Pathogens and Disease, 79, 2021, ftab041

https://doi.org/10.1093/femspd/ftab041
Advance Access Publication Date: 19 August 2021
Commentary

COMMENTARY

Toxic stress and burnout: John Henryism and social dominance in the laboratory and STEM workforce

Tiffany Rolle[1,2,†], Zer Vue[3,†], Sandra A. Murray[4], Salma Ash Shareef[5], Haysetta D. Shuler[6], Heather K. Beasley[3,8], Andrea G. Marshall[3] and Antentor Hinton, Jr.[3,7,*,‡]

[1]American Society of Human Genetics, Rockville, MD 20852, USA, [2]National Human Genome Research Institute, Bethesda, MD 20894, USA, [3]Department of Molecular Physiology and Biophysics, Vanderbilt University, Nashville, TN 37232, USA, [4]Department of Cell Biology, University of Pittsburgh, Pittsburgh, PA 15206, USA, [5]Department of Internal Medicine, Carver College of Medicine, University of Iowa, Iowa City, IA 52242, USA, [6]Department of Biological Sciences, Winston-Salem State University, Winston-Salem, NC 27110, USA, [7]Hinton and Garza Lopez Family Consulting Company, Iowa City, IA 52246, USA and [8]Department of Biochemistry and Cancer Biology, School of Graduate Studies and Research, Meharry Medical College, Nashville, TN 37208, USA

*Corresponding author: Department of Molecular Physiology and Biophysics Vanderbilt School of Medicine Basic Sciences The Vanderbilt Diabetes Research and Training Center 750 Robinson Research Building 2200 Pierce Ave Nashville, TN 37232-0615, USA. E-mail: antentor.o.hinton.jr@vanderbilt.edu

One sentence summary: We discuss the effects, causes and solutions to combatting John Henryism within the STEM community.

†Co-first Author

Editor: Alfredo Garzino-Demo

‡Antentor Hinton Jr., https://orcid.org/0000-0002-7730-952X

ABSTRACT

Persons Excluded from science because of Ethnicity and Race (PEERs) face chronic exposure to interpersonal stressors, such as social discrimination, throughout their scientific careers, leading to a long-term decline in physical and mental health. Many PEERs exhibit John Henryism, a coping mechanism to prolonged stress where an individual expends higher levels of effort and energy at the cost of their physical and mental health. In this article, we discuss how social dominance may increase John Henryism within the STEM community; the causes, effects and costs of John Henryism; and highlight solutions to combat these social adversity stressors within the academic institution.

Keywords: John Henryism; Persons Excluded because of Ethnicity or Race (PEERs); Dr Sherman James; STEM workforce; stress; social discrimination

INTRODUCTION

John Henryism is a coping mechanism for managing prolonged exposure to social stressors, such as social discrimination, by expending higher levels of effort at the cost of physical and mental health. The negative effects of John Henryism accumulate over time, not only affecting a person's health but also the institution (Dressler, Bindon and Neggers 1998; McGee and Stovall 2015; Hudson *et al*. 2016). The term John Henryism

Received: 17 June 2021; **Accepted:** 16 August 2021

originated from African American epidemiologist Dr Sherman James (James 2014, 2019; Hamblin, 2015; King 2020; Barrington, James and Williams 2020; Johnson-Lawrence, Scott and James 2020; Silberberg *et al.* 2020) (Fig. 1). Dr James used the story of John Henry, a hardworking sharecropper who encountered social and health disparities as many other African Americans during his time, to explain this phenomenon (James *et al.* 1992; Angner *et al.* 2011).

Today, Persons Excluded because of Ethnicity or Race (PEERs) experience social adversity and health disparities due to their physical appearance or socioeconomic background (Asai 2020) (Fig. 1). PEERs experience John Henryism within their workspaces, often leading to accumulating stress, loss of focus and burnout. The perpetuation of John Henryism within the STEM community promotes changes in identity, imposter syndrome and social anxiety, which negatively influences personal social well-being and increases vulnerability (Cokley *et al.* 2017; Bernard, Jones and Volpe 2020; McGee 2020).

While John Henryism was a term initially associated with African Americans, this phenomenon is experienced by many other marginalized groups (Fig. 1). The social dominance theory is where a social hierarchy disproportionally promotes power and special privileges to certain social groups (Pratto and Stewart 2011). Differences between social groups can influence many aspects of the members' social determinants of health (Figs 1 and 2), including income, education, health care, job security, food security and early childhood experiences, both in positive and negative ways (Figs 2 and 3).

Inequities observed among marginalized groups are maintained and reinforced by institutional discrimination and stereotypes. Marginalized groups have limited access to quality educational resources because of institutional discrimination, which influences multiple social determinant factors. Discriminatory grading, evaluations, teaching practices and distribution of resources contribute to educational disparities and achievement gaps (McGee 2020; Quinn 2020; Lorenz 2021). Members in higher social hierarchical groups have access to better resources which fosters higher scholastic achievement, while other groups experience an impaired trajectory. Lorenz (2021) observed teachers who expected lower math and reading levels among first-grade racial minority students, which is a distinct internalized stereotype. Stereotypes also contribute to the 'Model Minority' myth, such as the perception of universal socioeconomic success among Asian Americans; the 'Model Minority' is used as a reference group to compare other racial and ethnic groups. This myth is used to downplay the role of racism in the persistent struggles of other minority groups, such as African Americans. Parsing data by ethnicity reveals a host of disparities and higher poverty in many different Asian populations (AAPI 2017). Additionally, this myth ignores the selective recruitment of highly educated Asian immigrants that has contributed to Asian American success and promotes the flawed comparison between Asian Americans and other minority groups. It is incomprehensible to argue that racism, as well as more than two centuries of Black enslavement, can be overcome by hard work and strong family values (Chow 2017).

