

# Physical Activity as a Buffer for Anxiety Symptoms in Rural African American Adolescent Females

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## Abstract

The study examines how physical activity buffers the development of anxiety symptoms in response to race-related stress and negative youth experiences. The participants are 72 adolescent females from an understudied population of rural African American students residing in South Central Louisiana. Recent literature suggests that physical fitness increases one's ability to cope with psychological stress and may prevent or combat anxiety disorders. However, American adolescents are becoming less physically active, particularly African American females. Previous literature shows that adolescent females report higher levels of mental health challenges than their male counterparts. The results indicate that physical activity is an effective buffer against increased anxiety symptomatology. In addition, the results present this population as resilient rather than "at risk" for developing vulnerability to mental health challenges.

**Keywords:** Physical activity; Rural environment; Anxiety; African American adolescents; Females

## Introduction

The belief that physical health leads to mental health has recently been validated by researchers [1,2]. Particularly beneficial is the effect of physical activity on psychological coping [1,2] and academic outcomes [3]. However, the U.S. society is becoming increasingly sedentary. Consequently, rates of obesity, diabetes, heart disease, and other maladies are rising. These avoidable challenges are the leading causes of death for African American women, and these negative health trends apply to adolescents as well as adults [4,5]. The challenges that African American adult women face are likely to be rooted adolescent behaviors.

Adolescence is a critical developmental period in one's lifelong health trajectory. Often adolescents develop eating and physical activity habits that persist into adulthood [3]. Additionally, past work has evidenced that the onset of puberty is a sensitive developmental period for neural circuits involved in mental health and illness. Anxiety disorders are the most prevalent psychiatric disorders in the United States [6]. Much of the available empirical literature suggests that adolescence is a period of heightened anxiety and stress across many cultural contexts, characterized by adjustment problems and dysphoria [5,7,8]. It is important to note that these difficulties typically do not persist into adulthood; however, for a subgroup of adolescents the problems escalate into a prodromal stage of serious mental illness [5]. Thus, adolescents with anxiety problems are at increased risk for adult anxiety disorders, depressive disorders, and substance use problems. Anxiety has also been linked to lower academic outcomes for adolescents [9].

Though the field has made significant advances in the understanding of anxiety problems among adolescents, significant gaps in knowledge remain, particularly for African American youth [10]. Previous studies have found no statistically significant race-based

differences when examining the prevalence rates of anxiety symptoms among African American and Caucasian American adolescents [11,12]. However, African American youth are less likely than Caucasian American youth to seek and maintain both pharmacological and psychotherapy treatment [3,12]. Due to the differential treatment processes between racial and ethnic groups, it is important to discover factors that may contribute to anxiety symptomatology among African American adolescents. Furthermore, it is imperative to identify factors that may serve as a buffer against anxiety because, based on treatment trends among African Americans, it is not beneficial to solely rely on pharmacological and psychotherapy modalities of treatment to assist this population with anxiety symptom reduction.

The present study examines the potential benefits of physical activity on anxiety in an understudied population: rural African American adolescent females. These issues are particularly salient for this population. First, increased cognitive abilities include perceptions of discrimination and racism, which may lead to additional stress [13,14]. In addition, adolescent females of every racial and ethnic background tend to report higher levels anxiety than their male peers [9,10]. Finally, adolescent females engage in physical activity less than their male peers [15]. Therefore, it is necessary to examine if physical activity is a potential buffer to the development of anxiety, which would suggest that physical activity is potentially a healthy coping strategy for this population.

As previously stated, anxiety symptoms often first manifest during adolescence [5,8,16]. Research links adolescence with a rise in anxiety symptoms and other comorbid mental health disorders, particularly in females [9,10,17] which is partially due to increased internalization of stress and sensitivity to interpersonal conflict [18]. These mental health challenges are coupled with the interactions among cognitive, social, and physical changes, which simultaneously occur during adolescence [5,7,19,20]. Anxiety symptoms are associated with lower academic outcomes [9], diminished self-esteem [21], poor physical health [22],

increased risk for substance abuse [23,24] and a substantial risk for morbidity and mortality [25]. However, not much of the anxiety related research is conducted with rural, African American samples, probably due to their lessened availability of mental health resources and participation in clinical treatment [12].

