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Religiosity, Education, John Henryism Active Coping, and Cardiovascular Responses to Anger Recall for African American Men

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Abstract

The present study examined if high levels of religious attendance (ORG), private religious activity (NOR), or intrinsic religiosity (SUB) buffer cardiovascular responses to active speech and anger recall lab stressors alone and by John Henryism Active Coping (JHAC) and educational attainment. A sample of 74 healthy African American males, aged 23 to 47 years, completed psychosocial surveys and a lab reactivity protocol involving active speech and anger recall with a 5-minute baseline and ensuing recovery periods. Measures of religiosity, JHAC, and education were related to continuous measures of systolic and diastolic blood pressure (BP), for each task and

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rest period with repeated measures ANOVA tests. The period by education by JHAC interaction effect was significant for diastolic BP responses at low but not higher NOR. At low education and low NOR, diastolic BP levels increased significantly during anger recall and ensuing recovery for high but not low JHAC persons. Thus, being deprived of education and private religious activity may put these African American men in a vulnerable situation where higher effort coping may exacerbate their cardiovascular reactivity and recovery to anger induction.

Keywords
religiosity, coping, socioeconomic status, blood pressure, African Americans

African American men continue to lag behind other sociodemographic groups in terms of cardiovascular (CV) health (e.g., high rates of hypertension; Cutler et al., 2008; Long, Ponder, & Bernard, 2017; Thorpe et al., 2016; D. R. Williams, 2008). For African American men, daily life brings several chronic demands that test coping resources and thus produce adverse health outcomes (Hudson, Neighbors, Geronimus, & Jackson, 2016; D. R. Williams, 2008). Previous research is culling out a uniquely powerful role of coping in the context of psychosocial stressors like anger provocation, subtle racism, and financial burden (Brenner, Diez-Roux, Gebreab, Schulz, & Sims, 2017; Merritt, Bennett, Williams, Edwards, & Sollers, 2006; Spruill, 2010). Moreover, in African American communities compared with other ethnic groups, men and women often deal with societal barriers (e.g., poor access to quality educational resources and viable employment opportunities; Angner, Hullett, & Allison, 2011; Fernander, Durán, Saab, & Schneiderman, 2004; Grills et al., 2016; Sellers, Neighbors, & Bonham, 2011; D. R. Williams, 2008) that in turn lead to higher levels of stress due to lack of access to proper coping resources. Along those lines, stress reactivity (i.e., elevated CV responses to related mental stressors) predict high blood pressure (BP) and psychosocial risk disparately for African American men (Sherwood, Hill, Blumenthal, Johnson, & Hinderliter, 2017; Treiber et al., 2001).

John Henryism Active Coping Hypothesis

African American men likely need cope effectively with these stressors to reduce such health disparities. The relationship between active coping in particular and CV reactivity to mental stress is well established in that those with high levels of active coping may be at greater risk for acute CV events and chronic heart disease alike (Bennett et al., 2004; Subramanyam et al., 2013;

Yuenyongchaiwat, Baker, Maratos, & Sheffield, 2016). Active coping was initially assessed with the John Henryism Active Coping (JHAC) scale (James, 1996; James et al., 2006), aptly named after the mythical figure, John Henry. Reputedly, he was an African American steel worker in the mid-1800s who beat a steam-driven pile driver machine but shortly later died because of his monumental efforts.

Along those lines, JHAC is the propensity to be a high striver, or actively cope with the stressors in one's life. However, it has not been applied much in recent stress reactivity research with diverse populations (Adams, Aubert, & Clark, 1999; Fernander et al., 2004; Merritt, Bennett, Williams, Sollers, & Thayer, 2004). A plethora of epidemiological research suggests that persons with high JHAC, who have less coping resources like socioeconomic status (i.e., SES such as low educational attainment, occupational prestige, or income; James et al., 2006; Lehman, Taylor, Kiefe, & Seeman, 2009; Matthews et al., 2002; Walsemann, Goosby, & Farr, 2016) might be at higher risk for CV disease (Booth & Jonassaint, 2016; Clark & Adams, 2004; Fernander et al., 2004; LeBrón, Schulz, Mentz, & Perkins, 2015; Markovic, Bunker, Ukoli, & Kuller, 1998; McKetney & Ragland, 1996; Mujahid, James, Kaplan, & Salonen, 2017; Sellers et al., 2011; Subramanyam et al., 2013).

Under these circumstances, constantly revisiting challenging or anger-provoking stressors, in most cases yields persistently elevated CV responses with the excess emotional and cognitive activation associated with higher CV disease risk (see the upper part of Figure 1; Davidson, 2008; Davidson & Mostofsky, 2010; Fredrickson et al., 2000; Light et al., 1995; Neumann, Waldstein, Sollers, Thayer, & Sorkin, 2004; Sherwood et al., 2017; Wright, Treiber, Davis, & Strong, 1996). For instance, Merritt et al. (2004) found that young adult African American men with high JHAC and low socioeconomic status as measured by low educational attainment was linked with poorer diastolic BP recovery following an anger recall task. These results suggest that slowed CV recovery from stressors like anger provocation (Steptoe & Marmot, 2006; Treiber et al., 2001; Trivedi, Sherwood, Strauman, & Blumenthal, 2008) is a risk factor for future CV disease, especially among African Americans.

An optimal question then becomes how to help African American men with high JHAC and inadequate coping resources (a modifiable but costly element) to offset this CV risk. Recent studies compare strong traditional or communal religious activity and healthy elements of mainstream cultural values like materialism and individualistic notions of the Protestant work ethic. A healthy balance between the two appears best for mental health for people of color (Grills et al., 2016; Tyler, Boykin, Boelter, & Dillihunt, 2005). As such, traditional coping skills can be a valuable theoretical model for reducing JHAC-related health disparities.