These cultural and societal ideologies impact PEERs, often manifesting as John Henryism and are analogous examples of the chronic stress PEERs experience in their workplaces. John Henryism has detrimental physical and mental effects, including depression and declines in happiness (Wagner and Abbott 2007; Angner *et al.* 2011; Bronder *et al.* 2013; Hudson *et al.* 2016; King 2020), that can eventually leave the person drained and/or burned out. Although these stressors may not be readily apparent, the continual mental stress eventually impacts physical health (i.e. cardiovascular disease, metabolic syndrome, obesity and other health problems; James, Hartnett and Kalsbeek 1983; James 1994; James *et al.* 2006; McGee and Stovall 2015).

Mental and physical stress is a natural reaction to life experiences, from daily responsibilities (e.g. work and family) to serious events (e.g. disease diagnosis, war and death). However, the effects of chronic, prolonged stress on the physical and mental health should not be underestimated and dismissed (Yaribeygi *et al.* 2017). Constant exposure to social stressors, such as discrimination, amplifies mental stress. PEERs who face discrimination often overlook the effects that these daily stressors on their health. While researchers are just beginning to unravel how repeated chronic discrimination affects the body, it is worth discussing how stress-induced physiological and metabolic changes in the body contribute to physical illnesses. Stress activates a fight or flight response, which is controlled by the central nervous system (25–27). Researchers have demonstrated that the adrenal glands release the stress hormones adrenaline and noradrenaline in response to stress (Tai *et al.* 2007). These hormones increase the heart rate and blood pressure, sending blood to areas of the body where it is most needed during an emergency (e.g. muscles and heart; Yaribeygi *et al.* 2017; American Psychological Association 2018). Once the danger is gone, the fight or flight response is inhibited and the body returns to a non-stressed state. While some stress is normal, under chronic stress, such as that felt by PEERs in a toxic, discriminatory environment, there is a persistent release of adrenaline which overtime can result in blood vessels damage, elevated blood pressure and an increased risk of heart attacks or strokes (James *et al.* 1983, 2006; James 1994; McGee and Stovall 2015). In addition to adrenaline, the adrenal glands also release the stress hormone cortisol. Chronic cortisol release can negatively impact health in various ways (Chen *et al.* 2016). First, secreted cortisol travels to muscle cells and causes the breakdown of muscle proteins into amino acids. The amino acids travel in the blood to the liver for glucose synthesis, which is then secreted into the blood, raising the blood sugar levels. In addition, cortisol further increases blood sugar levels during stress by breaking down the fat stored in fat cells into fatty acids and glycerol; glycerol is also used for glucose synthesis by liver. Thus, chronic cortisol release and blood sugar elevations can increase the risk of diabetes (Joseph and Golden 2017). Furthermore, cortisol-induced release of fatty acids during fat breakdown can accumulate in arteries, increasing the risk of atherosclerosis and other cardiovascular diseases (Kalantaridou *et al.* 2004; Whirledge and Cidlowski 2013; Sugaya *et al.* 2015). Cortisol can also inhibit the immune, digestive and reproductive systems (Kalantaridou *et al.* 2004; Whirledge and Cidlowski 2013; Sugaya *et al.* 2015). Ultimately, chronic stress can increase health risks. It is imperative to identify chronic stressors within the STEM community to help maintain a healthy workforce and work environment. Until chronic social stressors, such as discrimination, can be eliminated, understanding the effects of chronic stress can lead to novel strategies for coping with stress-inducing events.

Sherman James developed the 12-point John Henryism Active Coping (JHAC) scale. The JHAC scale measures (a) atypical mental and physical vigor; (b) a focused determination to realize one's goals and (c) an unrelenting commitment to hard work. For each item, five response options range from '1' (completely false) to '5' (completely true). The overall JHAC score can extend

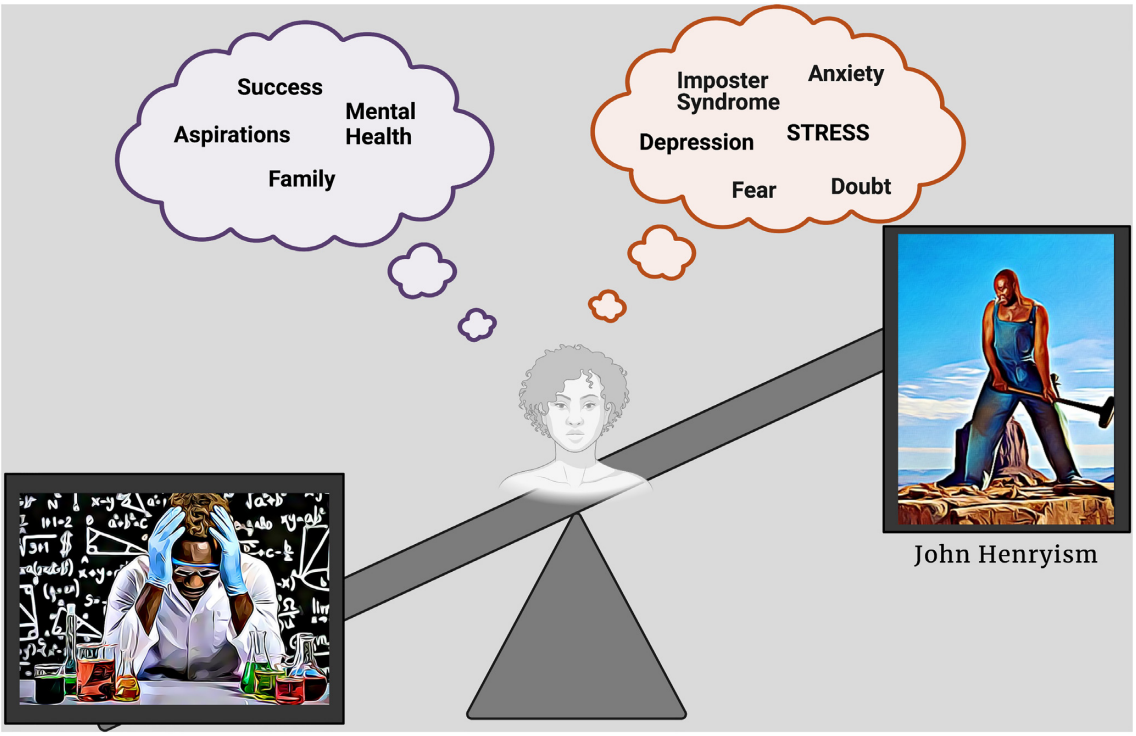

Figure 1. Frustration and coping with stress as a PEER. PEERs expend high levels of effort to cope with chronic social stressors, but at the of their health. This John Henryism coping strategy can cause an imbalance between productivity and PEER wellbeing. Figure created with BioRender.com

from 12 to 60 points (Table 1). A high score (maximum: 60 points) is associated with better psychological health. Whereas a low score (minimum: 12 points) is associated with low psychological health. If a person finds oneself with a low score, we suggest the person try and manage their stress in a variety of methods, discussed below. After a few months, whether the person has a high or a low score, the test should be retaken to see if the score has improved. We recommend using this tool frequently throughout the year.

