



# The role of physical activity enjoyment in the pathways from the social and physical environments to physical activity of early adolescent girls

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## ABSTRACT

Most girls experience a notable decline in physical activity (PA) in early adolescence, increasing their risk for harmful health outcomes. Enjoyment for PA (i.e., positive feelings toward PA) is a determinant of PA among girls during adolescence and sustained PA throughout adulthood. Previous studies recommended increasing girls' PA enjoyment in order to increase their PA, but did not include environmental-level strategies for how families, schools, or communities do this. To gain insight on such strategies, this study examines the role of PA enjoyment as a mediator of social and physical environments to moderate-to-vigorous intensity PA of early adolescent girls. Cross-sectional, secondary analyses, using structural equation modeling, were conducted on a U.S. national dataset of 1721 sixth grade girls from the Trial of Activity for Adolescent Girls in 2003. Mediation model fit parameters included  $\chi^2$  (292,  $N = 1721$ ) = 947.73  $p < 0.001$ , CFI = 0.95, RMSEA = 0.04 (90% CI = 0.03, 0.04), and SRMR = 0.037 suggesting overall good fit. There were no indirect effects on PA through PA enjoyment from the social or physical environmental factors. To PA, there were significant direct effects only from social support from friends ( $\beta = 0.15$ , CI = 0.09, 0.22). To PA enjoyment, there were significant direct effects from social support from family ( $\beta = 0.15$ , CI = 0.08, 0.23), school climate (teachers  $\beta = 0.15$ , CI = 0.10, 0.21 and boys  $\beta = 0.15$ , CI = 0.09, 0.20), and neighborhood environment ( $\beta = 0.10$ , CI = 0.04, 0.17). The findings of this study identified several direct effects of the social and physical environment on PA enjoyment that can begin to inform environmental-level strategies for increasing PA enjoyment among early adolescent girls.

## 1. Introduction

In 2013, only 27% of adolescents (age 10–19) met the physical activity (PA) recommendations of 60 min of PA a day (Centers for Disease Control, 2012). Another 14% of adolescents participated in no PA in the past week (Centers for Disease Control, 2012). Regular PA, especially of a moderate-to-vigorous intensity, is positively related to many physical health outcomes (e.g., healthy body weight, and low rates of chronic disease) (U.S. Department of Health and Human Services, 2008).

Health behaviors throughout childhood, including PA, are predictive of health behaviors throughout adulthood (National Cancer Institute, 2007). Studies have found that the greatest decline in PA occurs between childhood and adolescence, particularly among girls

(Troiano et al., 2008; Nader et al., 2008; Nelson et al., 2005; Trost et al., 2002). The rate of PA decline in early adolescence (10–14 years old) is also greater for girls than boys. From 12 to 15 years old, the mean minutes of moderate-to-vigorous PA decreases to a third of the mean minutes of PA among six to 11 year olds (Troiano et al., 2008). There is a gender disparity as well, as girls tend to have lower PA levels than boys for all ages (Troiano et al., 2008; Nader et al., 2008). Early adolescent girls have an immediate, high risk of becoming inactive and increasing their lifelong risk for harmful health outcomes.

The construct, PA enjoyment (i.e., a positive feeling toward PA; believing PA is fun), is an important determinant of girls' PA (Cairney et al., 2012). The more a girl enjoys PA the more likely she is to engage in PA. Studies show that PA enjoyment is not only an important determinant of PA among early adolescent girls (DiLorenzo et al., 1998;

Abbreviations: CFI, Comparative Fit Index; CI, confidence interval; df, degrees of freedom; PA, physical activity; RMSEA, Root Mean Square Error of Approximation; SD, standard deviation; SE, standard error; SRMR, Standardized Root Mean Square Residual; TAAG, Trial of Activity for Adolescent Girls

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Jago et al., 2011; Scarpa and Nart, 2012; Sallis et al., 2000), it also stands out from other determinants because of its intrinsic nature and relationship to long-term PA (Taylor et al., 2010; Labbrozzi et al., 2013). PA enjoyment is a type of intrinsic motivation to perform PA (i.e., PA is internally satisfying or engaging in PA has value in and of itself) (Labbrozzi et al., 2013). Studies show that this type of motivation for PA is more predictive of sustained PA engagement, compared with other types of motivation (e.g., extrinsic), likely because it does not rely on external rewards or circumstances that may change frequently (Taylor et al., 2010; Labbrozzi et al., 2013). The more a girl enjoys PA, the more likely she is to participate regularly in PA and continue to participate in PA over time, greatly reducing her risk of poor health outcomes (U.S. Department of Health and Human Services, 2008; Taylor et al., 2010; Labbrozzi et al., 2013).

Many studies recommend increasing girls' PA enjoyment in order to increase their PA, but do not present environmental-level strategies (i.e., strategies that can effect change across groups or populations rather than focusing on an individual) for how families, schools, or communities could do this. In addition to focusing on demographic characteristics (e.g., gender and race/ethnicity (Barr-Anderson et al., 2008; Lyu and Gill, 2011; Lyu and Pyo, 2006; Grieser et al., 2008; Kelly et al., 2010)) or individual-level constructs (e.g., self-efficacy, self-management, outcome expectancy (Kelly et al., 2010; Dishman et al., 2005a)) related to PA enjoyment, research is needed on the social and physical environments that contribute to PA enjoyment, and in turn the PA of girls in order to inform new, environmental-level strategies to prevent the decline in PA among girls in the short- and long-term.

