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# Journal of Psychophysiology

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# Elevated Baseline Anxiety Among African Americans in Laboratory Research Settings

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**Abstract.** We tested the hypothesis that African Americans would show greater anxiety than their European American counterparts when entering laboratory research settings. We examined subjective and physiological anxiety measures obtained both inside and outside the research laboratory from 126 African Americans and 147 European Americans in three separate studies. Consistent with our hypotheses, African Americans reported experiencing significantly more baseline anxiety and showed greater baseline physiological arousal consistent with anxiety than European Americans. These differences were evident when controlling for anxiety observed *outside* of the research setting as well as baseline differences in overall emotional experience. Our findings highlight the need to consider laboratory-induced anxiety as a potential confound in studies involving African Americans. This may be especially important in race comparison studies in which undetected baseline anxiety could alter the interpretation of subsequent race comparisons.

**Keywords:** African Americans, psychophysiology, experiment anxiety, research anxiety

The everyday experience of African Americans can be significantly different from their European American counterparts (Mendoza-Denton, Downey, Purdie, Davis, & Pietrzak, 2002; Sellers, Smith, Shelton, Rowley, & Chavous, 1998; Smith, Allen, & Danley, 2007). Converging lines of research on a number of psychological phenomena (e.g., stereotype threat) have now demonstrated that African Americans may experience increased anxiety in settings viewed as relatively benign by European Americans. Examples of such settings include counseling centers (Watkins, Terrell, Miller, & Terrell, 1989), educational institutions (Johnson, 1989; Mendoza-Denton et al., 2002), and academic testing (Steele & Aronson, 1995). In light of these findings and the historical mistreatment of African Americans in research contexts (e.g., Tuskegee; Byrd & Clayton, 2001; Harris, Gorelick, Samuels, & Bempong, 1996; Richards, 1997; Rushton & Jensen, 2005), we suggest that anxiety might also be heightened for African Americans in laboratory research settings.

Psychological findings from laboratory research settings are generally viewed with greater credibility than findings

drawn from less well-controlled settings. As such, racial differences in baseline anxiety in the laboratory would have important implications for how we approach, conduct, and understand research when African Americans are involved. For example, group differences in anxiety could contribute to reduced African American participation in psychological research, and when African Americans do choose to participate in research, elevated anxiety might actually confound the obtained psychological data and confuse the interpretations and conclusions drawn from it. For example, studies failing to examine and account for baseline anxiety differences might erroneously attribute group differences in performance to the experimental task rather than the experimental setting. Thus, uncovering any such differences in baseline anxiety becomes a critical issue for producing externally and internally valid research. The present study provides an empirical examination of this hypothesized difference by comparing African American and European American college students on their experience of baseline self-reported anxiety and physiological arousal across three independent laboratory studies.

## Psychological Research and African Americans

Graham's (1992) review of the state of mainstream psychological research with respect to African Americans revealed an alarming decrease in the number of articles focused on African Americans from 1974 to 1989. Since that time, this trend has seemingly reversed, with the emergence of new research traditions in cultural and ethnic psychology that explicitly consider how race and ethnic identity influence and are influenced by psychological processes. Most relevant to the present study, below we review three independent lines of research suggesting that African Americans (and other ethnic minorities) may experience increased situational anxiety relative to European Americans (Mendoza-Denton et al., 2002; Smith et al., 2007; Steele & Aronson, 1995). Further, this increased anxiety has been empirically linked to outcomes such as well-being, mental health, academic performance, and social functioning (Mendoza-Denton et al., 2002; Mendoza-Denton, Pietrzak, & Downey, 2008; Soto, Dawson-Andoh, & BeLue, 2011). Although none of these research programs directly discuss the experimental research setting as anxiety provoking, the indirect support for this supposition is nevertheless compelling.

One of the best-known research traditions to discuss the possible role of situational anxiety among African Americans is the work on *stereotype threat* (see Steele, 1997). Steele and Aronson (1995) demonstrated that African American college students performed more poorly than European American students on the same set of difficult verbal problems when they believed the goal was to assess their intellectual ability rather than to explore ways to enhance their learning skills. This well-established effect only emerges when African Americans possess high ability in the domain assessed, performing well in the domain is an important part of their identity, and the high ability is counter to the prevailing negative stereotype. These decrements in performance, which are similar to those expected under conditions of high test anxiety (e.g., Baumeister, 1984), are therefore attributed to anxiety about confirming well-known negative stereotypes about African American intellectual ability. To the extent that some psychological experiments are perceived as stereotype-relevant tests, they may elicit some of these same concerns in African Americans. Moreover, African Americans in such studies may fear contributing to findings that will ultimately hurt not only themselves, but the Black community at large, by building on a longstanding "deficit" view of Black Americans (Freimuth et al., 2001).

