Discrimination and the Stress Response: Psychological and Physiological Consequences of Anticipating Prejudice in Interethnic Interactions

Pamela J. Sawyer, PhD, Brenda Major, PhD, Bettina J. Casad, PhD, Sarah S. M. Townsend, PhD, and Wendy Berry Mendes, PhD

Objectives. We sought to demonstrate that individuals who anticipate interacting with a prejudiced cross-race/ethnicity partner show an exacerbated stress response, as measured through both self-report and hemodynamic and vascular responses, compared with individuals anticipating interacting with a nonprejudiced cross-race/ethnicity partner.

Methods. Through a questionnaire exchange with a White interaction partner (a confederate) Latina participants learned that their partner had racial/ethnic biased or egalitarian attitudes. Latina participants reported their cognitive and emotional states, and cardiovascular responses were measured while participants prepared and delivered a speech to the White confederate.

Results. Participants who believed that their interaction partner held prejudiced attitudes reported greater concern and more threat emotions before the interaction, and more stress after the interaction, and showed greater cardiovascular response than did participants who believed that their partner had egalitarian attitudes.

Conclusions. This study shows that merely anticipating prejudice leads to both psychological and cardiovascular stress responses. These results are consistent with the conceptualization of anticipated discrimination as a stressor and suggest that vigilance for prejudice may be a contributing factor to racial/ethnic health disparities in the United States. (*Am J Public Health.* 2012;102:1020–1026. doi:10.2105/AJPH.2011.300620)

Racial/ethnic disparities in mental and physical health in the United States are well documented and enduring. A 2004 report found drastic differences in disease incidence and mortality among African Americans, Latinos, and Whites.[1] Some mediators of the relationship between race/ethnicity and health include reduced access to health care, housing, and employment opportunities. Nevertheless, large racial/ethnic differences in health are still evident even after controlling for these factors.[2–5] Scholars assert that higher stress levels among minorities caused by exposure to prejudice and discrimination may contribute to health disparities.[4–8] We examined whether anticipating and taking part in an interethnic interaction in which one may be the target of prejudice can lead to increased psychological and physiological stress responses —specifically, threat cognitions, threat emotions, and increased cardiovascular reactivity.

Stress results from the perception that one's environment contains the potential for threat, loss, or harm.[9] Stress serves as the body's method of mobilizing resources and preparing for action by activating the sympathetic nervous system and hypothalamic-pituitary-adrenal axis responses. Stress can be adaptive as it helps the body to meet the demands of the threatening situation. However, exposure to chronic stress can lead to allostatic load, the wear and tear on the body produced through chronic or repeated activation of the stress-response systems. Allostatic load predisposes individuals to a number of health problems, including memory impairment, neural atrophy, and heart disease.[10] Cardiovascular responses resulting from exposure to stressors may over time contribute to the development of coronary and carotid atherosclerosis and hypertension.[11,12]

One potential stressor that may influence mobilization of the stress response is anticipating being a target of prejudice or discrimination. Anticipating prejudice or discrimination because of one's social identity can increase vigilance, or a hyperawareness for cues of mistreatment.[13,14] Increased vigilance for prejudice cues is associated with having interracial/interethnic mistrust,[15,16] negative emotions,[17] and depleted cognitive resources.[13,18] Chronic vigilance for discrimination may result in chronic stress exposure and be detrimental to health.[5,19] Vigilance evoked by mistrust can put people on guard for signs of the expected discrimination and lead to acute increases in blood pressure (BP), heart rate (HR), and stress hormones.[5,20] Chronic vigilance, often accompanied by rumination and worry, prolongs the negative effects of acute stress on physical and mental health.[19] Despite the importance of vigilance, research has rarely examined its role in the discrimination and health relationship.[5]

Several studies have shown a positive correlation between perceived experiences with discrimination and measures of psychological distress.[4,5,8] Indeed, perceived discrimination predicted psychiatric symptoms related to depression and anxiety better than age, gender, education, social class, or general stressors.[8,21,22] Other studies have shown a positive correlation between self-reported perceptions of discrimination and poor physical health outcomes including stroke, heart attack, diabetes, cancer, and lower birth weight babies.[22–28] In addition, several studies have shown a positive correlation between perceptions of racial/ethnic discrimination and physiological outcomes, including resting BP, BP reactivity, and hypertensive status.[29–36] Such correlational evidence, however, is not sufficient to conclude that perceived discrimination per se causes increases in BP.