Thankfully, stress can be managed using a variety of methods, including exercise, adequate sleep, meditation and mindfulness. However, further discussion is needed to help PEERs mitigate the detrimental effects of chronic stress. Unfortunately, counterproductive strategies are frequently used by PEERs and the STEM community. For example, Black STEM PhD students often experience elevated, sustained pressure to cope with racialized, oppressive environments, leading them to question their qualifications and capabilities (Smith, Hung and Franklin 2011; McGee 2016, 2018; Spates *et al.* 2019). McGee *et al* identified that these pressures often cause students to compromise on their sleep, exercise and self-care, resulting in disproportionately higher rates of physical and mental health problems (McGee and Stovall 2015). Additionally, McGee *et al* suggested that students felt that their training, employment and career success was more important than safeguarding their mental and physical health (McGee, Griffith and Houston 2019). PEERs experience John Henryism to adapt to stress-inducing events within their workspaces.

Recent studies observed John Henryism in low-income Latino and Asian communities in the United States (LeBrón *et al.* 2015; Logan, Barksdale and James 2015). However, one study failed to find the effect among wealthier Indian and Chinese immigrants to United States (Haritatos, Mahalingam and James 2007). This is likely due to the linked relationship between John Henryism and social dominance orientation (SDO), the degree to which a person believes that there should be social hierarchies (Passini and Morselli 2016). People with a high SDO trait believe that certain demographic groups should have more power than others. This is supported by a negative correlation between SDO and egalitarianism beliefs (Ho *et al.* 2012; Kleppestø *et al.* 2019; La Macchia and Radke 2020). Privileged individuals tend to view social hierarchies as a natural part of our social world and tend to have a lower awareness of privilege. This demonstrates the critical role of race and class in moderating the effects of John Henryism on physical health (Sanders and Mahalingam 2012).

CHANGING THE NARRATIVE

The stress-inducing events within in the research laboratory and academic community must be head-on. Despite certain challenges in the laboratory being traditionally difficult, the first step in changing the narrative is having an open dialogue, which includes a discussion on the stigma around discussing adversity in the STEM workforce. Open dialogue allows individuals to strategically plan and learn from the struggles of others. These conversations can build camaraderie around colleagues with the potential to generate innovative solutions to stress-inducing events (Fig. 3).

Open dialogue and improved coping mechanisms are all reactive actions to stressful stimuli (Chen *et al.* 2017). For example, individuals who are shown a picture of a person with a modified darker skin tone exhibit a higher level of brain activity associated with negative responses (Ronquillo *et al.* 2007; Maister *et al.* 2013; Farmer, Maister and Tsakiris 2014; Monk 2015; Grewal 2017; Lira *et al.* 2017; Devaraj, Quigley and Patel 2018). On the other hand, individuals exhibit lower levels of brain activity when shown the same image with a lighter skin tone (Maister *et al.* 2013). Furthermore, SDO is a dependable measure

