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RACE DIFFERENCES IN CARDIOVASCULAR AND CORTISOL RESPONSES TO AN INTERPERSONAL CHALLENGE IN WOMEN WHO ARE FAMILY CAREGIVERS

Objectives: To examine race differences in psychosocial and psychophysiological responses to family caregiving.

Design: Participants completed paper-and-pencil surveys and were exposed to a laboratory-based interpersonal challenge that included a period of rest, an interpersonal challenge, and a period of recovery.

Setting: A university research laboratory.

Participants: Sixteen Caucasian and 12 African-American postmenopausal (64 ± 10 years) women who were caregivers to a family member with dementia.

Measures: Psychosocial functioning included self-reported perceived stress, caregiver burden, social support, and caregiving meaning. Systolic and diastolic blood pressure (SBP, DBP) and heart rate (HR) were measured every two minutes during the rest, challenge, and recovery. Salivary cortisol was measured at rest and 15-minutes post-challenge.

Results: There was a Race \times Task interaction for SBP and HR but not DBP reactivity. African-American women showed greater reactivity than Caucasian women. The magnitude of this interaction was large. African-American women also reported greater caregiving from meaning than Caucasian women. In contrast, significantly more African Americans (58%) than Caucasians (14%) showed cortisol reactivity from rest to 15-minutes post-challenge.

Conclusions: The differential pattern of physiologic responses is consistent with studies outside of the caregiving literature, and suggests that caregiving may be perceived as more effortful among Caucasian women and less controllable among African-American women. (*Ethn Dis.* 2005;15:17–24)

Key Words: African American, Aging, Cardiovascular Reactivity, Caregiving, Cortisol, Race Differences, Women

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INTRODUCTION

In the United States, informal caregivers play a vital social and economic role.¹ An estimated one in four households provides unpaid care to a relative or friend who is 50 years of age or older, and of these, approximately 20% are caring for someone with dementia.² Approximately three fourths of those providing informal care to persons with dementia are women, and African Americans are more likely than Caucasians to care for older adults with dementia (26.9% vs 19.4%, respectively).³

Caregiving is associated with deleterious psychosocial outcomes,⁴ and interest is increasing in the adverse effect of caregiving on physical health outcomes, including mortality, particularly among those who experience high levels of caregiving strain.^{5,6} A recent review of racial and ethnic differences in the psychosocial experience of caregiving indicated that African-American caregivers are more likely than Caucasian caregivers to have more diverse informal social support networks (often including spirituality), report lower levels of depression (found more often in larger studies) and caregiving burden, and are more likely to cite cultural values about reciprocity, filial obligation, and sense of responsibility for providing care to older family members.⁷ Surprisingly few caregiving studies have examined racial and ethnic differences in health-related parameters (eg, cardiovascular and cortisol reactivity) that may underlie the increased risk of adverse health outcomes.

Cultural norms regarding reciprocity, filial obligation, and sense of respon-

sibility for providing care to older family members, combined with more diverse informal social networks, could be protective and associated with lower levels of reported distress as well as lower physiologic responses to stress. In contrast, among African Americans it may be less socially acceptable to report negative emotions regarding caregiving due to these same cultural values.⁷ African Americans might view becoming a caregiver as something that they have less choice and control over, since it is an expected or obligatory role.

We are aware of only one study that examined race differences in psychophysiological responses to family caregiving. Knight and McCallum⁸ used two laboratory-based challenges to induce cardiovascular reactivity in 100 Caucasian and 44 African-American family caregivers (all care recipients had dementia). They found that viewing caregiving in a positive light (ie, positive reappraisal) was a significantly more common coping response in African-American than Caucasian caregivers, consistent with other reports.⁷ For diastolic blood pressure (DBP), but not systolic blood pressure (SBP) reactivity, results varied by race and gender. Caucasian caregivers (men and women) and African-American women caregivers showed increases in DBP during the two stress challenges, with African-American women showing larger increases than Caucasians. African-American men, however, showed a decrease in DBP during the stress challenges.