Although the majority of work on discrimination and health is correlational,[4] these relationships have been tested with experimental methods. Several experiments have demonstrated that exposure to prejudice-related stimuli in the laboratory is related to increased physiological stress responses, often indexed by BP.[37–39] For example, researchers found that Black women who imagined themselves in, and gave a speech about, a discrimination scenario (being accused of shoplifting) had more pronounced and prolonged systolic blood pressure and diastolic blood pressure increases compared with White women or Black women in the control group.[40] This suggests that imagining a prejudice-relevant stimulus is sufficient to produce a physiological stress response. These findings are limited, however, by the lack of control over the actual event imagined, which is subject to retrospective biases. Furthermore, participants' levels of rejection sensitivity and stigma consciousness may have influenced the intensity of the event recalled[13,14]; thus, intensity of the event was not controlled.

We examined the effects of situationally induced expectations of discrimination on cardiovascular reactivity among Latina American participants. This examination extended previous work in several ways. First, we sought to put participants in a situation in which they actually anticipated experiencing prejudice rather than simply imagined experiences that might induce thoughts about discrimination. Thus, this research contributes to the vigilance literature by measuring anticipatory stress. Second, we examined the effects of manipulated discrimination expectations on cardiovascular reactivity among Latina participants, a population that has received less attention in the health and discrimination literature than has African Americans.[41] Research indicates that the more Latinos report experiencing discrimination, the poorer their self-reported health.[42,43] However, 2 studies reporting the relationship between perceived discrimination and BP among this population yielded inconsistent results.[41,44] Although these studies represent an important step in our understanding, they also highlight the need for greater attention to the cardiovascular and physical health effects resulting from actual or anticipated exposure to prejudice and discrimination among Latinos.

In the present study, Latina participants were given information suggesting that their partner, a White female student confederate (accomplice), held either prejudiced or nonprejudiced attitudes toward ethnic minorities. They then prepared for and delivered a speech to their partner while cardiovascular responses were assessed. Given previous research showing that experiencing prejudice is related to both psychological and physiological stress, we tested the following hypotheses. Compared with participants in the nonprejudiced condition, participants in the prejudiced condition will experience more threat cognitions (hypothesis 1), greater threat emotions (hypothesis 2), and greater cardiovascular reactivity (hypothesis 3). This pattern of results was predicted and tested at 3 phases of the experiment: anticipation phase, interaction phase, and postinteraction phase.

METHODS

Latina American college students (n = 54; mean age = 19 years; SD = 1.62; range = 18–28) volunteered to participate for course credit or $15 by selecting the study from a list posted on the Psychology Department's research participant pool Web site. We randomly assigned participants to the prejudice (n = 27) or nonprejudice condition (n = 27). The majority of participants (85%) were born in the United States. Before participation, we ascertained that no participant met criteria necessitating exclusion (i.e., pregnancy, presence of a heart murmur or pacemaker, or use of beta-blocking drugs).[45] The study was approved by the University of California, Santa Barbara, institutional review board, and all participants provided informed consent.

Materials and Procedure

During pretesting, participants completed an online questionnaire that included trait anxiety and depression subscales of the Brief Symptom Inventory.[46] The anxiety subscale assessed feeling nervous or shakiness inside; suddenly scared for no reason; fearful, tense or keyed up; and spells of terror and panic (Cronbach's α = 0.86). The depression subscale assessed feeling lonely, blue, no interest in things, hopeless about the future, and worthless (Cronbach's α = 0.88). Participants also completed the 8-item trait optimism subscale of the Life Orientation Test[47] with items such as: "In uncertain times, I usually expect the best" and "I hardly ever expect things to go my way" (reverse coded; Cronbach's α = 0.82).

Upon arriving at the lab, participants encountered a White female (a confederate blind to condition) waiting in the hallway. The female experimenter informed the participant and confederate that they would be working together later in the study and escorted them to separate rooms where they individually completed the preexperiment measures and physiological baseline. Participants completed an "attitude questionnaire," which served as the experimental manipulation and made ethnicity salient. Physiological sensors were applied to the participant and 5 minutes of baseline cardiovascular readings were taken.

Participants were told via a tape recorded message played over an intercom system:

> In this experiment we are studying interpersonal processes in working relationships. You are paired with another participant. Based on a random drawing, one of you will be assigned to give a 3-minute speech to the other on what you are like as a work partner. . . . Right now, we have given you the attitude form filled out by your partner. Please read over this form carefully. . . . Please fully use all 3 minutes since it will help you get to know your partner better and help you later on in the experiment when you work together.

All participants read that their partner (the confederate) self-identified as White and held attitudes similar to the campus mean on the 2 neutral attitude topics. The partner's alleged attitudes on the diversity items constituted the prejudice manipulation and included the following items: "I think stereotypes about ethnic minorities are often true"; "Ethnic minorities often do not have to work as hard as Whites do to get ahead"; "In my opinion, there is too much attention being paid these days to increasing ethnic diversity in universities"; and "Discrimination against ethnic minorities is no longer a problem in the United States." Participants were randomly assigned to condition, and learned in the prejudiced condition that the partner strongly agreed with all 4 diversity items and in the nonprejudiced condition, the partner strongly disagreed with all 4 items.

