JOHN HENRYISM AND BLOOD PRESSURE IN BLACK POPULATIONS: A REVIEW OF THE EVIDENCE

Sherman A. James, Professor of Epidemiology and Health Behavior/Health Education, University of Michigan

Peter E. Thomas, Doctoral Candidate, Department of Epidemiology, University of Michigan

Background

Investigators have known since the 12th century that socioeconomic status (SES) and health tend to be inversely correlated (Adler et al., 1994). That is, in a given community, persons in lower SES positions (typically measured by income, education, or occupation) are much more likely to become ill and die prematurely from a wide variety of causes than individuals in higher SES positions. African Americans, of course, are greatly over-represented in lower SES positions in U.S. society, relative to Whites (Oliver and Shapiro, 1997), and considerable evidence now implicates this relative socioeconomic deprivation as a fundamental cause of the large number of excess deaths observed yearly among African Americans (Williams and Collins, 1995). Much of this excess mortality among African Americans is due to cardiovascular disease (CVD) (Geronimus et al., 1996), more specifically to the devastating effects of hypertension on the heart and kidneys (Lopez et al., 1994; Cooper et al., 1997).

Black/White differences in nutrition, physical activity, and access to preventive medical care do not completely explain the racial differences in hypertension (Hall et al., 1985; Cooper et al., 1997) nor the inverse SES/blood pressure (BP) gradient usually observed for both racial groups (James, 1985). Because of the heightened exposure among Black Americans to racially motivated social and economic adversity (Williams, 1997), many epidemiologists continue to look for *psychosocial* explanations of Black Americans' heightened vulnerability to hypertension. The "John Henryism" hypothesis represents one approach to identifying psychosocial explanations of this disorder in African Americans. In this review, we summarize the evidence from a growing number of studies that have tested the John Henryism hypothesis in U.S. and non-U.S. Black populations.

The John Henryism Hypothesis

The construct of "John Henryism" derives from the well-known African American legend of John Henry, the "steel-driving" man, according to which the protagonist - John Henry - defeated a mechanical steel drill in an epic contest of "man against

machine." Immediately after his victory, however, John Henry dropped dead from complete exhaustion (Levine, 1977). The legend is therefore a critique of oppressive economic systems as well as a warning to the oppressed that the health costs of individually based prolonged struggles with adversity can be quite high. "John Henryism" is a synonym for such protracted individual struggles. It is also a behavioral predisposition that many African Americans seem to possess (James, 1994). See James et al. (1983, 1987, 1992) and James (1994) for more detailed accounts of the John Henryism hypothesis.

High-effort coping with adversity is known to be accompanied by a strong activation of the sympathetic nervous system - for example, sharp increases in heart rate and systolic blood pressure (Light et al., 1995). If these hemodynamic processes are evoked repeatedly in response to daily stressors, over many years, a structural remodeling of the peripheral vasculature bed and a related permanent increase in resting BP could result (Fray, 1993). Hence, the well-known increased risk for hypertension in poor and working class African Americans could be due to their heightened exposure to social and economic adversity on the one hand and, on the other, to their strong behavioral predisposition to confront such adversity with determined, high-effort coping (i.e., John Henryism). This formulation suggests an *interaction* between SES and John Henryism on risk for hypertension. That is, in carefully designed studies with minimal selection bias the highest risk for hypertension should be seen among low SES individuals with high levels of John Henryism.

The John Henryism Scale

John Henryism is measured by a 12-item Likert scale, the John Henryism Scale for Active Coping (James, 1994). Scale items emphasize mental and physical vigor, a commitment to hard work, and a single-minded determination to succeed. Two sample items are: "Once I make up my mind to do something, I stay with it until the job is completely done"; and "When things don't go the way I want them to, that just makes me work even harder." Responses to each item can range from "completely true" (score =5) to "completely false" (score = 1), with affirmative answers indicating high John Henryism. Total scale scores can range from a low of 12 to a high of 60.

Testing the Hypothesis

To test the John Henryism hypothesis, scale scores can be represented continuously or divided at the median to create low and high John Henryism subgroups. Similarly, conceptually meaningful categories of the SES measure can be created: < high school, high school, > high school, for education; and blue collar or white collar, for occupation. The hypothesized interaction is then tested by regressing mean BP values (linear regression) or hypertension status (logistic regression) on SES, John Henryism,

and the SES x John Henryism product term. Covariates like age and obesity should also be included in the models. While sex-specific models are recommended, data for men and women can be pooled if findings do not differ by gender.