The primary goal of our study was to examine potential race differences in psychosocial variables as well as in phys-

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An estimated one in four households provides unpaid care to a relative or friend who is 50 years of age or older, and of these, approximately 20% are caring for someone with dementia.²

iologic responses to a stressor among women who were caregivers for a family member with dementia. Our study adds to and extends the current literature by examining race differences in both cardiovascular reactivity and cortisol secretion in response to a laboratory stressor. The second goal was to examine whether African Americans and Caucasians displayed a differential pattern of responses to a stress stimulus. That is, we examined whether cardiovascular and cortisol responses were consistent or different by race.

METHOD

Participants

Participants were recruited from the metropolitan Columbia, South Carolina area between August 2001 and July 2002 from advertisements in local newspapers ($n=5$), Alzheimer's Association newsletters ($n=14$), Alzheimer's Association support groups ($n=3$), referrals from other participants ($n=3$), and respite care facilities ($n=3$). To be eligible, the participant had to be: 1) a postmenopausal woman; 2) the primary caregiver of a family member with Alzheimer's disease or another type of dementia (eg, due to Parkinson's disease or stroke); 3) African-American or Caucasian; and 4) able to travel to the testing site for the laboratory assessment.

Forty-eight female caregivers were screened for eligibility, and 35 (72.9%) were eligible to participate. Reasons for ineligibility were being premenopausal ($n=3$), not caring for a family member ($n=3$), not being the primary caregiver ($n=2$), being male ($n=1$), or not being Caucasian or African-American ($n=1$). Of the eligible participants, 28 completed the study (16 Caucasian, 12 African-American). Reasons for eligible participants not completing the study were an increase in caregiver demands ($n=1$), transportation difficulties ($n=2$), a change in medical status ($n=1$), returning to work ($n=1$), and unknown ($n=2$).

Procedure

Participants who were eligible for the study were scheduled for a morning laboratory assessment. All assessments began between 9:00 and 10:00 a.m. The assessment included measurements of height and weight, completion of self-report measures, and a laboratory challenge with measurement of blood pressure, heart rate, and salivary cortisol.

Measures

Health

Participants completed a self-report measure of their medical history, which included cigarette and alcohol use, caffeine consumption, current medications, and chronic diseases and conditions. Each participant had her height and weight measured, to the nearest 0.1 kilogram and centimeter, without shoes, with a Detecto 3P70 beam balance scale and stadiometer (Detecto, Webb City, Mo).

Caregiving Characteristics

Participants completed a survey that described various aspects of their caregiving.⁹ This survey included the participant's relationship to the care recipient, the recipient's diagnosis, years or months spent caregiving, type of care provided, and the impact of caregiving on other activities.

Psychosocial Functioning

The Screen for Caregiving Burden (SCB) is a 25-item self-report measure assessing the prevalence of experiences that are common among dementia caregivers and the distress associated with these experiences (rated on a scale of 1 = *no distress* to 4 = *severe distress*), resulting in both an objective and subjective burden score.¹⁰ Examples of statements included, "My relative continues to drive when he/she shouldn't," "My relative has been wetting the bed," and "My relative has gotten lost in the grocery store." Scores on the objective burden scale can range from 0 to 25, with higher scores indicating greater burden. Score on the subjective burden scale can range from 25 to 100, with a higher score indicating greater distress related to the experiences of caregiving. This measure has adequate validity and reliability and has been found to have internal consistency.¹⁰ The alpha coefficient in our sample was 0.82 for objective burden and 0.94 for subjective burden.

Meaning associated with caregiving was measured with the 12-item self-report Meaning in Caregiving Scale¹¹ which assesses the degree to which individuals view caregiving as a personally meaningful experience. Participants were asked to indicate their agreement with each statement on a scale from *strongly disagree* (1) to *strongly agree* (4). Examples of statements included, "I feel that it is important to this person that I have been involved in caregiving," and "I've learned a lot about myself as a result of caring for this person." Scores can range from 12 to 48, with higher scores indicating more meaning and positive value associated with caregiving. This measure has adequate reliability.¹¹ The alpha coefficient for our study was 0.82.