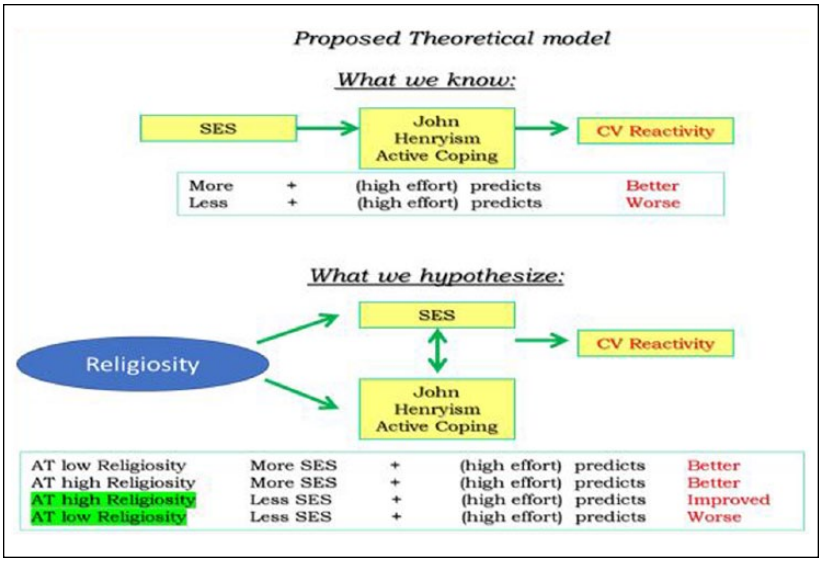

Figure 1. Proposed theoretical model for the current study.

Religiosity as a Buffer for Cardiovascular Disease

Religiosity (e.g., praying or going to religious service) is a well-known CV and psychological stress buffer for at-risk populations, especially for at-risk African Americans (Bell, Bowie, & Thorpe, 2012; Buck, Williams, Musick, & Sternthal, 2009; Steffan, Hinderliter, Blumenthal, & Sherwood, 2001; Yanek, Becker, Moy, Gittelsohn, & Koffman, 2001). Higher religiosity is linked with less psychosocial stress, lower rates of hypertension and heart disease (Bell et al., 2012; Chatters et al., 2008; Fitchett & Powell, 2009; Gillum & Ingram, 2006; Sørensen, Danbolt, Lien, Koenig, & Holmen, 2011), reduced CV and cortisol responses to social stress (Cooper, Thayer, & Waldstein, 2014; Masters, Hill, Kircher, Lensegrav Benson, & Fallon, 2004; Merritt & McCallum, 2013; Steffan et al., 2001; Tartaro, Luecken, & Gunn, 2005), and less risky health behaviors like smoking (Holt, Clark, Debnam, & Roth, 2014).

Moreover, in a national sample, African Americans (vs. comparative White Americans) reported that religion plays the largest role in health regardless of religious background (Hayward, Krause, & Pargament, 2017). Koenig and Büssing (2010) assessed religiosity through three major dimensions. Public religious activities represent frequency of attendance at religious services or

related assemblies that provides the opportunity for social interactions. Therefore, religious attendance can offer a unique form of social support (e.g., provides collective forms of religious experience and solidarity in the context of persisting racial discrimination and financial hardship) to African Americans (Bell et al., 2012; Blackmon, Coyle, Davenport, Owens, & Sparrow, 2016; D. R. Williams & Sternthal, 2007). Along those lines, in the African American community, education can moderate religious attendance, as more educated persons are less likely to attend religious services than less educated persons (Harrison, Koenig, Hays, Eme-Akwari, & Pargament, 2001). Also, private religious activities (i.e., like prayer, meditation, or scripture study) may provide a reliable form of immediate relaxation that translates to slower physiological activation that in turn are linked with better daily CV health (Ano & Vasconcelles, 2005; Koenig & Büssing, 2010; Park, 2007; D. R. Williams & Sternthal, 2007). In addition, subjective religiosity refers to experiencing the reality of God, religious belief as the life goal, and trying to connect religion in all domains of life (Koenig & Büssing, 2010). For instance, the Pew Landscape Survey (Pew Forum on Religion and Public Life, 2008) finds that almost 8 in 10 African Americans (79%) report religion is very central in their lives, versus 56% for all U.S. adults.

Until now, there is no evidence to support the buffering role of religiosity on JHAC. Consequently, we hypothesize that more religiosity predicts improved CV responses and recovery to anger recall for African American men. Next, we would hypothesize that more religiosity predicts improved CV responses and recovery to anger recall for high-JHAC African American men. A third hypothesis is that religiosity buffers the adverse CV reactivity associated with high JHAC and low education. If yes, then we would have one preferred means of offsetting the role of the JHAC hypothesis for CV reactivity to mental stress. In turn, we could extend the results into a more feasible preventive medicine model for reduction of CV disease related health disparities.

Method

Participants

A sample of 74 African American males ($n = 74$) aged 23 to 47 years (mean = 33.4 ± 8.8 years) were recruited by way of leaflets displayed at local businesses, colleges, and organizations, notices on local radio, and by word of mouth. Most participants (62, 83.8%) were non-students.

As education is a strong predictor of CV disease among African Americans and strongly related to JHAC and religiosity, it is a proxy for examining SES (Doom, Mason, Suglia, & Clark, 2017). Educational attainment included the

highest level of education in years from 1 to 21 years with: "high school graduate" at 13 years, "college or trade school degree" at 17 years, and "graduate or professional degree" at 21+ years (mean = 14.59 ± 2.40 years; Merritt et al., 2004). While the mean educational attainment score was slightly high, there was a satisfactory range of scores from 9 to 21 years of education. Based on mean educational attainment score, education level was assessed as a dichotomous variable by means of a cutoff at 13 years of education. Subjects at or below the cutoff were grouped as "low education" (n = 29) and those above as "high education" (n = 45).

Measures

Health Behaviors. Body mass index (BMI) scores (based on self-reports of weight in lbs. and height in inches) were mostly normal to high normal (BMI; mean = 26.2 ± 5.3). We also assessed smoking status using a 3-level index (Never smoked = 44.6%, Quit smoking = 27%, Current smoker = 28.4%) and marital status of the participants using four options (Single = 64.9%, Married = 24.3%, Separated = 4.1%, Divorced = 6.8%).

