, $F(1, 68) = 4.66$, $p = .03$, with lower HR for the NRC during Rest 2, $t(71) = -2.47$, $p = .01$.

Given the severely skewed reports of PR scores in the BRC and the unexpected presence of some subjects with high PR ratings in the NRC, we decided to create a new variable with three levels (StressPR3). One level comprised all persons in the BRC ($n = 36$), whereas the other two included persons in the NRC who perceived either (a) "no racism" (NRC-no PRex, $n = 15$) or (b) "a great deal" or "an extreme amount" of racism (NRC-hi PRex, $n = 7$). This post hoc and interactive approach allowed us to examine the effect for groups with extreme PR in the NRC while also accounting for the effect of the BRC on CVR.

StressPR3 × Period on Cardiovascular Levels

The StressPR3 × Period effects were not significant for mean DBP, $F(7, 47) = 2.08$, $p = .06$, and HR, $F(7, 47) = 2.01$, $p = .07$, levels. Figure 3 shows StressPR3 effects on mean DBP levels across all periods. Although DBP levels for the three

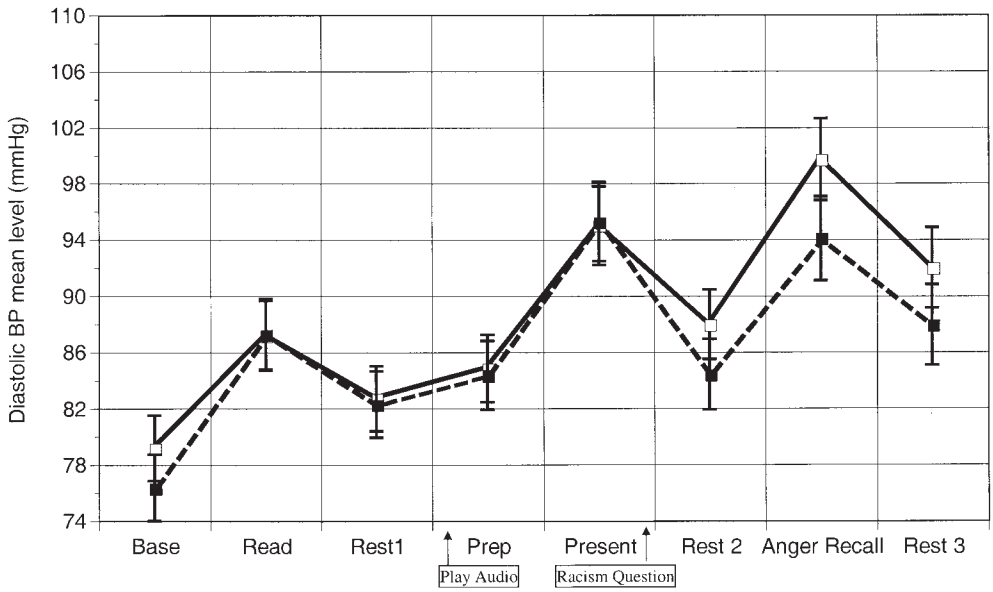

Figure 2. Period × Stressor effects on mean diastolic blood pressure (BP) levels from baseline to Rest 3. The dashed line with solid boxes represents the blatantly racist condition; the solid line with open boxes represents the nonracist condition. Error bars represent the standard error of each mean. Read = read aloud neutral text; Prep = preparation; Present = presentation; Anger Recall = remember level of anger during the experiment; all others are baseline or resting periods of the experiment.

Table 1
Mean Cardiovascular Change Scores for Each Period × Stressor Condition Effect and Period × StressPR3 Effect