Social support was assessed with a 20-item self-report scale that measured multiple dimensions of support: emotional/informational support, involving expressions of positive affect and em-

pathic understanding; tangible support, referring to the provision of material aid or behavioral assistance; affection support, involving expressions of love and support; and positive interaction support, referring to having other people with whom to engage in enjoyable activities.¹² Participants rated how frequently they had support available to them during specific situations (1 = *none of the time* to 5 = *all of the time*). Examples of statements included, "Someone to help you if you were confined to bed," "Someone to take you to the doctor if you needed it," and "Someone to love and make you feel wanted." The overall summary score can range from 20 to 100, with higher scores indicating greater perceived social support. For comparison, subscale scores were converted to scales that ranged from 20 to 100 points. This measure has adequate validity and reliability.¹¹ The alpha coefficient for our study was 0.92.

The Perceived Stress Scale (PSS) is a 14-item measure of the frequency with which various life situations were experienced as stressful.¹³ For each item, participants indicated how often they experienced the described event (0 = *never* to 4 = *very often*). Examples of items included, "In the last month, how often have you been upset because of something that happened unexpectedly?" "In the last month how often have you dealt successfully with irritating life hassles?" Scores can range from 0 to 56, with higher scores indicating greater perceived stress. The PSS has good validity, test-retest reliability, and internal consistency.¹³ The alpha coefficient for our study was 0.92.

Cardiovascular Reactivity

Cardiovascular reactivity (CVR) to a laboratory-based psychologic stressor was assessed during a stress interview with a trained technician. The stress interview was based on the interview used by King et al^{14,15} but modified based on work by Ewart et al to add a social competence component.¹⁶ The participant

was asked to discuss negative aspects of being a caregiver. This particular challenge was chosen because it is more ecologically valid relative to the actual stressors that caregivers experience,^{16,17} compared to challenges such as mental arithmetic or the cold pressor, and because it has been shown to be effective in producing CVR in caregivers.^{8,9,14,18-20}

Participants had their systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) measured every two minutes by an automated Dinamap blood pressure monitor (Critikon, PRO Series 100-400, Tampa, Fla), attached to the non-dominant arm. The Dinamap measures were calibrated prior to the stress task with a mercury sphygmomanometer for BP and palpation of the pulse by a trained technician. The Dinamap records BP using the oscillometric method.

The CVR protocol began with 6 minutes of rest with the participant sitting quietly alone in a room. This period of rest was followed with a stress interview in which participants were asked to talk about what they found to be most stressful about caregiving. This portion lasted at least 6 minutes. The technician's verbal responses were kept to a minimum and were used only to encourage the participant to speak about her stressful experiences and the emotions associated with them. After the stress task, the social competence portion assessed the participant's coping abilities by asking the participant what kind of advice she would give to another caregiver experiencing the same type of stressful experience. Finally, the participant spent the last 6 minutes sitting quietly alone in a room for the recovery period.

Heart rate, SBP, and DBP were averaged for each of the components of the protocol (rest, stress, social competence, and recovery) for each participant. Values that were seen as highly implausible were not used, including those that were >20 mm Hg or beats

per minute (bpm) than the measurement before or after, or if the BP monitor had difficulty in obtaining a reading. In total, 10 readings across all participants were eliminated from the final results. Reactivity was measured by subtracting the mean stress value from the mean resting value for HR, SBP, and DBP. Recovery was measured for these three variables by subtracting the mean post-stress (recovery period) values from the mean stress values.

Salivary Cortisol

Saliva samples were taken with a salivette following the 6-minute rest period and again 15 minutes after the completion of the stress interview. Salivary cortisol was measured by radioimmunoassay (Coat-A-Count Cortisol—Diagnostic Products Corporation, Los Angeles, CA), using a modification of an unextracted RIA for serum cortisol. Briefly, after centrifugation for 5 min at 2500 rpm, 50 μ L of cotton-filtered saliva were pipetted into assay tubes with 1 mL of I¹²⁵ cortisol. Following a 2-hour incubation at room temperature, free counts were measured. Cortisol standards were 0-12,500 pg/tube. The detection limit was 10-7250 ng/dL. Samples were batched and run in duplicate in the same assay. All cortisol measurements are reported in ng/dL.