Participants were then informed, through a rigged drawing, that they had been selected to play the role of "speaker," which constituted

delivering a 3-minute speech to their White partner. They were given 2 minutes to prepare a speech on "what I am like as a work partner."

Following speech preparation, participants completed a questionnaire assessing their expectations concerning the upcoming interaction. Items included "How much does your partner want to work with you?" rated on a 7-point scale with anchors 1 (not at all) and 7 (very much [reverse coded so that higher values reflect more negative expectations]) and whether they had any concerns about the upcoming interaction, and if so to list their concerns. Finally, participants rated the degree to which they were currently experiencing 5 threat emotions (fearful, inspired [reverse coded], nervous, worried, and overwhelmed; Cronbach's $\alpha = 0.83$) on a 5-point scale, with anchors 1 (not at all) and 5 (extremely).

Upon completion, the partner (the confederate) was brought into the participant's room. Participants delivered their speech to the confederate while their cardiovascular responses were recorded. Participants received no verbal feedback from the confederate, and, to minimize nonverbal feedback, a screen was erected between the participant and the confederate and remained in place for the duration of the 3-minute speech.

We collected cardiac and hemodynamic data according to established guidelines[48] with a tonometric blood pressure cuff that uses a sweep technology over the radial artery to estimate blood pressure responses approximately every 15 seconds, and electrocardiograph and impedance cardiograph modules manufactured by Biopac (Santa Barbara, CA). All signals were collected at 1000 Hz and integrated into a Biopac MP150 hardware system. We applied sensors in a modified Lead II configuration to obtain electrocardiogram and used a tetrapolar mylar band system to obtain impedance cardiography. Taken together, this equipment provided several measures of interest including HR, preejection period, cardiac output, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure, and total peripheral resistance. Total peripheral resistance is calculated with the standard formula ([mean arterial blood pressure/cardiac output] $\times$ 80) and represents an overall estimate of the amount of constriction versus dilation in the arterioles. We used Mindware software, version 2.5 (Mindware Technologies, Gahanna, OH) to edit and score cardiovascular responses.[45]

Postinteraction Cognitions and Emotions

Participants were to estimate their partner's impression of them on a scale from 1 (very poor) to 7 (very good [reverse coded so that higher values reflect a more negative impression]). A second item assessed their stress level during their speech rated on a scale from 1 (not at all stressful) to 7 (extremely stressful). Participants completed a manipulation check by rating their partner's racism on a scale from 1 (not at all racist) to 7 (racist), were probed for suspicion, and were fully debriefed.

We analyzed data by using IBM's PASW, version 18 (Armonk, NY) and set hypothesis tests at $\alpha = 0.05$, 2-tailed.

RESULTS

We recorded cardiovascular responses during the 5-minute baseline, 2-minute speech preparation, and 3-minute speech delivery

TABLE 1—Descriptive and Inferential Statistics Comparing Conditions at Baseline Among Female Latina American College Students: Santa Barbara, CA, 2005–2006

Variable	Prejudiced Condition (n = 27), Mean (SD) or % (No./Total No.)	Nonprejudiced Condition (n = 27), Mean (SD) or % (No./Total No.)	*P*
Demographics			
Age, y	19.26 (1.99)	18.63 (1.01)	.16
US-born	81 (17/21)	90 (17/19)	.57
Cardiovascular measures (minute 5)			
Systolic blood pressure, mm Hg	128.69 (17.04)	126.54 (16.07)	.64
Diastolic blood pressure, mm Hg	72.54 (12.39)	71.77 (13.62)	.83
Mean arterial blood pressure, mm Hg	91.26 (13.61)	90.03 (14.20)	.75
Preejection period, msec	93.75 (21.98)	101.54 (16.42)	.16
Heart rate	79.41 (12.07)	77.18 (13.52)	.52
Cardiac output, L/min	8.12 (2.14)	8.73 (2.25)	.33
Total peripheral resistance, dyne/sec	956.92 (279.19)	888.85 (270.59)	.39
Control variables			
Anxiety[a]	0.977 (0.799)	0.872 (0.638)	.6
Depression[a]	0.801 (0.648)	0.803 (0.827)	.99
Optimism[b]	4.19 (0.910)	4.29 (0.930)	.66

[a]Scores from an online questionnaire that included trait anxiety and depression subscales of the Brief Symptom Inventory.[46] The anxiety subscale assessed feeling nervous or shakiness inside; suddenly scared for no reason; fearful, tense or keyed up; and spells of terror and panic (Cronbach's $\alpha = 0.86$). The depression subscale assessed feeling lonely, blue, no interest in things, hopeless about the future, and worthless (Cronbach's $\alpha = 0.88$).

