

COMMENTARY

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

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

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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

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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 disproportionately 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; Whirlledge and Cidlowski 2013; Sugaya et al. 2015). Cortisol can also inhibit the immune, digestive and reproductive systems (Kalantaridou et al. 2004; Whirlledge 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

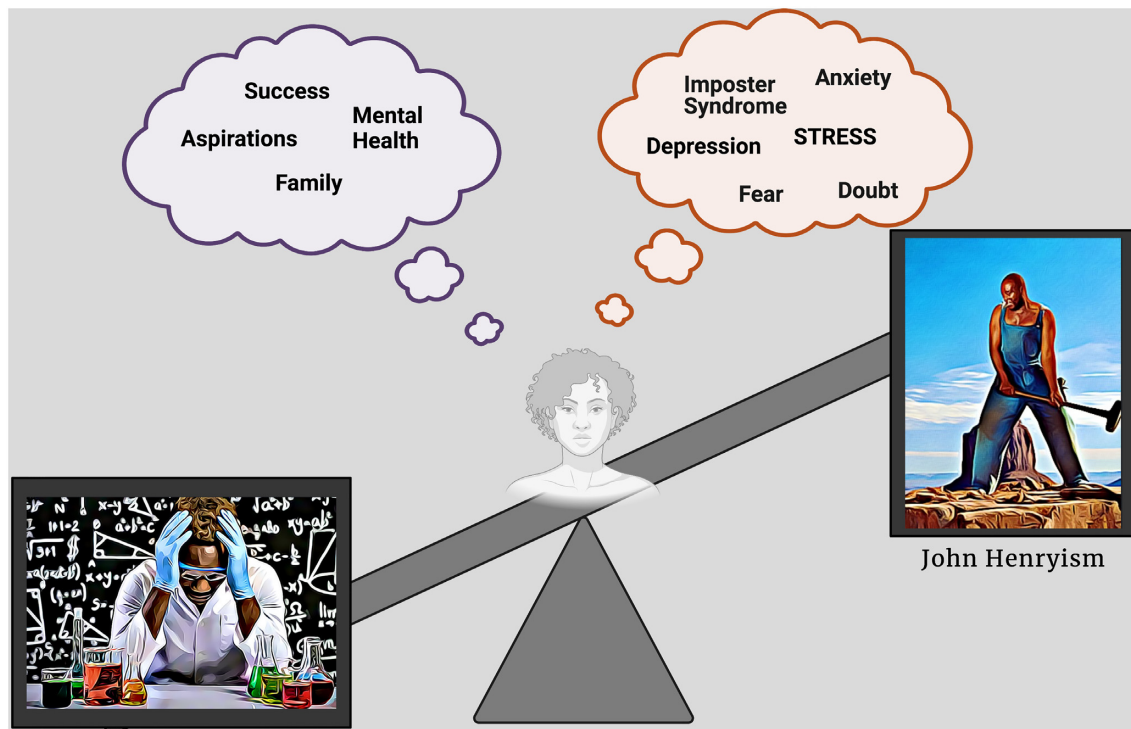


Figure 1. Frustration and coping with stress as a PEER. PEERs expend high levels of effort to cope with chronic social stressors, but at the cost of their health. This John Henryism coping strategy can cause an imbalance between productivity and PEER wellbeing. Figure created with BioRender.com

