



Need fulfillment and motivation in physical education predict trajectories of change in leisure-time physical activity in early adolescence



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ABSTRACT

Objectives: We examined (1) how psychological need fulfillment and motivation in physical education and leisure-time physical activity change during early adolescence, and (2) the degree to which need fulfillment and motivation predict trajectories of change in physical activity.

Design: Longitudinal survey.

Methods: Students ($N = 134$, ages 10–13 years) completed surveys assessing perceived competence, autonomy, relatedness, intrinsic motivation, and identified, introjected, and external regulations in physical education, and leisure time physical activity each semester in school for 3 years.

Results: Unconditional growth models showed an average increase in physical activity. Competence also increased, while autonomy and relatedness, and identified and introjected regulation decreased. Conditional models showed that students with higher levels of autonomy, relatedness, intrinsic motivation, and identified regulation had higher levels of physical activity at baseline and throughout the study. Students with lower levels of autonomy, relatedness, intrinsic motivation, and identified regulation experienced significantly greater increases in physical activity, but these effects were very small.

Conclusions: Need fulfillment and motivation variables positively predict physical activity. While youth with lower levels of need fulfillment and motivation have lower levels of physical activity, they also tend to increase physical activity levels more across early adolescence. These associations highlight how physical education experiences in early adolescence may influence change in physical activity, and suggest efforts to foster need fulfillment and autonomous regulation in physical education may promote physical activity.

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A fundamental objective of physical education is to help students internalize the value of physical activity and to engage regularly in physical activity outside of the classroom (i.e., leisure time physical activity) to enhance fitness and health (e.g., National Association for Sport and Physical Education, 2009; Pate, O'Neill, & McIver, 2011). Children who participate in more physical education tend to be more physically active overall; however, students typically do not spend the recommended amount of time engaging in moderate-to-vigorous physical activity during class (i.e., >50% of class time; Pate et al., 2011). Findings regarding the association between participation in physical education and leisure time physical activity are mixed. Some studies report that students

engage in more leisure-time physical activity on days when they have physical education (Dale, Corbin, & Dale, 2000), while other studies report that students engage in more leisure-time physical activity on days when they have limited or no physical education (Mallam, Metcalf, Kirkby, Voss, & Wilkin, 2003). A better understanding of how the quality of students' experiences within physical education predicts leisure-time physical activity behavior is critical to clarify the mixed findings on the associations between physical education and physical activity related health benefits in youth.

One consistent link between physical education participation and leisure-time physical activity is the type of motivation that students experience in class (e.g., Standage, Gillison, Ntoumanis, & Treasure, 2012). Motivation can be conceptualized as the different reasons why students engage in activities during physical education (Deci & Ryan, 1985; Ryan & Deci, 2007). Self-determination

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theory (SDT) purports that these reasons reflect different forms of motivation, ranging from more internalized and autonomous (intrinsic motivation and identified regulation) to less autonomous and controlling (introjected and external regulation). Intrinsic motivation is the most autonomous form of motivation and occurs when students participate in physical education as an end in itself. For example, they may participate because they enjoy it and have fun. Identified regulation occurs when students participate as a means to achieve a personally valued end, such as fitness outcomes. Introjected regulation occurs when students participate in physical education to avoid feelings of shame or to gain pride. External regulation involves participating to comply with an external demand such as avoiding punishment or seeking a reward. Autonomous motivation in physical education is positively associated with self-reported and objectively assessed leisure-time physical activity behavior, intentions for exercise, health-related quality of life, and effort, concentration, and pedometer step counts in physical education (Cox, Smith, & Williams, 2008; Hagger & Chatzisarantis, 2009; Lonsdale, Sabiston, Raedeke, Ha, & Sum, 2009; Ntoumanis, 2005; Standage et al., 2012).

The fulfillment of psychological needs for autonomy (perceptions of agency and volition; Katz & Assor, 2007), competence (perceptions of effectiveness; Deci & Ryan, 2000), and relatedness (perceptions of closeness and connectedness to others; Deci & Ryan, 2000), are also theorized to directly predict health and well-being outcomes (Deci & Ryan, 2000; Deci et al., 2001). Perceptions of autonomy, competence, and relatedness in physical education are positive predictors of effort and enjoyment in class, autonomous motivation for class participation, intentions for leisure-time physical activity, and self-reported physical activity behavior, and perceptions of relatedness are a negative predictor of worry in class (Cox, Duncheon, & McDavid, 2009; Cox et al., 2008; Ntoumanis, 2001; Standage, Duda, & Ntoumanis, 2005; Taylor, Ntoumanis, Standage, & Spray, 2010). More autonomous forms of motivation are theorized to exist in contexts where students' psychological needs are nurtured. Empirical evidence in physical education settings has shown that need satisfaction in physical education class directly and indirectly (via autonomous motivation) predicts intention for (Standage, Duda, & Ntoumanis, 2003) and self-reported (Cox et al., 2008; Standage et al., 2012) leisure-time physical activity. Overall, these findings indicate that both need satisfaction and motivation within the context of physical education may facilitate physical activity and perhaps health benefits in youth.

