

STRESS, COPING, AND HEALTH OUTCOMES AMONG AFRICAN-AMERICANS: A REVIEW OF THE JOHN HENRYISM HYPOTHESIS

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The John Henryism (JH) hypothesis argues that prolonged high-effort coping with chronic psychosocial stressors may be associated with elevated risk for negative health outcomes among those without sufficient socioeconomic resources. Early JH studies found a significant association between high JH, low socioeconomic status, and hypertension among African-Americans. More recently, these findings have been extended to a wide array of health status outcomes, including cardiovascular reactivity, neurohormonal secretion, and negative health behaviors. The present review provides a comprehensive overview of JHs conceptual bases and empirical support. Limitations of the construct are discussed and recommendations are made to guide future theoretical and research efforts in the area.

Keywords: John Henryism; Coping; Ethnicity; Stress; Socioeconomic status (SES)

Over the past 25 years, numerous investigations have sought to discern the etiological contributions of chronic stress and coping to the development of myriad chronic medical conditions, including hypertension and cardiovascular disease (CVD) (Anderson, 1998; James, 1987; Williams, 1992). Most have pursued the hypothesis that physiological dysfunction results from increased levels of perceived stress and/or the utilization of a coping disposition that fails to adequately buffer the impact of exposure to chronic stress. A number of theoretical constructs (i.e. type A, demand/control, effort–reward imbalance) have been advanced to elucidate this proposed association. However many such constructs, which have generally demonstrated predictive utility among Whites, have not been studied broadly among ethnic minority populations (Anderson, 1989), particularly African-Americans. In some cases, these constructs have demonstrated little or no utility with respect to the prediction of physiological outcomes among Blacks (Dressler, 1993; Thomas *et al.*, 1997). Thus, many have argued for the development and investigation of conceptual models that incorporate the social

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contextual experiences of African-Americans (James, 1994), a population that disproportionately suffers from many chronic medical conditions, including hypertension and CVD. As one of the very few empirically-tested constructs to theoretically integrate aspects of African-American's sociocultural experiences, the John Henryism (JH) hypothesis suggests that continuous and active engagement with chronic psychosocial stressors (i.e. occupational demands, discrimination, job insecurity) will promote sustained and dangerously elevated physiological reactions (i.e. elevated blood pressure, increased cardiovascular reactivity) that over time, may lead to hypertension and/or CVD.

The purpose of the current report is to review the conceptual bases and empirical support for the JH construct. It is our intention to present the wide breadth of JH research and to discern some of the inconsistencies in the construct's utilization. We will also present recommendations intended to guide research efforts in the area.

JOHN HENRYISM

The JH construct takes its name and is inspired in part by the legend of John Henry, the "steel driving man." According to the story (Williams, 1983), John Henry was an African-American railroad worker in the late 1800s whose fame emerged from his participation in a steel-driving contest in which he defeated a steam-powered drill. A close contest throughout, John Henry was forced to gather his great strength to overpower the mechanical drill, but died soon after his win from mental and physical fatigue. For James (1994), the fabled actions of John Henry served to illuminate the growing empirical literature describing the strong positive association between high-effort coping and elevated blood pressure (Harburg *et al.*, 1973).

For example, Harburg's (Harburg *et al.*, 1973) seminal investigation showed that compared to Whites, African-Americans living in high stress Detroit neighborhoods had higher mean blood pressure levels and increased hypertension prevalence compared to those living in low stress areas. This effect was greater for males and was limited to Black men under age 40. Harburg's findings suggested that coping in an active or high-effort manner might be associated with patterns of heightened sympathetic nervous system arousal, thereby leading to hypertension via dysregulation in cardiovascular control mechanisms.

Syme's (Syme, 1979) commentary on this and similar work suggested that the strong inverse association between socioeconomic status (SES) and hypertension typically observed in most American populations might be explained in part by the tendency of some in lower socioeconomic strata to utilize a prolonged, high-effort coping approach to manage their greater exposure to chronic psychosocial stressors. Because of their greater representation in low SES groups, this hypothesis was further advanced to explain Blacks' disproportionately high rates of hypertension and other cardiovascular conditions relative to European-Americans.