[b]Scores from the 8-item trait optimism subscale of the Life Orientation Test with items such as: "In uncertain times, I usually expect the best" and "I hardly ever expect things to go my way" (reverse scored; Cronbach's $\alpha = 0.82$).[47]

TABLE 2—Descriptive and Inferential Statistics for Hypothesis Tests Regarding Cognitive and Emotional States and Cardiovascular Responses in Prejudiced and Nonprejudiced Conditions Among Latina American College Students: Santa Barbara, CA, 2005–2006

Dependent Variable and Study Phase	Prejudiced Condition (n = 27), Adjusted Mean (SE)	Nonprejudiced Condition (n = 27), Adjusted Mean (SE)	*P*
Cognitive and emotional states			
Threat cognitions			
Anticipation phase	3.98 (0.158)	3.50 (0.155)	.04
Postinteraction phase	4.24 (0.189)	3.66 (0.186)	.04
Threat emotions			
Anticipation phase	2.48 (0.122)	2.07 (0.117)	.06
Postinteraction phase	4.90 (0.316)	3.88 (0.310)	.02
Cardiovascular responses			
Anticipation phase			
Systolic blood pressure, mm Hg	143.45 (2.15)	136.73 (2.01)	.02
Diastolic blood pressure, mm Hg	85.30 (1.90)	77.88 (1.78)	.007
Mean arterial blood pressure, mm Hg	104.69 (1.92)	97.48 (1.80)	.01
Preejection period, msec	89.11 (1.69)	95.82 (1.50)	.006
Heart rate	89.83 (1.49)	83.86 (1.40)	.006
Cardiac output, L/min	8.53 (0.335)	8.58 (0.299)	.91
Total peripheral resistance, dyne/sec	1061.51 (50.81)	1022.45 (46.30)	.57
Interaction phase			
Systolic blood pressure, mm Hg	150.88 (2.17)	148.73 (2.03)	.47
Diastolic blood pressure, mm Hg	90.49 (1.88)	88.26 (1.76)	.39
Mean arterial blood pressure, mm Hg	110.63 (1.93)	108.42 (1.81)	.41
Preejection period, msec	86.23 (1.99)	92.97 (1.82)	.01
Heart rate	94.54 (1.70)	89.04 (1.60)	.02
Cardiac output, L/min	9.01 (0.341)	8.87 (0.312)	.76
Total peripheral resistance, dyne/sec	1059.38 (46.42)	1075.66 (43.36)	.8

phases. We calculated mean values for all cardiovascular indices for each minute. We created reactivity scores by subtracting each individual's minute-5 baseline value from each minute of the speech preparation and delivery, then averaging each score. We multiplied changes in the preejection period by −1 so that increases in sympathetic activation were represented as shorter preejection period (PEP). We examined cardiovascular data for normality, and outliers (values > 2 standard deviations from the overall mean) were assigned a new value equal to 1% larger than the next highest value.[49]

We subjected all dependent variables to univariate analyses of covariance, controlling for self-reported trait anxiety, depression, and optimism. Analyses of cardiovascular reactivity also controlled for baseline minute-5 values to control for artifactual results associated with the correlation between absolute change and baseline levels.[50] There were no differences at baseline by condition in any of the cardiovascular measures across condition during baseline (independent sample *t*-tests, all $P > 0.15$; Table 1). The control variables were unrelated to baseline cardiovascular measures and experimental condition (Table 1).

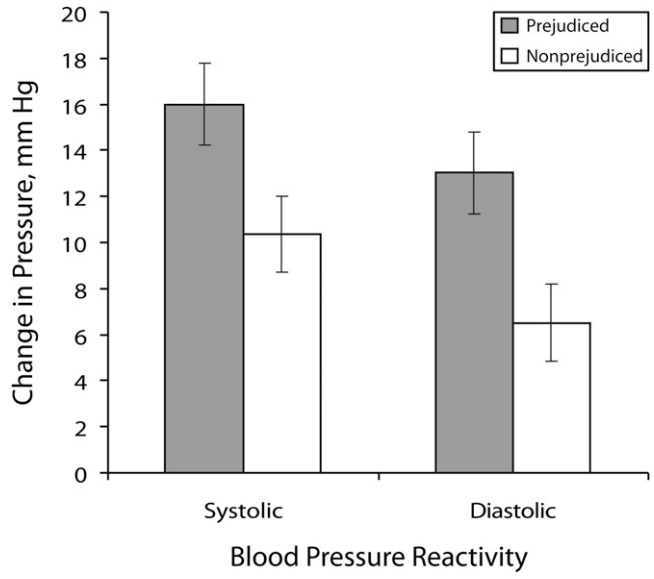
Participants in the prejudiced condition believed that their partner was more racist (mean = 3.96; SD = 1.61) than did participants in the nonprejudiced condition (mean = 1.26; SD = 0.66; $t_{52} = -8.10$; $P = .001$).