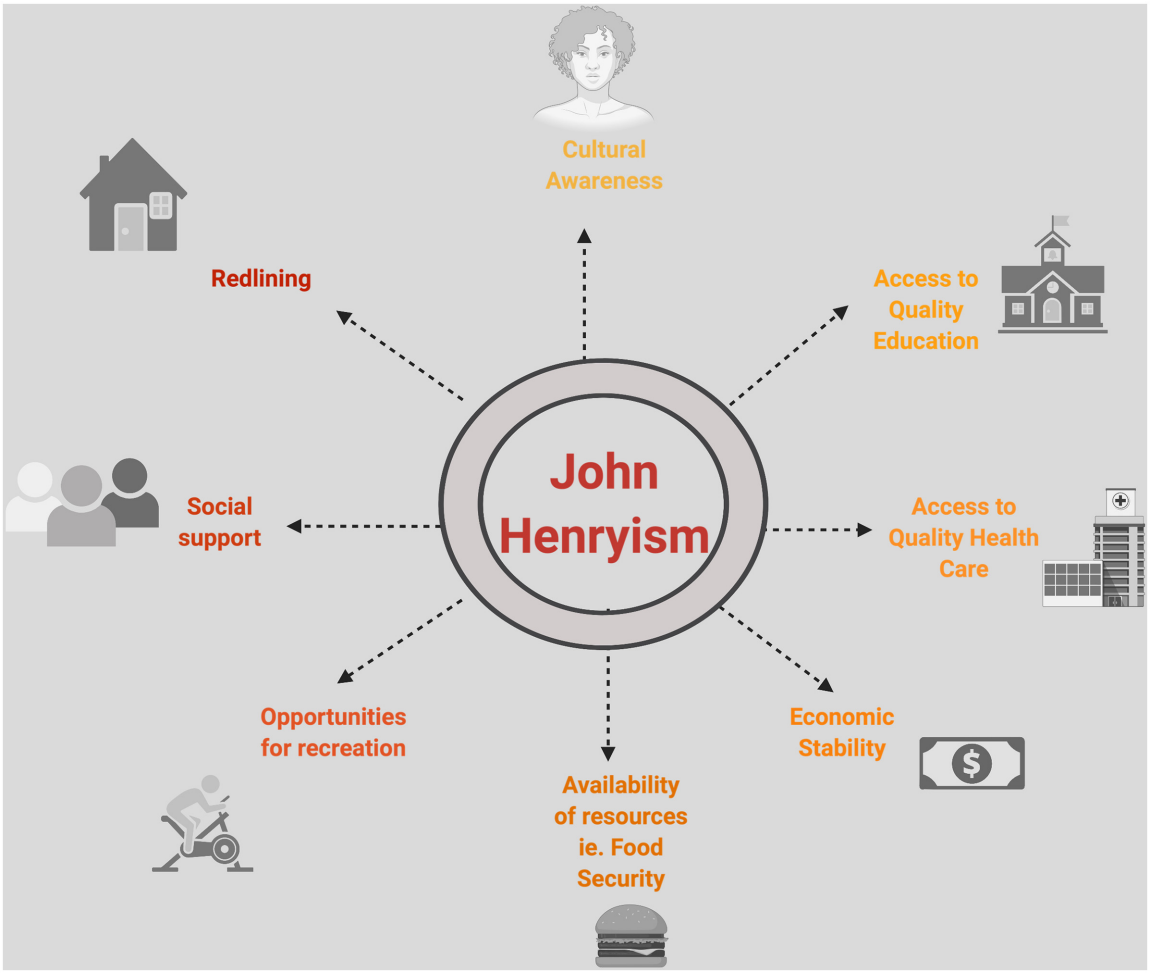

Figure 2. Social Determinates that PEERs Face. Social determinates of health that are affected by John Henryism. Figure created with BioRender.com

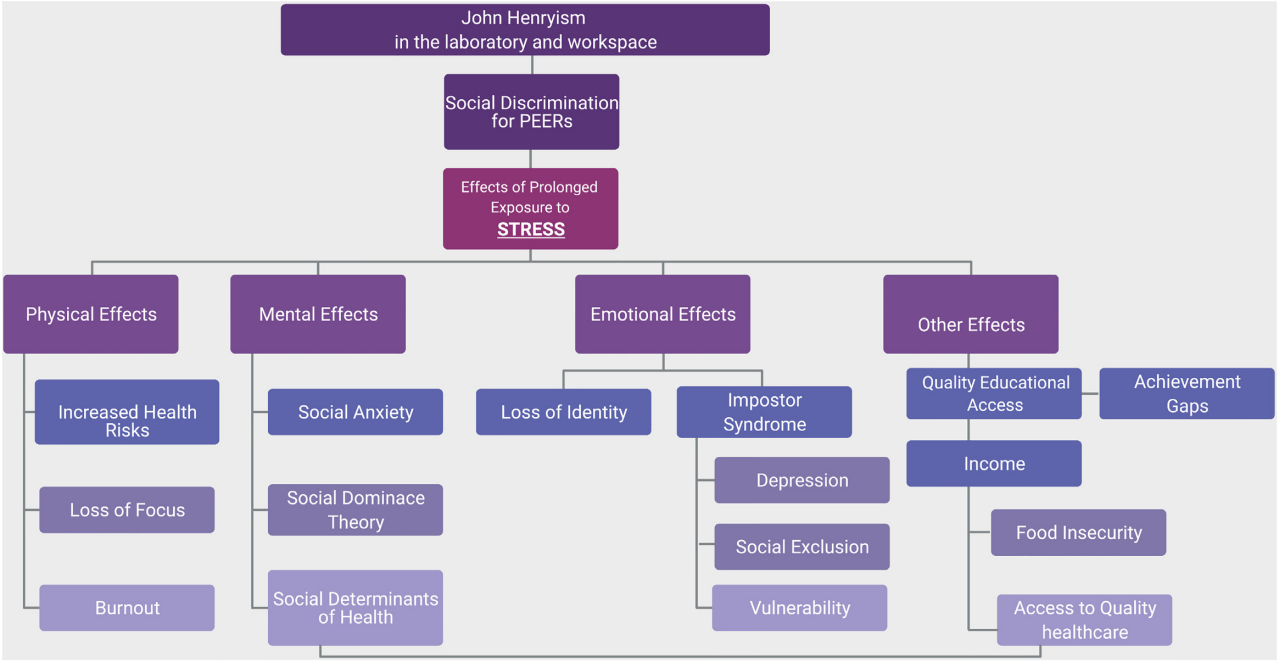

Figure 3. Chart depicting challenges that PEERs Face. Flow chart of how John Henryism and chronic stress, contribute to physical, mental and emotional problems. Figure created with BioRender.com

Table 1. This chart is adapted from Dr. Sherman A. James's 12-point scale to reference for measuring active coping due to John Henryism. The scoring, which can range from 12 to 60 points, evaluates psychological health, where higher scores are associated with better outcomes.

John Henryism Active Coping (JHAC) 12-Point Scale
1. I have always felt that I could make of my life pretty much what I wanted to make of it.
2. Once I make up my mind to do something, I stay with it until the job is completely done.
3. I like doing things that other people thought could not be done.
4. When things do not go the way I want them to, that makes me work even harder.
5. Sometimes I feel if anything is going to be done right, I have to do it myself.
6. It is not always easy, but I manage to find a way to do the things I really need to get done.
7. Very seldom have I been disappointed with the results of my work.
8. I feel that I am the kind of individual who stands up for what he believes in, regardless of consequences
9. In the past, even when things got REALLY tough, I never lost sight of my goals.
10. It is important for me to be able to do things in the way I want to do them rather than the way other people want me to do them.
11. I do not let my personal feelings get in the way of doing a job.
12. Hard work has really helped me to get ahead in life.
Adapted from Dr. Sherman A. James's John Henryism Scale