The John Henryism hypothesis (JHH) builds on Syme's commentary, positing that individuals of lower SES are more often exposed to chronic psychosocial stressors, that require a great deal of energy and attention to manage. These pervasive and unremitting psychosocial stressors may include financial difficulties, familial instability, discriminatory acts, exposure to violence, and limited access to quality health care (Adler and Ostrove, 1999). Not all individuals are expected to interact with their

stressors in a high-effort manner consistent with the JH construct. However, the JHH predicts that low SES individuals who utilize a high-effort coping approach account for a large proportion of the elevated levels of hypertension prevalence often found in the group. Put another way, the JHH predicts that the “inverse association between SES and blood pressure will be much more pronounced for individuals who score high on JH than for those who score low (James, 1994).”

More formally stated, JH is a “strong behavioral predisposition to cope actively with psychosocial environmental stressors (James, 1994).” The construct is characterized by three major themes: efficacious mental and physical vigor; a strong commitment to hard work; and a single-minded determination to succeed.

Empirical Support for the John Henryism Hypothesis

James' early cross-sectional investigations (James *et al.*, 1983, 1987, 1992) provided the initial empirical support for the JHH. The pilot study (James *et al.*, 1983) included a sample of 132 Black men, aged 17–60 years, who were members of a small, poor (only 1% earned over \$25,000 per year), and predominately Black community. Individual interviews were conducted to assess each subject's educational attainment, aspirations, medical problems, and health behaviors, and to gather information regarding each subject's social, religious, family, and work life. During the interview, three consecutive blood pressure measurements were taken. A median split was used to dichotomously characterize levels of both education and JH. Findings indicated that individuals who were high JH and low education had higher resting blood pressure than any other subgroup. Though these data were not statistically significant ($p < 0.10$), the trends suggested a need for more studies to both rectify and refine methodological concerns.

The JH construct was next tested in a sample of 820 African- and European-American men and women aged 21–50 years who resided in a rural county of North Carolina (James *et al.*, 1987). Because of ethnic differences in socioeconomic indicators, group-specific SES indices were created. Among Whites, those with less than 12 years of education, or those employed in blue collar jobs (Hollingshead scores 1–4) were assigned to the low SES group; while for Blacks, persons with less than nine years of education or those in lower blue collar jobs (Hollingshead scores 1–2) were considered low SES. Results showed that lower SES marginally ($p < 0.10$) predicted increased blood pressure for Black, but not for White participants. Similarly, there was no JH effect among White subjects. However, among high JH Blacks, those of low SES had a significantly higher levels of hypertension prevalence compared to higher SES participants (31.4 vs 11.5% respectively). At low JH, there was a small, nonsignificant difference between socioeconomic categories. This study was the first to test and demonstrate the apparent specificity of JH to African-American populations.

Because of the potential relevance to Blacks, James' group focused their next JH study (James *et al.*, 1992) on a much larger sample of African-Americans ($n = 1784$) aged 25–50 years. Though still from eastern North Carolina, the county utilized was more urbanized and contained a more economically diverse group of African-Americans. Three levels of SES were determined using a combination of educational attainment and the Hollingshead job prestige rating. Despite the greater representation of SES in the sample, neither the traditional inverse association between SES and hypertension, nor the JHH were supported.

Interestingly, a surprisingly high level of hypertension prevalence was found among high SES Blacks, which was accounted for by their higher levels of perceived stress. Higher levels of perceived stress in the group were found to account for the finding. To explain this counterintuitive outcome, the researchers advanced the intriguing hypothesis that when increased levels of perceived stress are found among those of low SES, the expected inverse association between SES and hypertension will be apparent. However, and as was the case in their study, when perceived stress is not inversely associated with SES, they postulated that there would be no inverse gradient between SES and hypertension (James *et al.*, 1992).

