John Henryism, Socioeconomic Position, and Blood Pressure in a Multi-Ethnic Urban Community

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Objectives: The John Henryism (JH) hypothesis suggests that, under adverse social and economic conditions, high-effort coping styles that reflect hard work and determination may contribute to elevated blood pressure. Results from tests of this hypothesis have been mixed, with variations by region, urban versus rural areas, race, gender, and age. The majority of studies reporting that socioeconomic position modifies associations between JH and blood pressure have been for non-Latino Blacks in rural communities. In contrast, most studies conducted in urban areas report little support for the JH hypothesis. Few studies have been conducted in samples that include Latinos. We extend previous research by testing the JH hypothesis in a multi-ethnic, low-to-moderate income urban community.

Design: We used multivariate linear regression to test the hypothesis that associations between JH and blood pressure were modified by income, education, or labor force status in a multi-ethnic (non-Latino Black, Latino, non-Latino White) sample (N=703) in Detroit, Michigan. The outcome measures were systolic (SBP) and diastolic blood pressure (DBP).

Results: John Henryism was associated with higher SBP (β=3.92, P=.05), but not DBP (β=1.85, P=.13). These associations did not differ by income, education, or labor force status. Results did not differ by race or ethnicity.

Conclusions: John Henryism is positively associated with SBP in this multi-ethnic, low-to-moderate income sample. This association did not differ by income, education, or labor force status. Results are consistent with studies conducted in urban communities, finding limited evidence that associations between JH and blood pressure vary by socioeconomic position. (*Ethn Dis*. 2015; 25[1]:24–30)

Key Words: John Henryism, Blood Pressure, Socioeconomic Status, Race, Ethnicity, Latino, Hispanic, African American, non-Latino Black, Health Inequities

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Introduction

Latinos and non-Latino Blacks (NLBs) in the United States are disproportionately likely to reside in urban areas characterized by social and economic disadvantage.[1] Residents of such areas experience excess morbidity and mortality,[2] and a substantial portion of that excess mortality is attributable to cardiovascular disease (CVD).[3] Socioeconomic position (SEP) and labor force status are associated with high blood pressure (HBP), a risk factor for CVD.[4–6] Adverse social and economic conditions may be associated with increased HBP and CVD risk through chronic activation of the stress-response system, which may dysregulate neuroendocrine functions.[7] Responses to stressful social and economic conditions may take many forms such as active efforts to respond to, and cope with, those adverse conditions. In an effort to understand excess CVD risk among non-Latino Blacks (NLBs) in the southeastern United States (US), James conceptualized John Henryism (JH) as a predisposition toward prolonged, high-effort coping in response to environmental challenges.[8] The JH hypothesis posits that JH may promote health among persons with adequate resources. However, under conditions of social or economic disadvantage, prolonged high-effort coping may be associated with chronic activation of the stress-related physiologic system, with long term effects contributing to HBP inequities.[8] As described below, the majority of the JH literature emerges from the southeastern US and has focused primarily on NLBs and non-Latino Whites (NLWs). Few studies have examined the JH hypothesis in samples that include Latinos. In this article, we extend the existing literature by examining the JH hypothesis in a sample of low-to-moderate income non-Latino Blacks, Latinos, and non-Latino Whites residing in Detroit, Michigan.

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Background

Results from tests of the hypothesis that JH may be associated with poorer health under conditions of social and economic adversity have been mixed. The literature finding support for the JH hypothesis predominantly pertains to blood pressure patterns among NLBs and emerges from the southeastern US, particularly rural regions. In North Carolina, studies indicate that NLBs with above-average JH and lower SEP had higher systolic (SBP) and diastolic blood pressure (DBP) and higher odds of HBP relative to their higher SEP

counterparts.[9–12] James and colleagues found no evidence that SEP modified these associations for NLWs.[13] In Jackson, Miss., Subramanyam and colleagues found that among NLBs, men with above-average JH and low SEP had higher HBP risk relative to those with high SEP.[14] These findings are consistent with the hypothesis that socioeconomic disadvantage is associated with elevated blood pressure among persons with high JH.