Worrell's review [26] of anxiety disorders in African Americans indicates much more research is needed. Approximately 29% of adults report having an anxiety disorder within their lifetime [27]. While African Americans tend to have lower rates of psychiatric disorders than Whites et al. report an exception in reports of anxiety disorders. However, the findings are inconclusive. The ambiguity of anxiety symptomology among this population emphasizes the importance of examining anxiety and other psychological disorders during the second decade of life when these disorders typically first begin to manifest [5].

While increased anxiety may be a normative part of adolescence, additional stress beyond normative levels is harmful to adolescent health. Previous research shows that chronic stressors can lead to anxiety and depressive symptoms in any population [28]. At a physiological level, chronic stress leads to an overactive Hypothalamus-Pituitary-Adrenalocortical axis (HPA axis), which is associated with chronic health problems [29]. Research shows an inverse relationship between socioeconomic status and anxiety [30]. Racial background often co-varies with socioeconomic status (SES), thus, putting African Americans who constitute a large portion of the low SES population, at greater risk for anxiety disorders. African American adolescents face additional challenges such as discrimination, violence, and race-related stress that are unique to their racial and ethnic group [31,32].

Because adolescents develop abstract thinking and greater ability to understand factors in the social environment outside of themselves [33] opportunities for more awareness of race-related stressors becomes more salient for racial minority adolescents. For African American adolescents, this includes perceptions of a society in which their race is often maligned. For instance, African Americans report perceiving racism more than any other U.S. racial and/or ethnic group [34], which has been linked to depressive symptoms, lowered self-esteem, higher externalizing behaviors, and school misconduct [14]. These experiences can be direct, for instance being called a racial slur, or indirect such as seeing one's race portrayed negatively by the media. Race-related stress is persistent both chronologically and environmentally [14,35] and there is a deleterious effect of racial discrimination on mental health [6]. It is therefore critical that we uncover potential buffers for chronic stress.

One potential buffer for chronic stress is regular physical activity [29]. Stress reactivity research indicates that greater physical fitness reduces responses to psychological stressors [1], which enables adolescents to have better outcomes despite negative environmental factors. Additional benefits of physical activity include lower levels of anxiety and improved mood and cognition [2,36]. Interestingly, physical activity has been found to have a greater effect for those individuals that are more physically and psychologically unhealthy [2]. Thus, inactivity may be a risk factor that interacts with other risk factors (i.e., physical and psychological health). One potential weakness in the current literature is a lack of studies examining non-clinical populations. It is important to examine physical activity as a potential preventative measure for the development of anxiety symptoms.

Adolescents in the United States engage in physical activity less than ever before. For instance, American adolescents watch approximately three to five hours of television per day [15]. Inactivity is highest for non-Hispanic Black and Hispanic adolescents, and these trends are more pronounced for female adolescents [15]. A study utilizing the data from the National Longitudinal Study of Adolescent Health (Add Health) explored inactivity across racial and ethnic groups and found that African American males and females spent an average of 20 hours watching television a week, which was significantly more than all of the other racial and ethnic groups. The study also found that weekly inactivity was highest among African American males and females. Ries et al. found that low SES African American adolescent females listed inadequate facilities, fear of violence, and physical activity as being "non-feminine" as major obstacles for engaging in physical activity. The present study examines these relationships in rural African American adolescent females. Ecological differences may contribute to differences in perceived stressors and available buffers for those stressors. "Rural families must deal with a restricted range of employment opportunities, great distances from residences to businesses and services, limited public transportation, and a lack of recreational facilities for children and adolescents" [37]. However, the rural context may also demonstrate assets such as increased community cohesion and integration of multiple contexts (e.g., school, church, community centers) [38,39]. Therefore, researchers must identify both the strengths and weaknesses of rural communities so that the strengths can be augmented and one can compensate for potential weaknesses. The present study has two hypotheses. First, we hypothesize that chronic stress, as a result of race related stress and negative youth experiences, leads to increased anxiety symptoms. Second, physical activity acts as a moderator of this relationship by reducing anxiety symptoms. In addition, this study addresses several weak points in the current literature. First, few studies exist that examine physical activity in people with sub-clinical levels of mental health challenges (i.e., anxiety). Likewise, there is a lack of literature in this area examining rural, African American adolescents. This population is assumed to be similar to their urban counterparts, but contextual factors may affect the development of mental health vulnerabilities.