To test this suggestion and its modification by JH, the authors stratified the sample, such that only those with low SES and high levels of perceived stress, as well as those high SES subjects with low perceived stress levels were included. Consistent with their post hoc expectations, a significant inverse gradient between SES and hypertension prevalence was found among this stratified sample. When participants were further segmented into high and low JH groups, the JHH was supported. At low JH, there was little variation in hypertension prevalence by SES. However at high JH, hypertension prevalence was significantly higher among low SES participants (35%). These findings provide additional support for James' suggestion (1983) that the combination of high perceived stress and high-effort coping (rather than increased perceived stress alone) accounts in part for the high rates of hypertension found among those of low SES, particularly African-Americans.

Taken together, the early JH investigations demonstrated the empirical validity of the JHH among Southeastern African-Americans. These initial studies were notable for numerous reasons, including their ability to detect differences in cardiovascular outcomes among low SES African-Americans, a group whose heterogeneity has rarely been explored. They also demonstrated that JH was related (albeit sometimes counterintuitively) to a host of other variables including: life satisfaction, perceptions of good health, being married, having children, being employed, having a high-status, better paying job, and attending church frequently (James *et al.*, 1983). The nature of these JH correlates suggests that JH is not accompanied by uniformly negative life circumstances; rather, risk may be encountered among those whose social and socioeconomic resources are not adequate buffers.

Table I presents a list of published empirical investigations of the JHH. As is shown, a number of subsequent investigations similarly were shown to support the JHH. For example, Wright *et al.* (1996) demonstrated that high JH scores were associated with higher resting blood pressure, higher total peripheral resistance, and lower cardiac index among 173 healthy White and Black children (aged 10–17 years). There was also a significant interaction such that high JH subjects of low SES had the most adverse cardiovascular risk profile. Wist and Flack (1992) were unable to demonstrate an effect of the JHH on blood pressure, but did find that high JH, low SES participants were significantly more likely to have higher cholesterol levels (> 240 mg/dl).

A number of studies have failed to support either the JHH or an independent association between JH and health outcomes (Francis *et al.*, 1991; Jackson and Adams-Campbell, 1994; Nordby *et al.*, 1995; Scribner *et al.*, 1995; McKetney and Ragland, 1996; Markovic *et al.*, 1998; Adams *et al.*, 1999; Williams and Lawler, 2001). At first glance, these inconsistencies would appear to challenge the JHH. It must be noted however, that JH studies have been conducted among myriad populations and have examined a range of modifying factors and outcome variables.

Relatively few JH investigations (subsequent to James' early work) have been conducted in a population similar to that used by James – lower SES African-American populations in the Southeast (James *et al.*, 1983, 1984, 1987). JH has subsequently been investigated in a much wider range of subject populations, but few of the studies finding support for the JHH have been replicated. These methodological complications and empirical inconsistencies challenge interpretations of JHs external validity.

We will now attempt to highlight some of the empirical trends and methodological issues that may contribute to the inconsistent findings in JH research.

Methodological Approaches to the Study John Henryism

The Interactive Approach

There is mixed empirical consensus regarding the “interactive,” as opposed to the “independent” approach to examining the effects of JH. Of the nine published studies using the traditional JH \times SES interaction approach to measuring the health consequences of JH (James *et al.*, 1983, 1987, 1992; Duijkers *et al.*, 1988; Wist and Flack, 1992; Light *et al.*, 1995; McKetney and Ragland, 1996; Wright *et al.*, 1996; Markovic *et al.*, 1998), at least six have supported the notion that high JH and low SES interact to affect cardiovascular functioning (James *et al.*, 1983, 1987, 1992; Duijkers *et al.*, 1988; Wist and Flack, 1992; Light *et al.*, 1995). Another found a non-significant trend in the hypothesized direction (Markovic *et al.*, 1998).

