Perceived Control Predicts Pulse Pressure in African American Men: The Baltimore Study of Black Aging

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Objective: Poorer health profiles among African American men throughout the life course evince greater rates of cardiovascular disease (CVD) and significantly earlier mortality compared with other groups. Despite growing emphasis on identifying how psychosocial factors influence disparate disease risk, little of this research has focused intently on African American men.

Methodology: Using hierarchical linear regression, we explored the additive influence of stress, depression, and perceived control on pulse pressure, an established marker of CVD risk, in a sample (N = 153) of African American men (mean age = 66.73 ± 9.29) from the Baltimore Study of Black Aging (BSBA).

Results: After accounting for age and health status indicators, perceived control emerged as a significant predictor of pulse pressure.

Discussion: These findings suggest that greater belief in one's own efficacy is a protective factor for cardiovascular health among African American men. Future research should examine whether enhancing perceived control can have an appreciable impact on the immense CVD burden in this and other at-risk populations. *Ethn Dis*. 2015;25(3):263-270.

Key Words: Perceived Control, Pulse Pressure, Cardiovascular Risk, African American Men

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Introduction

Poorer health profiles among African American men throughout the life course evince greater rates of chronic disease and significantly earlier mortality compared with other groups.[1] In 2010 the average life expectancy at birth in the United States was 78.7 years; however, average life expectancy for African American men was 71.8 years, the lowest among all groups examined.[2] Cardiovascular disease (CVD) disparities play a significant role in ethnic differences in overall mortality and CVD is the leading cause of death in African American men.[2-4] While racial/ethnic disparities in CVD risk, prevalence, and mortality are well-documented, less attention has been paid to the specific risk factors that may differentially impact African American men.

Hypertension is the most prevalent form of CVD in African American men, who are also more likely to have poorly controlled hypertension compared with men of other racial/ethnic backgrounds.[4] Research indicates that the pathophysiological vascular changes that precede hypertension begin as early as childhood.[5] For example, evidence of vascular dysfunction has been documented in adolescent African American males as young as 10 years old.[6] A number of studies have also shown altered vascular activity in young adult African American men.[7] In middle-age and beyond, changes in cardiac structure and function may further enhance vascular risk for African American men. Notably, several studies have reported greater arterial stiffness in African American, and among African American men.[8,9] Increased arterial stiffness reflects greater rigidity, or hardening, of the large central arteries (ie, the aorta) and is a significant predictor of future cardiovascular events as well as cardiovascular and all-cause mortality.[10,11] Pulse pressure, obtained by subtracting diastolic (DBP) from systolic (SBP) blood pressure, is a surrogate indicator of arterial stiffness that increases normally with age.[10-12] Importantly, African American men have been shown to exhibit greater pulse pressure relative to other groups.[13] Research further indicates that African Americans develop arterial stiffness at earlier ages and that psychosocial factors may play a role.[8,9,13,14]

Despite the emphasis on identifying how stressors contribute to health disparities, comparatively little research has focused on how psycho-

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social factors relate to mechanisms of CVD risk that uniquely afflict African American men. For instance, African American men often have lower socioeconomic status (SES) and socioeconomic factors including education and income have been linked to greater arterial stiffness.[1,15] African American men are also affected by other psychosocial stressors that contribute to poor health outcomes. Stress and depression are two of the most common indicators of psychosocial distress linked to increased CVD risk.[16] These factors have also been shown to mediate the effects of discrimination on health in African Americans.[17] Evidence further suggests that African American men with a mood or anxiety disorder are at an increased risk for multiple health conditions, including hypertension.[18] Greater depressive symptoms have also been associated with both greater inflammation and increased odds of having hypertension in African American men.[19] Although it remains to be determined whether these factors are associated with arterial stiffness in African American men, depression has been linked to arterial stiffness in clinical populations.[11]

Previous research has identified a sense of mastery, as one of several social determinants of depression among African American men.[20] Mastery has also been conceptualized as perceived control, or belief in one's ability/or inability to change or control events in one's environment.[20-22] Historically, African Americans have been conceptualized as having lower levels of perceived control due to factors including lower SES and persistent discrimination.[21-22] Contemporary research, however, is inconsistent with this notion. Notably, it was recently shown that a greater sense of control was associated with a more favorable health profile in African American adults.[23] Other research has indicated that a greater sense of mastery is protective of mental health throughout the life course in African American men.[20] These data raise the possibility that perceived control may be a beneficial psychosocial factor for cardiovascular health among African American men.