The literature on PA interventions among adolescent girls points toward a potential mediating role of PA enjoyment (Jago et al., 2011; Dudley et al., 2010; Standiford, 2013). Several theories identify determinants of PA. The Socio-Ecological Model of Health Behaviors and the Social Cognitive Theory define multiple social and physical environmental influences on PA (Bandura, 1986; Glanz et al., 2002). Erickson's Theory of Psychosocial Development explains as youth transition into adolescents, awareness of their surroundings increases; and the relative value placed on the opinions and beliefs of their friends, compared with their family, increases (Erikson, 1997). This body of literature and theories informed the following study objective and hypotheses.

The objective of this study was to examine the role of PA enjoyment in the pathways from the social (e.g., supportiveness for PA from family, friends, peers, and teachers) and physical (e.g., conduciveness of a girl's neighborhood for PA) environments to moderate-to-vigorous intensity PA among early adolescent girls in order to elucidate environmental-level leverage points to foster sustained PA of girls over time. We hypothesized that social support from family and friends, school climate (i.e., perceived attitudes, beliefs, and behaviors of teachers and boys at school), and the neighborhood (i.e., built environment features and perceived safety of the area around a girl's home) environment will have indirect effects on moderate-to-vigorous intensity PA, mediated by PA enjoyment. Further, we hypothesized that peer influence (i.e., social support from friends and school climate related to boys) will show stronger positive associations with PA enjoyment compared with other environmental influences.

## 2. Methods

### 2.1. Data

To examine the role of PA enjoyment as a mediator of the effects of social and physical environments on moderate-to-vigorous intensity PA of early adolescent girls, we performed secondary data analyses using the Trial of Activity for Adolescent Girls (TAAG), a diverse, national dataset of early adolescent girls in the United States (TAAG Investigators and NHLBI, 2004). Details of TAAG's study design and sample selection can be found in other studies (TAAG Investigators and

NHLBI, 2004; Stevens et al., 2005). Cross-sectional baseline data from sixth grade girls in Spring 2003, were selected for analysis in this study because sixth grade captures the central age for girls transitioning into adolescence from childhood (12 years old) (Stevens et al., 2005).

### 2.2. Study variables

Moderate-to-vigorous intensity PA and PA enjoyment were the two endogenous variables in this study. Total day moderate-to-vigorous intensity PA was objectively collected by Computer Sciences Applications uniaxial accelerometers. The devices were initialized prior to being distributed to participants, and programmed to start data collection in 30 s intervals at 5:00 AM the day after participants received the accelerometers (Pate et al., 2006). Participants were instructed to wear the accelerometers on their right hip at all times over seven days, except when sleeping or engaging in any activity that involves being submerged in water (TAAG Investigators and NHLBI, 2004). PA was assessed by calculating the mean minutes over six of the seven days that the accelerometer counts registered  $\geq 1500$ /half minute (i.e., moderate-to-vigorous intensity movement) (TAAG Investigators and NHLBI, 2004). In this study, PA is limited to moderate-to-vigorous intensity PA because national PA guidelines for adolescents in the United States recommend that most of the 60 min of PA per day be of moderate-to-vigorous intensity (U.S. Department of Health and Human Services, 2008). Additionally, studies have identified the disparate decline in moderate-to-vigorous intensity PA among girls compared with boys, highlighting a need to identify pathways to reverse this decline (Troiano et al., 2008; Nader et al., 2008). Pate and colleagues imputed missing accelerometer data using the Expectation Maximization algorithm recommended by Treuth and colleagues (Pate et al., 2006; Treuth et al., 2004; Catellier et al., 2005). Pate and colleagues found that for each participant over the six days PA was assessed, an average of 12 h of missing data were imputed (Pate et al., 2006).

All other variables were assessed in the self-report student questionnaire (TAAG Investigators and NHLBI, 2004). PA enjoyment (i.e., positive feelings toward PA) was assessed using an abbreviated Physical Activity Enjoyment Scale (Kendzierski and DeCarlo, 1991). This abbreviated scale included seven items (e.g., When I am active I feel bored) with 5-point Likert scale response options (disagree a lot to agree a lot). Responses were reverse coded, so higher scores denote more PA enjoyment (Kelly et al., 2010). Other studies using the abbreviated Physical Activity Enjoyment Scale have found good model fit (Dishman et al., 2010) and internal consistency ( $\alpha = 0.86$  (Motl et al., 2001)). The student questionnaire and the accelerometer data were all collected between January and March 2003. The student questionnaire was completed within one class period. The accelerometer data were collected over a three-week timespan, with a different equivalently-sized group of sixth grade girls assessed during each week (Pate et al., 2006).

Social support from friends and family, school climate, and neighborhood environment were the four exogenous variables in this study. Based on the Amherst Health and Activity Study (Sallis et al., 2002), a social support scale included four questions on how often a friend provided gestures or encouragement that facilitates PA during a typical week (Dishman et al., 2010) (e.g., How often do your friends do physical activities or play sports with you?) and five questions on how often family did the same (e.g., How often has a member of your household encouraged you to do physical activities or play sports?). Previous studies have found the scale to have two factors, based on source of the support, with acceptable model fit (Motl et al., 2001) and good internal consistency ( $\alpha = 0.75$  for social support from friends (Dishman et al., 2010);  $\alpha = 0.81$  for social support from family (Dishman et al., 2010)). School climate captured perceived attitudes, beliefs, and behaviors of teachers and boys at school related to girls' PA (Birnbaum et al., 2005). School climate was measured by a modified GRAD Study

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