Religiosity. The 5-item version of the Duke University Religion Index (DUREL) is brief and very easy to administer with just five items assessing three areas of religiosity: organizational religiosity (ORG), non-organizational religiosity (NOR), and subjective religiosity (SUB; Koenig & Büssing 2010). It was devised for application in large cross-sectional and longitudinal survey studies, with more than 100 published studies run worldwide. The ORG item measures frequency of attendance at church or related assemblies with reverse-coded response choices ranging from 1 (*never*) to 6 (*more than once per week*). The NOR item measures the frequency of time spent in private religious pursuits like prayer, meditation, or scripture study with reverse-coded response choices ranging from 1 (*rarely or never*) to 6 (*more than once a day*). Three items inquire about experiencing the existence of God, religious belief as the purpose of one's life and attempting to relate religion in all domains of life (SUB) with reverse-coded response options ranging from 1 (*definitely not true*) to 6 (*definitely true of me*). Overall SUB scores (based on the sum of the 3 items) can range from 3 to 18. To stay consistent with our prior repeated measures analytical tactic (Merritt et al., 2004), we decided to dichotomize the DUREL variables based on theoretical cutoffs (i.e., "a few times a month" or more for ORG, "≥ 2 times a week" or more for NOR, and for SUB at the median score of 12 or higher). Prior studies have established the validity and reliability of the DUREL (Koenig & Büssing, 2010; Lucchetti et al. 2012).

Table 1. Descriptive Statistics and Correlations for the Overall Sample (n = 74).

	M	*SD*	1	2	3	4	5	6	7	8	9
1. Age	31.51	9.51	—								
2. BMI	25.91	5.07	−.07	—							
3. Education	14.59	2.39	.09	.04	—						
4. JHAC	49.13	5.71	−.06	.13	.24*	—					
5. NOR	3.70	1.28	.01	.21	.30**	.25*	—				
6. ORG	3.39	1.95	−.03	.09	.20	.04	.40**	—			
7. SUB	.48	.50	.05	.09	.22	.52**	.52**	.45**	—		
8. DBP	69.31	9.42	.44**	.11	.01	.12	.07	−.05	.16	—	
9. SBP	115.41	10.17	.23	.25*	.02	−.01	.05	.19	.19	.66**	—

Note. BMI = body mass index; OP = Occupational Prestige; JHAC = John Henryism Scale of Active Coping; NOR = Non-Organizational Religiosity; ORG = Organizational Religiosity; SUB = Subjective Religiosity; DBP = diastolic blood pressure; SBP = systolic blood pressure.
*p < .05. **p < .01.

John Henryism. The John Henryism Scale of Active Coping (JHAC; Subramanyam et al., 2013) is a 12-item scale that measures usual degree of striving with persistent psychosocial stress. The sum of reverse-coded items generated an overall JHAC score that can extend from 12 to 60 points. Similar to related studies with similar populations (Bronder, Speight, Witherspoon, & Thomas, 2014; Fernander et al., 2004), JHAC scores showed acceptable reliability (Cronbach's α = .721), and JHAC was positively correlated with educational attainment, ORG, and SUB (see Table 1). Based on original studies where a mean score around 50 points suggests atypically high-effort coping and CV stress outcomes (James 1996; Light et al., 1995; Merritt et al., 2004; Wright et al., 1996), JHAC scores were dichotomized at the median score of 50 (34 participants classified as low JHAC and 40 as high JHAC). For convergent validity, higher JHAC scores correlate with better psychological profiles like happiness (Angner et al., 2011), conscientiousness and extraversion (Stanton, Jonassaint, Williams, & James, 2010), life satisfaction and religious coping for African American adults (James, 1996), and lower depression levels in young women (Bronder et al., 2014; Merritt & Dillon, 2012). For discriminant validity, JHAC scores are independent from Type A behavior pattern (James et al., 2006) and anger and hostility coping styles (Fernander et al., 2004; Light et al., 1995) for African American adults.

Procedure

Screening. After institutional review board approval, participants completed a 5-minute screening survey with health history, demographic, and psychosocial

factors. Exclusions were racial group status not including African American/Black American race, current unemployed status, diagnoses of related chronic medical conditions (e.g., hypertension, diabetes, heart disease, or cancer), current or prior use of antihypertensive medicine, or verified hypertensive resting seated BP readings. Of the 20 people who were interviewed and were excluded based on these chronic medical conditions (16 reported hypertension or other heart disease and four cancer). Five other persons did the screening but refused to arrange a lab visit or did not show up after arranging one. Independent samples t tests showed that these 25 persons were similar in age (mean = 28.84 ± 10.62; $t[97] = 1.179$, $p = .241$) and educational attainment (mean = 13.52 ± 2.23; $t[93] = 1.833$, $p = .070$) as the 74 men who participated in the lab visit.

We included employed men as we wanted to assess the moderating role of job-related stressors in a separate article and felt that it would make the final sample more homogeneous. In lab reactivity studies with "normotensive" adults, it is standard operating procedure to exclude for the chronic medical conditions noted, as they could confound the link between JHAC, education, religiosity, and CV responses to mental stress. That is, persons with a positive medical history for these conditions show elevated BP responses to psychosocial lab stressors like anger provocation (Treiber et al., 2001). As well, other studies suggest that persons with these conditions (especially African Americans) tend to score lower on related measures of religiosity (Merritt et al., 2004).

Lab Visit. Between 9:30 a.m. and 7:00 p.m., 90-minute lab sessions were done in a psychophysiology lab at Duke University Medical Center. A trained same-race and same-gender experimenter conducted all lab sessions to minimize response biases associated with the active speech and anger recall tasks. The subject completed informed consent and the JHAC and DUREL surveys and then the experimenter assessed casual (seated) BP four times with a Dinamap BP monitor. Subjects who were deemed as hypertensive (mean casual systolic BP ≥140 mmHg and/or mean casual diastolic BP ≥90 mmHg) were ineligible for the experimental protocol ($n = 1$).