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Few studies have examined the impact of psychosocial factors on arterial stiffness among African Americans, or have focused on this relationship exclusively in African American men. Given their greater vascular risk profile, the goal in our study was to examine the impact of psychosocial distress on pulse pressure in a community-based sample of middle-aged and older African American men. We hypothesized that greater psychosocial stress and depression would predict higher pulse pressure. Although much of the focus in biobehavioral research has been on psychosocial *risk* factors, it is equally important to identify *protective* factors, which may buffer African American men against adverse health outcomes. Thus, we also hypothesized that greater perceived control would predict lower pulse pressure.

Methods

The data for this work were derived from the Baltimore Study of Black Aging - Patterns of Cognitive Aging (BSBA-PCA), which was established to examine interrelationships among cognitive functioning, and indices of mental and physical health in an urban-dwelling population of African Americans from diverse educational backgrounds. Detailed methods for recruitment, sampling, and data collection have been described previously.[24] Participants completed a battery of cognitive tests as well as measures that assessed demographic and other health-related factors. The testing session lasted approximately two and a half hours. Data collection took place between 2006 and 2008. Our sample consisted of 602 participants aged ≥48 years, recruited from 29 predominantly African American senior apartment complexes in Baltimore, Md. After women were excluded, 153 middle-aged and older African American men were available for analysis. The BSBA-PCA study was approved by the Duke University Institutional Review Board.

Measures

Blood pressure was assessed as part of the BSBA protocol. Three measurements were taken using an oscillometric automated device (A

& D model UA-767; Milpitas, California) while the participant was seated. After SBP and DBP were averaged over the three measurements, pulse pressure was determined as the mean SBP minus the mean DBP.

We examined two measures commonly characterized to indicate psychosocial distress: 1) the Perceived Stress Scale (PSS); and 2) the Centers for Epidemiological Studies-Depression Scale (CES-D) and one measure assessing perceived sense of control: the Perceived Control Scale (PC).

The PSS is a global measure of the degree to which situations in one's life are appraised as unpredictable, uncontrollable, and overwhelming. Response options are 0 = Never to 4 = Very Often, and when scored, the 7 positively stated items are reverse-coded. A summary score is obtained by summing all items.[25]

Depression was assessed using the CES-D, a 20-item self-report scale that measures depressive symptomatology in the general population. Responses are scored 0 = Rarely or None of the Time to 3 = Most or Almost All the Time. The CES-D has high internal consistency with Cronbach's alpha ranging from .85 to .90.[26]

Perceived control was assessed using a 12-item measure originally developed for use in the Midlife in the United States (MIDUS) study.[21] The PC is based on two domains: *personal mastery*, which references an individual's sense of efficacy in reaching their goals and *perceived constraints*, which characterizes beliefs that desired goals are hindered by external factors outside of one's control. Responses are scored 1 = Strongly Agree to 7 = Strongly Disagree. Items on the personal mastery scale are reverse-scored and summed with the perceived constraints items to produce the PC total score. Cronbach's alpha in our sample was .86.

Demographic, socioeconomic and health status data were collected via self-report during the interview. Age was included in all analyses as it is a significant determinant of pulse pressure, especially after age 60.[10-11] SES has also been related to pulse pressure.[13] Education, measured as number of years of schooling completed and current monthly income, coded continuously in ranges of $100 increments (ie, 1 = $100 - $200), were selected as indicators of SES. In previous research, pulse pressure has been linked to both cognitive and physical functioning.[12,27] Thus, we included measures of both cognitive and functional status as covariates in our analyses. *Cognitive status* was assessed with the Short Portable Mental Status Questionnaire (SPMSQ), a brief measure that assesses orientation, memory function and other domains related to the capacity for self-care.[28] *Functional limitations* were measured as a composite of basic activities of daily living (ADLs), which include activities such as bathing, toileting, dressing and eating.[29-30] The total number of tasks for which participants experienced no (coded as 0) or some (coded as 1) impairment was then calculated, resulting in an index of physical functioning with higher scores reflecting a greater number of functional limitations. *Cardiovascular history* was obtained via participants' self-reports of whether they had been previously diagnosed by a physician with hypertension, diabetes, stroke, heart attack, angina or circulation problems. Responses were coded in 1,0 (yes/no) format, and summed to create a composite index of CVD risk history.