Statistical Analyses

Independent sample *t* tests (for continuous variables) and χ^2 (for categorical variables) analyses were used to test for race differences in baseline demographic, health-related, and psychosocial variables; cardiovascular reactivity and recovery; and cortisol values at rest and at 15-minutes post-stressor. A repeated measures analysis of variance (ANOVA) was used to test race (African American, Caucasian), task (rest, stress, recovery), and Race \times Task effects for SBP, DBP, and HR. Analyses of covariance (ANCOVA) were also run controlling for age of caregiver, hypertension status, use of cardiac medications (including med-

ications to control blood pressure), use of hormone replacement therapy, and body mass index, as these are all potential confounding variables (ie, could be associated with both race and cardiovascular reactivity). For cortisol, because of the variability in responses, we used a χ^2 statistic to compare race differences in the percentage of participants who showed at least a 50% increase in cortisol from baseline to 15-minutes post-challenge.

Because of the small sample size, we conducted a post hoc power analysis. Using a two-tailed alpha value of .05 and a sample of $N=28$, the power to detect a large difference between groups ($d=.80$) was .57. The power to detect a medium difference between groups ($d=.50$) was .25. Power was greater for correlational analyses, corresponding to power of .76 for large effect sizes ($r=.50$) and power of .33 for medium effect sizes ($r=.30$). Because power was a limiting factor, the effect sizes (d or eta squared) for all analyses are presented in addition to statistical significance.

RESULTS

Sample Characteristics

Demographic and caregiving characteristics are shown in Table 1. The Caucasian and African-American women were similar in age and number of chronic health conditions. More African-American than Caucasian women had hypertension. On average, women were taking 2.71 ± 1.92 different medications, with a range of 0 to 7. Participants were taking a wide range of medications, including those for arthritis (eg, rofecoxib), allergy (eg, fexofenadine), osteoporosis (eg, alendronate), cholesterol (eg, simvastatin), hormone replacement therapy (eg, estrogen), depression (eg, fluoxetine), and cardiac (eg, hydrochlorothiazide, amlodipine, and benazepril). No significant race differences were found in the percentage of women currently smoking, taking hor-

Table 1. Demographic, health, and caregiving characteristics, by race (N = 28)

Characteristic	Caucasian (N = 16)	African American (N = 12)
Age, mean years (SD)	65.69 (10.50)	62.00 (10.21)
Body mass index, kg/m ² (SD)	25.48 (5.65)	31.52 (8.56)
Chronic health conditions, N (SD)	2.19 (1.47)	2.50 (1.45)
Hypertensive, %	31.3	50.0
Medications, N (SD)	2.88 (2.30)	2.50 (1.31)
Hormone replacement therapy, %		
Antidepressants, %	56.3	41.7
Cardiac (including antihypertensives), %	18.8	16.7
% (including antihypertensives)	43.8	50.0
Current smoker, %	12.5	16.7
Age of care recipient, years (SD)	82.81 (7.99)	80.08 (11.63)
Care provided, hours/week (SD)	73.75 (56.65)	96.08 (42.54)
Duration of caregiving, months (SD)	47.56 (43.89)	60.00 (40.97)
Relationship of care recipient		
Spouse, %	50.0	25.0
Mother, %	50.0	50.0
Sister, %	0.0	16.7
Father, %	0.0	8.3
Type of assistance provided		
Shopping, %	93.8	100
Food preparation, %	93.8	100
Housekeeping, %	93.8	100
Laundry, %	93.8	91.7
Transportation, %	87.5	91.7
Finances, %	87.5	91.7
Medication, %	81.3	100
Personal care, %	68.8	91.7

mone replacement therapy, antidepressant medications, or cardiac medications. The African-American women had a significantly higher mean body mass index than the Caucasian women, $t(26) = -2.25, P = .03$.

No significant differences were seen between races for any of the caregiving characteristics. On average, participants had been caring for their family member for 52.89 ± 42.34 months, and most were responsible for assisting with activities of daily living, including shopping, food preparation, housekeeping, and laundry. Half of the Caucasian women were caring for their spouse compared to 25% of African Americans.

Race Differences in Psychosocial Variables

Mean values for the psychosocial variables, by race, are shown in Table 2. Race differences were only found in the meaning of caregiving scale; African-

American caregivers reported significantly higher caregiving meaning than Caucasian caregivers, $t(26) = -2.29, P = .02$. The magnitude of this difference corresponded to a large effect size. African-American caregivers also reported greater affection, positive interaction, and tangible social support than Caucasian caregivers, but these differences did not reach statistical significance (for affection, positive interaction, and tangible social support, the magnitude of this difference corresponded to a small-to-medium effect size). Caregiving burden, perceived stress, and social desirability scores were similar across race groups.

