

# Physiological Responses to Racism and Discrimination: An Assessment of the Evidence

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A growing body of research explores the impact of encounters with racism or discrimination on physiological activity. Investigators have collected these data in laboratories and in controlled clinical settings. Several but not all of the studies suggest that higher blood pressure levels are associated with the tendency not to recall or report occurrences identified as racist and discriminatory.

Investigators have reported that physiological arousal is associated with laboratory analogues of ethnic discrimination and mistreatment. Evidence from survey and laboratory studies suggests that personality variables and cultural orientation moderate the impact of racial discrimination. The neural pathways that mediate these physiological reactions are not known.

The evidence supports the notion that direct encounters with discriminatory events contribute to negative health outcomes. (*Am J Public Health*. 2003;93:243–248)

**RACISM OPERATES WITHIN** objective life conditions, popular culture, and religious and educational institutions.<sup>1</sup> Williams<sup>2</sup> listed racism among basic causes in a framework that described the relationship between health and race, arguing that racism shapes other important social determinants of health outcomes, including economic resources and the availability and nature of health care. The individual acts of bias and interpersonal discrimination that grow out of racism represent its latter-day, or surface,<sup>2(p328)</sup> manifestations. They are salt in wounds previously inflicted by a host of negative life events whose relationship to racism is often cloaked. Indeed, it is likely that, at the point at which people encounter these individual forms of racism, other racist institutional and cultural forces already have encroached on their lives.<sup>1</sup>

Here we describe a sample of studies focusing on the impact of various forms of racism on physiological activity. We selected reports from the medical literature and social science literature in which investigators directly measured physiological responses. The racially stressful material in

the reports was either recalled or experimentally imposed.

## STUDIES OF THE PHYSIOLOGICAL IMPACT OF RACISM

Laboratory experiments dominate investigations of the physiological consequences of racism. However, several important survey research projects have measured physiological activity. The laboratory studies expose individuals to analogues of racist events, whereas the survey studies focus on racism as perceived by the participant. Although the approaches differ substantially, both sets of studies provide evidence that is crucial to our understanding of the relationship between health and racial oppression. They have tested the proposition that analogues of racist events or memories of these encounters result in physiological arousal or negative health sequelae. Complex designs can identify factors that contribute to individual differences in responses to discrimination, determine the uniqueness of patterns of physiological reactions, or uncover the neural pathways that mediate these physiological effects.

Table 1 describes 4 paradigms available to researchers in this area. In *self-report correlational studies*, participants disclose their perceptions of the number and kinds of experiences they have had with racism or racial discrimination. Such studies seek to determine whether these reports correlate with changes in physiological arousal. Some investigations have revealed that personality and coping processes moderate the relationships between discrimination and physiological variables.

*Basic psychophysiological investigations* develop laboratory analogues of racially charged encounters and examine their physiological effects. In some instances, these studies compare the physiological activation resulting from discrimination and bias with responses to nonracial stressful events. These experimental studies permit the drawing of cause-and-effect conclusions about the relationships between physiological changes and racially noxious events.

A hybrid method combines the correlational and psychophysiological approaches. Studies of this type employ laboratory challenges that are known

**TABLE 1—Research Designs in Studies on the Physiological Effects of Racism**

Type of Study	Experimental Features	Level of Product
Self-report correlational	Recall of bias treatment and discrimination Basic physiological and personality assessment	Generates correlational statements regarding relationships among events, personality, physiological activation
Basic psychophysiology	Analogues of bias treatment and discrimination Laboratory physiological measurement	Permits cause-effect statements regarding physiological impact of racism
Moderated psychophysiology	Analogues of bias treatment and discrimination Assessment of personality or physiological predispositions Laboratory physiological measurement	Identifies sources of individual differences in physiological reactions to discrimination
Mediated psychophysiology	Analogues of bias treatment and discrimination Pharmacological blocks of selected neural paths Laboratory physiological measurement	Charts pathways responsible for the impact of racially noxious events

to elicit physiological responding. Investigators determine the relationship between physiological reactions to the challenges and reports of discrimination or racism, testing the hypothesis that encounters with discrimination will heighten general physiological reactivity. The notion that enhanced reactivity to stressors forecasts onset of disease has received a modicum of support.<sup>3</sup>

The *moderated psychophysiological approach* employs personality measures as predictors of individual differences in physiological responses to racist events. Hence, studies involving this approach retain the capacity to generate cause-effect statements about the relationship between racial discrimination and physiological activity. They also shed light on the characteristics of individuals that moderate responsiveness to racial stressors.