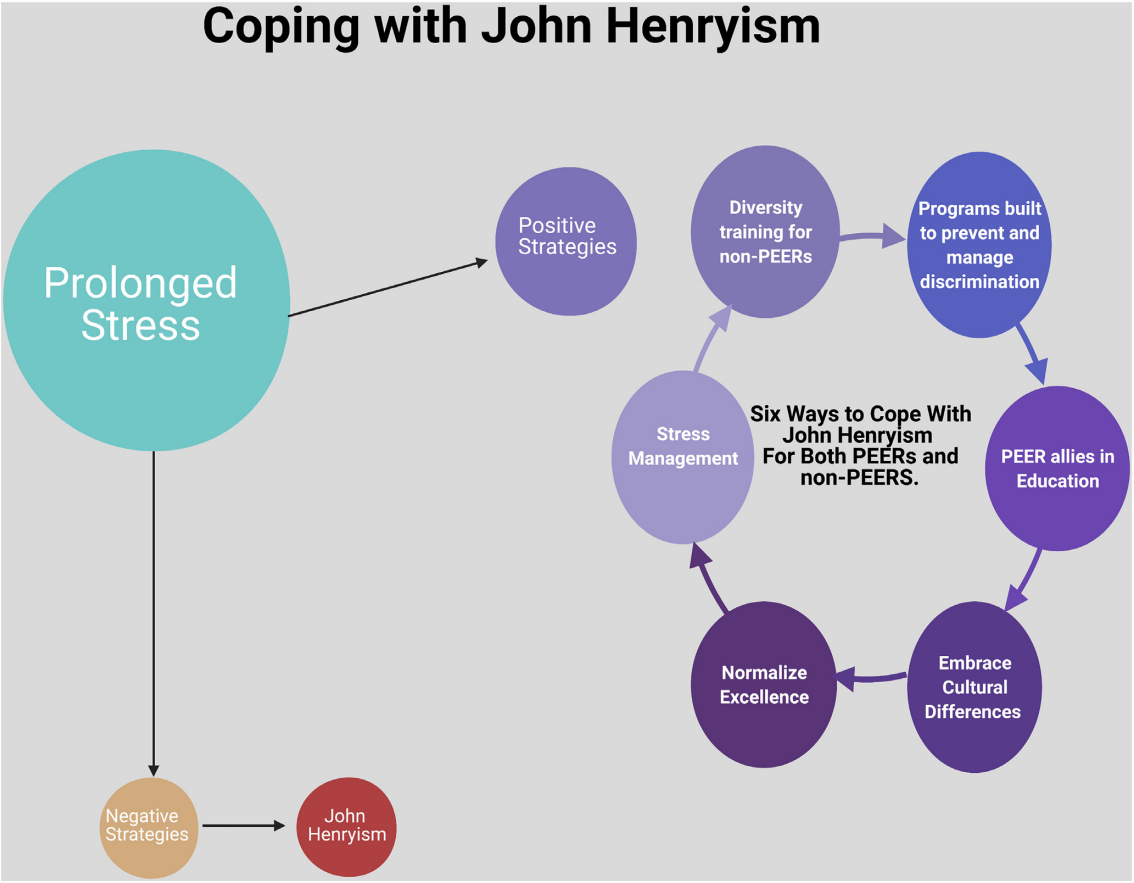

Figure 4. Strategies to Cope with John Henryism as a PEER. This figure details effective strategies for coping with stress and John Henryism. Figure created with BioRender.com

of prejudice and strongly correlates with prejudice against Black Americans and individuals viewed as physically unattractive (Moss, Miller and Page 1975; Cohrs and Asbrock 2009; Slatton 2012; Awad *et al.* 2014; Taylor *et al.* 2019). Prior research suggests that Black Americans are aware of racial stereotypes based on complexion, language linguistic and verbiage cues, including code-switching (Maddox and Chase 2004). Although many studies on John Henryism focus on stress and health issues among African Americans, Morrison *et al* revealed how JHAC12 plays a significant role in the scholarly experiences of African American males (James 1994; Morrison 2010). Additionally, students frequently encounter great hardships; especially when academic professionals demonstrate a lack of interest in the student's educational success. These students often struggle