Anticipation Phase

Hypotheses 1 and 2 predicted that participants in the prejudiced condition would experience more threat cognitions and emotions when anticipating the interactive task compared with participants in the nonprejudiced condition. In support of hypothesis 1, participants in the prejudiced condition expected that their partner wanted to work with them less than did participants in the nonprejudiced condition (Table 2). They also were more likely to indicate concern about getting along with their partner, as 52% (n = 14) of those in the prejudiced condition reported concern, compared with only 19% (n = 5) of participants in the nonprejudiced condition ($\chi^2_{1,54} = 6.58$; $P = .01$). A common concern in the nonprejudiced condition included "I don't know much about my partner or the task," whereas concerns in the prejudiced condition included, "Her ideas on discrimination" and "[she] . . . would not enjoy working with me based on her opinions about minorities."

There was a marginal main effect of condition on the composite threat emotions, such that participants in the prejudiced condition reported experiencing greater threat than did participants in the nonprejudiced condition. In sum, hypothesis 1 was supported for threat cognitions and hypothesis 2 was marginally supported for threat emotions.

Hypothesis 3 stated that participants in the prejudiced condition would experience a more



Note. The data reflect unadjusted mean difference scores from baseline.

FIGURE 1—Change from baseline in systolic blood pressure and diastolic blood pressure during speech preparation by condition.

malignant profile of cardiovascular reactivity when anticipating the interactive task compared with participants in the nonprejudiced condition. In support of hypothesis 3, participants in the prejudiced condition experienced a greater increase in systolic blood pressure during the speech preparation phase than did participants in the nonprejudiced condition (Figure 1). Participants in the prejudiced condition also experienced a greater increase from baseline in diastolic blood pressure than did participants in the nonprejudiced condition (Figure 1).

Participants in the prejudiced condition also experienced a shorter PEP and higher HR than did those in the nonprejudiced condition (Table 2). We found no condition main effects for cardiac output or total peripheral resistance. In sum, we observed higher systolic blood pressure, diastolic blood pressure, HR, and shorter PEP among Latina participants anticipating an interaction with a prejudiced evaluator compared with Latina participants anticipating an interaction with a nonprejudiced evaluator.

Interaction Phase

Hypothesis 3 predicted that participants in the prejudiced condition would experience a more malignant profile of cardiovascular responses when actually taking part in the interactive task compared with participants in the nonprejudiced condition. Contrary to hypothesis 3, there were no main effects of condition for BP, cardiac output, or total peripheral resistance. However, participants in the prejudiced condition did experience a greater increase in the sympathetic nervous system variables, specifically HR and shorter PEP, during the speech delivery phase than did participants in the nonprejudiced condition (Table 2). In sum, we did not observe blood pressure differences by condition during the evaluation task as we did during the anticipation phase.

Postinteraction Phase

Hypotheses 1 and 2 predicted that participants in the prejudiced condition would report more threat cognitions and emotions after completing the interactive task compared with participants in the nonprejudiced condition. In support of hypothesis 1, participants in the prejudiced condition believed that their partner had a less favorable impression of them than did participants in the nonprejudiced condition. They also rated the speech as more stressful than did those in the nonprejudiced condition. In sum, hypotheses 1 and 2 were supported for threat cognitions and threat emotions.

DISCUSSION

We examined stress responses among Latinas while they anticipated and took part in an evaluative interaction with a White female peer. Latinas led to believe that their partner was prejudiced against ethnic minorities showed greater blood pressure increases and sympathetic nervous system activation during speech anticipation, and reported more threat-related cognitions and emotions before and after the interaction, than did those led to believe their partner was not prejudiced. These findings support the role of vigilance as a stressor in that situational cues can lead to a stress response characterized by heightened physiological arousal and greater self-reported concern.[5,19] This effect was seen after we controlled for trait anxiety, depression, and optimism, suggesting that the results were associated with the situational threat of discrimination, rather than personality factors predisposing certain individuals to experience more threat.

Importantly, this heightened stress response was seen in the absence of behavioral confirmation; participants who learned that their partner held prejudiced attitudes experienced a heightened stress response while merely anticipating an interaction. Participants prepared for the speech while seated alone in an experimental room and without receiving any additional information indicating that discrimination would play a role in the upcoming interaction. This suggests that the mere threat of prejudice is sufficient to elicit a physiological response, even in the absence of actual behavioral cues and before individuals have actually entered into the situation in which discrimination may potentially take place. These findings provide support for the claim that chronic vigilance for discrimination can potentially be as physically and psychologically meaningful as actually experiencing discrimination.[5]

We did not observe a significant difference by condition on blood pressure reactivity during the speech delivery phase, although there were significant differences in sympathetic activation (HR and PEP). We suspect this may be because the speech task was stressful and novel for everyone thus obscuring the effects of interacting with a prejudiced evaluator.