*Mediated psychophysiological studies* would intensify the search for the mechanisms responsible for physiological change; unfortunately, no published reports of the mediators of racism effects are available. Studies involving this approach would administer selective pharmacological neural blocks as stressful events are encountered. Statistical strategies can also be

employed in the search for mediators of physiological responses.<sup>4</sup> These investigations form the foundation for strong causal statements regarding the physiological pathways mediating the effects of stress on disease.

Cacioppo and his colleagues<sup>5,6</sup> have summarized the inferences that psychophysiological studies allow about the relationships between physiological and psychological processes. They have described these inferences in terms of 2 continua. One represents the specificity of the relationship between the physiological and psychological domains. One-to-one relationships exist at the far end of this continuum. Here investigators show that a particular response or pattern of responses is exclusive to a psychological disposition. The opposing end, where several psychological states may elicit the same physiological responses, marks the region of many-to-one relationships. A one-to-one relationship between racial bias and physiological responses would imply that a unique pattern of physiological reactions occurs when bias is encountered.

The second continuum specifies the conditions under which the relationship between physiological and psychological vari-

ables emerges. The relationship is context dependent when it occurs in selected settings or with individuals who share particular characteristics. Context-free findings exist in all settings and with all types of participants. Exploring the contextual nature of the impact of racial discrimination on physiological processes might entail contrasting the responses of African Americans and Whites.

In Cacioppo's framework, studies producing *outcomes* and *concomitants* are similar with respect to the specificity dimension. These studies of discrimination and physiological activity are not concerned with demonstrating that reactions to racially noxious events are unique or exclusive to racism. Outcomes exist when studies make no attempt to generalize the relationship beyond the present context. However, concomitant relationships are inferred in instances in which studies manipulate context to determine whether the findings generalize across settings or groups. Experiments designed to establish *markers* or *invariants* search for exclusivity or uniqueness in physiological responses to racism. When investigators focus on establishing invariants, they attempt to show that exclusive rela-

tionships will hold for all groups and in all settings. These relationships would be markers if the study is designed to demonstrate unique responses to racism but only in a specific setting or group.

## EMPIRICAL FINDINGS

Table 2 sorts a sample of studies on discrimination and physiological activity according to paradigm and type of inference allowed; a majority of the studies listed involved the moderated psychophysiological approach. No investigation claims to establish pure exclusivity or absolutely context-free findings. Rather, we specified how facets of each design address the specificity and contextual nature of the relationships between physiological responses and racism.

### Survey Study Results

Findings relating physical health status to self-reported encounters with racism have been inconsistent. Some investigations have reported strong positive associations,<sup>7</sup> while others have revealed no associations.<sup>8</sup> Inverse relationships have also emerged in instances in which encounters with discrimination predict positive health outcomes.<sup>9,10</sup> Studies involving direct measures of physiological activity do not resolve these conflicting findings.

Table 2 shows that reports of discrimination relate to blood pressure through complex interactions with coping styles.<sup>11,12</sup> Krieger and Sidney<sup>11</sup> reported support for early survey findings indicating that a passive posture and denial of discriminatory treatment were related to higher blood pressure readings. James et al.<sup>12</sup> found that the "John Henryism" active coping style and unfair racial treatment were related