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

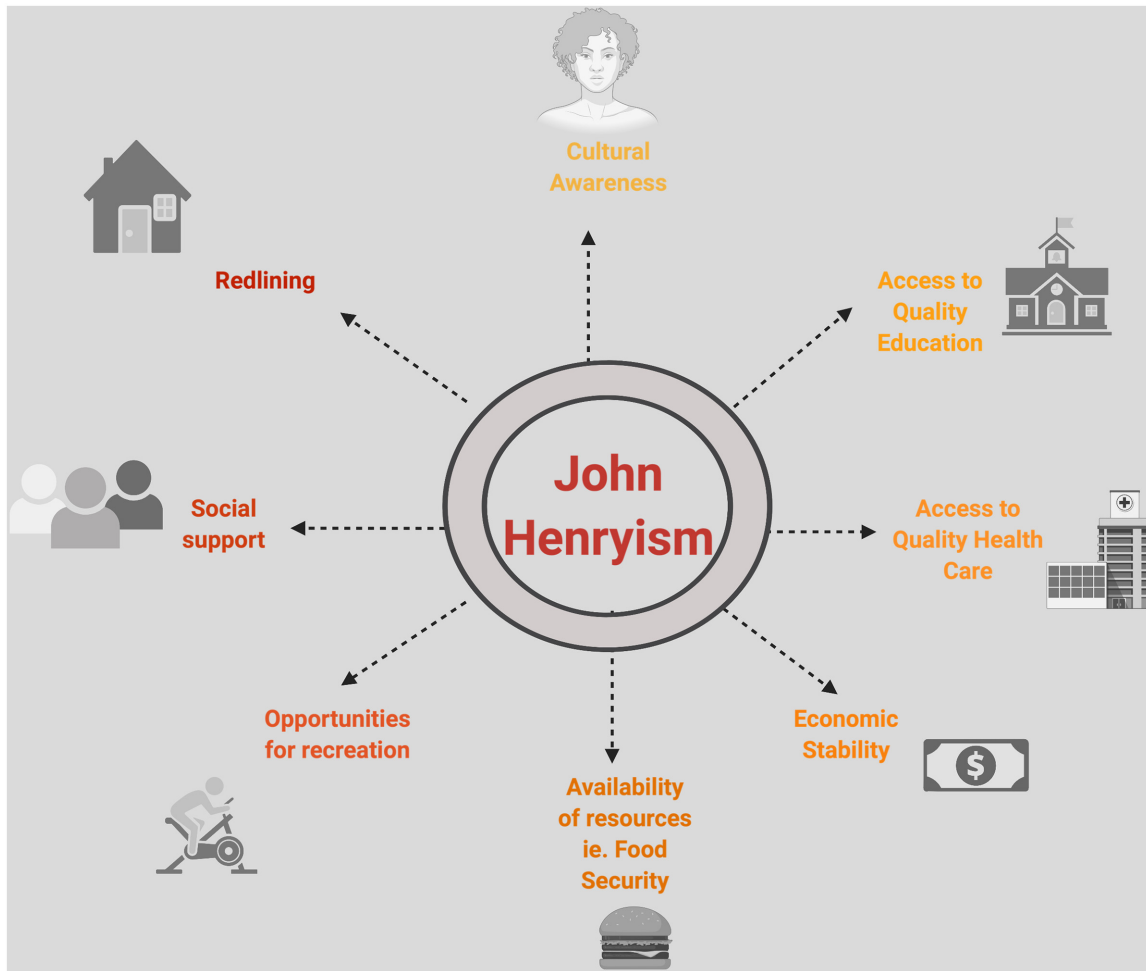


Figure 2. Social Determinates that PEERs Face. Social determinates of health that are affected by John Henryism. Figure created with BioRender.com