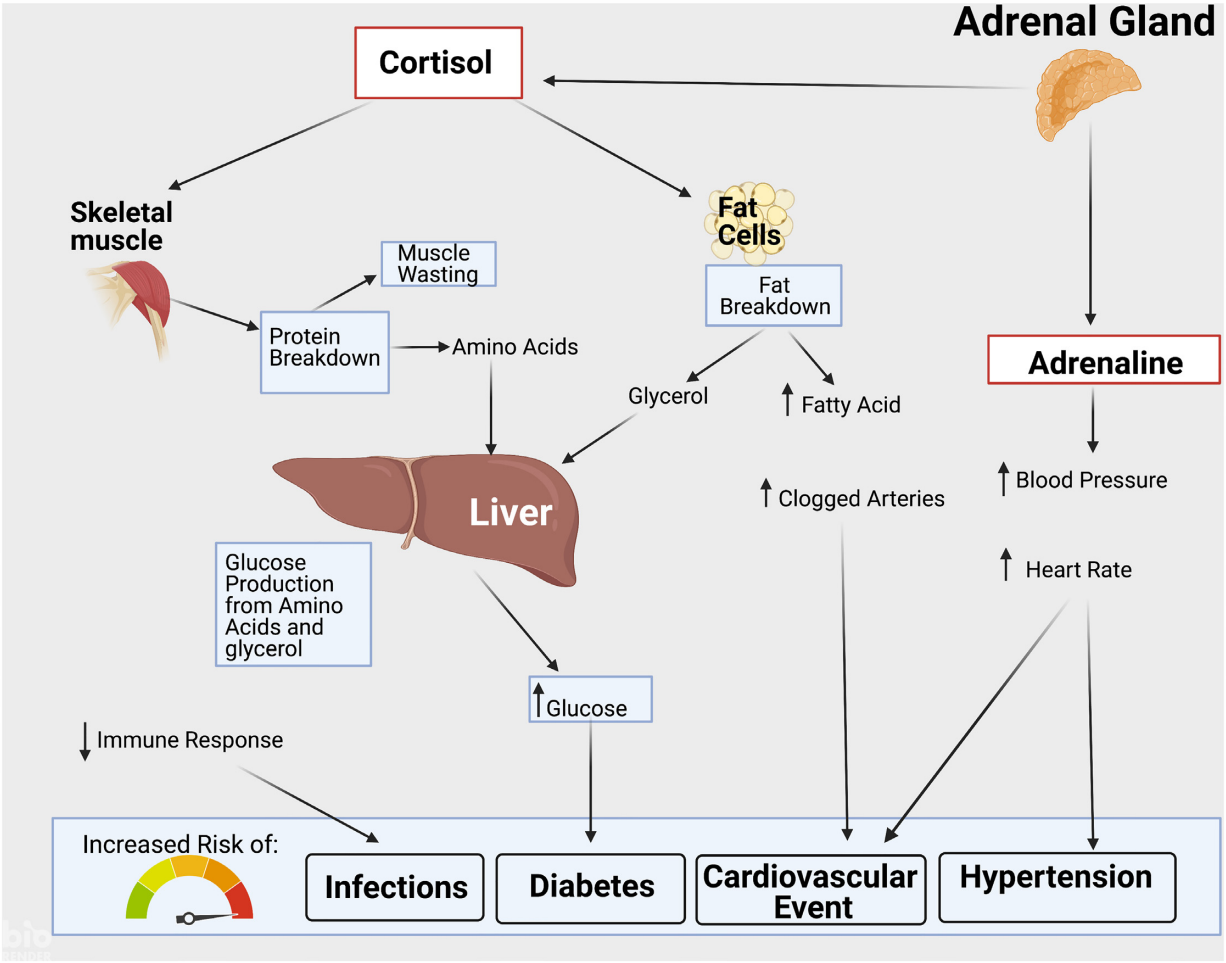

Figure 5. Stress has Consequences. Schematic representation of the link between chronic stress, adrenal stress hormones (adrenaline and cortisol) and physical illnesses. Figure created with BioRender.com

with the campus culture, requiring them to code-switch to adapt to their educational and work environment (Morrison 2010). Instead, academic professionals can create positive laboratory and work environments by embracing differences and fostering acceptance, which can help marginalized staff avoid code-switching. These differences in culture or physical attributes are not menacing and are essential for maintaining health and innovation. The scientific environment should move away from a rigid, monolithic view that inhibits new ideas and creativity. In lieu, positive change requires a new approach in which the unique identities of individuals are valued.

COPING WITH JOHN HENRYISM

Institutions can take steps to help defeat and overcome John Henryism using programs designed to prevent and manage the daily discriminatory stressors experienced by PEERs (Fig. 4). These programs can be as simple as assigning a mentor of similar race or background to PEER faculty, students, or others. This mentor can act as a guide and provide support in a lab or work environment where the mentee might otherwise not receive quality mentorship. Alternatively, an institution can create groups that occasionally meet to talk about similar experiences, find a common ground and learn from each other. This creates an environment that allows people to learn about the symptoms of John Henryism, how it works and what they can do to help themselves. These initiatives should also include non-PEERs, who may be oblivious about PEER experiences and mental health disparities within the institution.

There are several positive strategies that will help PEERs cope with John Henryism. Implementing these strategies will help PEERs and non-PEERs to cope with stressful events in a healthy manner. Simply, exercise programs can help to manage stress and be a preventative measure for many physical and mental illnesses caused by chronic stress (Figs 4 and 5).

One may consider training workshops to improve the perspective of non-PEERs toward PEERs colleagues, where they can learn how to combat institutional promoters of John Henryism (Fig. 4). This can change the workplace dynamic as everyone becomes awareness of the social obstacles faced by PEERs.

It is important for excellence to be normalized within minority communities to help increase representation within the STEM community. Normalizing PEER representation within the STEM community can help relieve the burden on minority groups, just as much as sports, entertainment, and music. It is also essential that PEER students and professionals showcase their academic and professional progress to draw attention and the successes within their community, allowing PEERs to embrace their education and culture instead of feeling that they should 'leave their culture at the lab door.'

CONCLUSION

The concept of John Henryism has been around since the 1970s, yet the STEM community continues to be oblivious to its widespread prevalence among its ranks. The purpose of this commentary is to promote awareness of John Henryism and its pervasiveness within research laboratories and other STEM workspaces. Ultimately, we would like to minimize the detrimental effects of John Henryism within underrepresented communities. To do so, we need to educate each other as much as possible by being open and willing to learn. We encourage PEERs and non-PEERs to have important conversations with their families about PEERs in STEM to help change the narrative. Institutions should form wholistic partnerships or adjunct positions with minority-serving institutions and/or historically Black colleges or universities to reinforce a positive culture of excellence.

In addition, we believe JHAC12 skills may be transferable to reducing other stressors in the modern world, such as stress caused by the rapid evolution of modern technology. Technostress is caused by an inability to adapt or cope with new technology, leading to social and mental health effects that can manifest as a rejection of new technology (Bondanini *et al.* 2020). For PEERs, this effect can be amplified through exposure to a glut of stereotype-affirming videos, which can have a negative impact on people who internalize stereotype threat beliefs and subsequently feel like they must counter and disprove stereotypes, further contributing to worsening health outcomes among these individuals (Subramanyam *et al.* 2013; Cuervo Carabel *et al.* 2018). Also, with the increased access to technology has come an increase in exposure to the violence and discrimination that some PEER communities have always known to exist. It is becoming increasingly difficult to access any form of social media and not be exposed videos of violence against POC, indifference and/or worse—support of the violence by non-PEERs to these events and the ever-pervasive thought of: am I next or could my loved one be next? Constant exposure to such content can lead to the rise of technostress in PEERs and lead to a rejection of these technologies as a means of mental self-preservation. It would be interesting to see whether JHAC skills are able to affect technostress in future studies.

FUNDING

HKB is supported by 2U54CA 163069-07 from NCI and R25 GM059994/GM/NIGMS NIH. SAM is funded by NSF grant number MCB- 2011577 and NIH NIGMS T32 5T32GM133353. AHJ is funded by Burroughs Wellcome Fund Award Career Awards at the Scientific Interface (CASI), UNCF/BMS EE Just Faculty Fund, the Ford Foundation, and NIH SRP subaward to #5R25HL106365-12 from the NIH PRIDE Program.

DATA AND MATERIALS AVAILABILITY

All data are available in the main text or the supplementary materials.'

