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Original article

## The Modifying Effects of Race/Ethnicity and Socioeconomic Status on the Change in Physical Activity From Elementary to Middle School

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*Article history:* Received November 23, 2016; Accepted May 2, 2017

*Keywords:* Physical activity; Socioeconomic status; Race/ethnicity; Youth; Adolescents

### ABSTRACT

**Purpose:** Youth physical activity (PA) levels differ by race/ethnicity and socioeconomic status (SES). It is well established that various multilevel factors may influence changes in PA. The present study examined whether the association between the change in individual, interpersonal, and environmental factors and the change in PA is modified by race/ethnicity or SES.

**Methods:** This study followed 643 youths and their parents from suburban and rural South Carolina participating in the Transitions and Activity Changes in Kids (TRACK) Study in 2008–2009 and 2010–2011. We assessed total PA in youth using accelerometry and categorized youth and parent survey data into blocks based on the socioecological model. Multivariate regression growth curve models evaluated whether the association between change in independent variables and change in PA was modified by race/ethnicity or SES.

**Results:** PA declined from fifth to seventh grade among all racial/ethnic and SES groups. Associations between the range of variables and change in PA were modified by race/ethnicity but not SES. Blacks did not share any common predictors of change in PA with whites or Hispanics. However, child-reported number of active friends was associated with total PA, and enjoyment of PA was associated with change in PA among both whites and Hispanics. Significant interactions by time varied by racial/ethnic group.

**Conclusions:** The factors that influence changes in youth PA vary by race/ethnicity but not SES. These findings reinforce the complex nature of addressing PA behavior in diverse samples and further support the need for culturally appropriate interventions to promote PA in youth.

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### IMPLICATIONS AND CONTRIBUTION

This study examined a wide array of multilevel factors on the change of physical activity in youth. Significant differences by race/ethnicity existed, further supporting the need to address specific needs of populations and not a one-size-fits-all method of behavioral change in youth.

**Conflicts of interest:** The authors have no conflicts of interest to disclose.

**Disclaimer:** The research presented in this article is that of the authors and does not reflect the official policy of the NIH.

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Regular physical activity (PA) is essential for lifetime health and wellness as it lowers the risk of multiple chronic health conditions [1]. In youth, PA promotes cardiorespiratory fitness [2] and cognitive development [3] and decreases anxiety and depression [2]. Although the health benefits of PA are well established, the majority of U.S. youth do not meet the public

health recommendations of at least 60 minutes of daily moderate- or vigorous-intensity PA (MVPA). Unfortunately, longitudinal studies have shown that PA levels during childhood tend to decrease as children age [4], and PA patterns in adolescence may extend into adulthood [5], further emphasizing the importance of increasing (or at least maintaining) PA in youth.

In an effort to better understand PA behavior, studies have examined individual (e.g., self-efficacy), interpersonal (e.g., social support), and environmental (e.g., PA equipment at home) factors that influence the decline in PA in youth [6,7]. These factors may be further influenced by sociodemographic dynamics, such as race/ethnicity and socioeconomic status (SES). Black youth spend more time engaged in MVPA than white and Hispanic youth [8], yet also spend the most time involved in sedentary behaviors [9]. Furthermore, studies have identified differences by race/ethnicity in factors that influence PA participation. One cross-sectional study found that perceived transportation barriers were related to PA in Hispanic girls, whereas social support for friends was among the factors related to PA in black and white girls [10]. Pate et al. [11] examined declines in PA from sixth to eighth grade and found black girls declined more than white or Hispanic girls. These racial/ethnic differences may be rooted in social factors such as racial discrimination—interpersonal racial discrimination, which can manifest as emotional distress due to increased psychological stress and increase the risk of unhealthy behaviors including physical inactivity, or institutional racial discrimination from residential segregation, which may restrict access to quality PA resources [12].