However, closer inspection of these outcomes yields an interesting caveat. With the exception of James' work supporting the JHH in a Southeastern African-American population (James *et al.*, 1983, 1987, 1992), many of the remaining studies successfully implementing the traditional interactive approach deviate in some way from the traditional hypothesis. For example, Duijkers' (Duijkers *et al.*, 1988) study supported the JHH, but in a sample of Dutch men and women. Light (Light *et al.*, 1995) found higher ambulatory blood pressure levels among women with high JH and high (but not low) status occupations. Finally, Wist and Flack (1992) failed to support the JHH in relation to blood pressure in a sample of adult African-American men and women, but they did find that high JH and low SES predicted higher cholesterol levels after adjustment for traditional risk factors.

We hesitate to draw firm conclusions regarding the interactive approach because of the small number of studies and the relative demographic heterogeneity of the study samples. It is of some interest however, that with the exception of a Dutch study (Duijkers *et al.*, 1988), investigations successfully predicting adverse cardiovascular outcomes from the traditional JHH have largely been conducted among subjects drawn from the Southeastern United States, which may provide some support for the view (James, 1994; Dressler *et al.*, 1998) that sociocultural aspects of this region may be significantly implicated in the expression of JH.

The Independent Approach

Studies examining the independent effect of JH have yielded more balanced results. Approximately half of the studies utilizing this method have found a significant main effect of JH on outcomes including elevated blood pressure (James *et al.*, 1984; Somova *et al.*, 1995; Dressler *et al.*, 1998), health behaviors (Van Loon *et al.*, 2001),

TABLE I Published empirical studies of the John Henryism hypothesis

<i>Reference</i>	<i>Sample</i>	<i>Dependent variable</i>	<i>Findings</i>
Adams <i>et al.</i> (1999)	141 African-American male and female college students	Blood pressure	No JH effect on blood pressure or JH \times perceived stress interaction.
Clark <i>et al.</i> (2001)	39 African-American female, college students	Mean arterial pressure	JH associated with higher arterial blood pressure during standardized speaking task. Interaction between JH and anger-out coping.
Dressler <i>et al.</i> (1998)	600 Southeastern African-American men and women	Blood pressure; hypertension	Interaction between gender and JH in relation to systolic blood pressure and hypertension status.
Duijkers <i>et al.</i> (1988)	200 Dutch men and women	High blood pressure	High JH associated with higher blood pressure in men.
Francis <i>et al.</i> (1991)	179 African-American and White men and women	Blood pressure	No JH effect on blood pressure.
Jackson <i>et al.</i> (1994)	421 urban African-American college students	Blood pressure	Higher JH among women than men. JH associated with social support for women. No JH effect on blood pressure.
James <i>et al.</i> (1983)	132 African-American men	Blood pressure	Men with low education and high JH had higher diastolic blood pressure.
James <i>et al.</i> (1984)	112 African-American males in rural, poor Southern community	Blood pressure	Significant interaction between JH and job success on blood pressure.
James <i>et al.</i> (1987)	820 African-American and White men and women	Blood pressure	High JH, low SES Blacks had 3-fold increased level of hypertension compared to Whites. JHH not supported among Whites.
James <i>et al.</i> (1992)	1784 African-American men and women	Blood pressure	Trend for high JH \times low SES on blood pressure levels. Findings affected by high level of perceived stress among high SES.
Light <i>et al.</i> (1995)	143 African-American and White men and women	Ambulatory blood pressure; cardiovascular reactivity	High JH among 71% of women and majority of Blacks with high status jobs. High JH women with high status jobs had higher ambulatory and laboratory diastolic blood pressure.

