The influence of the physical education environment on children's well-being and physical activity across the transition from primary to secondary school

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Running head: PHYSICAL EDUCATION DURING SCHOOL TRANSITION

The influence of the physical education environment on children's well-being and physical activity across the primary-secondary school transition

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Abstract

The purpose of the study was to explore change in children's physical self-concept and self-reported physical activity over a school transition period, as well as motivational and interpersonal influences on these two outcomes. Data were collected from 545 children (Mean age = 10.82, *SD* = 0.39, 51% female) at three time points before and after the United Kingdom secondary school transition. Multilevel modeling revealed that physical self-concept and physical activity showed different patterns of decline over the course of the study. Changes in the extent to which physical education (PE) teachers were perceived to provide psychological need support, peer focus on self-referenced learning and mastery, and changes in autonomous motives towards PE classes were positively associated with these outcome variables. The present study provides novel insight into important motivational and interpersonal factors that may need to be targeted to prevent negative developmental patterns over a potentially challenging period for children.

Keywords: task-climate, ego-climate, psychological need support, motivation

The influence of the physical education environment on children's well-being and physical activity across the primary-secondary school transition

Evidence continues to accumulate that children and adolescents are insufficiently active to accrue physical and mental health benefits (e.g., Verloigne et al., 2012). If current trends continue, it is proposed that there will be a significant burden on the health services of the developed world as today's inactive youth progress through the life course (British Heart Foundation, 2009). Schools have been recognized as key contexts, not only for promoting physical activity and healthy lifestyles, but for helping young people to realize their potential and feel good about themselves (Centers for Disease Control & Prevention, 2011). There is, therefore, a strong case to investigate motivational phenomena within structured school settings with a view to understanding children's well-being and physical activity.

The physical education (PE) 'classroom' provides a unique environment for investigating motivational and developmental issues among all young people. Because children participate in PE lessons throughout their school careers, it has been argued that PE can contribute to the development of positive physical self-perceptions, self-esteem, and physical activity in and beyond the school setting (Fox, 1992). During the compulsory school years, however, individuals typically transfer to a new school on two or three occasions (e.g., elementary to junior high in the United States and primary to secondary in the United Kingdom). Despite school transitions being associated with changes in perceptions of the self (Meece, Anderman, & Anderman, 2006), there is a lack of understanding of the interpersonal and motivational factors that help to explain changes in physical self-concept and physical activity over this period. Moreover, distinguishing between shifts in self-concept and behavior over the transition period and more general linear changes is necessary.

Physical self-concept refers to how individuals perceive and evaluate their physical self and includes feelings of "self-confidence, self-worth, self-acceptance, competence, and

ability" (Marsh, 2007, p.160). Studies have shown that a positive physical self-concept, as well as representing a desirable developmental outcome in its own right, has important consequences for young people's physical activity behavior (Crocker, Sabiston, Kowalski, McDonough, & Kowalski, 2006) and may contribute to adolescents' global self-esteem (Marsh, 2007). However, school transitions represent periods whereby young people encounter new environments, and significant individual and social developmental changes occur (Wigfield, Eccles, & Pintrich, 1996). In addition, declines in motivation and self-beliefs often seen at the time of transition may be a consequence of the mismatch between the needs of the individual and the school environment, and that many of the changes students encounter in the new school do not facilitate positive developmental outcomes (Meece et al., 2006). In contrast to transitional shifts, somewhat linear gradual processes may occur, whereby increasing cognitive maturity allows adolescents to adopt a more realistic judgment of their competencies in relation to others, which often leads to lower self-evaluations (Marsh, 1989).

Evidence also exists that physical activity shows overall declines during childhood and adolescence (Brodersen, Steptoe, Boniface, & Wardle, 2007), despite some evidence to suggest that aspects of physical activity behavior (e.g., active travel and bicycling) may be unharmed (Garcia, Pender, Antonakos, & Ronis, 1998) or increase somewhat over the transitional period (e.g., Cooper, Jago, Southward, & Page, 2012). Indeed, it is these contrasting patterns that are a central focus of the present study as researchers have yet to consider that developmental trends and transitional shifts in self-concept and activity may occur simultaneously. This more accurate description and delineation of temporal patterns will enable researchers to implicate broader developmental processes or the change in schools as key influences on changing self-evaluations and behavior.