## Methodology

### Participants

The rural community sample comprised 72 African American adolescent girls from a public school. According to the US Census the area in which the data were collected has a population of just over 22,000, is 50% African American, has a per capita income of \$22,500, and a population density of 91.5 people per square mile. Participants ranged from age 12-18 ( $m=14.75$ ,  $SD=1.53$ ). Participants were chosen based on availability from their class schedule. That is, students who had elective courses during data collection times were permitted to participate. This sample was drawn from a larger sample of 158 male and female students. The mean age for the larger sample was similar to the present sample ( $M=15.01$ ,  $SD=1.46$ ). The larger sample was majority female ( $n=101$ ).

The larger sample self-reported their racial background as 81% Black/African American, 16% White, 1% Hispanic, and 2% other. The participants' backgrounds were consistent with the larger school population. Less than half of the students come from single parent families (42%) and the majority of the mothers completed high school

(21%), some college (21%), or graduated from college (28%). Thirty one females from the larger sample were not included in this sample due to incomplete or improperly completed protocols or they did not self-report their racial background as Black or African American. These females did not differ significantly from the sample included on major demographic variables.

### Procedure

The participants completed a self-report questionnaire as part of a larger study concerned with the social and educational experiences, as well as the academic achievement and resilience of African American adolescents. The students and their guardians signed adolescent assent

and parental informed consent forms, respectively, and they were informed that their responses were confidential. The surveys included additional measures not included in this report, and participants took approximately one hour to complete it. A research team of graduate students that included at least one African American female graduate student administered the questionnaires to the participants during school hours. One graduate researcher read the questionnaire aloud and the students had the choice to either follow along with the researcher or complete the survey independently at their own pace. The participants received five dollars as compensation for their time (Table 1).

| Variables |                       | 1     | 2      | 3     | 4      | 5     | 6      |
|-----------|-----------------------|-------|--------|-------|--------|-------|--------|
| M         |                       | 14.75 | 8.76   | 1.71  | 1.5    | 3.3   | 0.45   |
| SD        |                       | 1.53  | 1.69   | 0.59  | 0.82   | 1.4   | 0.2    |
| 1         | Age                   | --    | 0.81** | -0.06 | 0.17   | -0.15 | 0.14   |
| 2         | Grade level           |       | --     | -0.12 | 0.11   | -0.16 | 0.14   |
| 3         | NYE*a                 |       |        | --    | 0.37** | 0.1   | 0.09   |
| 4         | Race-related stress b |       |        |       | --     | 0.15  | 0.14   |
| 5         | Physical activity c   |       |        |       |        | --    | -0.27* |
| 6         | Anxiety d             |       |        |       |        |       | --     |

**Table 1:** Bivariate correlation matrix of all the study's constructs (N = 71) +=p<0.10, \*=p<0.05, \*\*=p<0.001, NYE =Negative Youth Experiences, a Scale=1-5; b Scale=1-4; c Scale=1-7; d Scale=0-1

### Measures

#### Chronic stress

Two constructs comprise chronic stress: negative youth experiences (NYE) and the Index of Race-Related Stress (IRRS). The negative youth experiences scale (NYE) is a modified version of the Youth Experiences Measure [40,41], which is comprised of 21 questions with a Likert response of never, almost never, sometimes, almost always, or always. The Cronbach's alpha for this measure is 0.91, indicating adequate reliability. This scale was designed to examine the participants' discriminatory experiences in social and community settings.

For instance, students completed statements that asked how often "do sales people tend to follow you when you enter a store?" The scale has been reliably used with urban, African American females in a previous study [41].

The second measure was the Index of Race-Related Stress (IRRS) (32 items) [42,43], which measures the stress experienced by Blacks as a result of encounters with racism. Items are scored on a 5 point Likert scale (0=never happened, 1=happened, but not a bother, 2=happened, slightly upset, 3=happened upset, 4=happened, extremely upset).

This scale is divided into three sub-scales individual racism, collective/institutional racism, and cultural racism scores are then averaged to create a measure of global race-related stress. Items include questions like "You have been threatened with physical violence by a person or group of Whites/non-Blacks." IRRS has a Cronbach's alpha of 0.93, which indicates high internal consistency.