The difference between the anticipation and speech phases highlights the importance in future research of examining the psychophysiological effects of anticipating interpersonal stressors. Future research also should explore the extent to which BP elevation is sustained over time by investigating postspeech recovery. By doing so, we can gain a more complete picture of the stress response and how situational cues and individual differences play a role throughout the course of interpersonal interaction.

Limitations

Although this research provides an important contribution to our understanding of the impact of anticipated discrimination on health among Latinas, it is not without limitations. Because we attempted to create a situation in which participants would believe that they were interacting with a prejudiced partner, great care was taken to ensure that participants received no feedback from their partner during the speech task. This was done to ensure that all participants had a similar experience so that any differences in stress could be attributed to the condition manipulation, rather than to responses of the partner. However, this made the task less interactive than we would have preferred. Ethnic minorities often are confronted with prejudice in the world without the protection of a screen, and so a more valid test of our hypotheses would involve an actual interactive experience with a prejudiced partner.

Additional work should also integrate additional physiological systems to measure the body's stress response. Although the measures used in this study capture the activity of the sympathetic nervous system in response to stress, a more complete understanding would result from examination of the hypothalamic-pituitary-adrenal axis, the main endocrine pathway for stress response, as well as immune system functioning under duress. By examining the body's multisystemic response to stress, we may better understand the physical outcomes resulting from these responses.

Finally, the sample consists of young, educated adult women. Generalizing the findings to older and less-educated populations should be done with caution. Future research could replicate this study with a community sample. Although the sample consisted of women, the results are expected to replicate with Latino men because the manipulation was racism rather than sexism.

Implications and Conclusions

This work is among a few studies to show a causal effect of vigilance for prejudice on heightened stress responses during anticipation of interracial/interethnic interaction. Furthermore, this study is among a handful to examine the cardiovascular effects of anticipating prejudice among Latino Americans.[42–45] Some research suggests that Latinos experience prejudice and discrimination in the United States at levels comparable to that experienced by African Americans.[51] Recent data show that Latinos in the United States are experiencing an increase in prevalence of cardiovascular disease and related risk factors such as diabetes and metabolic syndrome.[52] This work has important implications for Latinos' health, as elevated BP is a known risk factor for several negative health outcomes. If members of minority groups experience a stress response from the mere threat of discrimination, even in the absence of behavioral confirmation, over time, the repeated sympathetic nervous system and hypothalamic-pituitary-adrenal axis activation can contribute to allostatic load. This load, in turn, has been shown to be a predictor of a number of mental and physical health outcomes, including increases in anxious and depressive symptoms, as well as exacerbated cardiovascular response and decreased immunological functioning, both of which have deleterious consequences for long-term health and functioning.[10]

In conclusion, conceptualizing the expectation of being a target of discrimination as a potential stressor may contribute to understanding the greater health problems experienced by ethnic minority groups in the United States. Although anticipated discrimination alone is undoubtedly not the only factor contributing to the differences in disease rates and mortality, it may play an important role in the physical and mental health of members of minority groups.[5] ■

About the Authors

Pamela J. Sawyer and Brenda Major are with the Department of Psychological and Brain Sciences, University of California, Santa Barbara. Bettina J. Casad is with the Psychology and Sociology Department, California State Polytechnic University, Pomona. Sarah S. M. Townsend is with the Department of Management and Organizations, Kellogg School of Management, Northwestern University, Evanston, IL. Wendy Berry Mendes is with the Department of Psychiatry, University of California, San Francisco.

Correspondence can be sent to Brenda Major, PhD, Department of Psychological and Brain Sciences, University of California, Santa Barbara, Santa Barbara, CA 93106 (e-mail: major@psych.ucsb.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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Contributors

P. J. Sawyer, B. Major, S. S. M. Townsend, and W. Berry Mendes had primary responsibility for the conceptualization and design of the study. P. J. Sawyer and B. J. Casad had primary responsibly for the data analysis and interpretation, with B. Major, W. Berry Mendes, and S. S. M. Townsend making contributions to data interpretation. All authors were involved in drafting and revising the article and approving the final article.

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Human Participant Protection

This study was approved by the institutional review board for the protection of human participants at the University of California, Santa Barbara. All participants provided informed consent.