Markovic <i>et al.</i> (1998)	658 Nigerian male and female civil servants	Blood pressure	Nonsignificant trend for higher blood pressure among those with high JH and high SES.
McKetney <i>et al.</i> (1996)	4986 African-American and White men and women	Blood pressure	No association for JH and education with blood pressure.
Nordby <i>et al.</i> (1995)	47 Norwegian hypertensive premenopausal women and 18 matched normotensive women	Hypertension	No JH effect on hypertension status.
Scribner <i>et al.</i> (1995)	1046 African-American and White 9th and 10th grade students	Blood pressure	No JH effect on blood pressure.
Somova <i>et al.</i> (1995)	2902 Black, White and Indian, South African students	Hypertension	Risk for hypertension highest among Black males after adjustment for JH. JH associated with smoking cessation.
Van Loon <i>et al.</i> (2001)	2514 Dutch men and women	Health behaviors	Prevalence of cholesterol (≥ 240 mg/dl) highest among high JH, low SES.
Wist and Flack (1992)	653 African-American men and women	Blood pressure; cholesterol	No JH \times SES effect on blood pressure.
Williams and Lawler (2001)	100 African-American and European-Americans with family incomes below the poverty line	Illness	No JH effect on stress-related illness.
Wright <i>et al.</i> (1996)	173 African-American and White children	Cardiovascular reactivity	High JH scores associated with higher resting blood pressure, higher total peripheral resistance, and lower cardiac index. Significant high JH \times low SES interaction.

and cardiovascular reactivity (Wright *et al.*, 1996; Clark *et al.*, 2001). Again however, JH was not uniformly associated with negative outcomes. Van Loon (Van Loon *et al.*, 2001) showed among a Dutch sample that high JH was associated with higher levels of smoking cessation.

As with studies implementing the traditional, interactive approach to studying the JHH, investigations in this category have been conducted among a wide range of populations and have utilized numerous dependent variables. Thus, there may be little utility in examining the factors that discriminate studies supporting the independent utilization of JH from those that do not. However, investigators should be aware of the conceptual limitations of this approach.

In isolation, JH measures only the disposition towards active engagement with psychosocial stressors. There is no reason then to suspect that JH should be independently associated with negative health outcomes. In fact, the high-effort coping approach may be extremely adaptive, particularly in the workplace or when rapid action is necessary to manage an acute stressor. James' hypothesis contends that prolonged use of the high JH style is deleterious for those in lower SES groups because they lack adequate social and psychosocial resources to buffer their coping efforts. Thus, if identification of risk is intended, investigators are advised to either utilize the traditional, interactive JHH approach, or to substitute a variable (for low SES) that discerns a resource-deprived group.

The latter suggestion may prove particularly fruitful in JH investigations, given the questionable nature of utilizing traditional SES measures among ethnic minority groups (Williams, 1996). Regardless of ethnic group membership, traditional objective measures of SES do not take into account essential social and psychosocial factors such as: previous exposure to adverse living conditions, multiple financial responsibilities (to family, debtors, children, etc.), intergenerational access to educational and occupational opportunities, or attainment of financial resources (Williams, 1996). Rather, the traditional assessment of SES (via education, income, job status) provides only a proxy of those unmeasured factors that may be more proximate cause of health status disparities (Williams *et al.*, 1994). Thus, use of these indices may severely impede the validity of conclusions made regarding the psychosocial experience of African-Americans.

Within the context of JH, neither education nor income contextually reflects workplace experiences, home responsibilities, neighborhood characteristics, and exposure to racial discrimination – factors are more ecologically associated with the conceptualization of the high-effort coping response. It seems likely that greater consideration of these more ecologically valid factors could improve external validity of JH to the prediction of negative health outcomes among individuals in a range of ethnic and socioeconomic distinctions. This approach may also broaden our current understanding of JH. We may find for example, that risk is encountered with high JH in the presence of psychosocial factors perceived (i.e. workplace demands, job control, discrimination, home difficulty) to be noncommensurate with the amount of effort expended by the individual.

Race

James' early conceptual and empirical (James *et al.*, 1987) work suggested the specificity of JH to African-Americans. As was discussed, James *et al.* (1987) found support for the traditional JHH in the prediction of elevated blood pressure among

African-Americans, but not Whites. While this finding was interpreted to suggest that JH might be more applicable among African-Americans, more recent evidence has not supported the assertion.

Among those studies utilizing demographically-heterogeneous samples (and that also present between-groups results), we identified only one additional empirical investigation (Light *et al.*, 1995) presenting ethnic differences in the JH effect on blood pressure. Light's group (1995) found that high JH African-Americans with high status jobs had significantly higher ambulatory blood pressure levels during the day compared to Whites and Blacks with lower status occupations. The remaining studies that have included both African- and European-American participants have failed to show ethnic differences in the effect of JH on health outcomes (McKetney and Ragland, 1996; Wright *et al.*, 1996; Williams and Lawler, 2001).