#### Anxiety

Anxiety was measured using a portion of the Revised Children's Manifest Anxiety Scale (RCMAS) [44]. Items are forced choice (1=yes, 0=no) and are summed to get a total anxiety score. The RCMAS scale has four subscales; Physiological Anxiety, Worry/Oversensitivity, Concentration Anxiety, and a Social Desirability scale. For this study, only the items from the first three subscales were used. Items include questions like "I get nervous when things do not go the right way for me."

The Social Desirability scale was omitted because there is minimal research literature available to substantiate that it increases the accuracy of the assessment of anxiety in youth; and a number of studies aiming to assess the psychometric properties of the RCMAS have found age, gender, and cultural differences on the Social Desirability scale [45]. Additionally, its content does not address the issues of this study, and the RCMAS maintains good internal consistency without the inclusion of the Social Desirability scale ( $\alpha=0.80$ ).

#### Physical activity

Physical activity was measured using two items from the questionnaire ( $r=0.48$ ). The participants were asked, "How often do you engage in physical activity?" This item is coded by a Likert scale ranging from 0 (never) to 5 (daily). They were also asked, "How many hours a week do you spend playing sports?" This item is scaled on a Likert scale ranging from 1 (0 hours) to 7 (11 hours or more). These items were summed and higher score indicated higher levels of

physical activity, while lower scores indicated lower levels of physical activity.

## Results

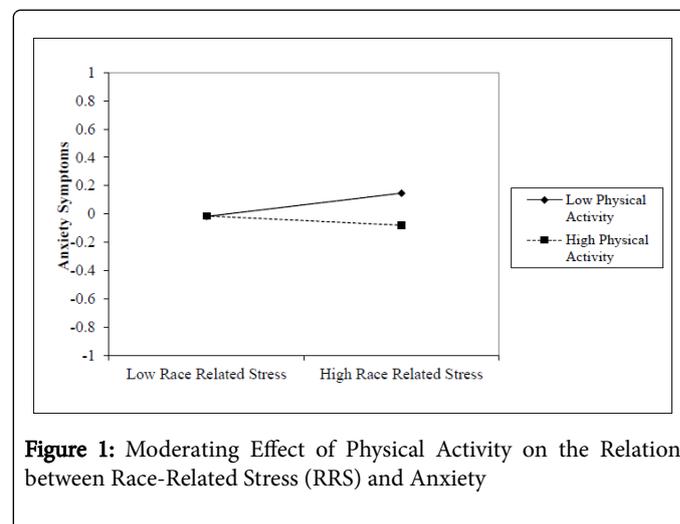
In order to examine the associations between the chronic stressors, anxiety, and physical activity the data were analyzed using bivariate correlation analysis and hierarchical regression analyses. Descriptive statistics were also obtained to observe distribution trends within the data (Table 1).

Age and grade level were included in the correlations with the study variables to observe if any cohort effects were present. Age nor grade level did not have statistically significant correlations with any of the other study variables. However, as expected, age and grade were highly correlated with each other ( $r=0.81$ ,  $p<0.001$ ). Overall, this sample reported low to moderate levels of both stressors; NYE scores ranged from 1.00-3.52 out of 5 ( $M=1.71$ ,  $SD=0.59$ ), and RRS scores ranged from 0.00-3.44 out of 4 ( $M=1.50$ ,  $SD=0.82$ ).

These scores are lower than scores reported by urban samples and may be a result of the rural context. The participants reported moderate levels of anxiety ( $M=0.45$ ,  $SD=0.20$ ). Physical activity scores were moderate and ranged from 1.00-6.00 out of 7 ( $M=3.30$ ,  $SD=1.47$ ). Next, as indicated in Table 1, a bivariate correlation analysis was conducted on the measured constructs. As expected, the relation between negative youth experiences (NYE) and race-related stress (RRS) was statistically significant ( $r=0.37$ ,  $p=0.001$ ). As expected, there was a negative correlation between anxiety and physical activity ( $r=-0.27$ ,  $p<0.05$ ), which suggests that higher levels of physical activity are associated with lower levels of anxiety and vice versa.

Finally, regression analyses were conducted to further explore the hypothesized relationships and test for moderation effects. The data were centered prior to running the regression analyses to avoid multicollinearity [46]. Hierarchical regressions were conducted to examine physical activity as a potential moderator of the relationship between the chronic stress (NYE or RRS) and symptoms of anxiety. The stressor

was added in the first step of the model, physical activity was added in the second step of the model, and the interaction term was added in the third step. The first regression tested the effect of negative youth experiences (NYE) on anxiety symptoms, and physical activity as a moderator of that relationship (Figure 1).