References

1. Health Policy Institute of Ohio. Understanding health disparities: 2004. Available at http://www.healthpolicyohio.org. Accessed March 11, 2007.
2. Finch BK, Hummer RA, Kol B, Vega WA. The role of discrimination and acculturative stress in physical health in Mexican-origin adults. *Hisp J Behav Sci.* 2001;23:399–429.
3. Williams DR, Yu Y, Jackson JS, Anderson NB. Racial differences in physical and mental health: socio-economic status, stress, and discrimination. *J Health Psychol.* 1997;2(3):335–351.
4. Pascoe EA, Smart Richmond L. Perceived discrimination and health: a meta-analytic review. *Psychol Bull.* 2009;135(4):531–554.
5. Williams DR, Mohammed SA. Discrimination and racial disparities in health: evidence and needed research. *J Behav Med.* 2009;32(1):20–47.
6. Krieger N. Does racism harm health? Did child abuse exist before 1962? On explicit questions, critical science, and current controversies: an ecosocial perspective. *Am J Public Health.* 2003;93(2):194–199.
7. Mays VM, Cochran SD, Barnes NW. Race, race-based discrimination, and health outcomes among African Americans. *Annu Rev Psychol.* 2007;58:201–225.
8. Williams DR, Neighbors HW, Jackson JS. Racial/ethnic discrimination and health: findings from community studies. *Am J Public Health.* 2003;93(2):200–208.
9. Carver C. Stress, coping and health. In: Friedman HS, Silver RC, eds. *Foundations of Health Psychology.* New York, NY: Oxford University Press; 2007:117–144.
10. McEwen BS. Mood disorders and allostatic load. *Biol Psychiatry.* 2003;54(3):200–207.

11. Adler N, Matthews K. Health psychology: why do some people get sick and some stay well? *Annu Rev Psychol.* 1994;45:229–259.

12. Kamarck T, Jennings JR. Biobehavioral factors in sudden cardiac death. *Psychol Bull.* 1991;109(1):42–75.

13. Inzlicht M, Aronson J, Mendoza-Denton R. On being the target of prejudice: educational implications. In: Butera F, Levine J, eds. *Coping With Minority Status: Responses to Exclusion and Inclusion.* Cambridge, UK: Cambridge University Press; 2009:13–36.

14. Kaiser CR, Vick SB, Major B. Prejudice expectations moderate preconscious attention to social identity threatening cues. *Psychol Sci.* 2006;17(4):332–338.

15. Adegbembo AO, Tomar SL, Logan HL. Perception of racism explains the difference between Blacks' and Whites' level of healthcare trust. *Ethn Dis.* 2006;16(4):792–798.

16. Benkert R, Peters RM, Clark R, Keves-Foster K. Effects of perceived racism, cultural mistrust and trust in providers on satisfaction with care. *J Natl Med Assoc.* 2006;98(9):1532–1540.

17. Brondolo E, Brady N, Thompson S, et al. Perceived racism and negative affect: analyses of trait and state measures of affect in a community sample. *J Soc Clin Psychol.* 2008;27(2):150–173.

18. Schmader T, Johns M. Converging evidence that stereotype threat reduces working memory capacity. *J Pers Soc Psychol.* 2003;85(3):440–452.

19. Brosschot JF, Gerin W, Thayer JF. The perseverative cognition hypothesis: a review of worry, prolonged stress-related physiological activation, and health. *J Psychosom Res.* 2006;60(2):113–124.

20. Clark R, Benkert RA, Flack JM. Large arterial elasticity varies as a function of gender and racism-related vigilance in Black youth. *J Adolesc Health.* 2006;39 (4):562–569.

21. Klonoff EA, Landrine H, Ullman JB. Racial discrimination and psychiatric symptoms among Blacks. *Cultur Divers Ethnic Minor Psychol.* 1999;5(4):329–339.

22. Paradies Y. A systematic review of empirical research on self-reported racism and health. *Int J Epidemiol.* 2006;35(4):888–901.

23. Contrada RJ, Ashmore RD, Gary ML, et al. Measures of ethnicity-related stress: psychometric properties, ethnic group differences, and associations with well-being. *J Appl Soc Psychol.* 2001;31(9):1775–1820.

24. Dressler WW. Lifestyle, stress, and blood pressure in a southern Black community. *Psychosom Med.* 1990;52(2):182–198.

25. Harrell JP, Hall S, Taliaferro J. Physiological responses to racism and discrimination: an assessment of the evidence. *Am J Public Health.* 2003;93(2):243–248.

26. Mustillo S, Krieger N, Gunderson EP, Sidney S, McCreath H, Kiefe CI. Self-reported experiences of racial discrimination and Black–White differences in preterm and low-birthweight deliveries: The CARDIA study. *Am J Public Health.* 2004;94(12):2125–2131.

27. Williams DR, Spencer MS, Jackson JS. Race, stress and physical health: the role of group identity. In: Contrada RJ, Ashmore RD, eds. *Self and Identity: Fundamental Issues.* New York, NY: Oxford University Press; 1999:71–100.