In contrast, several studies conducted in urban communities report findings that are inconsistent with the JH hypothesis. In the CARDIA study of young NLB and NLW adults in five US cities, McKetney and colleagues were unable to reject the null hypothesis that the association between JH and blood pressure did not vary by education.[15] The low HBP prevalence among this younger sample may contribute to these findings.[15] In addition, Fernander and colleagues found that among NLBs in Miami-Dade County, Fl., above-average JH was associated with higher SBP and DBP for NLB men of *higher* SEP, while among NLB women this association held only for those with *lower* SEP.[16] Contrary to their findings for NLB men, Subramanyam and colleagues reported that, among NLB women in Jackson, Miss., women with lower SEP and below-average JH had higher HBP risk than women with above-average JH.[14] This mixed evidence suggests that associations between JH, SEP, and blood pressure may be complex, with the patterns that emerge in urban areas differing somewhat from those reported in rural North Carolina communities and, also vary by race. Complex associations reported by Subramanyam and Fernander suggest that patterns in southeastern cities may differ from those reported in rural regions of the southeast and northern cities. These findings indicate a need to enhance understandings of associations between JH, SEP, and blood pressure across a variety of contexts.

To date, no studies have examined the JH hypothesis for blood pressure in samples that include substantial proportions of Latinos and few have examined the JH hypothesis in a post-industrial midwestern US city. As industry has declined, many midwestern US urban areas have experienced economic disinvestment, declining populations, increasing poverty rates, poorer educational systems, and fewer employment opportunities.[2,17–19] From 1975 to 1995, Detroit lost one-third of its population and experienced a two-fold increase in the poverty rate,[17] with continued population loss and rising poverty rates reflected in the 2010 Census.[20] These conditions contribute to concentration of a constellation of stressors, including poverty and unemployment/underemployment, which may adversely affect the health of Detroit residents. Given this mixed evidence, the aim of this study was to examine the effects of socioeconomic and occupational factors on associations between JH and blood pressure. Our research questions are informed by the JH hypothesis and supporting evidence,[9–12] notably that among those who experience social or economic disadvantage, positive associations between JH and blood pressure may be exacerbated. We examined three research questions. First, we examined the association between JH and blood pressure, hypothesizing that above-average JH would be associated with elevated blood pressure. Second, we tested whether the association between JH and blood pressure varied by SEP within a multi-ethnic urban sample to determine whether above-average JH was associated with higher blood pressure when accompanied by socioeconomic disadvantage. Third, we examined whether the association between JH and blood pressure varied by labor force status. We hypothesized that above-average JH would be more strongly associated with higher blood pressure among those not in the labor force. Given evidence suggesting differences in the association between JH and blood pressure by sex, age, and race, and the dearth of evidence related to Latinos, we conducted sensitivity tests on each of these dimensions.

METHODS

Sample

The Healthy Environments Partnership (HEP) is a community-based participatory research project that examines the influence of the social and physical environment on CVD risk among residents of Detroit, Michigan.[21] The 2002 HEP Community Survey was a stratified, two-stage probability sample of occupied housing units in three areas of Detroit designed to sample Latino, NLB, and NLW residents aged ≥25 years across socioeconomic strata in each study area. The final sample consisted of 919 face-to-face interviews.[21] Following James, the analytic sample was restricted to persons who were not taking HBP medication at the time of interview (N=703).[10] This restriction was made because the association between JH and blood pressure may be dampened by HBP treatment and to avoid confounding of associations between HBP treatment and SEP, a key explanatory variable.

Final weights were obtained from two components: probability and post-stratification. Weights were created to ensure appropriate representation of racial and ethnic groups across SEP, and were applied to adjust for probabilities of selection within strata, non-response bias, and to match the sample to Census 2000 population distributions of the study communities.[21] Though the proportion of missing data was low, we used multiple imputation procedures derived from Bayesian models[22] to impute missing values using the %IMPUTE routine (IVEWare, Ann Arbor, MI) in SAS v9.3 (SAS Institute, Cary, NC). Multiple imputation al-

lowed us to use the complete case approach and thus to obtain robust standard error estimates when using the complex sampling design.[23,24]

Measures

Outcome Variable

Interviewers used a portable cuff device (Omron model HEM 711AC) that passed Association for the Advancement of Medical Instrumentation Standards to collect three measures of blood pressure during the interview.[25] Systolic blood pressure and DBP were calculated as the mean of the second and third blood pressure assessments.

Independent Variable

John Henryism is measured by the 12-item John Henryism Active Coping Scale,[9] which captures three dimensions: ''efficacious mental and physical vigor, a commitment to hard work, and a single-minded determination to succeed'' (p. 666).[13] Example items include ''When things don't go the way I want them to, that just makes me work even harder'' and ''Hard work has really helped me to get ahead in life.'' Response options ranged from completely true (1) to completely false (4). Responses were reverse-coded, and JH was calculated as the mean of 12 items with a high score indicating high JH (Cronbach's alpha= 0.65). While some studies have used a continuous JH variable,[10] others have created a binary variable based on a median split of scores to convey the effect of having above-average JH.[8,9,11,13–15] The distribution of mean JH scores was positively skewed and traditional transformations of the variable did not address this skew nor the long tails in the distribution.[26] Therefore, consistent with James and colleagues,[9,11,13,14] we created a dichotomous variable classifying individuals above the median (3.5) as having above-average JH, and those at or below the median as having average or below-average JH. We also conducted tests using a continuous, mean-centered JH variable.