**Figure 1:** Moderating Effect of Physical Activity on the Relation between Race-Related Stress (RRS) and Anxiety

It was discovered that NYE was not significantly associated with anxiety symptomology ( $\beta=0.09$ ,  $p=0.48$ ). Physical activity explained a statistically significant amount of the variance in anxiety symptom scores ( $\beta=-0.28$ ,  $p<0.05$ ;  $\Delta R^2=0.08$ ). However, the interaction between NYE and physical activity was not significant ( $\beta=0.02$ ,  $p=0.89$ ). The second regression analysis examined the relationship between RRS and anxiety with physical activity as a moderator. Similar to the previous regression, RRS did not significantly contribute to the model ( $\beta=0.12$ ,  $p=0.35$ ). However, physical activity explained a significant amount of the variance in anxiety scores ( $\beta=0.30$ ,  $p<0.05$ ;  $\Delta R^2=0.09$ ). Furthermore, the interaction between RRS and physical activity was statistically significant ( $\beta=-0.30$ ,  $p<0.05$ ;  $\Delta R^2=0.09$ ) (Table 2).

| Variables                                   |                         | SE   | B      | $\beta$ |
|---|-------------------------|------|--------|---------|
| Step 1: $F(1,71)=1.35$ ; $R^2=0.02$         | RRS                     | 0.03 | 0.03   | 0.14    |
|   | Physical activity       | 0.02 | -0.04* | -0.30*  |
| Step 2: $\Delta F(2,70)=6.54$ ; $DR^2=0.08$ | RRS                     | 0.03 | 0.05   | 0.18    |
|   | Physical activity       | 0.02 | -0.04* | -0.30*  |
| Step 3: $\Delta F(3,69)=7.64$ ; $DR^2=0.09$ | RRS                     | 0.03 | 0.05   | 0.19    |
|   | Physical activity       | 0.02 | -0.04* | -0.27*  |
|   | Physical activity X RRS | 0.02 | -0.05* | -0.30*  |

**Table 2:** Moderating effect of physical activity on the relation between race-related stress (RRS) and anxiety ( $N=72$ ),  $+p<0.10$ ,  $*p<0.05$ ,  $**p<0.001$

As indicated in Figure 1, the finding suggests that physical activity acted as a moderator for the relationship between race-related stress and anxiety. As hypothesized, females who reported high RRS and low physical activity reported high amounts of anxiety. However, females who reported high RRS and high physical activity reported significantly lower levels of anxiety ( $\beta=-0.27$ ,  $p<0.05$ ). Simple slope analysis indicates that, under a condition of low RRS, physical activity did not have a significant effect on anxiety scores ( $\beta=-0.08$ ,  $p>0.10$ ).

However, under condition of high RRS, physical activity was significantly associated with lower anxiety scores ( $\beta=0.46$ ,  $p<0.01$ ). These results indicate that engaging in physical activity is most impactful for anxiety reduction for individuals who report higher levels of race related stress (Figure 1).

Thus, physical activity may serve as a protective factor against adverse mental health conditions, such as anxiety, for those experiencing race related stress.

## Discussion

The present study hypothesized that higher levels of race-related stress and negative youth experiences would lead to higher levels of anxiety, and that physical activity would moderate that relationship and directly reduce symptoms of psychological distress. Results only partially support this hypothesis. Examination of the descriptive statistics shows that this sample experienced a low level of both race-related stress and negative youth experiences. These negative youth experiences are associated with many negative outcomes such as aggression as well as depressive symptoms in urban adolescents [47]. Likewise, research links perception and experiences of racism to many negative outcomes for adolescents such as depressive symptoms, lowered self-esteem, higher externalizing behaviors, and school misconduct in urban adolescents [14]. However, these scales were developed to examine the experiences of urban adolescents, and the urban context includes more interaction with members of different racial backgrounds as well as more independence and social mobility due to public transportation [37]. Results of the present study indicate that in the rural context these negative experiences are less common. This finding parallels past research, which indicates that every day but not major experiences of discrimination are associated with anxiety disorders for African Americans [6]. More importantly, the null finding indicates that the experiences of urban and rural African Americans are quite different, and more research must be done with rural populations in order to better understand their unique perspectives and experiences.