**TABLE 2—Empirical Studies on the Physiological Effects of Racism and Discrimination**

Study/Sample/ Dependent Variable(s)	Nature of Inference	Findings	Comments
<b>Self-report correlational studies</b>			
James et al. <sup>12</sup> ; 112 AA men; blood pressure	Marker—explores the impact of several types of work-related stress in a Black sample	DBP elevated in successful, high “John Henryism” men who saw race as an impediment to success vs similar men who viewed race as helpful	Complex finding portends later complicated relationship between reports of discrimination and physiological activity
Krieger and Sidney <sup>11</sup> ; 831 AA men, 1143 AA women, 1006 C men, 1106 C women; blood pressure	Invariant—tests for impact of various forms of unfair treatment across Black and White samples	Lower blood pressure in those who report discrimination and challenge unfair treatment	Supports Krieger <sup>10</sup> ; higher pressure in those who fail to report discrimination and are passive when treated unfairly
Dressler <sup>17</sup> ; 86 AA men, 100 AA women; blood pressure	Marker—the effects of racism-related stressors (lifestyle incongruity) as well as chronic stress are examined	For participants aged 40–55 years, lifestyle incongruity and chronic stress were positively related to blood pressure	Incongruity measures are saturated with items related to material possessions and are weighted by class status; possibly related to materialism
Dressler and Bindon <sup>18</sup> ; 234 AA men, 366 AA women; blood pressure	Marker—possible racism-related stressor (cultural consonance) and other person variables used as predictors	Lifestyle cultural consonance was related to SBP; for both SBP and DBP, “kin support” consonance moderated the relationship between lifestyle consonance and blood pressure	Approach refines analysis of cultural variables by contrasting one’s orientation with community consensus
Daniels et al. <sup>19</sup> ; 47 AA women, 43 AA men; blood pressure and heart rate	Marker—relationship between cultural orientation (influenced by cultural racism) and blood pressure along with hostility’s impact was assessed	Tendency to embrace values of mainstream American culture was associated with higher DBP and heart rate, and higher SBP for men; hostility weakly related to heart rate only	Higher hostility scores were associated with embracing cultural values of the mainstream; cultural measure proved to be a superior predictor
<b>Basic psychophysiological with self-report of discrimination</b>			
Guyll et al. <sup>13</sup> ; 101 AA women, 262 C women; blood pressure and heart rate	Invariant—Effects of unfair treatment with and without racial discrimination studied in Black and White women	DBP levels of AA women who reported racial discrimination were more reactive to a speech stressor than levels of those who did not	Blood pressure and HR reactivity to a mirror tracer task did not differ as a function of experiences with discrimination
Bowen-Reid and Harrell <sup>14</sup> ; 122 women, 33 men; MAP and HR	Outcome—focused on the relationship of recollections of racist experiences with perception of racism’s severity in AA sample exclusively	HR and MAP reactivity to the mirror tracer were inversely related to experiences with racist events; findings did not hold for reactions to a hand-grip task	Higher levels of perceived racial stress associated with reduced HR reactivity, and recent encounters with racism associated with smaller blood pressure changes
<b>Basic psychophysiological studies</b>			
Morris-Prather et al. <sup>27</sup> ; 52 AA women, 40 AA men; blood pressure and pulse	Marker— Participants viewed stressful material involving harassment by Black and White officers	SBP and DBP increased as scenes were viewed; pulse rate was not influenced; SBP was more reactive for women; race of perpetrator of stress did not result in differential physiological changes	Affective responses of women to the scenes were more pronounced, but systolic pressure increases of the men tended to be greater; no evidence that responses to the White perpetrator were stronger
Kinzie et al. <sup>28</sup> ; 25 Cambodian women, 9 men, 27 Vietnam veterans, 1 woman, 22 “controls,” 15 men; HR	Invariant—Tested PTSD patients (2 ethnicities), control veterans, and nonveterans using scenes related to war, Cambodian war hospital, and domestic violence	Cambodians with PTSD evidenced strongest HR responses to all scenes; material related to specific experiences of Cambodians did not affect Cambodian control group	Employed culturally and historically relevant stressors; self-ratings of mood were sensitive to type of stressor; Cambodians rated the hospital scene most unpleasant
Blascovich et al. <sup>25</sup> ; 20 AA, 19 C; blood pressure, MAP	Invariant—High and low stereotype threat conditions (2 stressors) employed with 2 ethnic groups	MAP of AA in the high stereotype threat group was elevated; AA and C in other conditions did not differ	Stereotype threat procedures have been used primarily to study performance differences; initial demonstration of physiological effects
<b>Moderated psychophysiological studies</b>			
Sutherland and Harrell <sup>26</sup> ; 62 AA women; corrugator and zygomatic EMG activity, HR, finger pulse volume	Marker—fearful, neutral, and racially noxious imagery employed; AA sample exclusively	Imagining racially noxious and fearful scenes produced increases in corrugator EMG and HR; neutral scenes produced increases in zygomatic EMG; HR responses to racial scenes predicted by type A behavior pattern	Initial demonstration of the laboratory impact of racially noxious scenes on physiological responses; physiological reactions were not related to ability to use mental imagery
Armstead et al. <sup>23</sup> ; AA; blood pressure	Marker—racist, anger-provoking, and neutral scenes viewed by AA sample	Greater MAP reactivity to racial stressors than to either neutral or anger-provoking film clips	First evidence of a singular effect of racist material over other forms of stress in the laboratory; “anger-out” was associated with lower SBP during racist scenes