AUTHOR CONTRIBUTIONS

Examples:

Conceptualization: AHJ
Methodology: AHJ, HDS, TR, ZV and AGM.
Investigation: AHJ and HDS.
Visualization: HKB, SAM, AM, and AHJ.
Funding acquisition: SAM and AHJ.
Project administration: AHJ, SAM, HDS and HKB.
Supervision: AHJ, SAM and HDS.
Writing—original draft: AHJ, TR, ZV, SAM, SS, and HDS.
Writing—review & editing: AGM, ZV, SAM, HKB, and AHJ.

Conflicts of interests. None declared.

REFERENCES

AAPI. *Demographic Data & Policy Research On Asian Americans & Pacific Islanders*, AAPI. 2017.

American Psychological Association. American Psychological Association, 2018. Stress effects on the body (15 June 2021, date last accessed).

Angner E, Hullett S, Allison JJ. "I'll die with the hammer in my hand": John Henryism as a predictor of happiness. *J Econ Psychol* 2011;**32**:357–66.

Asai DJ. Race matters. *Cell* 2020;**181**:754–7.

Awad GH, Norwood C, Taylor DS *et al.* Beauty and body image concerns among African American college women. *J Black Psychol* 2014;**41**:540–64.

Barrington DS, James SA, Williams DR. Socioeconomic correlates of obesity in African-American and Caribbean-Black men and women. *J Rac Ethnic Health Dispar* 2020;1–11. DOI: 10.1007/s40615-020-00798-4 .

Bernard DL, Jones SCT, Volpe VV. Impostor phenomenon and psychological well-being: the moderating roles of John Henryism and school racial composition among black college students. *J Black Psychol* 2020;**46**:195–227.

Bondanini G, Giorgi G, Ariza-Montes A *et al.* Technostress dark side of technology in the workplace: a scientometric analysis. *Int J Environ Res Pub Health* 2020;**17**:8013.

Bronder EC, Speight SL, Witherspoon KM *et al.* John Henryism, depression, and perceived social support in Black women. *J Black Psychol* 2013;**40**:115–37.

Chen J, Wang Z-, Zuo W *et al.* Effects of chronic mild stress on behavioral and neurobiological parameters - role of glucocorticoid. *Horm Behav* 2016;**78**:150–9.

Chen JA, Gilmore AK, Wilson NL *et al.*, Enhancing stress management coping skills using induced affect and collaborative daily assessment. *Cognit Behav Pract* 2017;**24**:226–44.

Chow Kat. Model Minority' Myth Again Used As A Racial W edge Between Asians And Blacks (17 June 2021, date last accessed). 'Model Minority' Myth Again Used As A Racial Wedge Between Asians And Blacks. NPR. 2017.

Cohrs JC, Asbrock F. Right-wing authoritarianism, social dominance orientation and prejudice against threatening and competitive ethnic groups. *Eur J Soc Psychol* 2009;**39**:270–89.

Cokley K et. al. Impostor feelings as a moderator and mediator of the relationship between perceived discrimination and mental health among racial/ethnic minority college students. *American Psychological Association, US* 2017;**64**:141–54.

Cuervo Carabel T, Orviz Martínez N, Arce García S *et al.* Technostress in communication and technology society: scoping literature review from the web of science. *Archivos de prevencion de riesgos laborales* 2018;**1**:18–25.

Devaraj S, Quigley NR, Patel PC, The effects of skin tone, height, and gender on earnings. *PLoS ONE* 2018;**13**:e0190640.

Dressler WW, Bindon JR, Neggers YH. John Henryism, gender, and arterial blood pressure in an African American community. *Psychosom Med* 1998;**60**:620–4.

Farmer H, Maister L, Tsakiris M, Change my body, change my mind: the effects of illusory ownership of an outgroup hand