Cardiovascular Reactivity

Systolic Blood Pressure

Although no race difference was found in SBP at rest, significant differences were found for reactivity, t

Table 2. Mean scores (standard deviations) for psychosocial variables, by race

Characteristic	Caucasian (N = 16)	African American (N = 12)	Effect Size (d)	P
Perceived stress scale	27.19 (9.28)	28.83 (10.97)	-0.16	.679
Caregiving burden				
Objective burden	14.06 (5.09)	13.33 (4.25)	0.15	.683
Subjective burden	43.44 (14.62)	41.25 (14.69)	0.14	.699
Social support				
Total score	67.87 (16.40)	71.17 (18.80)	-0.18	.626
Affection	67.50 (22.03)	75.56 (20.76)	-0.36	.332
Emotional	71.09 (17.10)	68.75 (20.44)	0.12	.751
Positive interaction	60.00 (22.57)	67.22 (18.30)	-0.34	.359
Tangible	59.06 (23.40)	66.25 (25.33)	-0.29	.633
Caregiving meaning	36.88 (5.26)	40.83 (3.27)	-0.85	.022

(25)=2.89, $P=.008$, and recovery, $t(25)=3.20$, $P=.004$. As shown in Figure 1a, Caucasian caregivers had an increase of 25.04 ± 10.79 mm Hg from rest to stress and a decrease of 20.04 ± 10.60 mm Hg from stress to recovery. African-American caregivers had a smaller increase of 13.92 ± 8.76 mm Hg and a decrease of 7.03 ± 13.35 from stress to recovery. A statistically significant difference was seen in the slope from the stress-to-recovery task for African-American compared to Caucasian women, $t(16)=-2.72$, $P=.015$, which indicates that the rate of recovery was faster for Caucasian women than African-American women.

The repeated measures ANOVA indicated a significant main effect of task, Pilliai's Trace, $F(2,24)=50.58$, $P<.0001$, partial eta squared=0.81, and a significant Race \times Task interaction, Pilliai's Trace, $F(2,24)=5.13$, $P=.01$, partial eta squared=0.30. The main effect of race was not significant, $F(1,25)=.01$, $P=.92$, partial eta squared=0.00. The Race \times Task interaction was attenuated somewhat in the ANCOVA model, Pilliai's Trace, $F(2,19)=3.51$, $P=.05$, although the effect size was virtually identical, partial eta squared=0.27, as was the main effect of task, Pilliai's Trace, $F(2,19)=2.77$, $P=.09$, partial eta squared=0.23.

Diastolic Blood Pressure

No race differences were seen in DBP at rest, for reactivity, or for recovery.

As shown in Figure 1b, Caucasian caregivers had a mean increase of 11.57 ± 6.28 mm Hg from rest to stress, followed by a decrease of 10.55 ± 6.30 mm Hg from stress to recovery. African Americans increased 10.31 ± 5.82 mm Hg from rest to stress and then decreased 7.56 ± 5.40 mm Hg from stress to recovery. No difference was seen in the slope from the stress-to-recovery task for African-American compared to Caucasian women, $t(16)=-1.20$, $P=.25$, which indicates that the rate of recovery was not different for the two groups.

The repeated measure ANOVA indicated that there was a main effect for task, Pilliai's Trace, $F(2,24)=42.07$, $P=.00$, partial eta squared=0.78, but not race, $F(1,25)=1.28$, $P=.27$, partial eta squared=0.05. The Race \times Task interaction was not significant, Pilliai's Trace, $F(2,24)=1.08$, $P=.36$, partial eta squared=.08. No effects were significant when controlling for covariates.