Another social factor associated with race/ethnicity is SES. At present, the understanding of how SES is related to cross-sectional and longitudinal PA in youth is less clear but may be related to access [12,13]. SES has a broad spectrum of proxy definitions, including commonly used parent education and poverty index, a more objective measure developed from Census or neighborhood-level data. It is hypothesized that these social factors influence access to health care resources, which can reduce engagement in healthy behaviors [12]. A recent systematic review of 62 studies from across the world found no apparent uniform association or effect of SES on PA in adolescence [14]. However, six of the seven studies from the United States found proxies of SES to be statistically significantly associated with various measures of PA behavior. A more recent study of a nationally representative sample of U.S. youth that was not included in the systematic review demonstrated that youth of parents with only a high school education are less physically active than youth of college-educated parents, and the gap by SES is growing [15].

To guide the development of interventions designed to increase PA in youth, researchers and health professionals need to better understand the role race/ethnicity and SES play in influencing multiple levels of factors associated with PA. To our knowledge, no study has examined which factors are related to the decline in PA across race/ethnicity and SES in a sample of U.S. adolescents. Therefore, the first aim of the present study was to examine in a diverse sample of youth whether race/ethnicity or SES differences existed in total PA and the change in PA from fifth to seventh grade. The second aim was to determine the modifying effects of race/ethnicity and SES on parent- and child-reported individual, interpersonal, and environmental factors that may influence the change in PA from elementary to middle school. We hypothesized that these relationships will vary by

race/ethnicity and SES, which will provide additional insight into the documented differences in PA among youth.

## Methods

### *Participants and setting*

Participants were enrolled in Transitions and Activity Changes in Kids (TRACK), a prospective cohort study that examined PA levels in youth as they transitioned from elementary school in 2008–2009 to middle school in 2010–2011. The initial recruitment for TRACK yielded 1,083 fifth grade students in suburban and rural South Carolina. For the current analyses, we excluded students who did not report their race/ethnicity as non-Hispanic black, non-Hispanic white, or Hispanic ( $n = 187$ ) and participants with missing data: accelerometry ( $n = 181$ ), parent education ( $n = 16$ ), or poverty index ( $n = 28$ ). The final analysis sample included 643 youth (348 girls and 295 boys). The final analysis sample did not differ from the excluded sample by gender (54.5% vs. 54.1% girls), parent education (43.7% vs. 41.7%  $\leq$  high school), baseline total PA ( $28.4 \pm 4.47$  vs.  $27.9 \pm 4.61$  min/hour), or poverty index ( $16.5 \pm 7.18$  vs.  $16.3 \pm 6.77$ ). The University of South Carolina Institutional Review Board approved the study protocol. Youth participants completed assent forms and parents provided consent for their child and their own participation [16].

### *Measures*

**Physical activity.** We measured youth PA using the ActiGraph triaxial accelerometer (models GT1M and GT3X; Pensacola, FL). Participants wore the monitor for seven consecutive days at three different time points (fifth, sixth, and seventh grades). The accelerometer was attached to an elastic belt and worn over the right hip, anterior to the iliac crest. Participants were instructed to wear the monitor at all times except during water activities (i.e., swimming, bathing) and sleeping. The accelerometers recorded data in 1-minute intervals. We calculated time spent in sedentary, light, moderate, and vigorous PA using cut points developed by Freedson et al. [17] and total PA by summing the total minutes per day spent in light, moderate, and vigorous intensity activities [18]. Owing to the volume of total PA, this variable is presented as minute/hour. Participants who had  $>8$  hours of wear time on at least 2 days of the week were included in the analyses.

**Race/ethnicity and socioeconomic status.** Youth self-reported their race, choosing from seven options including “other,” and their ethnicity (Hispanic or Latino or non-Hispanic or non-Latino). We collapsed the responses from those two questions into race/ethnicity categories: non-Hispanic black (hereafter referred to as black), non-Hispanic white (hereafter referred to as white), Hispanic or Latino (hereafter referred to as Hispanic), and “other.” Owing to the variability of race/ethnicity included in the “other” category, we only used the first three categories in the current analyses.

Parental education and poverty index served as proxies for SES. Parents reported the highest level of education completed from six options, ranging from attends or has attended high school to completed graduate school. The final categories were  $>$ high school and  $\leq$ high school degree. We used “poverty status in the last 12 months” from the American Community

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