Period	Diastolic blood pressure	Systolic blood pressure	Heart rate
Preparation			
NRC	−2.44	−2.20	−7.20
BRC	−2.70	−4.20	−4.65
NRC-hi PRex	3.97	8.62	−5.62
NRC-no PRex	−3.57	−5.62	−7.56
Presentation			
NRC	7.99	9.33	−2.93
BRC	8.02	7.05†	−1.01
NRC-hi PRex	14.85	20.90	−2.26
NRC-no PRex	6.45	8.31	−2.56
Rest 2			
NRC	0.83	2.01	−9.27*
BRC	−2.73†	−3.08†	−5.67
NRC-hi PRex	9.48	15.39	−6.92
NRC-no PRex	−2.84†	−2.47†	−10.64
Anger recall			
NRC	12.63*	12.92	−4.08
BRC	6.87†	4.35†	−1.81
NRC-hi PRex	19.43	25.36	−3.88
NRC-no PRex	8.96†	10.88†	−4.68
Rest 3			
NRC	4.88	4.92	−9.01
BRC	0.72†	−0.45†	−6.35
NRC-hi PRex	15.17	22.13	−5.79
NRC-no PRex	0.33†	0.00†	−9.92

Note. NRC = nonracist condition; BRC = blatantly racist condition; NRC-hi PRex = higher perceptions of racism in the nonracist scenario; NRC-no PRex = no perceptions of racism in the nonracist scenario.
* $p < .05$ for stressor task effect. † $p < .05$ for contrast effect of NRC-hi PRex group with NRC-no PRex or BRC groups.

groups were similar during neutral reading, DBP levels increased more for the NRC-hi PRex group after rating PR in the audiotaped scenario.

StressPR3 × Period on CVR Scores

The StressPR3 × Period effects were not significant for DBP, $F(4, 50) = 1.67$, $p = .17$; SBP, $F(4, 50) = 1.37$, $p = .25$; or HR, $F(4, 50) = 1.07$, $p = .38$. However, there were significant between-groups StressPR3 effects for DBP, $F(2, 52) = 4.37$, $p = .01$, and SBP, $F(2, 52) = 4.53$, $p < .01$. DBP CVR scores for each Period × StressPR3 level are shown in Table 1. The NRC-hi PRex (vs. the BRC) group had significantly higher DBP during Rest 2, anger recall, and Rest 3 and higher SBP during presentation, Rest 2, anger recall, and Rest 3 ($p < .05$). The NRC-hi PRex (vs. the NRC-no PRex) group had significantly higher DBP and SBP during Rest 2, anger recall, and Rest 3 ($p < .05$).

Discussion

This study evaluated the role of race-based inequity and the mediating role of PR on CVR to a laboratory stress protocol. We predicted that the BRC would be associated with greater CVR than the NRC. Unexpectedly, we found that the nonracist provocation produced higher levels of DBP during the periods following the presentation. We found it interesting that follow-up analyses revealed that those persons who perceived high levels of racism in the NRC had significantly larger increases in DBP and SBP across the Rest 2, anger recall, and Rest 3 periods compared with those who saw no racism and those in the BRC. Indeed, in the NRC, those reporting high PR had DBPs greater than 100 mm Hg during presentation (i.e., before they were asked about their perceptions of racism, making it impossible to have been affected by being asked), anger recall, and Rest 3, levels that were never reached by the NRC-no PRex or BRC groups. It is important to note that we found that the NRC produced greater CVR and then we went on to find that those NRC participants who perceived high levels of racism displayed exaggerated reactivity, reaching a mean DBP of 105 mm Hg during anger recall.

These findings suggest that heightened CVR may be encountered by those who are likely to generate racist attributions to explain otherwise ambiguous provocative interpersonal situations. Given the frequency with which Blacks report encountering such situations, these findings may be of considerable importance in explaining some of the variance in Black–White disparities in CVR. The latter point is especially relevant given that Black populations show more vascular responses to laboratory stressors (e.g., DBP, vascular resistance; Anderson, Lane, Taguchi, & Williams, 1989).

The finding that high perceptions of racism in the NRC are associated with higher elevations in BP is notable, given the observations that older, blatant forms of racism are increasingly being supplanted by more subtle forms of racism (Cose, 1995; Dovidio, 2001). Given the mounting literature on the negative health effects of overt forms of racism this finding may appear surprising, yet interracial interactions in modern society may often be associated with attributional ambiguity (Crocker, Voelkl, Testa, & Major, 1991). In response to the overtly racist (BRC) stimulus, participants could unambiguously interpret the clerk's behavior as being motivated by discriminatory intent. In the more ambiguous (NRC) condition, participants were placed in the position of evaluating the motivation for the unfair treatment. The attributional ambiguity of the NRC may have required additional cognitive attention to process the event. The NRC stimulated higher CVR following active speech, perhaps as the result of a carryover effect of repeated reflection or of rumination about the ambiguous shopping scenario earlier in the protocol (McKegney & Williams, 1967).