Heart Rate

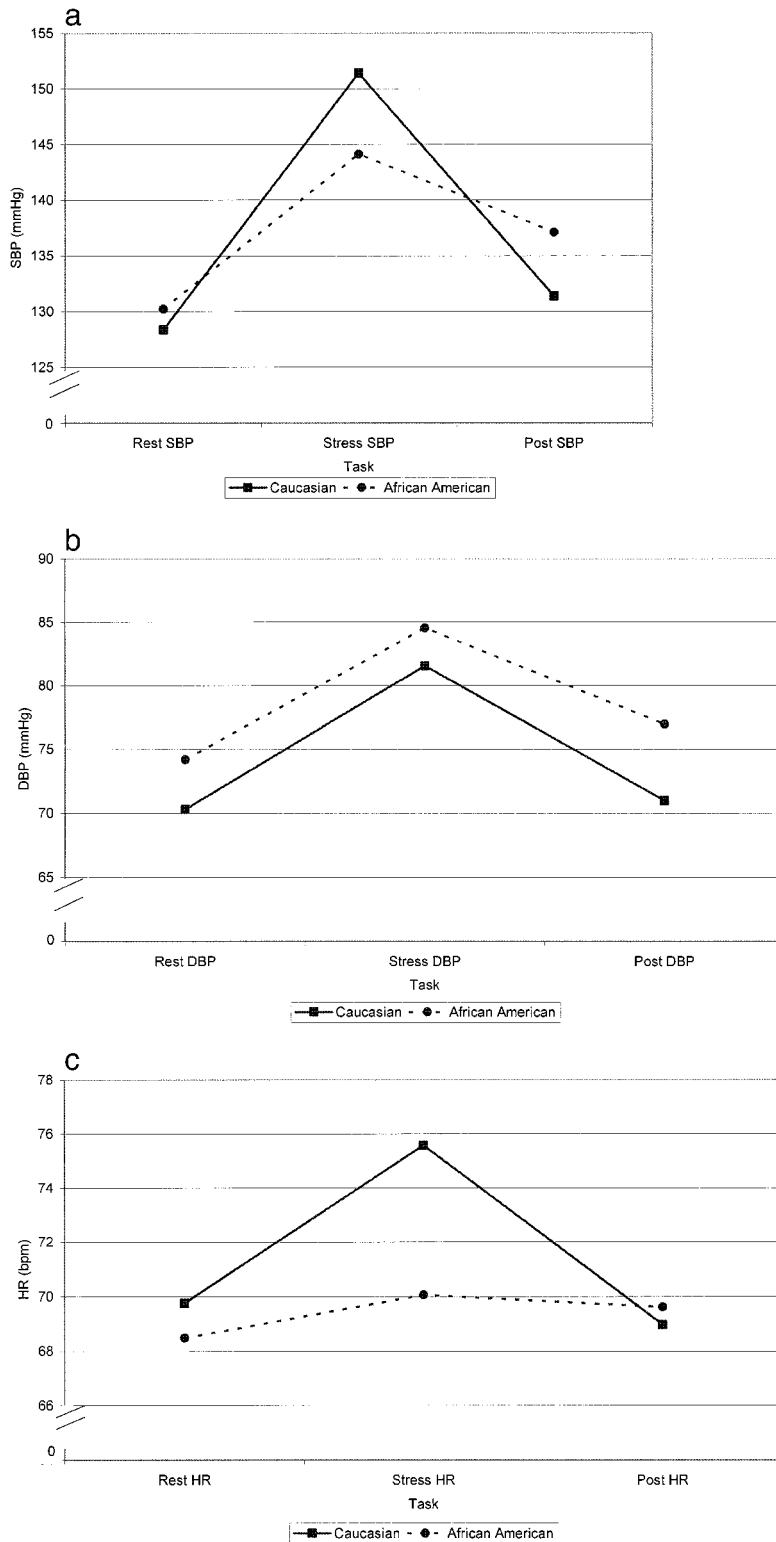
Although no race difference was seen in HR at rest, the race difference in HR reactivity, $t(25)=1.73$, $P=.097$, and HR recovery, $t(25)=1.87$, $P=.074$, approached statistical significance. As shown in Figure 1c, Caucasian women's heart rate increased, on average, 4.74 ± 5.72 bpm from rest to the stress task, compared to the African Americans, whose heart rate increased

1.57 ± 3.10 bpm from rest to the stress task. From the stress task to recovery, Caucasian women had a decrease of 7.05 ± 9.78 bpm, while the African-American women had a decrease of 0.44 ± 8.31 bpm. No difference was seen in the slope from the stress-to-recovery task for African-American compared to Caucasian women, $t(16)=0.12$, $P=.90$, which indicates that the rate of recovery was not different for the two groups.