Moderator Variables

SEP indicators included household income and educational attainment. The poverty-to-income ratio (PIR) assesses self-reported household income relative to the federal poverty level for the respective year, accounting for household size.[27] A dichotomous version of this variable was used, with PIR>1 indicating household income greater than poverty level and PIR $\leq$1 (referent) indicating household income at or below the poverty level. Educational attainment was dichotomized to at least a high school education/GED and less than a high school education (referent). Labor force status was a dichotomous measure consistent with the Census definition: in the labor force (currently working for pay, temporarily laid off, or looking for work) and not in the labor force (referent; not temporarily laid off and/or not looking for work, and not working for pay).[28] We also tested a three-category variable: currently working (referent), involuntarily unemployed, and voluntarily unemployed, to assess sensitivity.

Covariates

Covariates included self-reported race, ethnicity, age, and sex; and clinical indicators of chronic disease. Applying racial and ethnic definitions that accorded with Census 2000 definitions, participants were coded as NLW, NLB (referent), or Latino (regardless of racial group). Age, measured in years, was derived from the participant's date of birth, then divided into four categories: aged 25–34, 35–44, 45–59, and $\geq$60. Clinical indicators of chronic disease included glucose, total cholesterol, triglycerides, and high and low density lipid levels derived from fasting blood samples.

Analysis

Exploratory data analysis techniques were used to assess the distribution of the dependent variable and to determine how to include predictors in the models. For the first hypothesis, that above-average JH is associated with higher blood pressure, we regressed SBP or DBP on JH, adjusting for covariates. To test the second hypothesis, that above-average JH is associated with higher blood pressure when accompanied by socioeconomic disadvantage, we regressed SBP or DBP on JH and SEP, controlling for covariates. Interaction terms for JH and household poverty, and JH and education, were then included in separate models. To test the hypothesis that above-average JH is more strongly associated with higher blood pressure for those not in the labor force, we regressed SBP or DBP on JH and labor force status, adjusting for covariates. The effect modification of labor force status on JH and blood pressure was then examined. We conducted sensitivity tests examining whether associations between JH and blood pressure varied by race, ethnicity, sex, and age.

RESULTS

Estimated population characteristics are presented in Table 1. Of the sample, 35.31% were aged 25–34 years, 30.09% were aged 35–44 years, 22.89% were aged 45–59 years, and 11.70% were aged $\geq$60 years. Half (49.96%) were female, 25.37% were Latino, 52.28% were NLB, 19.38% were NLW, 64.21% had a per capita household income above the poverty level, 63.89% had at least a high school education, 68.70% were in the labor force, and 43.95% had above-average JH. The mean SBP and DBP was 125.04 mm Hg and 78.14 mm Hg, respectively.

Results for tests of the associations between JH and SBP and DBP are shown in Tables 2 and 3, respectively. Model 1 suggests a positive association of JH with SBP (β=3.92; Table 2). A similar trend was visible for associations between JH and DBP (β=1.85; Table 3), but was

Table 1. Weighted descriptive statistics, 2002 (*N*=703)

Variable	Percent (%)	Mean (SE)
Sociodemographics		
Aged 25–34	35.31	
Aged 35–44	30.09	
Aged 45–59	22.89	
Aged 60+	11.70	
Female	49.96	
Latino	25.37	
Non-Latino Black	52.28	
Non-Latino White	19.38	
Household income above poverty	64.21	
High school graduate	63.89	
In labor force	68.70	
High John Henryism (>median)	43.95	
Health		
Systolic blood pressure (mm Hg)		125.04 (0.75)
Diastolic blood pressure (mm Hg)		78.14 (0.53)
Cholesterol (mg/dL)		196.66 (2.99)
Triglycerides (mg/dL)		189.24 (8.44)
HDL (mg/dL)		53.28 (0.91)
LDL (mg/dL)		110.67 (2.78)
Glucose (mg/dL)		114.75 (2.71)

not statistically significant. Table 2 shows associations between JH and SBP were not significantly modified by household poverty (β=1.68; Model 2), or by education (β=2.79; Model 3). In Table 3, associations between JH and DBP were not modified by household poverty (β= 0.10; Model 2) or education (β=1.47; Model 3).

