COMMENTARY

# Disadvantage, self-control, and health

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Substantial inequities in disease risk and mortality by socioeconomic status (SES) and race challenge us to understand how health disparities emerge and can be eliminated. Building on a strong foundation of studies documenting disparities in a range of diseases and health problems, researchers are increasingly focusing on potentially modifiable mechanisms through which SES and race influence disease risk. One set of mechanisms involves risk factors for disease that occur more frequently in disadvantaged groups that, if reduced, could close the gap in morbidity and mortality. These include lack of access to health care, exposure to toxins and physical hazards, health-damaging behaviors, and adverse social environments (1). A second set of mechanisms involves protective factors that, if bolstered in disadvantaged groups, could do the same. These include social resources such as social support and social participation and psychological resources such as optimism, self-esteem, and perceived control (2). Whereas it is generally assumed that reducing risk factors and/or increasing protective factors will be beneficial in reducing disparities, Miller et al. (3) provide a more qualified assessment of one protective factor—self-regulation—and suggest that although greater self-regulation improves psychosocial outcomes, it may increase biological risk in more disadvantaged groups.

## Self-Regulation As a Protective Factor

Self-regulation covers a broad set of capabilities including the capacity to suppress inappropriate impulses, delay gratification of immediate needs in the service of achieving longer-term goals, and self-regulating one's emotions and behaviors. Self-regulation, which develops over the course of childhood and young adulthood, enables deliberative, goal-oriented actions. It is linked to a wide range of favorable outcomes including school completion and better health behaviors in adolescence, wealth accumulation, avoidance of criminal activities, and better health in adulthood (4).

## Self-Regulation and Health

The importance of self-regulation for cognitive and social development is understood, and interventions have been developed for children from kindergarten through high school that have been shown to be effective in changing attitudes, behavior, emotional skills, and school achievement (5). The impact of self-regulation on physical health is less well established. One of the largest studies to explore the self-regulation–health association followed a cohort of a thousand children from birth up to age 32 (4). The researchers examined the relationship of self-regulation in childhood to a health index at age 32 that included indicators of immune and cardiovascular health, respiratory function, and dental and sexual health. They found that the adults who had greater self-regulation in childhood had lower substance use and better overall physical health.

There is reason to believe that self-regulation would confer beneficial effects on health, but how? One pathway is through health behaviors. To the extent that self-regulation better enables people to resist engaging in health-damaging behaviors, including use of tobacco, alcohol, and other harmful substances, greater self-regulation should be associated with a lower prevalence of the diseases linked to these behaviors.

**Miller et al. identified a potential biological cost associated with greater self-control.**

Greater self-regulation may also buffer children from some of the health problems generated by exposure to chronic stress. Repeated cycles of stress responses that are functional in the short term in addressing threats can cause long-term harm to both the brain and the body (6). Low-resource environments are characterized by more adverse physical and social environments that expose children to greater interpersonal conflict and threat (7). Self-regulation may help children deal more effectively with stress exposures. The biological cascade triggered by perceptions of danger reflects the balance between the actual threat that is posed and the person's appraisal of his or her ability to deal with it. Low-SES children who feel less control and less confidence in their ability to master problems will be more likely to interpret an encounter as threatening. In an experimental study, low-SES adolescents viewing the same situation appraised ambiguous events more negatively than did their higher-SES peers yet did not respond differently to clearly positive or clearly negative events (8). Among low-SES children, a greater sense of self-control may enable them to interpret ambiguous situations as posing a challenge rather than a threat. Challenge appraisals elicit different—and more benign—physiological responses (9).

## Can Self-Regulation Confer Risk?

It is likely that the link between self-regulation and health will be weaker than with cognitive and social outcomes. However, it would be surprising to find a negative impact of self-regulation on health. This makes the results reported by Miller et al. (3), showing a possible negative effect of self-control on health, so intriguing.