*Continued*

TABLE 2—Continued

McNeilly et al. <sup>24</sup> ; 30 AA women; blood pressure and HR	Marker—Participants debated a racially charged or nonracial issue; AA sample only employed	Debating racial material elicited more pronounced HR and blood pressure responses; elevations in blood pressure were more persistent for the debate of racial material	Availability of a supportive confederate did not affect HR or blood pressure responses to either stressor; for HR and SBP during speaking and listening phases, HR was more reactive to racial topics
Jones et al. <sup>30</sup> ; 60 AA women; HR, corrugator EMG, digital blood flow	Outcome—Stressful scenes were 2 forms of racism; AA sample used exclusively	Viewing and imagining subtle and blatant racism elicited increases in corrugator EMG and HR and decreases in digital blood flow	Both imagery and video modes of presentation provoked physiological responses to racism; Afrocentrism, a measure of Black identity, was related to HR changes during subtle racism only
Torres and Bowens <sup>31</sup> ; 6 AA men, 11 AA women; blood pressure	Marker—Responses to affect-neutral material, math, and recall of racial incident were measured in an AA sample	All tasks led to increases in SBP; neutral and math increased DBP; no effects of tasks on HR resulted	Tendency to have internalized Black identity scores positively correlated with SBP during recall of racial material and math stress
Fang and Myers <sup>29</sup> ; 31 AA males, 31 C males; blood pressure and HR	Invariant—Neutral, racially noxious, and anger-provoking material used; both White and Black participants viewed the film clips	DBP reactivity was greater to racial and angry than to neutral material; DBP responses were similar for racial and anger material; SBP and HR responses to stressful scenes did not differ from neutral	SBP and DBP recovery was somewhat slower in individuals with high levels of hostility

Note. AA = African American; W = White; SBP = systolic blood pressure; DBP = diastolic blood pressure; HR = heart rate; PTSD = posttraumatic stress disorder; MAP = mean arterial pressure; EMG = electromyographic.

to elevated blood pressure among successful men. Two reports related physiological reactivity to laboratory tasks to experiences with racism and discrimination. Guyll and associates<sup>13</sup> found that diastolic blood pressure reactivity to a speech stressor was enhanced among individuals who had experienced discrimination. Supportive of Krieger and Sidney's findings, Bowen-Reid and Harrell<sup>14</sup> reported an inverse relationship between discrimination and cardiovascular activity; individuals who reported experiences with racism were less reactive to a mirror tracer task.

Studies of cultural orientation and physiological activity have produced more consistent results. This research is important because a central facet of racism is disruption of the cultural fabric of the oppressed group.<sup>1,15,16</sup> The cultural aspect of racism is best measured in terms of the manner in which the values of individuals have been influenced. Three studies listed in Table 2 suggest that cardiovascular measures are related to cultural affinities when

culture is considered with other contextual variables.

Dressler and colleagues<sup>17,18</sup> have refined measures of incongruity and consonance of cultural values that are associated with blood pressure. They have shown that individuals who report materialistic aspirations beyond their means or espouse cultural values that differ from community consensus tend to have elevated blood pressure levels. Daniels et al.<sup>19</sup> measured tendencies to embrace the mainstream American cultural values of materialism, individualism, and competition. Results showed that blood pressure was higher among African American men with stronger mainstream orientations.

#### Discussion of Survey Studies

Refined measures of discrimination and personality would clarify the contradictory findings reported in studies involving self-report strategies. Several measures of perceived racism and discrimination are available.<sup>20,21</sup> The precision of these instruments must be tested within

modern models of racism.<sup>1,16</sup> Furthermore, individuals high in neuroticism may exaggerate reports of negative life events. Other factors, known as response sets,<sup>22</sup> may influence people's willingness and ability to recall discriminatory events. These factors include social desirability and acquiescence. Future studies should include measures that would adjust for the tendency to deny or embellish reports of racism and discrimination.