It should be noted that JH research has not been conducted solely among American populations. JH was found not to differentiate between hypertensive Norwegian women and matched controls (Nordby *et al.*, 1995), but was related to higher levels of smoking cessation (Van Loon *et al.*, 2001) and blood pressure among males (Duijkers *et al.*, 1988) in Dutch samples. Only one non-American study has examined the effect of JH on ethnic differences in cardiovascular outcomes. Somova and colleagues (1995) found in a sample of 2902 Black, White, and Indian South Africans, a significant association between suppressed anger and hypertension (above 160/95 mmHg) in each ethnic group. After adjustment for JH however, the risk of hypertension was strongest for Black male participants.

Taken together, there is little support for James' (James *et al.*, 1987) suggestion regarding the specificity of JH to African-Americans. However, most JH investigations have been conducted among exclusively Black samples and few studies have systematically explored whether JH may promote ethnic differences in cardiovascular outcomes.

Gender

Many studies have found no gender difference in the effects of high JH on health outcomes (James *et al.*, 1987, 1992; Wist and Flack, 1992; Wright *et al.*, 1996; Adams *et al.*, 1999; Van Loon *et al.*, 2001). James (1994) has argued against interpretation of the JHH as being primarily applicable to men. He posited that African-American males and females would similarly experience the economic and social bases responsible for driving JH behaviors.

Despite this suggestion, there is increasing evidence that high JH may prove more deleterious for men (Duijkers *et al.*, 1988; Jackson and Adams-Campbell, 1994; Light *et al.*, 1995; Somova *et al.*, 1995; Dressler *et al.*, 1998). Duijkers *et al.* (1988) found in their Dutch sample of 200 males and females (aged 20–59 years) that higher JH levels were associated with blood pressure only among men, after adjustment for traditional risk factors. Similarly, Somova's group (1995) found that when JH was adjusted for, the risk of experiencing hypertension was strongest among Black male students.

In fact, at least one study suggests that high JH may be protective against physiologic arousal in Black women. Dressler's (Dressler *et al.*, 1998) study of 600 African-American men and women revealed that high JH men were approximately 50% more likely to be hypertensive than were high JH women. Women high in JH were actually at decreased risk for hypertension. Interestingly, though a significant relation

was shown between JH and hypertension in men, there was no support for James' (James *et al.*, 1983) hypothesis of a JH by SES interaction, nor a three-way interaction with gender. Similar findings have been determined for other constructs of stress/coping, particularly job strain which has in some studies, not been predictive of blood pressure at home and work among women (Light *et al.*, 1992; van Egeren, 1992) as it does in men (Schnall *et al.*, 1994).

Interestingly, Light (Light *et al.*, 1995) found that high JH women with high-status jobs had higher diastolic blood pressure levels (both in an ambulatory assessment protocol and in the laboratory) in comparison to other women. The higher blood pressure levels found in this group did not differ significantly from those of men. However, when gender differences in the high JH \times low job status groups (consistent with the traditional JHH) were examined, significantly higher blood pressure levels were found among men.

Dressler (Dressler *et al.*, 1998) called for a sociocultural approach to interpret the gender differences in the effects of high JH. He argued that for Black women (particularly those in the rural South) maintenance of the family structure might be associated with the perception of cultural success (thereby fulfilling the goal of high-effort coping behaviors). High JH then, he suggested, might be an adaptive strategy among this group, allowing them to fulfill both occupational and domestic responsibilities in a manner that is likely to be appreciated culturally, if not from others. African-American men may judge themselves by a different standard, equating material and occupational attainment with success. However, achievement for many in this group is likely to be quelled by structural barriers and resource deficits, making high JH a deleterious disposition if used in a prolonged manner. The extent to which these arguments are applicable to men and women in other populations is unclear. There is certainly increasing evidence that women utilize differential means of stress adaptation (possibly due to their multiple social roles), which may be reflected physiologically (Krieger *et al.*, 1993; Lundberg *et al.*, 1994; Brisson *et al.*, 1999). Additionally, despite their greater exposure to stress (Davis *et al.*, 1999), women are less reactive to it (Stoney *et al.*, 1988; Girdler *et al.*, 1990). This may suggest that the threshold for detection of biological changes resulting from JH may be higher among women than men, thereby reducing the likelihood of identifying JH-related outcomes among females. This issue deserves additional research attention.