Then, the subject completed three standard stressor tasks combined with four resting periods. First, the subject rested for 5 minutes. Next, the subject read a brief neutral script (instructions for washing clothes) aloud in his ordinary speaking voice. This task was used to gather a baseline index of "talking" BP and to familiarize subjects with the BP recording apparatus and to better account for speaking during the stressor tasks that follow (based on Merritt et al., 2004). Following the reading task, the subject rested for 3 minutes.

The second mental task involved a 10-minute active speech task with a 2-minute audiotaped overtly racist or a "non-racist" scenario (subjects

randomly assigned). The overtly racist stressor portrayed unfair treatment in a shopping scenario that clearly suggested racial bias while the nonracist stressor portrayed unfair treatment in the same shopping scenario not clearly based in racial bias (Merritt et al., 2006). The subject listened to the tape and then took 5 minutes to prepare a 5-minute presentation including his views and feelings about the scenario and how he would react to the scenario if the object of the unfair treatment. During the presentation period, the experimenter asked several standardized questions about favored affective and behavioral coping responses to the scenario. Then, the subject rested quietly for 10 minutes.

The last mental task was a 5-minute anger recall task in which the subject recalled and discussed an earlier event that made him angry then and still makes him angry when he thinks about it (Fredrickson et al., 2000). The goal of the anger recall task is to prime negative thoughts and optimal recall of the event, thereby enhancing emotional and physiological engagement in a lab setting (Fredrickson et al., 2000; Luecken & Gallo, 2008). Recent studies highlight anger recall stress as very provocative for elevated BP reactivity as well as reduced BP recovery in real life (Cooper et al., 2014; Gerin et al., 2006; Ironson et al., 1992; Merritt et al., 2004; Neumann et al., 2004; Ottaviani, Shapiro, & Fitzgerald, 2011). The experimenter included prompts about the part of the event that incited the most anger as well as favored coping responses. The subject rested for 3 minutes after the anger recall task. We arranged the order of tasks so that the reading task got subjects habituated to the lab location and the active speech task revealed how a hypothesized racist (vs. nonracist) stressor effects CV responses to succeeding anger recall. Lastly, the experimenter debriefed the subject and then compensated him with $30 and a BP reading card with follow-up recommendations on completion of the study.

Cardiovascular Reactivity Scores. Systolic and diastolic BP were obtained nonstop with an Ohmeda 2300 Finapres BP monitor with a finger cuff placed on the middle or ring finger of the left hand (at a sampling rate of 150 Hz; Guelen et al., 2008). We computed average scores for systolic and diastolic BP readings during baseline, neutral reading, post neutral reading baseline, speech preparation, presentation, post-speech recovery, anger recall, and final recovery. Past research shows that all four reactivity tasks consistently raise BP responses above resting levels and predict future CV risk (Fredrickson et al., 2000; Saab et al., 1992). Potential outliers were to be handled using standard correction methods (i.e., case deletion or mean substitution). However, no major problems were found.

Separate ANOVA tests comparing the baseline period and the post-neutral reading period with the neutral reading period showed that CV responses increased from baseline to neutral reading ($p[t]$s $< .01$) while the baseline and

the post-neutral reading periods did not contrast from each other ($p[t] > .05$). Past research shows that speaking alone causes surges in CV response (Prkachin, Mills, Zwaal, & Husted, 2001). Thus, we applied a conservative method to computing reactivity scores (Task—Baseline) and adopted the values from the reading task for each dependent variable as the baseline. Reactivity scores were created for speech preparation, presentation, post-speech recovery, anger recall, and final recovery (per Merritt et al., 2004).

Plan for Analysis

We employed a repeated-measures ANOVA with two levels of each respective DUREL factor (low/high) for Aim #1, a 2 (JHAC: low/high) × 2 (DUREL factor: low/high) repeated-measures ANOVA for Aim #2, and a 2 (JHAC: low/high) × 2 (education factor: low/high) repeated-measures ANOVA run by low and high levels of each respective DUREL measure for Aim #3 with the five CV reactivity scores above as within-subject dependent variables. These analyses were conducted with SPSS-24 software (with a reduced a priori alpha level of .01, given the number of statistical analyses). While there are issues with artificial reduction of data for primary variables, we wanted to stay consistent with the analytical approach used in Merritt et al. (2004), where we applied a repeated measures ANOVA approach with dichotomized scoring for JHAC and education variables. As well, the large number of periods in our lab stress reactivity research design does not work well with multiple regression modeling, where only one dependent measure can be assessed at one time. We corrected all omnibus tests for violations of sphericity (Vasey & Thayer, 1987) and ran pairwise (Tukey) tests to locate significant omnibus tests based on a priori expectations of specific cell means for high JHAC and low education persons (two-tailed *t* test).

Results

Overall, there were no concerns with missing data. As shown in Table 1, ORG was positively correlated with educational attainment, NOR and SUB. NOR was positively correlated with SUB. SUB was positively correlated with educational attainment and, surprisingly, average resting diastolic BP. Age was positively correlated with average resting diastolic BP.

Aim #1: Does Religiosity Predict CV Responses to Stress?

F statistics and *p* values for repeated measures ANOVA between- and within-group omnibus tests for the period by respective DUREL effects are displayed

Table 2. Effects of Organizational Religiosity and John Henryism on Within Group Cardiovascular Change Scores.

	Diastolic BP			Systolic BP		
	0.71			0.73		
Epsilon	*F* (*df*)	*p*(*F*)	[η]	*F* (*df*)	*p*(*F*)	[η]
ORG	0.02 (1, 69)	.879	[.001]	0.70 (1, 69)	.407	[.010]
JHAC	0.21 (1, 69)	.645	[.003]	0.03 (1, 69)	.870	[.001]
ORG × JHAC	1.61 (1, 69)	.209	[.023]	3.74 (1, 69)	.057	[.051]
Period (P)	41.14 (4, 276)	.0001	[.374]	18.54 (4, 276)	.0001	[.212]
P × ORG	1.09 (4, 276)	.351	[.016]	0.91 (4, 276)	.436	[.008]
P × JHAC	0.31 (4, 276)	.808	[.004]	0.58 (4, 276)	.623	[.013]
P × ORG × JHAC	0.54 (4, 276)	.645	[.008]	0.45 (4, 276)	.710	[.007]

Note. Epsilon is for the Greenhouse–Geisser repeated measures effect. BP = blood pressure; JHAC = John Henryism Scale of Active Coping; ORG = Organizational Religiosity. η is the partial eta squared for that specific effect.