Another relevant research tradition can be found in the literature on *race-based rejection sensitivity*, a term denoting anxious expectations about the possibility of rejection in a given situation because of one's racial minority status (Mendoza-Denton et al., 2002; Mendoza-Denton et al., 2008). Though this phenomenon has not been ascribed exclusively to African Americans, the initial work describing this phenomenon demonstrated that African American college students were more likely to "anxiously expect, readily perceive, and intensely react to status-based

rejection" than White or Asian college students (Mendoza-Denton et al., 2002, p. 896). Importantly, the theory proposes that members of stigmatized groups may come to expect race-based rejection not just by non-stigmatized individuals, but by institutions that have historically marginalized or excluded members of their group. Historically White Colleges and Universities (HWCUs) may well fall into this category. Within this framework, African Americans entering psychological research settings at HWCUs may anticipate possible rejection (i.e., discriminatory treatment, physical or psychological harm) based on a history of racism toward African Americans within educational settings as well as prior mistreatment of African Americans in research contexts. A prominent example of such mistreatment is the infamous Tuskegee Syphilis Study, a United States Public Health Service project in which Black men with syphilis were misled about their condition, studied without their knowledge, and denied appropriate treatment for decades (Green, Maisiak, Wang, Britt, & Ebeling, 1997). Rejection sensitivity theory would predict that such anticipation would fuel anxiety.

A final area of study to support the idea of increased anxiety among African Americans in research settings is found in the broad literature on discrimination and racism. It is well documented that such experiences are typically accompanied by feelings of discomfort and threat, and that anticipation of these feelings may elicit anxiety (Swim, Hyers, Cohen, Fitzgerald, & Bylsma, 2003). Anxiety may also emerge after chronic exposure to environments that African Americans experience as racially hostile or unsafe (Smith et al., 2007). Indeed, Hunter and Schmidt's (2010) recent sociocultural model of anxiety psychopathology posits that African Americans' awareness of racism can lead to elevated fears and anxiety related to minority status that may manifest in rather routine settings of everyday life such as in the classroom or during routine physical examinations (Johnson, 1989, 2006). Consistent with this, Labinson, Giacco, Gift, Mansoor, and White (2008) found that African American hypertension patients commonly show a *white-coat effect* (WCE) in which they evidence higher resting blood pressure in the presence of their primary care doctor than they do at home.

In sum, the psychological and historical differences outlined above provide ample reason to expect that African Americans and European Americans might, on average, respond differently to psychological research settings, with African Americans experiencing greater anxiety even before experimental manipulations begin (i.e., at baseline). This differential experience in anxiety should be evident in individual self-reports of emotion and potentially in anxiety-related physiological measures.

## Capturing Physiological Differences Related to Anxiety Across Race

The notion that racial differences in anxiety may be manifested in patterns of physiological activation raises two important questions relevant to the present study. First, are

there sufficiently reliable patterns of physiological activation associated with anxiety that can serve as an index of baseline anxiety? If so, are there known differences between African Americans and European Americans, in particular physiological measures that would confound their interpretation as measures of baseline anxious arousal?

With regard to the first question, research on autonomic responding in fearful or anxiety-provoking situations suggests some agreement in the pattern of physiological activity associated with the experience of anxiety. With some variation among specific studies, findings have generally shown that when anxiety is experimentally induced, the following physiological changes occur with some consistency: heart rate increases, respiration rate increases, respiration depth decreases, diastolic and systolic blood pressure increases, blood flow to the finger decreases, pulse transit time to the finger decreases, skin conductance increases, and finger temperature decreases (Boudewyns & Levis, 1975; Ekman, Levenson, & Friesen, 1983; Funkenstein, King, & Drolette, 1954; Kreibig, Wilhelm, Roth, & Gross, 2007; Levenson, Ekman, & Friesen, 1990; Thyer, Papsdorf, Davis, & Vallecorsa, 1984). Despite evidence for a pattern of anxious arousal, some have argued that psychophysiological measures primarily distinguish broader categories of emotion, such as positive versus negative emotions (Larsen, Berntson, Poehlmann, Ito, & Cacioppo, 2008; Tomaka, Blascovich, Kelsey, & Leitten, 1993). Accordingly, Barrett (2006) suggests that physiological activity should be used in conjunction with other measures, such as self-reported affect, when making presumptions about the presence of a particular emotion. We follow these recommendations by looking at both subjective reports of anxiety as well as physiological measures that have consistently shown empirical relationships with laboratory-induced anxiety.