Despite the numerous benefits of a physically active lifestyle for children and adolescents (Stensel, Gorely, & Biddle, 2008), little research has shed light onto the potential developmental mechanisms during this important period. Research examining self-perceptions has documented a decline in perceptions of competence in PE across the primary-secondary school transition (Warburton & Spray, 2008). There is, nevertheless, no evidence pertaining to the motivational processes underpinning the development of physical self-concept across the transition.

Interpersonal Environment in Physical Education: The Role of Teachers and Peers

Teaching practices within school settings represent a powerful developmental influence on students' motivation and beliefs (Eccles & Roeser, 2011). Using self-determination theory (Deci & Ryan, 2000), researchers have explored the extent to which teachers support students' psychological needs by enhancing students' feelings of volition and self-governance (i.e., autonomy support; Cheon, Reeve, & Moon, 2012), providing quality information on how students can achieve desired outcomes (i.e., structure; Connell & Wellborn, 1991), and promoting feelings of belonging and connectedness (i.e., involvement; Connell & Wellborn, 1991). Within the PE context, a body of largely cross-sectional research proposes positive relationships between this 'psychological need support' and students' adaptive motivation, engagement, and psychological health (e.g., Taylor & Ntoumanis, 2007), although more consideration of structure and involvement has been entreated (Standage, Gillison, Ntoumanis, & Treasure, 2012).

Beyond the role played by teachers, children's peers have long been espoused as an important developmental influence (e.g., Eccles & Roeser, 2011), and may also have a notable, yet different, impact on the PE class environment. For example, peers may not be likely to play a major role in creating a well-structured class with expectations and consequences clearly outlined; however, peers may significantly influence what aspects of

achievement children focus on during tasks (Horn & Amorose, 1998). Achievement goal theory (Nicholls, 1989) differentiates between two types of motivational environment that students' peers may help to create. First, a task-involving climate encourages effort, task mastery and improvement so that young people derive satisfaction from personal progress. In contrast, an ego-involving climate fosters comparison with peers so that children derive satisfaction from competing with and beating others, and demonstrating greater competence than their peers with less observable effort. A dearth of research exists concerning the peer-created motivational environment in PE, however, within youth sport contexts a peer-created task-involving climate has been associated with more adaptive cognitive, affective and behavioral outcomes, compared to an ego-involving climate (e.g., Jõesaar, Hein, & Hagger, 2012; Ntoumanis, Taylor, & Thøgersen-Ntoumani, 2012). There is a need to establish temporal patterns in associations between peer-climate, self-beliefs, and physical activity as they transfer schools and encountered different PE classes.

Motivation in PE

Self-determination theory has also been extensively employed to explore children's motivation in school settings. The theory differentiates between types of motivation that vary in their levels of self-determination. At the most self-determined, or autonomous, end of the continuum is intrinsic motivation, which refers to the enactment of an activity for its own sake, because the activity is interesting and enjoyable. Next are three types of extrinsic motivation, which reflect engagement in an activity for reasons separate from the activity itself. In a descending order of self-determination, the different motives are: Identified regulation (i.e., pursuit of an activity to obtain desired and personally valued outcomes), introjected regulation (i.e., engagement in 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). Finally, when a student perceives no worthwhile reason for taking part in PE, he or she is

amotivated, that is, neither intrinsically nor extrinsically motivated (Deci & Ryan, 2000). A significant quantity of PE-based research (e.g., Standage, Duda, & Ntoumanis, 2003; Taylor, Ntoumanis, Standage, & Spray, 2010) suggests that adaptive outcomes generally result from intrinsic motivation and identified regulation. In contrast, maladaptive outcomes are generally associated with controlling regulations (i.e., introjected regulation, external regulation and amotivation, although this proposal has not always been observed regarding introjected regulation (e.g., Gillison, Osborn, Standage, & Skevington, 2009).

Although changes towards increasingly maladaptive motivational environments and experiences have been observed across later childhood and adolescence (e.g., Barkoukis, Ntoumanis, & Thøgersen-Ntoumani, 2009; Ntoumanis, Barkoukis, & Thøgersen-Ntoumani, 2009), linear changes across school transitions have only recently begun to be explored (Spray, Warburton, & Stebbings, 2013). However, it is possible that temporary increases in autonomous motivation may occur due to the novelty of joining a new school (cf. Delamont & Galton, 1986) but this may mask more general declines over childhood. In addition, self-determination theory and achievement goal theory can be used to understand the interpersonal and motivational factors that help to explain and potentially off-set declining self-evaluations and changes in physical activity over the school transition.