The anxiety measure indicated that these adolescents only experience a moderate amount of anxiety, which is to be expected from a non-clinical, community sample. Previous research findings suggest that African American adolescent females who are exposed to stressors should be vulnerable to developing symptoms of psychological distress [9,14]. However, the present sample does not reflect this pattern, and instead demonstrates resilience. One possible explanation is that the rural context is serving as a protective factor for these symptoms of psychological distress. It is, therefore, not surprising that the hypothesized moderation effects were not strongly supported. Even though NYE and RRS experiences may be less common in a rural setting, adolescents still need healthy coping strategies for dealing with these suboptimal experiences. As other research with rural populations point out, the rural environment affords more opportunity for relationships to develop and both real and fictive kin relationships may serve as additional buffers to life's challenges [37,48].

The strongest finding was the relationship between physical activity and anxiety. Females who were physical activity reported significantly less anxiety than their inactive peers. Coupled with previous literature on physical activity rates, this finding highlights the potential importance of promoting physical activity within this population [49]. This finding has great implications for preventative intervention programming with this population. Physical activity interventions, both within the school context and community context, can serve to reduce anxiety symptomatology among rural, African American adolescent females. Such interventions are becoming increasingly important as African Americans often do not seek and maintain treatment for psychological disorders. Therefore, decreasing the need for treatment for psychological disorders, such as anxiety, will contribute to the resilience of this population.

## Future Directions

The present study is indicative of the need for more research to examine rural African American adolescents and females. Previous research identifies African American adolescent females as an at risk population for the development of anxiety disorders. However, the present sample shows more signs of resilience than risk because of the low reports of chronic stressors. More research is needed to identify factors that function as protective factors. As previous research has noted the rural context itself may serve as a protective factor by limiting direct encounters with racism compared to the urban context [9,37,48]. The rural context may afford more daily physical activity from walking or non-structured activities. However, the rural context can also include challenges to physical activity such as access to adequate facilities [37,38].

Future research should identify protective factors such as significant relationships with adults [38] which could inform intervention development for school and community contexts. Additionally, future research should seek to identify challenges that may be unique to this rural population that contribute to anxiety disorders. Finally, it is also important that rural African American adolescent females develop healthy coping strategies for experiences with racism and psychological distress in general. The coping strategies may be associated with parents' racial socialization and other parenting practices previously examined in other rural environments [48]. Adolescents may then utilize established healthy coping strategies if a change in context (e.g., college enrollment) presents new challenges [50]. Additionally, as noted from the Strong African American Families intervention with rural African American participants [48], changes in parenting behaviors may lead to a reduction of risk behaviors in which some adolescents engage.

## Limitations

First, the physical activity measure may have been vulnerable to social desirability effects. Also, there is no way to differentiate vigorous sports training from light general recreation. Intensity of the physical activity may be as important as time spent exercising. The measure also does not distinguish between sports play for an organized team, such as a school team, and sports play that occurs in the community independent of adult supervision. Also, the hypothesis may not have been supported due to suppression effects of the physical activity. However, the strengths of the study outweigh the potential weaknesses. The statistically significant main effects between physical activity and mental health challenges indicates a need to examine these relations more in rural populations. The fact remains that physical activity in and of itself is inversely related to anxiety, which points to its positive potential.

## Conclusion

There is little debate that physical activity directly reduces anxiety and chronic stress. Anxiety is associated with lower academic achievement and a host of other negative outcomes [9]. The results of this study and others support the promotion of physical activity as a preventative measure to the development of negative mental health outcomes, such as anxiety. This is particularly true for adolescent females. These findings are in addition to well established connections between regular physical activity and reduced rates of diabetes, heart disease, obesity, and many other negative health markers. Many of these problems are typically associated with adults, but, health habits in

adolescence predict health habits in adulthood [3]. Likewise, rates of obesity and type II diabetes are growing in adolescents at an alarming rate. Furthermore, these health problems are easier to prevent than to reverse. Thus, establishing positive health habits, such as regular physical activity will have lifelong benefits for youth. There needs to be a schematic shift in how we regard physical activity from that of a desired aspect of daily life to a necessary and integral part of daily life. This shift needs to be coupled with policies and interventions that are designed to promote physical activity in our adolescents. The long term goal is to produce adolescents, who become adults, with a healthy mind in a healthy body.

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