Table 3. Effects of Non-Organizational Religiosity and John Henryism on Within Group Cardiovascular Change Scores.

	Diastolic BP			Systolic BP		
	0.71			0.73		
Epsilon	*F* (*df*)	*p*(*F*)	[η]	*F* (*df*)	*p*(*F*)	[η]
NOR	0.80 (1, 69)	.374	[.011]	0.53 (1, 69)	.469	[.008]
JHAC	0.12 (1, 69)	.736	[.002]	0.11 (1, 69)	.738	[.002]
NOR × JHAC	0.24 (1, 69)	.627	[.003]	0.01 (1, 69)	.920	[.001]
Period (P)	53.85 (4, 276)	.0001	[.438]	22.51 (4, 276)	.0001	[.246]
P × NOR	0.52 (4, 276)	.660	[.007]	1.17 (4, 276)	.321	[.017]
P × JHAC	0.33 (4, 276)	.797	[.005]	0.90 (4, 276)	.439	[.013]
P × NOR × JHAC	2.69 (4, 276)	.050	[.037]	1.30 (4, 276)	.276	[.018]

Note. Epsilon is for the Greenhouse–Geisser repeated measures effect. BP = blood pressure; JHAC = John Henryism Scale of Active Coping; NOR = Non-Organizational Religiosity. η is the partial eta squared for that specific effect.

in Tables 2 and 3. There were significant period effects for diastolic BP or systolic BP reactivity, with post hoc tests showing significant increases in systolic and diastolic BP during active speech and anger recall ($p[t]$s < .0001).

Table 4. Effects of Subjective Religiosity and John Henryism on Within Group Cardiovascular Change Scores.

	Diastolic BP			Systolic BP		
	0.71			0.73		
Epsilon	*F* (*df*)	*p*(*F*)	[η]	*F* (*df*)	*p*(*F*)	[η]
SUB	4.26 (1, 69)	.010	[.001]	0.03 (1, 69)	.857	[.001]
JHAC	0.08 (1, 69)	.772	[.001]	0.07 (1, 69)	.796	[.001]
SUB × JHAC	0.24 (1, 69)	.624	[.003]	1.29 (1, 69)	.260	[.018]
Period (P)	39.14 (4, 276)	.0001	[.362]	18.53 (4, 276)	.0001	[.212]
P × SUB	0.26 (4, 276)	.845	[.004]	0.91 (4, 276)	.436	[.013]
P × JHAC	0.49 (4, 276)	.681	[.007]	1.47 (4, 276)	.224	[.021]
P × SUB × JHAC	0.19 (4, 276)	.898	[.003]	0.09 (4, 276)	.963	[.001]

Note. Epsilon is for the Greenhouse–Geisser repeated measures effect. BP = blood pressure; JHAC = John Henryism Scale of Active Coping; SUB = Subjective Religiosity. η is the partial eta squared for that specific effect.b.

As shown in Tables 2 to 4, there were no significant period by NOR, period by ORG, nor period by SUB effect for any CV responses. The between-groups SUB effect was significant for diastolic BP responses, however there no significant group differences for any period (ts > −0.34, ps > .734). There were no significant between-groups ORG or NOR effect for any CV responses. As well, there were no significant period by JHAC or JHAC between-groups effects.

Aim #2: Does Religiosity Moderate the Role of JHAC in CV Responses to Stress?

F statistics and *p* values for repeated measures ANOVA between- and within-group omnibus tests for religiosity by JHAC effects are displayed in Tables 2 to 4. There were no significant period by DUREL by JHAC effects for any CV responses. As well, there were no significant between-groups DUREL by JHAC effect for any CV responses. As well, there were no significant period by JHAC or JHAC between-groups effects.

Aim #3: Does Religiosity Moderate the Role of JHAC by Education in CV Stress Responses?

F statistics and *p* values for repeated measures ANOVA between- and within-group omnibus tests for education by JHAC effects by low and high levels of each respective DUREL measure are displayed in Tables 5 and 6.

Table 5. Effects of Education and John Henryism on Within Group Cardiovascular Change Scores at Low Non-Organizational Religiosity.

	Diastolic BP			Systolic BP		
	0.62			0.60		
Epsilon	*F* (*df*)	*p*(*F*)	[η]	*F* (*df*)	*p*(*F*)	[η]
ED	0.23 (1, 27)	.630	[.009]	.10 (1, 27)	.752	[.004]
JHAC	0.11 (1, 27)	.739	[.004]	0.16 (1, 27)	0.687	[.006]
ED × JHAC	5.67 (1, 27)	.025	[.174]	1.97 (1, 27)	.171	[.068]
Period (P)	25.71 (4, 108)	.0001	[.488]	8.83 (4, 108)	.0001	[.247]
P × ED	2.91 (4, 108)	.049	[.098]	.67 (4, 108)	.538	[.025]
P × JHAC	2.97 (4, 108)	.047	[.099]	1.98 (4, 108)	.102	[.068]
P × ED × JHAC	6.56 (4, 108)	.001	[.195]	2.58 (4, 108)	.073	[.087]

Note. Epsilon is for the Greenhouse–Geisser repeated measures effect. BP = blood pressuer; JHAC = John Henryism Scale of Active Coping; ED= Education. η is the partial eta squared for that specific effect.

Table 6. Effects of Education and John Henryism on Within Group Cardiovascular Change Scores at High Non-Organizational Religiosity.