Although the studies above suggest utility in measuring physiological responses to corroborate the experience of anxiety, physiological measures obviously index other psychological and biological states and conditions, some of which may vary systematically by race. For example, there are two well-documented physiological differences in the literature between African Americans and European Americans that appear to be context independent. The first is a decades-old observation of lower skin conductance among African Americans, possibly due to darker skin pigmentation and differences in the number of active sweat glands (Boucsein, 1992; Johnson & Corah, 1963; Johnson & Landon, 1965; Juniper & Dykman, 1967; Lieblich, Kugelmass, & Ben-Shakhar, 1973; Morell, Myers, Shapiro, Goldstein, & Armstrong, 1988). The second is the consistently higher resting blood pressure observed in African Americans relative to European Americans, which has been attributed to a host of possible factors ranging from heredity to racism-related chronic stress (Krieger, 1990; Krieger & Sidney, 1996; Levinson et al., 1985; Morell et al., 1988; Roberts & Rowlands, 1981). With respect to the present study, known differences in baseline skin conductance and blood pressure

in African Americans versus European Americans present a confound, and therefore we excluded these two measures from the present analyses.

## The Present Study

The present study is a secondary analysis of data from three independent laboratory studies of ethnicity and emotion. These data were combined to determine whether African Americans experience greater baseline anxiety than European Americans when participating in laboratory studies. The three studies shared nearly identical procedures and measures from the recruitment phase through the baseline assessment, thus allowing us to collapse across studies to increase the statistical power of our hypothesis tests. The design of these studies also provided an opportunity to examine anxiety in three different ways. First, we compared both groups on a self-reported anxiety measure completed *at home*, 2 weeks prior to the experiment. Second, we examined self-reported anxiety assessed *in the laboratory* on the day of the experiment, but before experimental manipulations were introduced. Third, we examined baseline physiological data available for two of the three studies in our analyses. We hypothesized that African Americans would (1) report more subjective anxiety and (2) demonstrate heightened physiological arousal consistent with anxiety during a resting baseline period relative to their European American counterparts.

## Methods

### Participants

Participants were 126 African American and 147 European American college students drawn from three separate but related studies of ethnicity and emotion (in-group advantage in empathic accuracy, Soto & Levenson, 2009; in-group responses to emotional film clips, Roberts & Levenson, 2006; ethnic differences in responses to simple emotional stimuli, Soto, Levenson, & Ebling, 2005). The studies were conducted at the Berkeley Psychophysiology Laboratory at the University of California, Berkeley over a period of approximately 8 years (1995–2003).

Participant eligibility and ethnic group membership for all three studies were determined from responses to a demographic questionnaire (see Soto et al., 2005). To be eligible, African American and European American participants (along with their parents and all of their grandparents) had to be US-born. In addition, they were required to endorse at least moderate identification with their ethnic group and report that at least 50% of their close friends and 10% of their neighborhood while growing up shared their ethnicity.<sup>1</sup>

<sup>1</sup> For Studies 2 and 3, these criteria were met if the total percentage during childhood *or* adolescence exceeded the specified amount. For Study 1, these criteria were met if the sum of the percentage during childhood *and* adolescence exceeded the specified amount.

Table 1. Demographic and methodological information by study

	Study 1	Study 2	Study 3
Ethnicity, <i>n</i> (% Female)			
African American	39 (50.9)	47 (51.1)	40 (60)
European American	43 (60.5)	56 (55.4)	48 (50)
Total	77 (59.7)	103 (53.4)	88 (54.5)
Mean age in years ( <i>SD</i> )	20.9 (3.8) <sup>a</sup>	21.1 (3.2)	21.0 (2.7)
Recruitment methods			
Newspaper	No	Yes	Yes
Radio	No	Yes	No
Flyers	Yes	Yes	Yes
One-on-one contact	Yes	No	Yes
Announcements in classrooms/meetings	Yes	No	Yes
Compensation			
Payment	\$35	\$50	\$60
Course-credit	Yes	No	No
Duration of laboratory session(s)	2–2.5 hr	2 hr	1.5–2 hr

Notes. <sup>a</sup>A total of six participants from Study 1 and one participant from Study 2 did not indicate their age.

Only European Americans reporting Catholic or Protestant upbringing and African Americans reporting a Christian (Baptist) upbringing were included in the studies. These criteria ensured that participants were appropriate representatives of their ethnoracial group (based on national statistics) and that the groups were relatively homogeneous. Participants were compensated with either monetary payment or class credit. Across the entire sample, 55.6% of the participants were women and the mean age was 21 years ( $SD = 3.1$ ). There were no differences between the groups in age or gender distribution. An overview of the demographic and methodological details relevant to each individual study is provided in Table 1.

## Procedure

Eligible individuals for each study were invited to participate in a two-part study on ethnicity and emotion. Interested participants were first mailed questionnaires comprising the demographics questions described above and several other measures. After finishing the questionnaires, participants were scheduled to come into the Berkeley Psychophysiology Laboratory within 2 weeks to complete the experimental portion of the study. Participants in Study 3 had a second experimental session approximately 2 weeks after the first session.