#### Experimental Study Results

Basic and moderated psychophysiological paradigms impose racist or discriminatory events on individuals in the laboratory. Investigators have successfully structured stressful racist encounters using manipulations of social situations, tasks that require participants to debate or make speeches, and imagined and viewed scenes.<sup>23–31</sup> Blascovich et al.<sup>25</sup> applied the stereotype threat procedure, in which participants are led to believe that racial factors may have an impact on task performance. They found that

adding racial elements to a task enhanced its effect on physiological responses. Armstead et al.<sup>23</sup> and McNeilly et al.<sup>24</sup> showed that viewing or debating racist material produces greater blood pressure changes than viewing or debating nonracist material, but others have reported that exposures to events with racial overtones and other forms of stress result in similar responses.<sup>26–29</sup>

The search for the sources of individual differences in responses to racism has been less than systematic, and much work remains to be done. Within the moderated psychophysiological literature, we located 5 projects that included measures of personality. Two studies reported weak relationships between Black identity and physiological responses to racism.<sup>30,31</sup> Hostility, anger, and elements of the type A personality pattern have shown limited predictive utility.<sup>23,26,29</sup> Studies of psychological stress and disease require attention to individual differences in responding.<sup>32</sup> Research of this type will identify those most vulnerable to the impact of racism.

**Discussion of Experimental Studies**

Researchers have been generally successful in demonstrating that racist material, as with other forms of stress, elicits physiological arousal. It is not possible to argue from the existing findings that the different responses to racism are unique. In the few studies in which responses to racial material appeared to exceed responses to other stressors, rival hypotheses are tenable. For example, increasing the social complexity or level of threat in the racial situation may account for enhanced reactivity.

The limited utility of traditional personality measures as predictors of responses to racism encourages investigators to fashion new strategies. The findings from self-report studies encourage investigators to include measures of cultural orientation among predictors of laboratory responses to racism. However, cultural values such as spirituality and communalism may exert their influence on longer term responses to racism. These variables may affect how events are reappraised long after their occurrence. Laboratory designs are limited to measuring immediate reactions to and short-term recovery from racism. Although the effects of cultural orientation may be more apparent in field studies of racism in which ambulatory measures are obtained, such effects may also emerge in laboratory studies.

**CONCLUSIONS**

One challenge facing future researchers is that of refining the study of individual differences in responses to racism. The focus thus far has been on personality dimensions, such as hostility and racial or cultural identity, that may

produce exaggerated responses. A separate set of variables render some individuals resilient against the ravages of racism. Research will determine whether traditional cultural variables such as spirituality and communalism buffer the impact of racism.

Because survey research usually assesses perceptions of racism, it can explore the important subtler aspects of racism, including cultural and institutional forms. These types of racism often reside within social structures and persist even as legal and social sanctions discourage more blatant interpersonal racism.<sup>1,15</sup> Laboratory studies have focused largely on the effects of individual racial discrimination and other negative interpersonal episodes. The challenge remains that of developing experimental paradigms that would allow determination of the physiological effects of institutional and cultural racism.

It is essential to locate the physiological mediators of the effects of racism. Indeed, brain imaging technology has helped identify cholinergic pathways that link anxiety and cardiovascular reactions.<sup>33</sup> Encounters with certain forms of racism certainly increase anxiety. They also tend to cause one to worry and to rehearse defensive and aggressive actions. Mediation studies that employ pharmacological blocks and brain imaging techniques will reveal similarities and differences between the psychophysiology of anxiety, rumination, and experienced racism, which will assist in establishing unique facets of physiological responses to racism.

Ultimately, research will reveal the relative impact of racist encounters on persistent health disparities. Models of allostasis and alldynamism show that physiological set points and the mecha-

nisms governing them are not fixed.<sup>34</sup> External stressors can permanently alter physiological functioning. Racism increases the volume of stress one experiences<sup>35</sup> and may contribute directly to the physiological arousal that is a marker of stress-related diseases.<sup>36</sup> ■

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**Contributors**

J.P. Harrell developed the framework for this article and served as the principal writer. S. Hall and J. Taliaferro executed literature searches, drafted short summaries of empirical findings, and assisted in the editing of the final version.

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