	Diastolic BP			Systolic BP		
	0.78			0.78		
Epsilon	*F* (*df*)	*p*(*F*)	[η]	*F* (*df*)	*p*(*F*)	[η]
ED	0.89 (1, 38)	.351	[.023]	0.009 (1, 38)	.926	[.001]
JHAC	0.02 (1, 38)	.877	[.001]	0.775 (1, 38)	.384	[.020]
ED × JHAC	0.44 (1, 38)	.508	[.012]	4.72 (1, 38)	.036	[.111]
Period (P)	36.14 (4, 152)	.0001	[.487]	15.55 (4, 152)	.0001	[.290]
P × ED	3.15 (4, 152)	.026	[.077]	1.04 (4, 152)	.379	[.027]
P × JHAC	2.01 (4, 152)	.114	[.050]	0.96 (4, 152)	.415	[.025]
P × ED × JHAC	1.55 (4, 152)	.203	[.039]	0.23 (4, 152)	.882	[.006]

Note. Epsilon is for the Greenhouse-Geisser repeated measures effect. BP = blood pressuer; JHAC = John Henryism Scale of Active Coping; ED = Education. η is the partial eta squared for that specific effect.

NOR. As shown in Tables 5 and 6 and Figure 2, the period by education by JHAC effect was significant for diastolic BP responses at low but not higher NOR. At low education and low NOR, diastolic BP levels increased significantly during anger recall ($t[14] = -3.12$; $p = .008$) and ensuing recovery ($t[14] = -3.07$; $p = .008$) for high but not low JHAC persons. Surprisingly, at low education and low JHAC, diastolic BP levels increased marginally during anger recall for high but

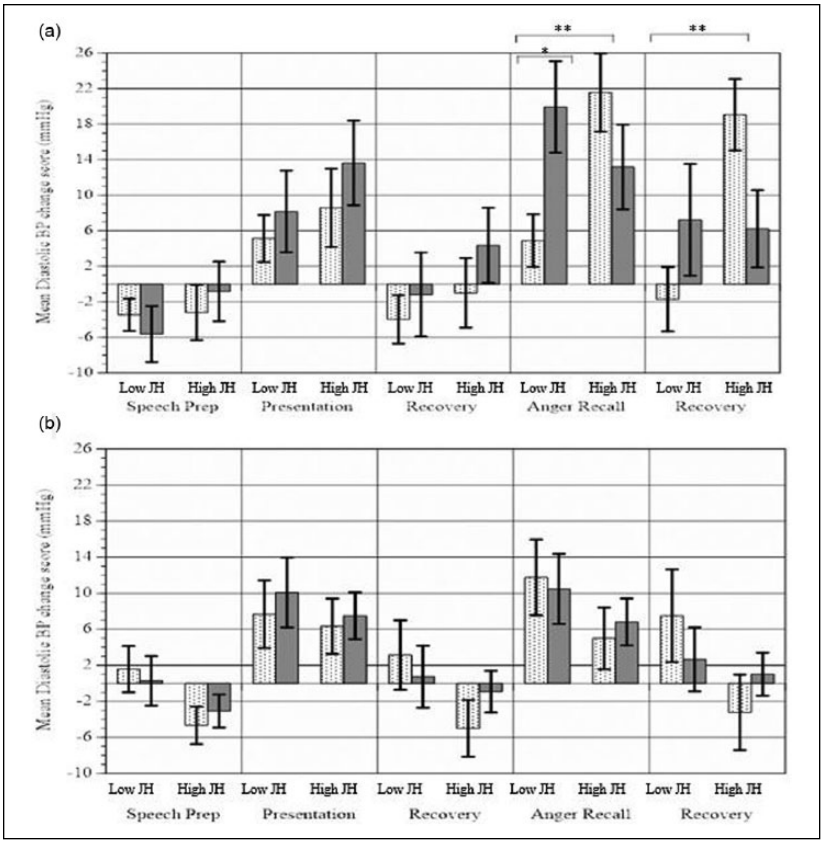

Figure 2. Period by Non-Organizational Religiosity (NOR) by John Henryism (JH) effects on diastolic blood pressure (BP) scores from speech preparation to final recovery by (a) low and (b) high education.
Note. Dotted bars = low NOR; Solid bars = high NOR. Error bars denote standard errors. $^{**}p < .01$. $^{*}p < .05$.

not low NOR persons ($t[17] = -2.36$; $p = .044$). The period by education by JHAC effect was not significant for systolic BP responses at low or higher NOR.

ORG. There were no significant period by education by JHAC effects or between-groups education by JHAC effects by level of ORG for any CV responses (Fs < 3.14, ps > .085). Also, there were no significant period by JHAC or JHAC between-groups effects by level of ORG (Fs < 2.08, ps > .116).

SUB. There were no significant period by education by JHAC effects or between-groups education by JHAC effects by level of SUB for any outcome (Fs < 2.13, ps > .110). Also, there were no significant period by JHAC or JHAC between-groups effects by level of ORG (Fs < 1.68, ps > .191).

Exploratory Analyses: Multiple Regression as an Option

Of note, we ran the main aims in inclusive hierarchical multiple regression (HMR) models with continuous measures of educational attainment and each DUREL variable and a dichotomized (i.e., median-split) measure of JHAC as predictors and respective baseline adjusted mean CV scores for speech prep, presentation, Rest 2, anger recall, and Rest 3 as unique dependent measures. Predictors were entered in the following order: (a) average baseline score for the corresponding CV measure, age, BMI, and smoking status (all continuous variables except for smoking status); (b) JHAC, education level, and the respective DUREL subscale (ORG, NOR, and SUB, respectively); (c) the two-way interaction terms of education level, JHAC, and the respective DUREL subscale; and (d) the three-way interaction term for education level, JHAC, and the respective DUREL subscale.

Variables for all interaction terms were centered or standardized. A median-split was maintained for JHAC scores since the body of research on the JHAC hypothesis suggests that the cutoff at the median tells us something special about its health effects, over and above a continuous JHAC scoring approach (James, 1996; James et al., 2006). The combined HMR models allow for the adjustment of the independent effects of continuous measures of education level and the respective DUREL subscale and JHAC; when also assessing two-way effects and the adjustment for two-way effects when assessing the three-way effect. As well, we could assess the role of each specific level of religiosity in CV responses when considering the various JHAC and education subgroups (Cohen, Cohen, West, & Aiken, 2013). Note that the criterion for significance for the various HMR tests given the Type I error rate for multiple tests was $p < .01$.