The repeated measure ANOVA indicated a main effect for task, Pilliai's Trace, $F(2,24)=5.66$, $P=.01$, partial eta squared=0.32, but not for race, $F(1,25)=0.60$, $P=.44$, partial eta squared=0.02. The Race \times Task interaction was not statistically significant, Pilliai's Trace, $F(2,24)=1.98$, $P=.16$, partial eta squared=0.14. In the ANCOVA model, the main effect of task remained significant, Pilliai's Trace, $F(2,19)=5.13$, $P=.02$, partial eta squared=0.35, and the Race \times Task interaction was statistically significant, Pilliai's Trace, $F(2,19)=4.73$, $P=.02$, partial eta squared=0.33. The main effect of race was not significant, Pilliai's Trace, $F(1,20)=1.79$, $P=.20$, partial eta squared=0.08.

Cortisol

Overall, no race differences were seen in cortisol levels at rest or at 15 minutes following the stress interview,



although variability was great, especially among Caucasians. Participants who showed at least a 50% increase in cortisol levels from rest to 15 minutes following the stress interview were classified as “reactors.” Overall, 35% of participants were classified as reactors, although a significant race difference was seen in this effect: African-American women were significantly more likely to be reactors than Caucasians (58% vs 14%, respectively), $\chi^2(1, N=26) = 5.54, P < .02$. This effect remained significant ($P < .05$) even when controlling for covariates.

DISCUSSION

This study examined possible race differences in cardiovascular and cortisol reactivity to a psychosocial challenge among older women who care for a family member with dementia. Previous studies have shown that African-American caregivers, in general, report lower levels of psychologic distress and experience greater caregiving meaning than Caucasian caregivers, which may be due to more diverse informal social networks and a greater sense of reciprocity, filial obligation, and sense of responsibility for providing care to older family members.⁷ However, only one study⁸ has examined corresponding differences in cardiovascular reactivity, and no consistent pattern by race, gender, or type of reactivity (SBP, DBP, HR) emerged.

Although both African-American and Caucasian women in our study had an increase in SBP in response to a psychosocial challenge, this increase was significantly greater in Caucasian than in African-American women. The magnitude of this Race \times Task interaction was large ($\eta^2 = 0.27$). Furthermore, only Caucasian women showed an increase in HR in response to the psychosocial challenge, and the magnitude of this Race \times Task interaction was also large ($\eta^2 = 0.33$). Both Caucasian and African-American wom-

Fig 1a. Race differences in systolic blood pressure (SBP) during rest, interpersonal challenge (stress), and recovery (post). **Fig 1b.** Race differences in diastolic blood pressure (DBP) during rest, interpersonal challenge (stress), and recovery (post). **Fig 1c.** Race differences in heart rate (HR) during rest, interpersonal challenge (stress), and recovery (post)

Significantly more African-American women than Caucasian women had at least a 50% increase in cortisol levels from rest to 15 minutes following the psychosocial challenge,

en had a significant increase in DBP in response to the challenge, but no race differences were seen in this increase over the tasks. Race differences in cortisol findings, however, showed an opposite pattern relative to the SBP and HR data. Significantly more African-American women than Caucasian women had at least a 50% increase in cortisol levels from rest to 15 minutes following the psychosocial challenge, which suggests they were more reactive to the stressor. With regard to the psychosocial variables, caregiving burden, perceived stress, and social desirability levels were similar across race. African-American women, however, reported greater personal meaning associated with caregiving than did Caucasian women. The magnitude of this difference was large. African-American women also scored higher than Caucasian women on several domains of social support, with these effect sizes in the small-to-medium range (although not statistically significant).

According to Lazarus and Folkman (1984),²¹ whether a potential stressor is perceived to be stressful is determined by the balance between primary appraisal (cognitive appraisal of the event as positive, neutral, or negative and, if negative, to what extent it is presently harmful, threatening for the future, and potentially challenging) and secondary appraisal (assessment of coping abilities to deal with the potential stressor). Perceptions of stress are greatest when the

event is viewed as negative, when the event is viewed as either harmful or threatening, and when the person does not believe he or she has the resources to cope with the event. Variations in primary and secondary appraisal result in a continuum of stress responses, which would also be expected to result in differential physiologic responses.