Future research should attempt to replicate these findings and investigate whether they extend to Black women. Although the PR effects in the present study are suggestive, future studies should also include a more comprehensive assessment of PR in the shopping scenario. It is possible that studying real-life experiences in which subtle racism occurs will uncover even more impressive CVR. Such assessments can be done retrospectively through survey or interview protocols or prospectively using ambulatory BP monitoring. If the current findings hold in future research with larger samples of Blacks, then they might have significant implications for the continued excess of cardiovascular disease in Blacks.

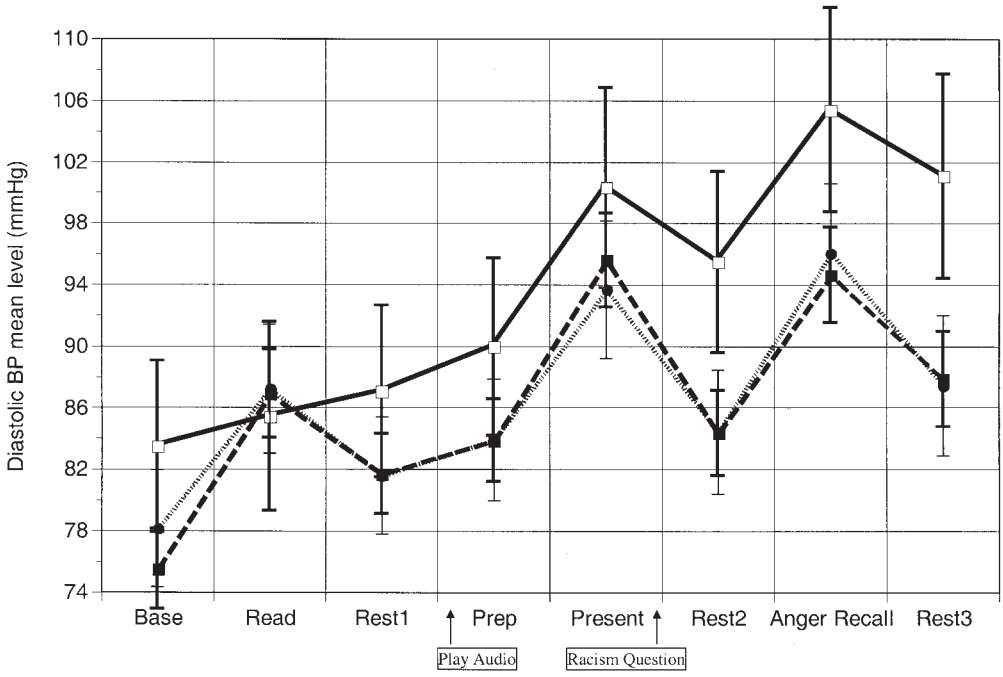

Figure 3. Period × StressPR3 (a variable measuring three levels of stress) effects on mean diastolic blood pressure (BP) levels from baseline to Rest 3. The solid line with the open boxes represents higher perceptions of racism in the nonracist condition, the dashed line with the black boxes represents the blatantly racist condition, and the thin dashed line with the gray circles represents no perception of racism in the nonracist condition. Error bars represent the standard error of each mean. Read = read aloud neutral text; Prep = preparation; Present = presentation; Anger Recall = remember level of anger during the experiment; all others are baseline or resting periods of the experiment.

References

Anderson, N. B., Lane, J. D., Taguchi, F., & Williams, R. B. (1989). Patterns of cardiovascular responses to stress as a function of race and parental hypertension in men. *Health Psychology, 8,* 525–540.

Armstead, C. A., Lawler, K. A., Gordon, G., Cross, J., & Gibbons, J. (1989). Relationship of racial stressors to blood pressure responses and anger expression in Black college students. *Health Psychology, 8,* 541–556.

Blascovich, J., Spencer, S. J., Quinn, D., & Steele, C. (2001). African-Americans and high blood pressure: The role of stereotype threat. *Psychological Science, 12,,* 225–229.