Group-based correlation analyses were run to resolve the pattern of significant HMR effects for the interactions of education, JHAC, and/or respective DUREL measure. Using the Fisher r-to-z transformation, a parametric test, z scores were computed to assess the significance of the difference between correlation coefficients (Fisher's Z_{diff}) of JHAC and education with outcomes by respective DUREL measure (Cohen et al., 2013). A significant difference suggests that differences in JHAC and education are associated with a different pattern of cortisol slope scores by respective DUREL measure.

As shown in Table 7 and Figure 3, the results for NOR and diastolic BP largely mirrored those for the repeated measures ANOVA tests. The three-way effects for JHAC, education, and NOR for Anger recall and Rest 3 diastolic BP were each significant. During Anger recall and Rest 3, higher NOR scores predicted marginally lower diastolic BP at low education and high JHAC but significantly higher diastolic BP at low education and low JHAC. The correlation coefficients for the two low education groups by JHAC and NOR were significantly different for diastolic BP at Anger recall and Rest 3. There were no significant three-way effects for ORG (F_{change}s < 2.597, ps > .112) or SUB (F_{change}s < 1.901, ps > .173) and none for systolic BP (F_{change}s < 2.791, ps > .100).

Discussion

We hypothesized that religiosity would offset the excess CV reactivity to anger recall associated with low education and high JHAC (Merritt et al., 2004). The results showed that, at low education and low levels of private religious activity, higher (but not low) JHAC was associated with more diastolic BP reactivity and less diastolic BP recovery to anger recall among African American men. As we know, low education is a strong predictor of high BP (Logan, Barksdale, & Chien, 2014; Merritt et al., 2004; Subramanyam et al., 2013). Thus, being deprived of education and religion may put these men in a vulnerable situation where higher effort coping may exacerbate their CV recovery (Brody et al., 2013). This is the first study to investigate and find a meaningful interactive link between religiosity, education, and JHAC with CV stress reactivity. Contrary to previous studies (Bell et al., 2012; Buck et al., 2009; Cooper et al., 2014; Steffan et al., 2001; Yanek et al., 2001), religiosity independently or in combination with JHAC did not significantly predict CV responses.

These results also suggest that religiosity alone is not sufficient to offset the previously reported elevated CV response to anger recall for low educated and high JHAC African American men (Merritt et al., 2004). In contrast to recent religiosity studies of mental health (Hayward et al., 2017; Pew Forum on Religion and Public Life, 2008), it may not have a buffering role because African American men commonly do not seek help for stress-related concerns in general (Plowden & Young, 2003) and perhaps through religiosity because of their high JHAC style. Second, JHAC as a chronic active coping tendency can interrupt efforts at relaxation commonly linked with private religious activity (e.g., meditation or prayer; Ano & Vasconcelles, 2005; Koenig & Büssing, 2010; Park, 2007; D. R. Williams & Sternthal, 2007).

Table 7. Hierarchical Regression Results for Education Level, John Henryism, Non-Organizational Religiosity, and Diastolic Blood Pressure Score[a].

Variable	Std. Beta	*t*	Partial *R*	*R*	Adj. R^2	R^2 change
Speech Prep						
Step 1: Age	0.015	0.271	0.033	0.902	0.803	0.814**
Body mass index	−0.036	−0.691	−0.083			
Smoking status	0.027	0.493	0.060			
Base diastolic BP	0.902	17.169**	0.901			
Step 2: ED	−0.016	−0.267	−0.033	0.903	0.796	0.002
JHAC	−0.037	−0.630	−0.078			
NOR	0.005	0.085	0.011			
Step 3: ED × NOR	0.023	0.379	0.048	0.907	0.793	0.006
JHAC × NOR	−0.129	−1.427	−0.178			
JHAC × ED	0.002	0.021	0.003			
Step 4: JHAC × ED × NOR	0.095	1.089	0.138	0.909	0.794	0.003
Presentation						
Step 1: Age	−0.064	−0.752	−0.091	0.755	0.545	0.570**
Body mass index	−0.004	−0.046	−0.006			
Smoking status	−0.006	−0.070	−0.008			
Base diastolic BP	0.753	9.423**	0.753			
Step 2: ED	−0.105	−1.138	−0.271	0.763	0.537	0.013
JHAC	0.012	0.132	−0.134			
NOR	0.086	1.021	−0.140			
Step 3: ED × NOR	−0.013	−0.142	−0.018	0.776	0.538	0.019
JHAC × NOR	−0.200	−1.479	−0.185			
JHAC × ED	0.091	0.697	0.088			
Step 4: JHAC × ED × NOR	0.155	1.196	0.151	0.782	0.541	0.009
Pre-anger recall						
Step 1: Age	0.023	0.350	0.042	0.855	0.716	0.732**
Body mass index	−0.010	−0.152	−0.018			
Smoking status	0.033	0.492	0.060			
Base diastolic BP	0.852	13.506**	0.853			
Step 2: ED	−0.082	−1.137	−0.140	0.861	0.714	0.010
JHAC	−0.006	−0.088	−0.011			
NOR	0.083	1.265	0.155			
Step 3: ED × NOR	−0.093	−1.285	−0.161	0.867	0.711	0.010
JHAC × NOR	−0.026	−0.239	−0.030			
JHAC × ED	0.032	0.366	0.039			
Step 4: JHAC × ED × NOR	0.176	1.739	0.217	0.873	0.720	0.012

(continued)

Table 7. (continued)

