



Reciprocal effects of motivation in physical education and self-reported physical activity



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ABSTRACT

Objectives: The present study tested whether self-reported school and leisure-time physical activity have a reciprocal relationship with Physical Education (PE)-based motivational regulations described by self-determination theory. Participants were 635 11- and 12-year-old school children from the United Kingdom.

Design & Method: A cross-lagged longitudinal design over two time points was employed. Study hypotheses were analyzed using latent factor reciprocal effects models.

Results: Following temporal invariance tests, data revealed positive relationships between both types of physical activity and subsequent changes in autonomous motivation, but not the oft-stated reverse relationship. No relationships were observed involving introjected regulation. Theoretically aligned relationships between external regulation and changes in physical activity were observed, but no reverse relationships. Both types of physical activity behavior were negatively associated with changes in amotivation in PE, but surprisingly, amotivation in PE positively predicted changes in leisure-time physical activity.

Conclusions: In general, physical activity participation may help children internalize reasons for partaking in PE and foster self-determination. However, the widespread theory that self-determined PE motives can develop school and leisure-time physical activity participation was not compellingly demonstrated.

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1. Introduction

There is now strong evidence to suggest that general levels of physical activity in children and adolescents are inadequate to accrue meaningful health benefits. Only 21% of boys and 16% of girls aged 5–15 years in the United Kingdom are meeting guidelines for recommended physical activity levels (Health and Social Care Information Centre, 2014). Schools have been documented as important settings to combat these insufficient levels of activity (Centers for Disease Control and Prevention, 2011). In particular, physical education (PE) classes may help develop healthy physical activity behavior in school and in leisure-time (Office for Standards in Education Children's Services & Skills, 2013). There is, therefore, compelling reason to explore PE-related phenomena with a view to inform the promotion of children's physical activity in various contexts.

Self-determination theory (SDT; Deci & Ryan, 2012) is a well-

evidenced framework that focuses on human motivation and has been applied to the study of children's motivation in PE contexts (e.g., Ntoumanis, 2012). A key postulate of the theory distinguishes between types of motivation that vary in their levels of self-determination. Intrinsic motivation represents complete self-determination and refers to performing an activity for its own sake, because the activity is interesting and enjoyable (Deci & Ryan, 2012). In a descending order of self-determination, four different types of extrinsic motivation are also defined within the theory: Integrated regulation (i.e., partaking in an activity because it represents the essence of the self. Note that this motive is generally not considered in child samples, possibly due to an underdeveloped sense of self; Vallerand, 2001), identified regulation (i.e., pursuit of an activity to attain personally meaningful outcomes), introjected regulation (i.e., engaging in a behavior to feel worthy or to avoid feelings of guilt or shame), and external regulation (i.e., engagement to obtain a reward or avoid punishment; Deci & Ryan, 2012). An individual may also completely lack any reason to participate in an activity and is, therefore, amotivated (Deci & Ryan, 2000).

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Broadly speaking, autonomous motivation (i.e., intrinsic motivation and identified regulation) in PE has been positively associated with physical activity behavior, whereas controlling regulations (i.e., introjected regulation and external regulation) and amotivation have been unrelated or negatively related to physical activity in cross-sectional (Aelterman et al., 2012), prospective (Standage, Gillison, Ntoumanis, & Treasure, 2012), and longitudinal work using multilevel modeling (McDavid, Cox, & McDonough, 2014; Taylor, Ntoumanis, Standage, & Spray, 2010; Taylor, Spray, & Pearson, 2014). That said, introjected regulation has, on occasion, been positively associated with physical activity (e.g., time-invariant individual differences in sixth grade students; McDavid et al., 2014). In fact, this positive relationship has been observed in a meta-analysis of self-determined motivation and physical activity in children and adolescents (Owen, Smith, Lubans, Ng, & Lonsdale, 2014). With the exception of one study that focused on physical activity in physical education classes (Aelterman et al., 2012), physical activity is usually operationalized within broad leisure-time contexts, and measured in a variety of ways (i.e., self-report, pedometer, and accelerometer).

This body of research stems from theory suggesting that autonomous motivation leads to favorable behavior. The hierarchical model of intrinsic and extrinsic motivation, for example, proposes that motivation in any given context leads to behavioral consequences in that context and other related settings (Vallerand, 2001). Therefore, there is an assumption that a temporal or causal sequence exists between motivation in PE and subsequent physical activity. However, most studies testing this process have employed a cross-sectional design (Owen et al., 2014). Equally plausible, therefore, is the reverse process whereby physically active individuals are more likely to become more autonomously motivated in PE classes. A similar argument was put forward, and subsequently tested, regarding psychological need satisfaction (a separate, but related, motivational concept associated with SDT) and physical activity (Gunnell, Bélanger, & Brunet, 2015). All children have a natural inclination to internalize motives for behavior and this is only prevented under conditions that thwart fundamental psychological needs (Deci & Ryan, 2000). It is reasonable to assume, therefore, that more time spent being active provides greater opportunity for the internalization of associated activities, such as PE class participation, to occur (i.e., increased autonomous motivation, lower controlling motivation and amotivation).