Aims and Hypotheses

The present study sought to identify changes in the PE class environment, motivation towards PE, physical self-concept and physical activity behavior across the primary-secondary school transition by simultaneously exploring linear trends and transitional shifts. We expected that students' physical self-concept would linearly decline on average, because of increasing cognitive maturity (Marsh, 1989) rather than transitional changes. We also expected physical activity and autonomous motivation to show a general linear decline to reflect broad developmental processes (Brodersen et al., 2007; Ntoumanis et al., 2009) but

also a positive transitional shift (i.e., an increase) from primary to secondary school (Cooper et al., 2012; Delamont & Galton, 1986). No linear changes were expected in introjected and external regulation, whereas amotivation was expected to increase linearly (Ntoumanis et al., 2009). A lack of previous longitudinal research across educational transitions prevented us from speculating on transitional shifts in these variables, as well as any trends in the interpersonal factors within PE.

We also aimed to investigate whether interpersonal and motivational factors could explain the linear or transitional changes in physical self-concept and physical activity over this period. On the basis of theory and prior research on relationships between achievement goals, motivation and individuals' beliefs and behavior (Taylor & Ntoumanis, 2007; Ntoumanis et al., 2012), we expected that perceived teacher needs support and peer task climate across the transition would positively predict physical self-concept and physical activity. In contrast, we expected the inverse relationship to be observed between a perceived ego-climate and the outcomes under consideration. Regarding the motivational determinants, we hypothesized that autonomous regulations (i.e., intrinsic and identified regulation) across the transition would be positively associated with physical self-concept and physical activity, whereas controlling regulations (i.e., introjected regulation and external regulation) and amotivation would be negatively related to the outcomes.

Method

Participants and Procedures

The United Kingdom school system usually involves moving from primary school to secondary school at approximately 11-years-old, when students experience a complete change in school environment, including new peers and teachers and different class sizes. Nine hundred and thirty-nine primary school children provided data at the first time point, however, because we wanted to analyze linear and transitional change over time, participants

who did not complete measures at all three time points were not included in the analysis. Hence, 545 primary school students aged between 10 and 12 years-old (M = 10.82, SD = 0.39, 51% female) who were based in 52 classes taught by different teachers participated in the study. These students were subsequently taught by 40 different PE teachers in secondary school. Schools were based in Wales and the Midlands region of England. A series of multivariate analysis of variance tests using Wilk's lambda test statistic revealed no differences in study variables across the participants with and without complete data, with the exception of slightly lower self-reported physical activity in participants with complete data (3.46 versus 3.60; $p < .05$; partial $\eta^2 = 0.1$). Attrition was mainly due to students transitioning to a secondary school that was not part of the study or absence from school on the day of data collection.

Following acceptance of an invitation to participate, consensual procedures commensurate with the American Psychological Association regulations were conducted with teachers, parents of prospective participants, and the students. This included approval from a University Ethical Committee panel. The study was introduced and explained to the teachers before data collection, and to the students at the beginning of a scheduled lesson. Students were asked to answer a multi-section questionnaire honestly and were told that there were no right or wrong answers. To maintain anonymity, student responses at different time points were matched by a coding system using the students' date of birth and their class identification. Students were asked to complete all measures near the end of primary school (T1, in June or July), at the beginning of secondary school (T2, in November or December), and around Easter vacation the following year (T3, in March or April). The participating classes engaged in a range of activities over the course of the study, including soccer, athletics, hockey, and basketball.

Measures

Perceptions of teacher psychological need support. The instructional style of the teacher was measured using 16 items from the Teacher As Social Context Questionnaire (TASCQ; Belmont, Skinner, Wellborn, & Connell, 1992). Six items measured autonomy support (e.g., “My PE teacher listens to my ideas”), five items measured structure (e.g., “My PE teacher makes it clear what he/she expects of me”) and five items measured interpersonal involvement (e.g., “My PE teacher likes me”). All items were responded to on a 7-point scale ranging from 1 (*not at all true*) to 7 (*very true*) and the mean score of all items was taken to reflect overall need support. Internal consistency of the TASCQ has been demonstrated in a similar aged sample (Belmont et al., 1992).