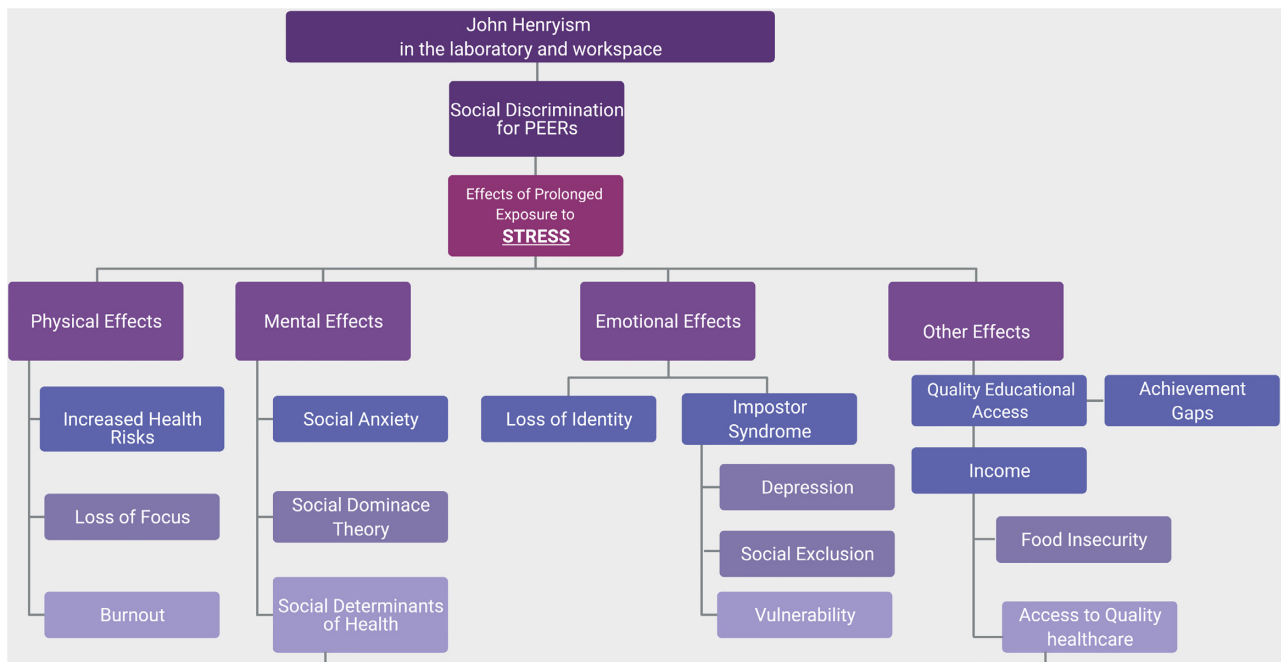


Figure 3. Chart depicting challenges that PEERs Face. Flow chart of how John Henryism and chronic stress, contribute to physical, mental and emotional problems. Figure created with BioRender.com

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

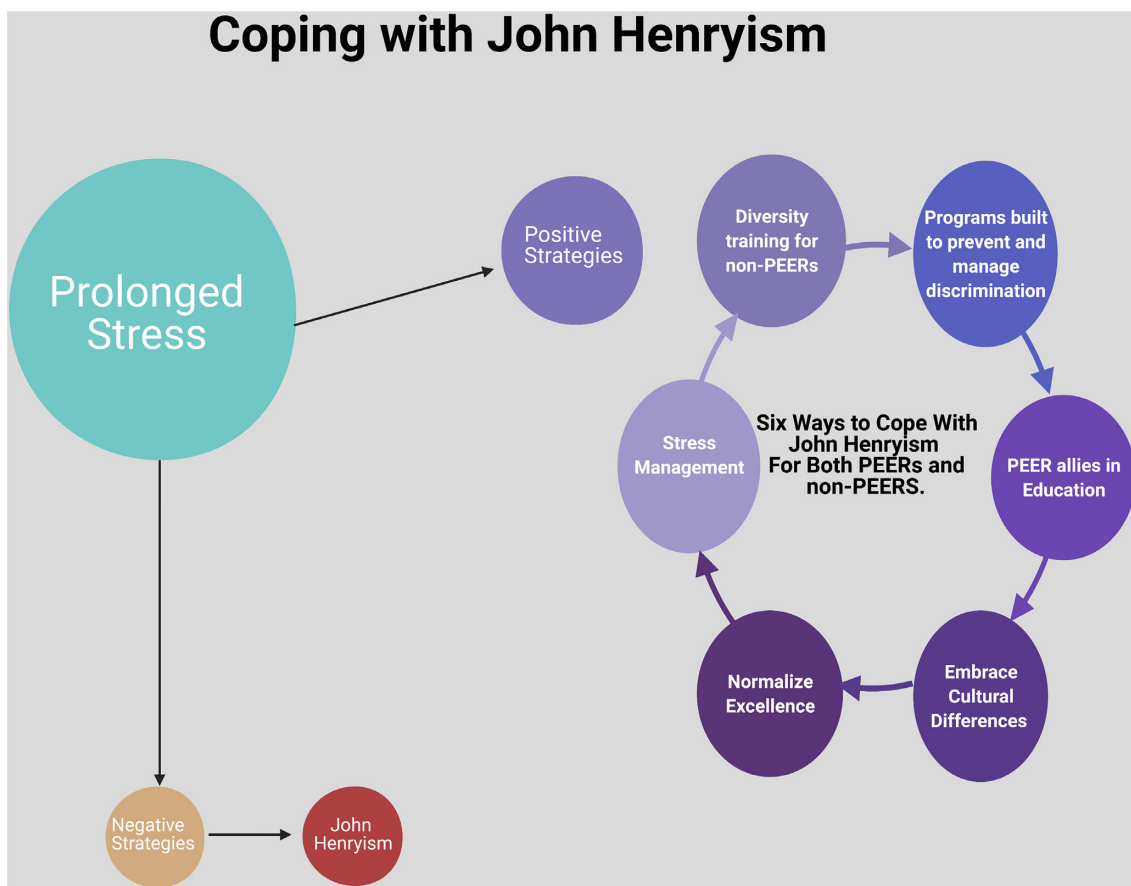


Figure 4. Strategies to Cope with John Henryism as a PEER. This figure details effective strategies for coping with stress and John Henryism. Figure created with BioRender.com