Measurement of John Henryism

The JH construct is measured using the John Henryism Scale for active coping (JHAC12) (James, 1996). The 12-item, 5-point Likert-type scale assesses the three main JH themes (efficacious mental and physical vigor; a strong commitment to hard work; and a single-minded determination to succeed). Five response options for each item extend from completely true (coded as "one") to completely false (coded as "five"). Each item is reverse-coded and summed to derive a total JH score that ranges from 12 to 60, with high scores representing higher levels of JH. The JHAC12 is appropriate for use in both Black and White populations (as well as other ethnic minority groups) and is not gender specific. The JHAC12 has demonstrated acceptable internal consistency in both White and African-American samples (James *et al.*, 1983; James, 1994), and is independent from similar constructs, such as the type A behaviour pattern (Weinrich *et al.*, 1998).

The assessment of JH can at times, present analytic and interpretive difficulties. Scores on the 12-item JH Active Coping Scale (JHAC) are often quite high for both Blacks and Whites. These high-scale scores (normally averaging 50–54 out of 60) have been found in most JH investigations. Commonly, JHAC12 scale scores are dichotomized by median split, arguably making meaningful differences between high and low JH groups difficult to discern. James and his colleagues (James *et al.*, 1987) attributed the high scores to the possibility of social desirability biases in the scale. High JH levels may also be found because the JHAC12 taps factors that represent core American values (i.e. hard work, determination).

Refinement of JH assessment is another important area of future study. In spite of the analytic difficulties, the short length of the JHAC12 makes it preferable in large-scale epidemiologic investigations. It is likely that the JHAC12 could be further shortened for such studies and factor analytic methods may assist in the identification of items that best reflect the JH themes. With regard to its utilization in psychological and clinical investigations (where longer measures are generally acceptable), the JHAC12 may benefit from further elaboration. This goal may be served by the development of an alternative self-report measure that is designed to make finer distinctions between JH groups and minimizes the risk of social desirability biases. Additionally, a structured interview approach may also be of some benefit, particularly for clinical investigation of the construct.

Determinants of John Henryism

Few studies have investigated factors serving as determinants of JH. James' conceptualized of the construct as culturally patterned, based on "the protracted struggle of African-American men and women to free themselves from pervasive and deeply entrenched systems of social and economic oppression (James, 1994)." James found empirical support for this notion among the poor, rural populations in which the construct was conceptualized. However, a lack of external validity for JH among other Black populations and its apparent strength in unexpected samples (Duijkers *et al.*, 1988), suggests that additional research is necessary to elucidate the potential personality, social, and psychosocial factors that may determine the JH disposition.

One important area of future study includes investigation of the extent to which personality (as distinct from social contextual factors) is responsible for promoting JH behaviors. Increasingly, researchers are focusing attention on the heritability of personality traits (Livesley *et al.*, 2003) and more recent research has extended this model to the study of coping.

The quantitative genetic approach offers an important step in the identification of the proportions of individual variance due to genetic and environmental influences in the study of African-Americans (Whitfield and Brandon, 2000). Quantitative genetics as an approach, in theory, accounts for 100% of the variability in JH scores. Variance is partitioned into additive genetic influences, shared environmental influences, and nonshared environmental influences (see Plomin *et al.*, 1997).