on implicit attitudes toward that outgroup. *Front Psychol* 2014;**4**: 1016.
Grewal D. in The 'Bad is Black' Effect (16 June 2021, date last accessed) *Sci Am*. 2017.
Hamblin J. *The Atlantic* The Paradox of Effort- A medical case against too much self-control. The Paradox of Effort (14 June 2021, date last accessed). 2015.
Haritatos J, Mahalingam R, James SA. John Henryism, self-reported physical health indicators, and the mediating role of perceived stress among high socio-economic status Asian immigrants. *Soc Sci Med* 2007;**64**:1192–203.
Ho AK, Sidanius J, Pratto F *et al*. Social dominance orientation: revisiting the structure and function of a variable predicting social and political attitudes. *Pers Soc Psychol Bull* 2012;**38**:583–606.
Hudson DL, Neighbors HW, Geronimus AT *et al*. Racial discrimination, John Henryism, and depression among African Americans. *J Black Psychol* 2016;**42**:221–43.
James SA, Hartnett SA, Kalsbeek WD, John Henryism and blood pressure differences among black men. *J Behav Med* 1983;**6**:259–78.
James SA, Hoewyk JV, Belli RF *et al*. Life-course socioeconomic position and hypertension in African American men: the Pitt County Study. *Am J Public Health* 2006;**96**:812–7.
James SA, Keenan NL, Strogatz DS *et al*. Socioeconomic status, John Henryism, and blood pressure in Black adults: the Pitt County Study. *Am J Epidemiol* 1992;**135**:59–67.
James SA. John Henryism and the health of African-Americans. *Cult Med Psychiatry* 1994;**18**:163–82.
James SA. *Racism: Science and Tools for the Public Health Professional*. Washington, DC: American Public Health Association, 2019. Chapter 8.
James SA. Sherman James and the John Henryism Hypothesis (14 June 2021, date last accessed). Dr. Sherman James discussing John Henryism Hypothesis and association with stress. 2018.
Johnson-Lawrence V, Scott JB, James SA. Education, perceived discrimination and risk for depression in a southern black cohort. *Aging Ment Health* 2020;**24**:1872–8.
Joseph JJ, Golden SH. Cortisol dysregulation: the bidirectional link between stress, depression, and type 2 diabetes mellitus. *Ann N Y Acad Sci* 2017;**1391**:20–34.
Kalantaridou SN, Makrigiannakis A, Zoumakis E *et al*. Stress and the female reproductive system. *J Reprod Immunol* 2004;**62**: 61–8.
King E, *Theses and Dissertations*.1525. *Discrimination, Depression, and John Henryism in African American and Caribbean Black Adolescents*. Starkville, MS: Mississippi State University, 2020:14–15. Discrimination, depression, and John Henryism in African American and Caribbean Black adolescents.
Kleppestø TH, Czajkowski NO, Vassend O *et al*. Correlations between social dominance orientation and political attitudes reflect common genetic underpinnings. *Proc Natl Acad Sci* 2019;**116**:17741.
La Macchia ST, Radke HRM. In: Zeigler-Hill V., Shackelford T. K. (eds.). *Encyclopedia of Personality and Individual Differences*. Cham: Springer International Publishing. 2020, 5028–36.
LeBrón AMW, Schulz AJ, Mentz G *et al*. John Henryism, socioeconomic position, and blood pressure in a multi-ethnic urban community. *Ethn Dis* 2015;**25**:24–30.
Lira M, Egito JH, Dall'Agnol PA *et al*. The influence of skin colour on the experience of ownership in the rubber hand illusion. *Sci Rep* 2017;**7**:15745.
Logan JG, Barksdale DJ, James SA. John Henryism active coping, acculturation, and psychological health in Korean immigrants. *J Transcult Nurs* 2015;**28**:168–78.
Lorenz G. Subtle discrimination: do stereotypes among teachers trigger bias in their expectations and widen ethnic achievement gaps? *Soc Psychol Educ* 2021;**24**: 537–571
Maddox KB, Chase SG. Manipulating subcategory salience: exploring the link between skin tone and social perception of Blacks. *Eur J Soc Psychol* 2004;**34**:533–46.
Maister L, Sebanz N, Knoblich G *et al*. Experiencing ownership over a dark-skinned body reduces implicit racial bias. *Cognition* 2013;**128**:170–8.
McGee E, Griffith D, Houston S, II. "I know I have to work twice as hard and hope that makes me good enough": exploring the stress and strain of Black doctoral students in engineering and computing. *Teach Coll Rec* 2019;**121**:1–38.
McGee E. "Black Genius, Asian Fail": the detriment of stereotype lift and stereotype threat in high-achieving asian and black STEM students. *AERA Open* 2018;**4**:2332858418816658.
McGee EO, Stovall D. Reimagining critical race theory in education: mental health, healing, and the pathway to liberatory praxis. *Educ Theory* 2015;**65**:491–511.
McGee EO. Devalued black and latino racial identities: a by-product of STEM college culture? *Am Educ Res J* 2016;**53**: 1626–62.
McGee EO. Interrogating structural racism in STEM higher education. *Educ Res* 2020;**49**:633–44.
Monk EP, Jr. The cost of color: skin color, discrimination, and health among African-Americans. *Am J Sociol* 2015;**121**: 396–444.
Morrison GZ. Two separate worlds: students of color at a predominantly White university. *J Black Stud* 2010;**40**:987–1015.
Moss MK, Miller R, Page RA. The effects of racial context on the perception of physical attractiveness. *Sociometry* 1975;**38**:525–35.
Passini S, Morselli D. Blatant domination and subtle exclusion: the mediation of moral inclusion on the relationship between social dominance orientation and prejudice. *Person Indiv Differ* 2016;**89**:182–6.
Pratto F. Stewart AL. Social dominance theory. In: *The Encyclopedia of Peace Psychology*. New York City, NY: John Wiley & Sons, 2011.
Quinn DM. Experimental evidence on teachers' racial bias in student evaluation: the role of grading scales. *Educ Eval Pol Anal* 2020;**42**:375–92.
Ronquillo J, Denson TF, Lickel B *et al*. The effects of skin tone on race-related amygdala activity: an fMRI investigation. *Soc Cognit Affect Neurosci* 2007;**2**:39–44.
Sanders MR, Mahalingam R. Social dominance orientation and John Henryism at the intersection of race and class. *Polit Psychol* 2012;**33**:553–73.
Silberberg M, Muhlbaier LH, Hart-Brothers E *et al*. The role of socioeconomic status in a community-based study of diabetes secondary prevention among African Americans. *Int J Health Promot Educ* 2020;1–11. DOI: 10.1080/14635240.2020.1866999.
Slatton BC. A Body That Does Not Compare: How White Men Define Black Female Beauty in the Era of Colorblindness Genders, Online Journal (3 June 2021, date last accessed). A Body That Does Not Compare: How White Men Define Black Female Beauty in the Era of Colorblindness Boulder, CO: College of Arts and Sciences, University of Colorado Boulder, 2012.

Smith WA, Hung M, Franklin JD. Racial battle fatigue and the miseducation of black men: racial microaggressions, societal problems, and environmental stress. *J Negro Educ* 2011;**80**: 63–82.

Spates K, Na'Tasha ME, Watts BC *et al*. Keeping ourselves sane: a qualitative exploration of Black women's coping strategies for gendered racism. *Sex Roles* 2019;**82**:1–12.

Subramanyam MA, James SA, Diez-Roux AV *et al*. Socioeconomic status, John Henryism and blood pressure among African-Americans in the Jackson heart study. *Soc Sci Med* 2013;**93**:139–46.

Sugaya N, Izawa S, Saito K *et al*. Effect of prolonged stress on the adrenal hormones of individuals with irritable bowel syndrome. *Biopsychosoc Med* 2015;**9**:4.

Tai TC, Claycomb R, Siddall BJ *et al*. Stress-induced changes in epinephrine expression in the adrenal medulla in vivo. *J Neurochem* 2007;**101**:1108–18.

Taylor E, Guy-Walls P, Wilkerson P *et al*. The historical perspectives of stereotypes on African-American males. *J Hum Rights Soc Work* 2019;**4**:213–25.

Wagner J, Abbott G. Depression and depression care in diabetes. *Relat Perceived Discrim Afr Am* 2007;**30**:364–6.

Whirledge S, Cidlowski JA. A role for glucocorticoids in stress-impaired reproduction: beyond the hypothalamus and pituitary. *Endocrinology* 2013;**154**: 4450–68.

Yaribeygi H, Panahi Y, Sahraei H *et al*. The impact of stress on body function: a review. *EXCLI J* 2017;**16**:1057.