On the days of the experimental session, participants were greeted by a research assistant who guided them

through the informed consent process and served as the experimenter for the remainder of the study. In all studies, the experimenter and participant were matched on gender because the application of physiological sensors involves some bodily contact. Efforts were also made to match participants and experimenters on ethnicity because prior studies have demonstrated that experimenter ethnicity can influence physiological responses to laboratory tasks (Anderson, 1989; Murphy, Alpert, Willey, & Somes, 1988). We were able to fully match participants and research assistants on ethnicity in Studies 2 and 3; Study 1 participants were not matched because we did not have African American research assistants working in the laboratory at that time. During the consenting process, participants in Study 1 were informed that they would be asked to make judgments about several videos involving couples interacting. Participants in Study 2 were informed that they would be presented with different simple, emotional stimuli (e.g., startling sounds). Participants in Study 3 were informed that they would be watching several emotional films.

After informed consent, the research assistant explained the physiological sensors and attached them to the participant. Baseline self-ratings of anxiety were then obtained, along with additional emotion self-ratings (see below). In Studies 2 and 3, these ratings were immediately followed by a 2-min silent rest period during which baseline psychophysiological measures were recorded (described below).<sup>2</sup> These subjective and physiological anxiety measures were the primary dependent variables in our analyses.

<sup>2</sup> The first experimental task or manipulation in each study took place immediately after baseline measures were obtained. The task in Study 1 consisted of watching four, 20-min videotaped conversations between female targets (of varying ethnicity) and their dating partner while participants continuously rated the emotional valence and intensity of the target (see Soto & Levenson, 2009). Participants in Study 2 were presented with a series of expected and unexpected startling sounds while their subsequent subjective, behavioral, and physiological responses were measured (see Soto et al., 2005). In Study 3, participants viewed 16 film clips designed to evoke amusement, sadness, disgust/anger, or neutral affect, while subjective, behavioral, and physiological responses were recorded (see Roberts & Levenson, 2006).

## Measures and Data Reduction

### Symptom Checklist-90-Revised (SCL-90-R; Derogatis & Spitzer, 2000)

Participants completed the SCL-90-R as part of the at-home questionnaire packet. The SCL-90-R is a widely-used 90-item self-reported measure of multiple types of psychiatric distress. Individual item responses (rated on a 0–4 scale) are aggregated to derive subscales indexing different syndromes. For the present study, we examined the anxiety subscale score, which asked respondents to indicate how much they were bothered by anxiety symptoms such as nervousness, feeling tense, and heart pounding within the past week. This served as our *at-home* measure of anxiety. The SCL-90-R anxiety subscale has demonstrated good internal consistency in previous research ( $\alpha = .88$  and test-retest reliability of  $r = .80$ ; Derogatis, 1994) and in the present sample ( $\alpha = .87$  for overall sample;  $\alpha = .88$  for African Americans;  $\alpha = .85$  for European Americans). In addition, the SCL-90-R has been used extensively and successfully with a wide range of populations, including European American and African American college and noncollege populations (Ayalon & Young, 2009).

### Emotion Ratings

Baseline subjective emotion ratings were obtained by asking participants to indicate how strongly they felt each of 12 different emotions (amusement, anxiety, contempt, disgust, embarrassment, fear, anger, happiness, interest, relief, sadness, surprise) using a 9-point scale ranging from 0 = *not at all* to 8 = *very much*. For the purposes of this study, our primary interest was the single-item anxiety rating, which served as our baseline self-reported anxiety measure.

### Physiological Measures

Six physiological indicators of interest were measured during the 2-min baseline using a system consisting of a Grass Model 7 12-channel polygraph (Grass Instruments, Quincy, MA) and a computer.

- (1) *Cardiac interbeat interval* (IBI) was derived from the electrocardiogram recorded using two Beckman miniature electrodes (Beckman Instruments, Fullerton, CA) with Redux paste placed on opposite sides of the chest. The interval between successive R-waves was measured in milliseconds.
- (2) *Finger pulse transmission time* (FPT) was measured using a UFI photoplethysmograph (UFI Instruments, Morro Bay, CA) attached to the top phalange of the second finger of the nondominant hand. Transmission time was measured as the time interval in milliseconds between the R-wave of the electrocardiogram and the upstroke of the peripheral pulse at the finger.

- (3) *Finger pulse amplitude* (FPA), the trough-to-peak amplitude of the finger pulse, was also measured from the UFI photoplethysmograph.
- (4) *Finger temperature* (TEM) was measured using a Yellow Springs Instruments thermistor (Yellow Springs, OH) attached to the palmar surface of the first phalange of the fourth finger of the nondominant hand.
- (5) *Respiration intercycle interval* (ICI), defined as the interval (in ms) between successive inspirations, was measured using a pneumatic bellows stretched around the thoracic region.
- (6) *Respiration depth* (RD) was determined from the respiratory tracing by subtracting the point of maximum expiration from the point of maximum inspiration.