Most research linking need satisfaction and autonomous motivation in physical education to leisure-time physical activity behavior has used assessments at three or fewer time points, so can only examine cross-sectional associations or linear trajectories of change over time. Furthermore, most prior studies have not examined whether variations in needs and motivation predict trajectories of change in physical activity over time (e.g., Cox et al., 2008; Standage et al., 2012). By measuring need satisfaction, motivation, and physical activity behavior on more than four occasions, an average trajectory of time can be fitted to describe how the sample changes and, if the trajectory assumes a linear or non-linear form (i.e., quadratic, or cubic effects). A quadratic effect would reflect average trends that accelerate or decelerate over time, while cubic effects would reflect trends that have two points of acceleration or deceleration of change over time. Furthermore, between-student predictors of the average trajectory of change in physical activity can be tested. Early adolescence may be a particularly crucial time to explore these longitudinal associations when declines in average autonomous motivation in physical education (Cox et al., 2008; Ntoumanis, Barkoukis, & Thøgersen-Ntoumani, 2009) and leisure-time physical activity (Nader, Bradley, Houts,

McRitchie, & O'Brien, 2008; Troiano et al., 2008; Wall, Carlson, Stein, Lee, & Fulton, 2011) have been reported. There is, however, a lack of longitudinal research that explores potential nuances in trajectories of change in physical activity behavior (e.g., quadratic or cubic patterns) or identifies physical education variables, such as psychological need fulfillment and motivation, that predict these trajectories, which may differ from cross sectional findings. In addition, without a longitudinal assessment researchers cannot be sure whether these tenets of self-determination theory merely correlate with or actually predict adolescents' physical activity behavior over time.

Trajectories of change in and associations between need satisfaction and motivation in physical education have been examined longitudinally. Ntoumanis et al. (2009) measured need satisfaction and motivation each fall and spring semester for three years in a cohort of 13–15 year olds; however, they did not examine trajectories of, or associations with, physical activity. Intrinsic motivation showed an average linear decline, and identified regulation and relatedness showed an average decline that tapered during the final year of junior high school. There was no average trend for competence need satisfaction or introjected or external regulation, but there was significant between-student variability in trajectories of external regulation over time. Competence and relatedness at time one predicted between-student differences in intrinsic motivation and identified regulation. In addition, initial perceptions of competence moderated the linear trajectories of identified and external regulation. Specifically, students with relatively high levels of competence had no significant change in identified and external regulation, and students with relatively low levels of competence decreased in identified regulation and increased in external regulation over time.

Taylor et al. (2010) longitudinally examined need satisfaction and motivation in physical education and physical activity in students ages 11–16, but the time period was relatively brief, with assessments at the beginning, middle, and end of one school trimester. Physical activity behavior increased over time, and students who reported relatively higher average levels of competence across the study had greater increases in physical activity behavior over time compared to students with relatively lower levels of competence. In contrast, another study found a linear decline in physical activity from the fall of grade seven to the fall of grade nine (Yli-Piipari, Leskinen, Jaakkola, & Liukkonen, 2012). However, motivation was only examined at one time point, in the spring semester of grade six. A composite index of self-determined motivation predicted self-reported leisure-time physical activity in grade seven, but not in subsequent years. Considered together, these findings provide preliminary evidence regarding the trajectories of change in need fulfillment, motivation, and physical activity during adolescence, and suggest that need fulfillment and autonomous motivation may predict trajectories of physical activity over time. But further research including the concurrent measurement of psychological need fulfillment and motivation in physical education class and leisure-time physical activity is necessary to determine how these variables change, and how between-person variation in need fulfillment and motivation predict trajectories of physical activity during adolescence.

The purpose of this study was to test (1) change over time (including linear, quadratic, and cubic change) in psychological need fulfillment and motivation in physical education, and leisure-time physical activity, and (2) the degree to which individual differences in need satisfaction and motivation predict trajectories of leisure-time physical activity across grades six to eight. Based on theoretical propositions and empirical longitudinal and cross-sectional evidence, we hypothesized that (1) physical activity behavior, psychological need fulfillment, and autonomous

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