Tests of the hypothesis that labor force status modified the association between JH and SBP (β=−1.44; Table 2, Model 4) and DBP (β= −1.39; Table 3, Model 4) were not statistically significant. Those with above-average JH who were in the labor force trended toward lower SBP and DBP compared to everyone else.

We also tested whether the association between JH and blood pressure varied by race, ethnicity, sex, and age (results not shown). We did not find significant effect modification of NLW race on the association between JH and SBP or DBP, or for the interaction of JH and Latino ethnicity on SBP or DBP. Male or female sex did not modify the association between JH and SBP or DBP. Among those with above-average JH, there was a marginally significant stronger association between JH and SBP among persons aged ≥60 years, compared to younger counterparts, but not for DBP.

Results for tests of robustness of findings, using continuous JH and household poverty variables, were comparable to those for categorical variables. However, using these variables in their continuous form was the least informative approach due to the variables' skewed nature.[26] Results were similar for the three-level labor force variable.

Table 2. Systolic blood pressure regressed on John Henryism, socioeconomic position, and labor force status (*N*=703)

Outcome: SBP	Model 1		Model 2		Model 3		Model 4	
N	703		703		703		703	
F	0.07		0.07		0.07		0.07	
R-Square	0.19		0.19		0.19		0.19	
	B	SE	B	SE	B	SE	B	SE
Intercept	119.87	4.04	120.26	4.09	120.54	4.13	119.54	4.05
Aged 35–44	2.94[a]	1.41	2.82[a]	1.36	2.81	1.42	3.00[a]	1.42
Aged 45–59	7.57[b]	1.88	7.56[b]	1.89	7.54[b]	1.87	7.58[b]	1.88
Aged 60+	17.30[b]	3.25	17.34[b]	3.25	17.26[b]	3.25	17.23[b]	3.20
Female	−8.47[b]	1.48	−8.46[b]	1.48	−8.55[b]	1.48	−8.51[b]	1.49
Latino	−2.63	1.47	−2.59	1.48	−2.56	1.44	−2.59	1.49
Non−Latino White	−0.34	2.02	−0.23	2.01	−0.13	1.92	−0.38	2.01
John Henryism	3.92[a]	1.62	2.86	2.57	2.17	2.44	4.90	2.80
Household income above poverty	−1.34	1.82	−2.10	2.01	−1.32	1.81	−1.36	1.82
High school graduate	−1.04	1.41	−1.01	1.38	−2.32	1.53	−1.06	1.39
In labor force	1.31	2.07	1.38	2.06	1.41	2.06	1.91	2.41
JH x household income above poverty			1.68	3.10				
JH x high school graduate					2.79	2.46		
JH x labor force							−1.44	3.12

Note: All models adjust for chronic disease. [a] $P<.10$; [b] $P<.01$.
SBP: Systolic blood pressure; SE: Standard error; JH: John Henryism.

Table 3. Diastolic blood pressure regressed on John Henryism, socioeconomic position, and labor force status (*N*=703)

Outcome: DBP	Model 1		Model 2		Model 3		Model 4	
N	703		703		703		703	
F	0.03		0.03		0.03		0.03	
R-Square	0.08		0.08		0.09		0.09	
	B	SE	B	SE	B	SE	B	SE
Intercept	74.63	3.21	74.66	3.14	74.98	3.23	74.32	3.26
Aged 35–44	3.10[b]	1.17	3.09[b]	1.18	3.03[b]	1.19	3.15[b]	1.17
Aged 45–59	5.13[c]	1.17	5.13[c]	1.18	5.11[c]	1.18	5.14[c]	1.16
Aged 60+	−0.91	2.05	−0.90	2.05	−0.93	2.06	−0.98	2.06
Female	−2.99[b]	1.05	−2.99[b]	1.05	−3.03[b]	1.06	−3.02[b]	1.05
Latino	−2.85[a]	1.36	−2.84[a]	1.36	−2.81[a]	1.34	−2.81[a]	1.37
Non−Latino White	0.26	1.46	0.27	1.47	0.37	1.43	0.22	1.45
John Henryism	1.85	1.03	1.78	1.56	0.93	1.57	2.80	1.95
Household income above poverty	−0.38	1.43	−0.43	1.55	−0.37	1.42	−0.41	1.45
High school graduate	−0.19	1.02	−0.19	1.02	−0.86	1.23	−0.21	1.01
In labor force	−0.37	1.53	−0.37	1.52	−0.32	1.52	0.20	1.85
JH x household income above poverty			0.10	2.15				
JH x high school graduate					1.47	2.02		
JH x in labor force							−1.39	2.49

Note: All models adjust for chronic disease. [a] $P<.10$; [b] $P<.05$; [c] $P<.01$.
DBP: Diastolic blood pressure; SE: Standard error; JH: John Henryism.