The majority of findings presented by Miller et al. (3) replicate previous studies showing benefits of self-control. In a sample of low-SES, African-American high school students in a rural area, those with greater self-control had greater reductions in psychosocial problems including depression, internalizing symptoms, aggressive behavior, and substance abuse. The fact that the reduction in substance abuse associated with greater self-control was significantly larger the greater the degree of disadvantage reinforces the view that these skills are especially valuable for the most disadvantaged children.

However, in a follow-up at age 22 y, Miller et al. (3) identified a potential biological cost associated with greater self-control. They used a blood sample from participants to provide a biomarker of epigenetic aging. Epigenetic aging was not significantly related to self-control in the sample as a whole, but there was a significant interaction between self-control and disadvantage measured at ages 17–20 y such that, among the less-disadvantaged participants in the sample,

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greater self-control was linked to less epigenetic age acceleration, whereas among the more disadvantaged, age acceleration was positively related to self-control.

## Disadvantage, Stress, and Accelerated Aging

The concept of accelerated aging is a useful way to capture processes associated with social disadvantage that may compromise health in the long run. Members of disadvantaged groups have, on average, earlier age of onset of diseases of aging such as cardiovascular disease, arthritis, diabetes, and some forms of cancer. Life expectancy at age 25 is shorter for those with less income and less education (10), as is true for African-Americans compared with European-Americans (11). Biomarkers that can quantify the degree to which a person's body is aging prematurely are valuable for identifying enhanced risk before the appearance of disease.

Illuminating the biological processes that underlie health disparities can yield valuable insights into ways to address them. Two measures of accelerated aging are most frequently being used in studies of health disparities. One is telomere length, which captures cellular aging and predicts risk of disease and mortality and is linked to stress exposure (12) and to lower SES, including among children (13). The second is allostatic load, an index of dysregulation across multiple systems of the body, which is hypothesized to capture the wear and tear of repeated exposures to stress. Allostatic load, too, predicts the development of cardiovascular and other diseases and is associated with stress exposure (6) and low SES also among children (14).

The measure of epigenetic aging is relatively novel and limited evidence is available on its implications for future health. Two different metrics were used by Miller et al. (3) to measure epigenetic aging. One metric was significantly related to disadvantage, but the other was not, and the patterning of the interactions differed. Using one metric, more disadvantaged adolescents with greater self-control showed more epigenetic age acceleration than those with less control, whereas degree of self-control had little influence on epigenetic age acceleration in the less disadvantaged. Using the other metric, self-control had no significant influence on epigenetic aging among the more disadvantaged, whereas among the less disadvantaged, those with greater control showed significantly less epigenetic aging than those with less control. Viewed one way, this inconsistency raises questions about the robustness of the measure. However, if the metrics are intended to capture different aspects of epigenetic aging, these differences can potentially be informative.

It is impressive that Miller et al. (3) found significant effects despite the homogeneity of an all-black, rural, poor sample. Their findings remind us that blessings can be mixed, but more could be learned by studying these factors in more diverse samples. A wider range of SESs might reveal more significant contrasts and provide greater opportunity to elaborate the underlying biological mechanisms. A mixed-race sample could more directly address the question of why African-Americans, despite their greater social disadvantage and poorer physical health, generally show more positive mental health.

Concepts such as "weathering" (15) and "John Henryism" (16) suggest unique stresses encountered by African-Americans, such as the challenges to succeed in the face of racism and discrimination. Miller et al. (3) suggest that these play a role in their findings. A direct test of whether the same pattern emerges among white people and whether greater self-control leads to maladaptive levels of goal striving will be useful in assessing the meaning and generalizability of the findings. Finally, including additional biomarkers and health outcomes could provide more evidence on the meaning and utility of the epigenetic aging metrics. Although the findings by Miller et al. (3) are too preliminary to inform policy or intervention, they suggest the kind of data that will be needed to know whether there is a downside to self-regulation.


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