Variable	Std. Beta	*t*	Partial *R*	*R*	Adj. R^2	R^2 change
Anger recall talk						
Step 1: Age	−0.020	−0.228	−0.028	0.732	0.509	0.536**
Body mass index	−0.029	−0.351	−0.043			
Smoking status	0.043	0.485	0.059			
Base diastolic BP	0.730	8.800**	0.730			
Step 2: ED	−0.217	−2.370+	−0.282	0.766	0.543	0.051
JHAC	−0.037	−0.425	−0.053			
NOR	0.153	1.836	0.222			
Step 3: ED × NOR	0.075	0.591	−0.232	0.792	0.567	0.040
JHAC × NOR	−0.246	−1.880	−0.040			
JHAC × ED	−0.075	−0.851	−0.297			
Step 4: JHAC × ED × NOR	0.338	2.826**	0.340	0.819	0.611	0.043*
Post-anger recall recovery						
Step 1: Age	−0.026	−0.343	−0.042	0.808	0.632	0.653**
Body mass index	−0.038	−0.530	−0.064			
Smoking status	0.081	1.067	0.128			
Base diastolic BP	0.801	11.154**	0.804			
Step 2: ED	−0.149	−1.836	−0.222	0.820	0.638	0.020
JHAC	−0.036	−0.486	−0.060			
NOR	0.053	0.722	0.089			
Step 3: ED × NOR	0.566	1.045	0.132	0.833	0.645	0.021
JHAC × NOR	0.400	0.579	0.073			
JHAC × ED	−0.311	−0.302	−0.038			
Step 4: JHAC × ED × NOR	−9.705	−2.075*	−0.257	0.854	0.681	0.035*

Note. BP = blood pressure; JHAC = John Henryism Scale of Active Coping; NOR= Non-Organizational Religiosity; ED= Education; partial *R* = partial correlation.
[a]*df*: Step 1 = 4, 68; Step 2 = 3, 65; Step 3 = 3, 62; Step 4 = 1, 61.
*$p < .01$. **$p < .001$. +$p < .05$.

The unexpected trend where more prayer predicted elevated BP responses to anger recall for low JHAC and low educated men are intriguing as well. Perhaps a sense of lack of control linked with low education limits the CV impact of prayer for low JHAC men. On the other hand, perhaps prayer means something different for this JHAC by education subgroup (e.g., passive acceptance of higher power vs. an enhanced sense of personal empowerment; Hayward et al., 2017).

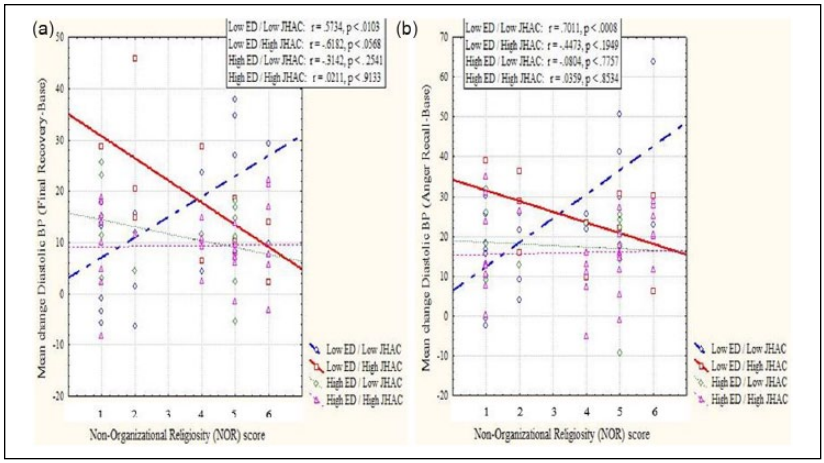

Figure 3. Period by education (ED) by John Henryism active coping (JHAC) by Non-Organizational Religiosity (NOR) effects on mean change diastolic blood pressure (BP) for (a) Final Recovery-Baseline and (b) Anger Recall-Baseline change score.
Note. NOR are represented by: 1 = Rarely or never, 2 = A few times a month, 3 = Once a week, 4 = ≥ 2 times a week, 5 = Daily, 6 = More than once a day.
Fisher's *z* difference test for the two NOR and mean Rest 3 change diastolic BP correlation coefficients at low education (Fisher's Z_{diff} = 3.03; p = .0024).
Fisher's *z* difference test for the two NOR and mean Rest 3 change diastolic BP correlation coefficients at high JHAC (Fisher's Z_{diff} = 1.75; p = .0801).
Fisher's *z* difference test for the two NOR and mean Anger Recall change diastolic BP correlation coefficients at low education (Fisher's Z_{diff} = 2.98; p = .0029).
Fisher's *z* difference test for the two NOR and mean Anger Recall change diastolic BP correlation coefficients at high JHAC (Fisher's Z_{diff} = 1.21; p = .2273).

Of note, neither SUB nor ORG play equally protective roles. Perhaps the intrinsic aspects of private religious activity link with deeper engagement in spiritual flow than the superficial elements of religious belief or attendance (Koenig & Büssing, 2010). More qualitative research will offer novel mechanisms for these disparate moderating effects of religiosity for African American men.

The study only included African American men to examine the unique role that specific psychosocial factors have had for their CV health in past studies (Merritt et al., 2004; Sherwood et al., 2017; Treiber et al., 2001). Future studies will examine the moderating role of religiosity in the links of education, JHAC, and CV stress responses among ethnically diverse men and women. As well, explore more integrative measures of SES (e.g., life course; Walsemann et al., 2016) for further assessment of the JHAC hypothesis.

Future interventions in stress reduction and BP control for diverse groups is moving toward tailored care in church-based settings (Baruth et al., 2011; L. B. Williams et al., 2016). For instance, Merritt, Zawadzki, Di Paolo, Johnson, and Ayazi (2017) found among young adults that more distraction associated with self-selected leisure activities (i.e., preferred activities like jogging or prayer done to escape from daily stress and/or to keep daily routine) is linked with less depressive symptoms and better subjective sleep quality at higher levels of JHAC. Thus, as prayer could represent an SSLA, perhaps a more tailored intervention for the high JHAC and low education risk group is required.

Also, future studies could refine the JHAC construct so that we can better resolve what specific underlying psychosocial factors may explain its role in CV health disparities. Next, future studies will use more qualitative methods like ambulatory assessments and interviews to uncover unique aspects of religiosity that may buffer the JHAC hypothesis.

Overall, we have novel evidence for how religiosity moderates the roles of JHAC and education in elevated CV reactivity to anger recall for African American men. These findings extend both the JHAC and religiosity and health literatures and thus offer new and exciting ideas for reducing existing CV health disparities.

Authors' Note

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