28. Pamuk E, Makuk D, Heck K, Reuben C. *Socioeconomic Status and Health Chartbook.* Hyattsville, MD: National Center for Health Statistics; 1998.

29. Clark R. Perceptions of interethnic group racism predict increased vascular reactivity to a laboratory challenge in college women. *Ann Behav Med.* 2000;22 (3):214–222.

30. Din-Dzietham R, Nembhard WN, Collins R, Davis SK. Perceived stress following race-based discrimination at work is associated with hypertension in African-Americans. The Metro Atlanta Heart Disease Study, 1999–2001. *Soc Sci Med.* 2004;58(3):449–461.

31. James K, Lovato C, Khoo G. Social identity correlates of minority workers' health. *Acad Manage J.* 1994;37 (2):383–396.

32. Krieger N, Sidney S. Racial discrimination and blood pressure: the CARDIA study of young Black and White adults. *Am J Public Health.* 1996;86(10):1370–1378.

33. Steffen PR, McNeilly M, Anderson N, Sherwood A. Effects of perceived racism and anger inhibition on ambulatory blood pressure in African Americans. *Psychosom Med.* 2003;65(5):746–750.

34. Brondolo E, Rieppi R, Kelly KP, Gerin W. Perceived racism and blood pressure: a review of the literature and conceptual and methodological critique. *Ann Behav Med.* 2003;25(1):55–65.

35. Clark R. Interactive but not direct effects of perceived racism and trait anger predict resting systolic and diastolic blood pressure in Black adolescents. *Health Psychol.* 2006;25(5):580–585.

36. Brondolo E, Libby D, Denton D, et al. Racism and ambulatory blood pressure in a community sample. *Psychosom Med.* 2008;70(1):49–56.

37. Armstead CA, Lawler KA, Gordon G, Cross J, Gibbons J. Relationship of racial stressors to blood pressure responses and anger expressions in Black college students. *Health Psychol.* 1989;8(5):541–556.

38. Fang CY, Myers HF. The effects of racial stressors and hostility on cardiovascular reactivity in African American and Caucasian men. *Health Psychol.* 2001;20(1):64–70.

39. McNeilly MD, Robinson EL, Anderson NB, et al. Effects of racist provocation and social support on cardiovascular reactivity in African American women. *Int J Behav Med.* 1995;2(4):321–338.

40. Lepore SJ, Revenson TA, Weinberger SL, et al. Effects of stressors on cardiovascular reactivity in Black and White women. *Ann Behav Med.* 2006;31(2):120–127.

41. Salomon K, Jagusztyn NE. Resting cardiovascular levels and reactivity to interpersonal incivility among Black, Latina/o, and White individuals: the moderating role of ethnic discrimination. *Health Psychol.* 2008;27(4):473–481.

42. Finch BK, Vega WA. Acculturation stress, social support, and self-rated health among Latinos in California. *J Immigr Health.* 2003;5(3):109–117.

43. Franzini L, Fernandez-Esquer ME. Socioeconomic, cultural, and personal influences on health outcomes in low income Mexican-origin individuals in Texas. *Soc Sci Med.* 2004;59(8):1629–1646.

44. Ryan AM, Gee GC, LaFlamme DF. The association between self-reported discrimination, physical health and blood pressure: findings from African Americans, Black immigrants, and Latino immigrants in New Hampshire. *J Health Care Poor Underserved.* 2006;17(2 suppl):116–132.

45. Townsend SSM, Major B, Sawyer PJ, Mendes WB. Can the absence of prejudice be more threatening than its presence? It depends on one's worldview. *J Pers Soc Psychol.* 2010;99(6):933–947.

46. Derogatis LR, Melisaratos N. The Brief Symptom Inventory: an introductory report. *Psychol Med.* 1983; 13(3):595–605.

47. Scheier MF, Carver CS. Optimism, coping and health: assessment and implications of generalized outcome expectancies. *Health Psychol.* 1985;4(3):219–247.

48. Sherwood A, Allen MT, Fahrenberg J, Kelsey RM, Lovallo WR, van Dooren LJP. Methodological guidelines for impedance cardiography. *Psychophysiology.* 1990;27 (1):1–23.

49. Tabachnick BG, Fidell LS. *Using Multivariate Statistics.* 3rd ed. New York, NY: Harper Collins; 1996.

50. Cohen J, Cohen P. *Applied Multiple Regression /Correlation Analysis for the Behavioral Sciences.* Hillsdale, NJ: Erlbaum; 1983.

51. Roberts RK, Swanson NG, Murphy LR. Discrimination and occupational mental health. *J Ment Health.* 2004;13(2):129–142.

52. Davidson JA, Kannel WB, Lopez-Candales A, et al. Avoiding the looming Latino/Hispanic cardiovascular health crisis: a call to action. *Ethn Dis.* 2007;17(3): 568–573.