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

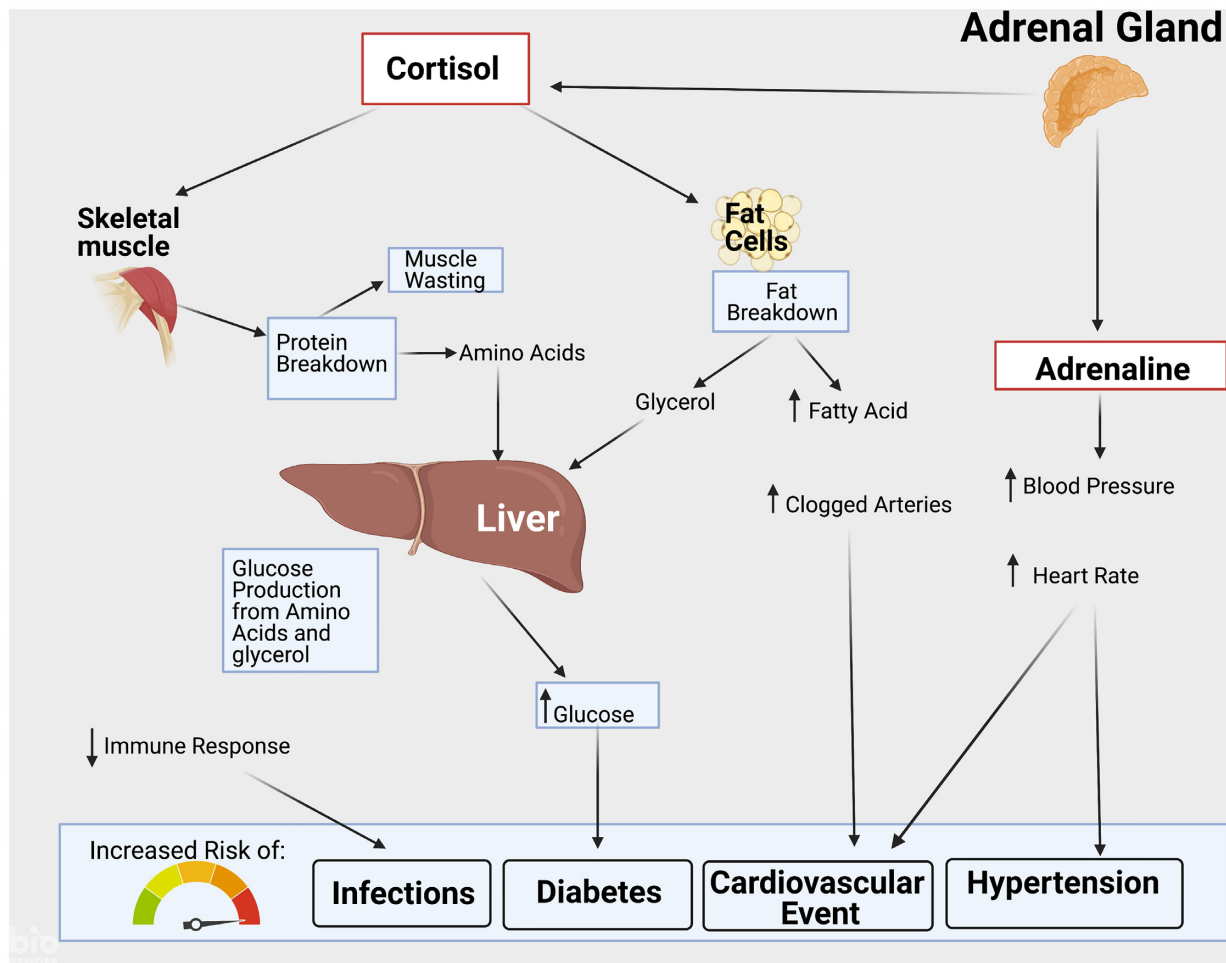


Figure 5. Stress has Consequences. Schematic representation of the link between chronic stress, adrenal stress hormones (adrenaline and cortisol) and physical illnesses. Figure created with BioRender.com

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.

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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.

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