DISCUSSION

We used data from a multi-ethnic urban sample to test the hypothesis that JH may adversely affect health for those who encounter structural barriers to realizing socioeconomic benefits from their high-effort coping. In addition to testing this hypothesis for income and education, we also examined labor force participation as an effect modifier. Because previous studies suggested that these patterns vary by race, sex, and age, we conducted sensitivity tests for each of these variables. In this sample, above-average JH was associated with elevated SBP for all participants, regardless of SEP or labor force status. We did not find evidence to support the hypothesis that this association varied by household poverty, education, labor force status, race, ethnicity, or sex. We found a modest association with age: Those in the highest age category (aged ≥60 years) had a steeper association between JH and SBP compared to younger respondents. This may reflect enhanced vulnerability for elevated blood pressure later in life among those with a lifelong pattern of high-effort coping.

In this sample, above-average JH was associated with elevated SBP for all participants, regardless of SEP or labor force status.

Our finding of no statistically significant modification of associations between JH and blood pressure by SEP joins mixed findings in the literature. While several studies report evidence consistent with the hypothesized heightened adverse effects of JH on blood pressure for those experiencing socioeconomic adversity,[9–13] others do not.[15] Our finding of no effect modification by education is consistent with results reported by McKetney and colleagues.[15] The absence of effect modification by income or labor force participation in this sample, combined with mixed evidence from other studies, suggests that associations between JH, SEP, and blood pressure may be complex. Studies finding support for the JH hypothesis are largely from the Southeast, and largely from rural areas, while those finding less support are predominantly from urban areas. The associations between JH, SEP, and blood pressure may be shaped by the particular contexts within which they emerge. Since the 1950s, Detroit has experienced population out-migration,[29] demographic shifts, economic disinvestment, and economic restructuring that contributed to high poverty rates and residential segregation,[30] and, in turn, access to education and employment.[31] The areas of Detroit included in this sample and Detroit as a whole have lower SEP relative to the state and nation.[20,32,33] Subsequently, the more favorable socioeconomic categories in this study (e.g., above the poverty level, high school education or higher) may exert less of a health advantage for persons with above-average JH than might be observed in samples with greater variation in SEP and those with more participants who report higher incomes. To the extent that residents with greater education may not realize economic benefits of that education within a city with limited

employment opportunities, those benefits may be less visible in this sample than in other contexts. Also, while one's household income may exceed the poverty level, community SEP may influence the relationship between JH and blood pressure. For example, using data from the HEP sample, Schulz and colleagues found that neighborhood poverty was associated with cardiovascular and metabolic risk, above and beyond household poverty.[34] Potential effects of neighborhood SEP were not accounted for in this study, and may influence the relationship between JH, individual SEP, and blood pressure.

While some studies report racial differences in associations between JH and blood pressure,[13,35] our findings join others that have not found racial or ethnic differences.[36] The current study involved a multi-ethnic sample from a midwestern city that has experienced substantial economic disinvestment,[29] and whose residents live in neighborhoods with greater disadvantage than the nation.[20,33] Studies indicating that associations between JH and blood pressure vary by race emerge from rural areas in the Southeast. This mixed evidence may reflect social and economic patterns across contexts, and which may be visible in racial differences. Indeed, income inequalities between NLWs and NLBs vary across geographic regions.[37] Implications of these variations in social and economic opportunities across the country for variations in associations between JH and blood pressure should be explored. Future studies would be strengthened by the use of datasets with large samples to examine associations within racial, ethnic, and sex strata.

This study makes several contributions to the literature. The present study examined the JH hypothesis in a multi-ethnic urban sample of Latinos, NLBs, and NLWs. Few studies have tested the JH hypothesis for samples involving Latinos. Further, few studies have examined the JH hypothesis in a midwestern post-industrial city. Our findings suggest that, in the social and economic context of Detroit, high JH is associated with elevated SBP for all residents, regardless of SEP. It is feasible that under conditions of social and economic disadvantage, differences in associations between JH and blood pressure by income, education, or race in associations between JH and blood pressure are less marked, emerging more clearly under conditions where there is greater variation in social or economic conditions. Future studies examining the influence of neighborhood SEP on the relationship between JH and blood pressure may prove useful in understanding the effects of contextual factors on these associations.

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