Statistical Analysis

Means, standard deviations and bivariate correlations were calculated to describe the sample and to assess initial associations among pulse pressure, covariates and the focal predictors. Hierarchical regressions were run to determine linear relations between perceived stress, depression, perceived control and pulse pressure. Covariates were entered in two blocks: age and SES (ie, education and income) were first entered (model 1), cognitive status (SPSMQ), functional capacity (ADLs) and cardiovascular history were then entered (model 2). Next, perceived stress, depression and perceived control were entered sequentially (models 3–5). *P*-values that were <.05 were considered to be statistically significant. Analyses were conducted using SPSS version 22.0 software (SPSS, Inc. Chicago, IL).

Results

Descriptive statistics are presented in Table 1. Men in our sample ranged in age from 50-89 years and had an average of 11.26 ± 3.04 years of education. The sample was characterized by generally low levels of cognitive and functional impairment as indicated by total SPMSQ (M = 9.09, SD = 1.15) and ADL (M = 1.67, SD = 2.11) scores. Perceived stress and depression were strongly correlated (r = .73, P<.001); whereas, perceived control was inversely correlated with both

stress (r = -.39, P<.001) and depression (r = -.49, P<.001). As expected, pulse pressure was positively associated with age (r = .40, P<.001). Pulse pressure was not significantly related to either perceived stress (r = -.09, P=.13) or depression (r = -.04, P=.31), but was significantly associated with perceived control (r = -.22, P=.004).

Hierarchical regression results are displayed in Table 2. Age was the only significant predictor, (β = .90, *se* =.18, P<.001) in model 1 that overall accounted for 17% of the variance in pulse pressure. Cognitive status (SPSMQ), functional capacity (ADLs) and cardiovascular history were not significant but explained an additional 3% of the variance in model 2. Perceived stress was entered alone in model 3 but was not predictive of pulse pressure, (β = -.02, *se* =.17, P=.90) and explained no additional variance. Depression was entered in model 4 but was also not a significant predictor of pulse pressure, (β = -.03, *se* =.27, P=.91). Given the moderate correlations between perceived control with perceived stress and depression (Table 1), we retained these measures in testing the effects of perceived control. Perceived control significantly predicted an additional 3% of the variance in pulse pressure, (β = -.20, *se* =.18, P=.029).

Discussion

Despite a substantial decrease in death rates since the early 2000s, African American men continue to have the highest mortality rate in the United States. The poorer health profile among African American men represents a public health crisis and the majority of the risk for mortality in this group comes from CVD. There is accumulating evidence that psychosocial factors play a significant role in racial/ethnic CVD disparities.[31] Our analysis focused on African American men in the latter half of life, when the information value of pulse pressure as a marker of arterial stiffness and increased risk for CVD events may be greatest.[10]

Previous studies have found depression and other factors to be associated with greater arterial stiffness.[11,14] Yet, counter to our primary hypothesis, we did not find perceived stress or depression to be significant predictors of pulse pressure. Similar results have been reported by others. Notably, Lewis and colleagues also found non-significant effects for a composite psychosocial measure, which included depression, on arterial stiffness in older adults from the Health, Aging and Body Composition study. However, these researchers did find that another psychosocial factor, inadequate social support, was associated with greater arterial stiffness, but only among older African Americans.[14] Relatedly, we found that higher perceived control was associat-