To be included in this review, studies had to satisfy two criteria: (1) focus on the John Henryism hypothesis, as defined above; and (2) include data on persons of African heritage. Medline was employed to identify eligible studies published by August 30, 1999. The following keywords were used: blood pressure, Blacks, SES, stress, John Henryism, active coping. Nine studies met both selection criteria.

Findings

The summary table organizes the evidence chronologically and by authors, geographical location, study design/sampling strategy, demographic characteristics, SES measure employed, detection of SES main effects as well as SES by John Henryism interactions.

It should be noted that the three studies by James and colleagues (1983; 1987; 1992) involved community probability samples and focused on working age adults. These three studies were also conducted in a geographical region (eastern NC) well-known for its significantly elevated cardiovascular disease death rates (Gillum and Prineas, 1985).

Despite modest variations in choice of SES measures, the studies by James and colleagues provide support for the John Henryism hypothesis - at least in African Americans. The support was weaker in the 1992 study, however, because of a surprising U-shaped relationship between SES and psychological stress (James et al., 1992; Strogatz et al., 1997). Since psychological stress was also positively and significantly associated with BP in this particular study (Strogatz et al., 1997), its U-shaped relationship with SES attenuated the inverse SES/BP relationship along with the hypothesized SES by John Henryism interaction.

Wiist and Flack (1992) reported an inverse association between SES and BP in their cardiovascular screening work among church attendees in Oklahoma City, but they found no evidence for an SES by John Henryism interaction on BP. It is not clear how much the non-probability sampling strategy, and the generally older ages of study participants influenced these findings.

Using an ambulatory BP monitoring device, Light et al. (1995) studied on-the-job mean BP in relationship to SES and John Henryism in a convenience sample of Black women, White women, Black men, and White men employed in institutions located in the Research Triangle Park, North Carolina. Higher SES women had higher on-

the-job BP and the combination of high SES and High John Henryism was associated with the highest on-the-job BP for women (Blacks and Whites combined) and Blacks (women and men combined). Light et al. (1995) speculated that higher SES women and Blacks may experience higher levels of on-the-job stress due to the unique pressures associated with path-breaking, executive level jobs in work environments not previously characterized by racial and gender diversity in senior management positions. This speculation is consistent with the U-shaped relationship between SES and psychological stress reported by James et al. in their 1992 study and confirmed later, by Strogatz et al. (1997).

In a sample of Black and White children (ages 10-17) with a positive family history of hypertension, Wright et al. (1996) investigated resting BP and BP reactivity to laboratory stressors in relationship to family SES background and the children's scores on John Henryism. No interaction was observed between family SES and John Henryism on BP reactivity, but interactions were observed for resting SBP and DBP, as well as total peripheral resistance (TPR). Elevated TPR is the hemodynamic mechanism typically responsible for elevated BP in persons with so-called "essential " hypertension (Wright et al., 1996).

McKetney and Ragland (1996) found no support for the John Henryism hypothesis in the Coronary Risk in Young Adults (CARDIA) study. In 1985, CARDIA investigators recruited approximately five thousand Black and White men and women (ages 18-30) who resided in one of four large U.S. cities to participate in a long-term investigation of age-related precursors of heart disease. The four cities were Birmingham, AL; Minneapolis, MN; Chicago, IL; and Oakland, CA. Education, the SES measure used in CARDIA, was *positively* associated with BP at baseline in this youthful cohort. Reminiscent of the findings by Light et al. (1995), the combination of being a college graduate and scoring high on John Henryism was associated with *higher* BP. The role of psychological stress in accounting for the SES/John Henryism findings in CARDIA is unknown.

To our knowledge only one study has examined the John Henryism hypothesis among Africans. In Benin City, Nigeria, Markovic et al. (1998) assessed mean BP differences between higher and lower grade civil servants. Consistent with most reports on the relationship between SES and BP in developing countries (Cooper et al., 1997), higher grade civil servants in the Benin City study had higher mean BP's than lower grade workers. Perhaps even more interesting, however, the highest mean BP was observed for higher-grade workers who scored high on John Henryism. After Light et al. (1995), many of these higher grade Nigerian civil servants were probably path breakers in terms of having to carry out high pressure, managerial level jobs – in the face of chronic uncertainty. Repeated high-effort coping with such conditions could further augment sympathetic arousal.

Finally, in an intriguing study by Dressler and colleagues (1998) of African American men and women in Tuscaloosa, AL, education was inversely associated with BP but there was no evidence of an SES by John Henryism interaction. However, gender-specific associations were observed: high John Henryism was associated with higher mean BP among men and with lower mean BP among women. This is the first study to report such gender-specific effects. While it should be noted that Dressler et al. (1998) used attenuated response options (3 rather than 5) for the John Henryism scale items, their findings nevertheless underscore the need for more research on gender differences in the meaning of "high" and "low" John Henryism scores and how such differences might influence the predicted associations with BP.