This reciprocal process has been largely ignored in the literature but can be tested using longitudinal data in which motivation and physical activity are evaluated on at least two occasions. Reciprocal effects models have been used to consider alternative processes, such as academic self-concept and achievement (e.g., Marsh, 1990) and motivational quality and burnout (Lonsdale & Hodge, 2011). Statistically significant paths from initial motivation to subsequent physical activity and from initial physical activity to subsequent motivation would indicate the existence of reciprocal effects. This type of autoregressive cross-lagged analysis provides stronger evidence for relationships than cross-sectional results because it accounts for cross-sectional associations between both constructs, as well as the temporal stability of each construct (i.e., intra-individual change is measured). The reciprocal effects hypothesis has significance for theorists who propose that self-determined motivation is a crucial mechanism for physical activity promotion (e.g., Owen et al., 2014). Complementary to this proposal is the potential for physical activity participation to create engaged and self-determined students in PE classes.

A further focus in the present study is the testing of sequential relationships between PE motivation and different periods of physical activity, namely school and leisure-time. Self-determination in PE class has been associated with higher levels of objectively

measured (via step counts) physical activity in the PE class (Lonsdale, Sabiston, Raedeke, Ha, & Sum, 2009). Theories that have stemmed from SDT, such as the hierarchical model of motivation (Vallerand, 2001) and the trans-contextual model of autonomous motivation (Hagger & Chatzisarantis, 2015) also describe how motivation in one context can influence behavior in another. As such, motivation in PE has been positively associated with self-reported physical activity in leisure-time contexts (e.g., Barkoukis, Hagger, Lambropoulos, & Torbatzoudis, 2010; Hagger et al., 2009; Taylor et al., 2010). It is currently unknown whether motivation in PE is correlated with a more general consideration of school physical activity which includes recess or lunch-time. In the present study, therefore, leisure-time physical activity (after school hours, evenings, and weekends) and school-based physical activity (PE class, recess, and lunch time) were distinguished. Also, the aforementioned models do not consider whether behavior in one context can influence motivation in another. Evidence exists to suggest that out of school sport participation is associated with stable amotivation in PE, whereas, non-participation is associated with increasing amotivation (Ntoumanis, Barkoukis, & Thøgersen-Ntoumani, 2009). The influence of past behavior on subsequent cognition has been acknowledged in some theoretical frameworks, such as the theory of planned behavior (Hagger, Chatzisarantis, & Biddle, 2001; Rhodes & Courneya, 2003), but has received little attention as an antecedent of self-determination.

To summarize, the present study aimed to test the reciprocal longitudinal associations between individual motivational regulations towards PE and self-reported physical activity. Integrating previous evidence (Aelterman et al., 2012; McDavid et al., 2014; Standage et al., 2012; Taylor et al., 2010; 2014) with theorized internalization processes (Deci & Ryan, 2000) led to the hypothesis that motivation in PE and physical activity would have a mutually dependent relationship. This challenges the unidirectional causal relationship from motivation to behavior that is often assumed. Stronger evidence of this reciprocal relationship was expected between PE motivation and school physical activity, rather than leisure-time physical activity, because of the proximity of context (PE and school versus PE and leisure-time). Stronger evidence was also expected for the positive relationships involving intrinsic and identified regulation, compared to non-significant or negative relationships involving introjected regulation, external regulation and amotivation. This was hypothesized because autonomous regulations tend to have a greater association with physical activity behavior, compared to controlling regulations or amotivation (Owen et al., 2014).

2. Method

2.1. Participants and procedures

Secondary school students participated in the study ($N = 635$, including 466 11-year-olds, 150 12-year-olds, 19 unspecified, 58% male) who were sampled from 65 classes in nine secondary schools based in Wales and central England. Eighty-eight percent of participants reported their ethnicity as White, one percent as Black, four percent as South Asian, and six percent as Other. None of the sampled participants were included in a separate study that took place within the same broader project (i.e., Taylor et al., 2014). Fifteen participants did not report the class that they belonged to, so they could not be included in the analysis because the nested class structure was accounted for. One hundred sixty-nine participants did not complete measures during the second time point, either for logistical reasons or absence from school. However, all analyses conducted in this study used the full sample of 620 participants to avoid a suboptimal listwise deletion strategy (Newman,

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