Table 1. Sample descriptives and intercorrelations

Variable	Mean or %	SD	Range	1	2	3	4	5	6	7	8	9	10	11
N	153	-	-											
1. Age, yrs	66.80	9.18	50-89	-										
2. Education, yrs	11.26	3.04	4-20	-.12	-									
3. Median income, $	1000-1100	600.00	100-2300	.34[c]	.32[c]	-								
4. SPMSQ	9.09	1.15	1-10	.11	.23[c]	.07	-							
5. ADL	1.67	2.11	0-12	.13	-.05	.09	-.07	-						
6. CVD Hx	1.75	1.27	0-5	.07	.10	.02	.11	.29[c]	-					
7. PSS	18.27	10.29	0-46	-.36[c]	-.20[b]	-.25[c]	-.26[b]	.25[b]	.11	-				
8. CES-D	12.21	9.02	0-46	-.19[a]	-.27[b]	-.19[a]	-.15[a]	.42[c]	.08	.73[c]	-			
9. PC	46.59	10.00	21-70	-.12[a]	.28[b]	.09	.12	-.27[b]	-.10	-.39[c]	-.49[c]	-		
10. SBP, mm Hg	148.49	25.77	104-230	.85[a]	-.10	.01	-.07	-.03	.10	.01	.03	-.24[b]	-	
11. DBP, mm Hg	87.55	13.79	54-137	.17[b]	-.02	-.05	-.07	-.17[a]	-.05	.14	.11	-.12	.67[c]	-
12. PP, mm Hg	60.94	19.61	26-116	.40[c]	-.12	.05	-.04	.09	.16[a]	-.09	-.04	-.22[b]	.85[c]	.17[a]

a. P<.05.
b. P<.01.
c. P<.001
SPSMQ, Short Portable Mental Status Questionnaire; ADL, Activities of Daily Living; PSS, Perceived Stress Scale; CES-D, Centers for Epidemiological Studies- Depression Scale; PC, Perceived Control.

Table 2. Perceived stress, depression and perceived control predicting pulse pressure

	Model 1	Model 2	Model 3	Model 4	Model 5
Predictors	B (SE) [β]	B (SE) [β]	B (SE) [β]	B (SE) [β]	B (SE) [β]
Age	.90 (.18) [.42][c]	.90 (.18) [.42][c]	.89 (.20) [.42][c]	.89 (.20) [.42][c]	.79 (.20) [.37][c]
Education	-.30 (.54) [-.05]	-.26 (.56) [-.04]	-.28 (.57) [-.04]	-.29 (.58) [-.05]	-.16 (.57) [-.03]
Income	-.23 (.27) [-.08]	-.23 (.27) [-.08]	-.23 (.27) [-.08]	-.23 (.27) [-.08]	-.21 (.27) [-.07]
SPSMQ		-1.58 (1.35) [-.09]	-1.61 (1.38) [-.10]	-1.6 (1.39) [-.09]	-1.51 (1.37) [-.09]
ADLS		-.10 (.75) [-.01]	-.07 (.78) [-.01]	-.04 (.84) [.00]	-.08 (.83) [-.01]
CVD Hx		2.38 (1.23) [.16]	2.40 (1.25) [.16]	2.39 (1.26) [.16]	2.27 (1.24) [.15]
PSS			-.02 (.17) [-.01]	-.01 (.23) [.00]	-.07 (.23) [-.04]
CES-D				-.03 (.27) [-.01]	-.19 (.27) [-.09]
PC					-.39 (.18) [-.20][a]
R^2	.17[c]	.20	.20	.20	.23[a]
ΔR^2	.17[c]	.03	.00	.00	.03[a]

a. $P<.05$.
b. $P<.01$.
c. $P<.001$.
SPSMQ, Short Portable Mental Status Questionnaire; ADL, Activities of Daily Living; PSS, Perceived Stress Scale; CES-D, Centers for Epidemiological Studies- Depression Scale; PC, Perceived Control.

ed with lower pulse pressure. In considering that the inverse of this relationship, (ie, lower perceived control, higher pulse pressure) is also true, our results are at least partially consistent with this prior work. Overall, the limited nature of these collective findings, as well as the fact that most prior studies did not examine the influence of sex or psychosocial factors, further underscores the need for additional research on the impact of these factors on arterial stiffness and other markers of CVD risk in African Americans.