Conclusions

It is clear from the foregoing discussion that research on how John Henryism influences the SES/BP gradient in persons of African ancestry is still in its infancy. Our review identified nine studies involving Black populations that were specifically designed to test the John Henryism hypothesis. Of these nine studies, three were conducted by the senior author of this paper. These three studies - all conducted in eastern NC - provide the most consistent support for the hypothesis as it was originally formulated. The remaining six studies reported intriguing variations on the hypothesized interactions. In several studies, for example, SES was positively - rather than inversely - associated with BP; and, in these cases, high John Henryism seemed to contribute to the positive association. Given the well-known *positive* association between SES and BP in countries undergoing rapid urbanization, including countries in Africa, the etiological significance of repetitive high-effort coping with novel job and other environmental stressors in these urbanizing societies deserves increased attention. Similarly, in the U.S., increased attention should be given to the health consequences of high John Henryism in higher SES Black Americans, especially among those who are energetically engaged in path-breaking managerial positions formerly denied Black Americans (James et al., 1992; Light et al., 1995). More research is also needed on possible gender differences in the SES/John Henryism interaction on BP. Finally, as the work by Wright et al. (1996) makes clear - research on the childhood origins of "high" John Henryism, especially in African Americans, is a topic ripe for some creative exploration.

ACKNOWLEDGEMENTS
The authors thank Dr. Arline Geronimus for her helpful comments on an earlier version of this paper.

Studies Examining the John Henryism Hypothesis in Black Populations

Authors	Study Design & Setting	Sample	SES measure	Research Question	Findings
James et al. 1983	eastern NC x-sectional probability sample	Black men ages 17-60 N=132	education (<HS, ≥HS)	inverse SES/BP? SES*JH interaction?	yes yes
James et al. 1987	eastern NC x-sectional probability sample	Blacks (50%) Whites (50%) ages 21-50 N=820	educ/occup Index (low, high)	inverse SES/BP? SES*JH interaction?	yes (Blacks) no (Whites) yes (Blacks) no (Whites)
James et al. 1992	eastern NC x-sectional probability sample	Blacks 66% F ages 25-50 N=1784	educ/occup Index (low, med, high)	inverse SES/BP? SES*JH interaction?	yes (weak) yes[1] (weak)
Wiist & Flack 1992	Oklahoma City, OK x-sectional convenience sample	Blacks 66% F 21-89 yrs N=625	educ/occup Index (low, high)	inverse SES/BP? SES*JH interaction?	yes no
Light et al. 1995	Research Triangle, NC x-sectional convenience sample	Blacks (48%) Whites (52%) 50% F ages 18-49 N=143	occupation (low, high)	inverse SES/BP? (ambulatory work BP) SES*JH interaction? (ambulatory work BP)	no, direct[2] (women) high SES & high JH associated with *higher* BP (women & Blacks[3])

[1] For hypertension, p value for interaction term =0.08.
[2] Women in higher status jobs had higher work time ambulatory BP's
[3] Findings apply to all women (Black and White) and all Blacks (women and men)

Studies Examining the John Henryism Hypothesis in Black Populations, cont.

Authors	Study Design & Setting	Sample	SES measure	Research Question	Findings
Wright et al. 1996	Augusta, GA x-sectional convenience sample	Blacks (53%) Whites (47%) 43% F ages 10-17 N=173	parents' educ (<HS, ≥HS)	inverse SES/BP?	yes
				SES*JH interaction?	yes (pooled data)
McKetney & Ragland 1996	CARDIA 4 large cities x-sectional probability sample	Blacks (52%) Whites (48%) 53% F ages 18-30 N=4986	education (<HS, HS, coll)	inverse SES/BP?	no, direct[4]
				SES*JH interaction?	high SES & high JH associated with *higher* DBP (pooled data)
Markovic et al., 1997	Benin City Nigeria x-sectional convenience sample	Blacks 39% F ages 20-65 N=658	occupation (low, high)	inverse SES/BP?	no, direct[4]
				SES*JH interaction?	high SES & high JH associated with *higher* BP
Dressler et al., 1998	Tuscaloosa, AL x-sectional probability sample	Blacks 60% F ages 25-65 N=600	education (mean yrs)	inverse SES/BP?	yes
				SES*JH interaction?	no
				Gender*JH interaction?	yes (positive, M; inverse, F)

[4] Direct associations between SES and BP are common in developing countries but uncommon in industialized countries

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