Brondolo, E., Rieppi, R., Kelly, K. P., & Gerin, W. (2003). Perceived racism and blood pressure: A review of the literature and conceptual and methodological critique. *Annals of Behavioral Medicine, 25*(1)*,* 55–65.

Clark, R. (2000). Perceptions of interethnic group racism predict increased vascular reactivity to a laboratory challenge in college women. *Annals of Behavioral Medicine, 22,* 214–222.

Clark, R. (2003a). Parental history of hypertension and coping responses predict blood pressure changes in Black college volunteers undergoing a speaking task about perceptions of racism. *Psychosomatic Medicine, 65,* 1012–1019.

Clark, R. (2003b). Self-reported racism and social support predict blood pressure reactivity in Blacks. *Annals of Behavioral Medicine, 25,* 214–222.

Clark, R., & Anderson, N. B. (2001). Efficacy of racism-specific coping styles as predictors of cardiovascular functioning. *Ethnicity and Disease, 11,*286–295.

Clark, R., Anderson, N. B., Clark, V. R., & Williams, D. R. (1999). Racism as a stressor for African Americans: A biopsychosocial model. *American Psychologist, 54,* 805–816.

Cose, E. (1995). *The rage of a privileged class.* New York: HarperCollins.

Crocker, J., Voelkl, K., Testa, M., & Major, B. (1991). Social stigma: The affective consequences of attributional ambiguity. *Journal of Personality and Social Psychology, 60,* 218–228.

Dovidio, J. F. (2001). On the nature of contemporary prejudice: The third wave. *Journal of Social Issues, 57,* 829–849.

Fang, C. Y., & Myers, H. F. (2001). The effects of racial stressors and hostility on cardiovascular reactivity in African American and Caucasian men. *Health Psychology, 20,* 64–70.

Feldman, P. J., Cohen, S., Hamrick, N., & Lepore, S. J. (2004). Psychological stress, appraisal, emotion and cardiovascular response in a public speaking task. *Psychology and Health, 19,* 353–368.

Guyll, M., Matthews, K. A., & Bromberger, J. T. (2001). Discrimination and unfair treatment: Relationship to cardiovascular reactivity among African-American and European American women. *Health Psychology, 20,* 315–325.

Harrell, J. P., Hall, S., & Taliaferro, J. (2003). Physiological responses to racism and discrimination: An assessment of the evidence. *American Journal of Public Health, 93,* 243–248.

Jones, D. R., Harrell, J. P., Morris-Prather, C. E., Thomas, J., & Omowale, N. (1996). Affective and physiological responses to racism: The roles of Afrocentrism and mode of presentation. *Ethnicity and Disease, 6,* 109–122.

Kreiger, N., & Sidney, S. (1996). Racial discrimination and blood pressure: The CARDIA study of young Black and White adults. *American Journal of Public Health, 86,* 1370–1378.

Linden, W. (1987). A microanalysis of autonomic activity during human speech. *Psychosomatic Medicine, 49,* 562–578.

McKegney, F. P., & Williams, R. B. (1967). Psychological aspects of hypertension: II. The differential influence of interview variables on blood pressure. *American Journal of Psychiatry, 123,* 1539–1545.

McNeilly, M. D., Robinson, E. L., Anderson, N. B., Pieper, C. F., Shah, A., Toth, P. S., et al. (1995). Effects of racist provocation and social support on cardiovascular reactivity in African-American women. *International Journal of Behavioral Medicine, 2,* 321–338.

Prkachin, K. M., Mills, D. E., Zwaal, C., & Husted, J. (2001). Comparison of hemodynamic responses to social and nonsocial stress: Evaluation of an anger interview. *Psychophysiology, 38,* 879–885.

Steffen, P. R., McNeilly, M., Anderson, N., & Sherwood, A. (2003). Effects of perceived racism and anger inhibition on ambulatory blood pressure in African Americans. *Psychosomatic Medicine, 65,* 746–750.

Sutherland, M. E., & Harrell, J. P. (1986). Individual differences in physiological responses to fearful, racially noxious, and neutral imagery. *Imagination, Cognition, and Personality, 6,* 133–150.