While there are a number of different designs used in quantitative genetic analyses, the classic twin method is the most common. This approach involves comparing intra pair correlations for identical or monozygotic and fraternal or dizygotic same sex twin pairs typically using structural equation modeling (e.g. Neale and Cardon, 1992; Whitfield, 1994). Previous researchers have focused on environmental

explanations to account variability in JH. Preliminary data from the Carolina African-American Twin Study of Aging indicate that 65% of the variance in JH is explained by environmental factors, with 35% of variance explained by genetic factors. The findings indicate that while individual variability on this measure arises primarily from environmental sources, genetic influences are important to consider.

Alternative Mediating Mechanisms

The body of evidence on JH has focused extensively on cardiovascular functioning. However, current research suggests that a variety of biological systems and other mechanisms may be important mediators of coping behaviors.

Behavioral Risk Factors

Surprisingly few investigations have examined the influence of JH on negative health behaviors (e.g. cigarette smoking, physical activity, diet, alcohol consumption). Such research would seem especially prudent given that health behaviors constitute a primary mechanism linking psychosocial factors with disease (Siegler *et al.*, 1997). These factors may also be more readily amenable to intervention and prevention efforts than others under investigation.

Van Loon's group (2001) investigated the relations among personality, coping, and behavioral risk factors for cancer in a sample of 2514 Dutch men and women. In this relatively homogenous White European sample, findings revealed a significant association between JH and smoking cessation. It is unclear whether these findings can be generalized to an American sample, but they do support the notion that JH behaviors are not uniformly negative. In fact, JH may be adaptive in certain clinical contexts that require significant effort and resilience (i.e. recovery from major surgery, drug treatment, management of chronic disease).

Edwards and colleagues (2002) recently examined the substance use and health behavior patterns of African-American college students at historically Black colleges and universities. Preliminary results from 587 male and female students revealed a number of interesting relations with JH. Higher JH in their study was associated with adolescent smoking initiation (before age 18), but a reduced propensity of recent cigarette smoking, which is consistent with previous investigations in another population (Van Loon *et al.*, 2001). JH was also associated with alcohol abuse, such that those with high JH levels were more likely to have missed a class because of alcohol intoxication and to have been arrested for a motor vehicle infraction resulting from alcohol use. The investigators interpret these data to indicate that the management of school-related stressors and the consequences of substance use may be more differentially problematic for African-American college students as a function of their style of coping.

Biological Mechanisms

An increasing number of findings have detailed the importance of the hypothalamic-pituitary-adrenal (HPA) axis in mediating exposure to chronic stress and negative affect (Steckler *et al.*, 1999; Chrousos, 2000; Ockenfels, 1995). Studies examining the effect of stress and coping on the HPA-axis of ethnic minorities are largely forthcoming.

Bennett's group (2002) examined the association between JH, elevated job demands, and awakening cortisol secretion in a sample of African- and European-American men and women. Findings revealed that the normal awakening rise in cortisol was suppressed among subjects with both high levels of JH and high-job demands. Surprisingly, when stratified by ethnicity, African-American participants demonstrated a significantly negative cortisol response to awakening. The authors suggested that this group might have transitioned from mere exposure to chronic stress (which would have been associated with a steeper salivary cortisol response to awakening; Pruessner *et al.*, 1999) to a state of sustained negative affect (e.g. burnout, rumination) as a result of their long-term engagement with occupational stress.

Future JH research should evaluate a range of other potentially relevant classes of biomarkers (i.e. cytokines, catecholamines, inflammatory and immune markers), reflecting the numerous biological systems that may be affected by prolonged high-effort coping. Such investigations may elucidate in a more nuanced manner, the ethnic and gender disparities occurring as a result of the JHH. Future research should also examine the effects of the JHH on clinical pathologies, treatment, and survival. Such investigations may result in the identification of additional targets for intervention and prevention efforts.

CONCLUSION

To conclude, this article has reviewed evidence surrounding the effect of the JHH on health outcomes. Such research serves to remedy the historical dearth of empirical attention devoted to the health of African-Americans and members of other ethnic minority groups. It has been the purpose of this exercise to identify additional factors that may aid in this endeavor. We hope that such a compendium of research can eventually lead to the development of interventions at the individual, organizational, and population levels.

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