Four additional measures (systolic blood pressure, diastolic blood pressure, mean arterial pressure, and skin conductance level) were collected as part of these procedures but were not used in the present analyses due to well-established differences between our groups of interest on these particular measures (see Introduction).

Although these data were collected in all three studies, Study 1 did not include a true resting physiological baseline, because participants were engaged in a task during the baseline period instead of resting. Therefore, baseline physiology was examined only for Studies 2 and 3. Second-by-second averages of each physiological channel were computed and then averaged over the length of the 2-min baseline. Finally, these averages were scaled such that higher scores represented physiological activation in the direction associated with anxiety as outlined in Kreibitz et al. (2007). More specifically, we used the following to operationalize greater anxious arousal: decreases in cardiac interbeat interval (increases in heart rate), decreases in finger pulse transit time, decreases in blood flow to the finger, decreases in finger temperature, decreases in respiration intercycle interval (increases in respiration rate), and decreases in respiration depth.

## Results

### At-Home Anxiety

Our first analysis was to determine whether African Americans and European Americans differed in anxiety outside the laboratory (SCL90-R anxiety). To do this we ran a  $2 \times 3$  [Ethnicity (African American, European American)  $\times$  Study (Studies 1, 2, and 3)] ANOVA with SCL-90-R anxiety scores as the dependent variable. Consistent with our expectations, there was no main effect of Ethnicity on the SCL-90-R,  $F(1, 257) = 2.73, p = .10, \eta_p^2 = .01^3$  (see Table 2 for means). There was a marginal main effect of Study,  $F(2, 257) = 2.85, p = .06, \eta_p^2 = .02$ , such that participants in Study 2 showed a nonsignificant trend toward higher SCL-90-R anxiety scores relative to the other two studies.

<sup>3</sup> The effect size estimate  $\eta_p^2$  reflects partial eta-squared as provided by SPSS in conjunction with the analyses presented.

Table 2. Comparison of mean (standard error) scores on primary dependent variables and covariates

	European American	African American	$F(df_{num}, df_{den})$	$\eta_p^2$
At-home anxiety	.35 (.05)	.46 (.05)	2.73 (1,257)	.01
Baseline subjective anxiety	2.89 (.18)	3.70 (.19)	9.74 (1,256)*	.04
Baseline physiology				
IBI	0.02 (0.1)	-0.03 (0.11)	0.12 (1,182)	.00
FPT	0.00 (0.1)	0.02 (0.11)	0.01 (1,182)	.00
FPA	-0.24 (0.09)	0.30 (0.10)	15.97 (1,182)*	.08
TEM	-0.22 (0.1)	0.26 (0.11)	11.08 (1,182)*	.06
ICI	-0.28 (0.1)	0.30 (0.10)	16.35 (1,182)**	.08
RD	-0.14 (0.1)	0.17 (0.11)	4.62 (1,182)*	.02

Notes. At-home anxiety = SCL-90-R anxiety subscale; Baseline subjective anxiety = single-item anxiety rating. Means for baseline self-reported anxiety and baseline physiology are adjusted for the at-home anxiety scores. Accompanying  $F$  statistics for baseline subjective anxiety and physiology reflect the results of an ANCOVA procedure with the at-home anxiety score included in the model as a covariate. All physiological variables reflect standardized scores with higher scores indicating greater arousal consistent with anxiety. Abbreviations for physiological measures are as follows: IBI = interbeat interval, FPT = finger pulse transit time, FPA = finger pulse amplitude, TEM = finger temperature, ICI = respiratory intercycle interval, RD = respiratory depth. \* $p < .05$ . \*\* $p < .01$ .

The Study  $\times$  Ethnicity interaction was not significant,  $F(2, 257) = 0.40$ ,  $p = .67$ ,  $\eta_p^2 = .00$ . Although we did not find pronounced group differences, the sizeable  $F$ -value for the Ethnicity main effect and our desire to examine possible laboratory-based anxiety *above and beyond* differences in at-home anxiety led us to include at-home anxiety as a covariate in our main analyses as a way of providing a conservative test of our hypotheses.

## Laboratory-Based Anxiety

Hypothesis 1, that African Americans would demonstrate greater self-reported anxiety than European Americans in the laboratory prior to any experimental manipulations, was tested using a  $2 \times 3$  (Ethnicity  $\times$  Study) ANCOVA with the single-item baseline anxiety rating as the dependent variable. Ethnicity and Study treated as between-subjects factors, and at-home anxiety (SCL-90-R anxiety scores) entered as a covariate. The resulting analysis yielded a significant main effect of Ethnicity,  $F(1, 256) = 9.74$ ,  $p < .01$ ,  $\eta_p^2 = .04$ . In support of Hypothesis 1, African Americans reported significantly greater subjective anxiety at baseline than European Americans (see Table 2). A main effect of study also emerged,  $F(2, 256) = 8.49$ ,  $p < .01$ ,  $\eta_p^2 = .06$ , with participants in Study 1 reporting more subjective baseline anxiety than participants in Studies 2 and 3. The Ethnicity  $\times$  Study interaction was not significant,  $F(2, 256) = .50$ ,  $p = .62$ ,  $\eta_p^2 = .00$ , demonstrating that the greater self-reported baseline anxiety among African Americans was consistent across all three studies.