Age has previously been shown to be a significant predictor of pulse pressure in African Americans.[13] Researchers have indicated that pulse pressure is predictive of clinical outcomes in individuals age ≥50 years, independent of other blood pressure components.[10] Previous research has also noted that socioeconomic disadvantage accounts for some of the between-group ethnic difference in pulse pressure.[13] In particular, an analysis of data from NHANES III revealed an increasingly protective effect of income on pulse pressure, irrespective of age, sex, or ethnicity. Pulse pressure was also found to be highest among those with less than a high school education but also higher in individuals with a high school degree in comparison to those with more than a high school education. We included two common indicators of SES, education and income, but neither was predictive of pulse pressure among the men in our sample. It is notable that these indicators were inversely correlated with both stress and depression, but positively associated with perceived control. Interestingly, SES appears to have differential effects on risk for poor mental health in African American men. For instance, one study recently showed that African American males with an income ≥$80,000 had increased odds of depression compared with African American males with lower income. However, risk of a depressive episode over the past year was lower among African American men with 13 or more years of education, while lifetime odds were significantly greater among unemployed compared with employed African American males.[32] Thus, the effects of SES on physical health may also be more complex among African American men. Alternatively, though the mean and median level of education and income were not exceptionally high in our sample, it appears that these factors may be important to maintaining a greater sense of control in mid- and late-life in African American men.

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A large body of literature has shown that greater perceived control is an important factor for mental and physical health; however, perceived control remains an understudied construct in African Americans.[20,22]

Although typically associated with greater CVD risk, research has shown a positive association between John Henryism active coping and perceived control. Particularly, while correlated, these constructs were also found to have independent inverse associations with psychological distress in a multi-ethnic sample drawn from the National Comorbidity Survey.[33] John Henryism has been shown to be positively associated with both conscientiousness and extraversion.[34] Others have reported a similar association between extraversion and sense of control among African Americans.[35] Overall, these results indicate that personality factors may be a common substrate between perceived control and how individuals cope with various psychosocial stressors. Evidence further indicates that factors experienced during childhood have an impact on the sense of control later in life among African Americans. Using follow-up data from the African American Health cohort, researchers examined the impact of attending segregated schools on late life sense of control among African American adults. Compared with adults who attended desegregated schools, African Americans who completed at least half or more of their primary and secondary education under segregated conditions actually exhibited a higher sense of control. Additionally, across both groups, a greater sense of control was positively associated with a more favorable health profile including lower blood pressure and better lung function, grip strength and balance.[23] Perceived control has also been associated with better psychosocial and physical functioning among African Americans with chronic disease (ie, diabetes).[36] Taken collectively, these findings are consistent with the larger view that a greater sense of control is associated with better overall health. Our findings indicate that these salubrious effects are potentially cardio-protective, and may persist across the life course in African American men.

Limitations

There are some limitations of our study that are important to consider. First, our measure of arterial stiffness was based on data collected via an automated BP monitor. Pulse pressure derived from peripheral blood pressure may not be the most accurate indicator of arterial stiffness. However, central and peripheral blood pressure become more closely aligned in older individuals, which partially explains why both SBP and pulse pressure are stronger late-life predictors of adverse outcomes.[10]

In addition, our sample size was relatively small and also composed entirely of participants living in urban senior apartment communities. Men in our sample endorsed relatively few functional limitations, and 95% of our sample obtained two or fewer errors on the SPMSQ. In addition, the absence of significant findings for stress and depression may have been due to low levels of these factors in our sample. For instance, more than 70% of our community-based sample scored below the recommended CES-D cutoff score (ie, 16) that is proposed to reflect mild depressive symptomatology. In general, there are not cut-off scores for perceived stress; thus, interpreting the relative highness or lowness of any one individual's score is sample-dependent. In BSBA, the PSS was administered in interview format and scores were normally distributed, so it seems unlikely that non-response and under-reporting were significant factors. Collectively, these findings indicate that the men in our sample were generally healthy, possessed a relatively high degree of cognitive functioning, and did not experience very much distress. Thus, our findings may not generalize to younger samples, as many of the stressors that are most salient through young and middle adulthood (ie, parenting, work) are not as pertinent or impactful in later life, or to middle-aged and older African American men living in rural environments or those with significant cognitive or functional impairment.

Conclusions

The research presented here suggests that there are cardio-protective effects of having a greater sense of perceived control in older African American men. We focused on men in mid- and late-life, but acknowledge that the development of both risk and protective factors likely begins much earlier in the life course. With age, undoubtedly, comes some selection bias. Nonetheless, studying older African American men could be especially useful for future research on survival since, beyond the age of 65, they have, arguably, lived beyond their life expectancy. In our study, perceived control was a small but significant source of variance; as such, additional research is needed to: 1) examine

the relationship between perceived control and CVD risk factors in a more age-diverse context; and 2) determine whether enhancing perceived control may have an appreciable impact on reducing the CVD burden in this at-risk population.

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