Indeed, literature in psychophysiology indicates a dissociation between the sympathetic nervous system and the hypothalamic-pituitary-adrenal (HPA) axis in response to different stressors. Frankenhaeuser and colleagues²²⁻²⁴ have shown that effort and distress are two important dimensions of the stress experience. The effort dimension represents positive aspects of the stress experience (similar to challenge appraisals) in which the person is engaged in active coping and feels in control of the situation and outcome. The effort dimension results in a sympathetic nervous system response, including an increase in HR and BP. The distress dimension corresponds to coping with a low perception of control and represents negative aspects of stress. This second dimension would activate the HPA axis, resulting in cortisol secretion. A number of investigators have found this dissociation: increased sympathetic responses with effort tasks and both increased sympathetic and HPA axis responses with distress tasks.²²⁻²⁶

Based on these theories and patterns of physiologic findings, our data are consistent with the idea that Caucasian caregivers were involved in effort coping that is characterized as engagement in an effort to reach a solution to a problem. The accentuated cardiovascular responses without enhanced cortisol secretion would fit this profile. In contrast, the African-American caregivers might be involved in similar activities, but with coping processes associated with effort, feelings that they are not in control of the situation, and distress. These individuals would, theoretically, present with an attenuated cardiovascular re-

sponse and increased levels of cortisol, as was shown. Cultural norms regarding reciprocity, filial obligation, and sense of responsibility for providing care to older family members in African Americans may result in attenuated self-reported distress, but these same norms might also result in lower perceptions of control over the caregiving situation, since it is something that is expected (vs chosen), and thus result in greater cortisol secretion. More studies are needed to replicate these findings and increase understanding of behavioral and physiologic mechanisms.

Our study had a number of limitations. We cannot be certain that African-American and Caucasian caregivers perceived the laboratory stressor similarly. African-American caregivers might have been reluctant to disclose their stress and negative feelings in the interpersonal challenge due to social desirability issues. Another limitation to our study was the small sample size. The lack of statistically significant differences in our psychosocial variables may have been the result of limited power; however, differences in scores between African-American and Caucasian women along most variables were small and did not show a consistent pattern. Two exceptions were caregiving meaning and social support. It would have been interesting to also examine whether caregiving meaning and social support mediated the association between race and cardiovascular reactivity, but our study was not adequately powered for this type of analysis. For analyses in which we were able to detect significant differences in SBP, HR, and cortisol reactivity, we had adequate power (observed power was .6-1.0). Most other analyses revealed small, and perhaps not meaningful, differences that would have required a large sample size. Another limitation was our recruitment and sampling; our convenience sample prohibits us from generalizing our findings to caregivers in general. Finally, limiting our sample to postmenopausal women

limits our ability to make generalizations to the large number of premenopausal women. With increasing age, particularly after menopause, women exhibit greater autonomic activity and less parasympathetic activity, and consequently postmenopausal women are more reactive to laboratory stress paradigms.²⁷ Similarly, rates of hypertension in women increase after menopause.²⁸ The mechanisms accounting for these changes are not well understood, are likely multifaceted, and are not likely due simply to reductions in estrogen.²⁸ Thus, while age and menopausal status differences do not negate our findings of race differences in reactivity in a postmenopausal sample of caregivers, we cannot conclude that the premenopausal women would show the same degree of reactivity, nor can we conclude that race differences in reactivity would be present in a premenopausal sample of women.

Despite these limitations, our study contributes to the literature on psychophysiological health parameters in caregivers and to racial/ethnic differences in these variables. Our preliminary results suggest that caregiving is perceived differently by African-American and Caucasian women and that these differences result in different patterns of cardiovascular and cortisol reactivity. Larger-scale studies that include both men and women caregivers and include multiple physical and psychologic challenges are needed.

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AUTHOR CONTRIBUTIONS

Design and concept of study: Wilcox, Wilson
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Manuscript draft: Wilcox, Bopp, Wilson, Fulk, Hand

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Acquisition of funding: Wilcox

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