To test Hypothesis 2, that we would see greater physiological arousal consistent with anxiety among African Americans relative to European Americans, a  $2 \times 2$  (Ethnicity  $\times$  Study) MANCOVA procedure was conducted with the six physiological measures (scaled so that higher scores indicate greater anxious arousal) from Studies 2 and 3 entered as dependent variables, Ethnicity and Study treated as between-subjects factors, and at-home anxiety entered as a covariate. Consistent with Hypothesis 2, we found an overall main effect of

Ethnicity,  $F(6, 177) = 7.12$ ,  $p < .01$ ,  $\eta_p^2 = .19$ . This was qualified by an overall significant Ethnicity  $\times$  Study interaction,  $F(6, 177) = 2.54$ ,  $p < .05$ ,  $\eta_p^2 = .08$ . Follow-up univariate analyses revealed that African Americans demonstrated significantly more anxious arousal on the finger temperature, respiratory intercycle interval, and respiratory depth measures across both studies, and in finger pulse amplitude in Study 1. There were no differences between groups in interbeat interval or finger pulse transit time (see Table 2). Thus, Hypothesis 2 was largely supported.

## Post Hoc Analyses

### Emotion Response Bias

Our findings raised two further questions that our data enabled us to answer. First, it is possible that differences in how African Americans and European Americans experience emotions or report on their emotional experiences, in general, might better explain our findings. For example, given prior research pointing toward greater emotional expressivity among African Americans relative to European Americans (Hecht, Collier, & Ribeau, 1993; Reminick, 1988), differences in self-ratings of anxiety may simply be due to differences in overall expressivity or emotional experience. It is also possible that African Americans tend to experience more negative emotions in general, given the historical context of discrimination and other factors described earlier. To test this, we first computed an overall emotion composite score for each participant (average ratings across all emotion terms except anxiety) and a negative emotion composite score (average ratings of contempt, disgust, embarrassment, fear, anger, sadness). We then reran all of our original analyses involving self-reported anxiety and physiological arousal controlling for both of these composite scores, in addition to controlling for the SCL-90-R anxiety score (at-home anxiety). Under these very stringent conditions, the findings were unchanged.

### Effect of Prior Exposure

Second, given what appears to be a robust difference in anxiety between African Americans and European Americans, we questioned whether this group difference could be attenuated or eliminated by repeated exposure to the laboratory setting. The availability of a second, nearly identical session in Study 3 permitted us to test this notion. To test whether prior exposure to the research setting eliminated group differences in anxiety within Study 3, we conducted a 2 (Ethnicity)  $\times$  2 (Sessions 1 and 2) repeated-measures ANCOVA with ethnicity as a between-subjects variable, session number as a within-subjects variable, baseline anxiety ratings as the dependent measure, and SCL-90-R anxiety (at-home anxiety) as a covariate; we then conducted a similarly-structured MANCOVA with our physiological variables as the dependent measures. For self-rated anxiety, results yielded a significant main effect of Session,  $F(1, 84) = 17.08$ ,  $p < .01$ ,  $\eta_p^2 = .17$ , with scores decreasing significantly from Session 1 to Session 2 ( $M = 2.98$ ,  $SE = .24$  vs.  $M = 1.77$ ,  $SE = .21$ , respectively), and a significant main effect of Ethnicity,  $F(1, 84) = 4.70$ ,  $p < .05$ ,  $\eta_p^2 = .05$ , such that African Americans generally reported greater anxiety than European Americans ( $M = 2.77$ ,  $SE = .28$  vs.  $M = 1.97$ ,  $SE = .25$ , respectively). There was no significant interaction of session and ethnicity. For our physiological measures, there was a significant main effect of Ethnicity,  $F(6, 78) = 9.13$ ,  $p < .01$ ,  $\eta_p^2 = .41$ , such that African Americans demonstrated greater anxious arousal than European Americans in finger pulse amplitude, finger temperature, and respiratory intercycle interval. There was no significant main effect of session, nor a significant interaction of session and ethnicity. Thus, self-reported anxiety across the two sessions of Study 3 demonstrated a clear habituation effect, but this did not eliminate the group difference in self-reported anxiety or anxiety-related physiology.

### Discussion

We tested the hypothesis that African Americans, relative to European Americans, would demonstrate increased baseline anxiety in a laboratory research setting, using data from three independent laboratory studies to compare subjective and physiological indicators of anxiety. The results supported our prediction that African Americans experienced elevated anxiety during the initial stages of participating in experimental research. To the best of our knowledge, this is the first empirical instantiation and internal replication of this group difference.

### Robustness of Group Differences in Anxiety

Two methodological considerations in the present study make our findings particularly striking. First, the difference emerged in the subjective report of anxiety *and* in four of six physiological variables that have been found in the past to

reliably index anxiety (Kreibig et al., 2007). Although the absolute levels of reported anxiety were moderate ( $M = 3.7$  on a 0–8 scale), and the group difference constituted a medium effect size ( $\eta_p^2 = .04$ ), the anxiety was sufficient to be detectable in the participants' concurrent physiological arousal. However, it is noteworthy that the difference in physiology emerged primarily in the respiratory system and peripheral vascular system, perhaps because the modest level of anxiety might not have been sufficient to result in changes in cardiac response. Nevertheless, the convergence of findings using both self-reported and physiological indicators of anxiety provides increased confidence that there was a different anxiety experience between European Americans and African Americans.

Second, the difference in baseline anxiety emerged even when participants were ethnically matched with experimenters. The ethnic matching strategy has been shown to reduce the experience of anxiety among African Americans in experimental settings (Baratz, 1967). Consistent with this previous work, African American participants in Study 1, which did not include matching of participant and experimenter ethnicity, exhibited significantly higher self-reported anxiety relative to participants in Studies 2 and 3. Even when racial matching occurred, however, African Americans still showed greater baseline anxiety than European Americans. Our result echoes the finding that the aforementioned white-coat effect among African American hypertension patients is relatively insensitive to the race of the observing clinician (Labinson et al., 2008). This reinforces the notion that aspects of the research context above and beyond experimenter race contribute to heightened anxiety among African American participants.

### Origins of Laboratory-Based Anxiety

Our data allowed us to rule out several explanations for the observed differences. First, anxiety differences emerged even after controlling for anxiety *outside* of the experiment setting (i.e., at-home measure of anxiety), suggesting that African Americans' higher anxiety at baseline was not merely a manifestation of generally high levels of anxiety. Second, differences in baseline anxiety were not explained by differences in baseline reports of overall emotion or negative emotion. This latter point was particularly important to establish, given previous descriptions of greater emotional expressivity among African Americans versus European Americans (Hecht et al., 1993). Third, elevated baseline anxiety among African Americans was apparent even in the second session of Study 2, *after* participants had a chance to habituate to the laboratory environment. Taken together, these findings strengthen our conclusion that the elevated anxiety captured was due to the experience of being African American in an experimental setting.

Although we cannot pinpoint the precise mechanism leading to the observed anxiety differences between African Americans and European Americans, we suggest at least three possible contributing factors, as raised in the Introduction. First, and consistent with the literature on stereotype

threat, African Americans in experimental research settings may experience a heightened sense of evaluation and concern that negative conclusions will be drawn about their group based on their performance. Second, African Americans may be sensitized to expect rejection or harm in experimental settings, given historical experiences with rejection by traditionally White institutions. Third, general fears around discrimination and racism may elevate anxiety in any environment in which African Americans may not feel entirely safe.

Any or all of the above mechanisms may also contribute to a fourth potential explanation: mistrust or suspicion of researcher motives or research environments (see Boykin, 1979), in turn resulting in greater baseline anxiety. Prior literature documenting apprehension surrounding research participation provides some support for this notion (Brawley & Tejeda, 1995; BeLue, Taylor-Richardson, Lin, Rivera, & Grandison, 2006; Freimuth et al., 2001). This apprehension is especially heightened when the research could be construed as potentially harmful, invasive, or painful (Braunstein, Sherber, Schulman, Ding, & Powe, 2008; McNeilly et al., 2000). The physiological measures used in the studies reported here may have contributed to such heightened mistrust. Moreover, this mistrust may also reflect part of a larger cultural mistrust among African Americans (Whaley, 2001) which may have emerged as an adaptive response to historically unsafe environments and which may be passed on to future generations via racial socialization (Hughes et al., 2006). Future studies may be able to empirically determine the extent to which each of these contributes to elevated research anxiety among African Americans, given that our data did not allow us to test for mediating mechanisms.

## Implications of Elevated Laboratory-Based Anxiety Among African Americans

### External Validity

Our results call attention to a potential research issue that may have far-reaching implications for psychological science moving forward, as well as for health science. First, insofar as a systematic baseline difference in anxiety between African Americans and European Americans reflects greater apprehension among African Americans entering a research setting, it could contribute to lower African American participation rates in psychological research, as has been observed in medical research (Corbie-Smith, Thomas, Williams, & Moody-Ayers, 1999; DeFreitas, 2010). Importantly, this lack of representation could hinder the accuracy and generalizability of our findings, and considerably slow progress toward understanding critical disparities between African Americans and European Americans (e.g., societal and health disparities, performance disparities, cardiovascular disparities; Anderson 1989; Mays, Cochran, & Barnes, 2007). As one example, the white-coat effect for African Americans may be overlaid or intertwined with anxiety about the medical setting over and above any particular reactions to the race of the physi-

cian. Such issues would need to be disentangled to truly understand race differences in physiological assessments and in turn health outcomes.

### Internal Validity

Second, the presence of elevated baseline anxiety among African Americans who ultimately do choose to participate in experimental research may lead to systematic, but unstudied, differences in their responses. For example, if stereotype threat produces anxiety that significantly alters or impairs performance, stereotype-confirming results become more likely (Steele & Aronson, 1995). If this phenomenon is widespread, many distorted conclusions may be drawn about racial group differences. A prominent example of such a confound has been demonstrated in the case of the negative impact on African American test performance created by anxiety related to White examiners (Katz & Cohen, 1962; Katz, Epps, & Axelson, 1964; Katz, Henchy, & Allen, 1968). Thus, uncovering differences in baseline anxiety in other types of experimental settings becomes a critical issue for producing internally valid psychological research.

### Ethical Concerns

Third, as ethical scientists, psychologists must be concerned about a pattern of data pointing to increased discomfort among any subset of the population when participating in research. That the population in this case is African Americans, who have already suffered indignities at the hands of psychologists and other researchers in the name of science (Green et al., 1997; Richards, 1997; Rushton & Jensen, 2005), is especially troubling. The historical legacy of discrimination, racism, and exclusion can be seen today in the sensitivity of African Americans toward rejection by those people or places they consider to represent the past abuses (Mendoza-Denton et al., 2002). In order to fundamentally impact African American representation within psychology in a way that continues to meaningfully improve upon the situation described by Graham (1992), there must be a concerted effort to ensure that this group feels increasingly welcomed and safe within our laboratories.

### Future Directions

By acknowledging and addressing the differential presence of experiment-related anxiety among African Americans, psychologists can take important steps to develop a more positive relationship with the African American community, in which the abuses of past decades are replaced with a more socially responsible approach. To accomplish this, differences related to their unique history and experience in society (such as elevated baseline anxiety) must be documented and addressed ahead of time (Breland-Noble, Bell, & Nicholas, 2006). Understanding these differences can help prepare researchers to interact with research participants in

a more sensitive manner, and allow them to implement statistical controls in subsequent analyses or make more informed interpretations of research findings. As an important first step, we suggest regularly assessing baseline self-reported anxiety in any laboratory study (after consenting participants but before introducing manipulations). These improvements in procedure will be critically important when considering high stakes outcomes and measures that can have impact on policies and practices that affect members of the African American community. For example, conclusions drawn about studies of intelligence and standardized test performance (e.g., Rushton & Jensen, 2005) would be drastically different when considering the possible presence of robust anxiety in psychological research settings.

## Limitations

A number of limitations are worth consideration. First, the present work did not allow us to fully disentangle whether the elevated anxiety among African Americans was a result of being in *any* experimental setting or *our specific* experimental setting (i.e., studies of emotion and ethnicity using psychophysiological methods). We suspect that the former is more likely as prior work has suggested that many research settings can be anxiety provoking for African Americans (Braunstein, Sherber, Schulman, Ding, & Powe, 2008; McNeilly et al., 2000; Moore & Collins, 2002; Thompson, Neighbors, Munday, & Jackson, 2003). Second, the similarity in samples across studies (young, college students) limits the generalizability of our findings. However, qualitative research has shown that African American apprehension about research cuts across various levels of education and income (Freimuth et al., 2001). Third, the reliance on a single-item measure of anxiety in the laboratory was less than ideal and more robust measures of subjective anxiety should be considered for future research. Fourth, given that we partially expected differences in anxiety because African Americans may be especially concerned about the potential that their data may be used to misrepresent African Americans, it is possible that social desirability may have influenced our findings. Unfortunately, we did not measure social desirability in the present study. Finally, our assessments did not include physiological data obtained outside of the laboratory. The inclusion of such data (e.g., ambulatory readings) would provide greater strength to our claim that the physiological differences observed were due to the research setting.

## Conclusion

We hypothesized and found evidence to support the experience of significantly greater anxiety among African Americans at the start of an experiment when compared to their European American counterparts. This anxiety was not better accounted for by other mechanisms such as anxiety experienced in the home prior to coming into the laboratory or

tendencies in the reporting of other emotions. Future research can illuminate whether this anxiety is roused because research paradigms, as we suggest, are reminiscent of past threats and harms committed against African Americans. Nevertheless, a broader awareness of this phenomenon might encourage psychological researchers to take the necessary steps to address this issue and move toward a more socially responsible and inclusive social science.

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