Perceptions of peer-created task- and ego-climate. The extent to which peers were perceived to create a task- or ego-involved motivational climate was measured using nine items from the Peer Motivational Climate in Youth Sport Questionnaire (Ntoumanis, & Vazou, 2005) adapted to physical education settings. The items followed the stem “In this PE class most pupils…” and were responded to on a 7-point scale ranging from 1 (*not at all true*) to 7 (*very true*). A task climate was measured using four items tapping into peers’ emphasis on self-referenced improvement (e.g., “Help each other improve at activities and skills in PE”) and an ego climate was measured using five items assessing peers’ emphasis on competition (e.g., “Want each other to perform better than other pupils in the class”). Factorial validity and internal consistency of the subscales have been demonstrated (Ntoumanis & Vazou, 2005).

Motivational regulations. Motivational regulations were measured using the 20 items (four for each subscale) developed by Goudas, Biddle, and Fox (1994), which followed the stem, “I take part in PE. . . .” Example items are “Because it is exciting” (intrinsic motivation), “Because it is important for me to do well in PE” (identified regulation), “Because I would feel bad if I didn’t” (introjected regulation), “Because that’s what I’m

supposed to do" (external regulation), and "But I don't really know why" (amotivation). All items were responded to on a 7-point scale ranging from 1 (*not at all true*) to 7 (*very true*). Factorial validity and internal consistency of the subscales has been recently demonstrated (Lonsdale, Sabiston, Taylor, & Ntoumanis, 2011).

Physical self-concept. Physical self-concept was measured using the three items from the short form of the Physical Self-Description Questionnaire (Marsh, Martin, & Jackson, 2010). An example item was "Physically, I am happy about myself" and items were responded to on a 6-point scale ranging from 1 (*false*) to 6 (*true*). Previous work has demonstrated the reliability and validity of the subscale (Marsh et al., 2010).

Physical activity. The Physical Activity Questionnaire for Older Children (PAQ-C; Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997) was used to assess participants' physical activity behavior. The PAQ-C measures 7-day recall of general levels of moderate and vigorous physical activity by utilizing memory cues, such as lunch time and evenings to enhance the recall of activity. An example item is, "In the last seven days, on how many evenings did you do sports, dance or play games in which you were very active?" Students then responded on a 5-point scale ranging from 1 (*none*) to 5 (*6 or 7 last week*, although this varied depending on the context of the question). Internal consistency and validity have been previously demonstrated in similar aged samples by Crocker et al. (1997).

Data Analysis

The data had a hierarchically nested structure with time points (level 1) nested within students (level 2), who were then nested within primary school classes (level 3). However, some students from the same primary class moved to different secondary schools, therefore, secondary school classes were not a higher level of analysis which encompassed primary classes in an unambiguous fashion. Rather, students were *cross-classified* in primary school classes and secondary school classes (i.e., a second level 3). As a result, we constructed

cross-classified multilevel models (Hox, 2010) to carry out the analysis using MLwiN software (version 2.25; Rasbash, Browne, Healy, Cameron, & Charlton, 2012).

We first constructed intercept only models which allowed us to calculate the amount of variance in each study variable associated with each level of analysis (i.e., within-person, between-person, between-primary school class, and between-secondary school teacher). To examine patterns of change in the study variables, unconditional growth models were created by simultaneously adding a linear time predictor variable (each time point was dummy coded as 0, 1 or 2) and a dichotomous school predictor variable indexing the transitional shift from primary to secondary school (coded as 0, 1, 1).

Next, we added the interpersonal variables as predictors of physical self-concept to the unconditional growth model. These variables were individual-mean centered to obtain a pure estimate of intraindividual effects (Enders & Tofighi, 2007). The slope coefficients in this model represented the average relationship between the interpersonal variables and physical self-concept at the beginning of the study (i.e., in primary school; time = 0). Therefore, we also included time × interpersonal variable interaction terms and school × interpersonal variable interaction terms. These terms examined whether the relationship between the interpersonal variable and physical self-concept a) changed over time and b) changed from primary to secondary school. As an estimate of effect size, R_1^2 values were calculated by comparing the final models to the intercept only models (i.e., the proportional reduction in error at the intraindividual level; Hox, 2010).

These models were then replicated with the motivational regulation variables (intrinsic, identified, introjected, and external motives, as well as amotivation) replacing the interpersonal variables and then the analytical process was repeated with physical activity substituting physical self-concept as the outcome variable.

Results

Preliminary Analysis

Missing data was less than 0.01% of the total possible data. Such a low value is highly unlikely to be problematic (Tabachnick & Fidell, 2006); therefore, we imputed missing data values using an expectation maximization algorithm to facilitate computation of the cross-classified models. Means and bivariate correlations among the study variables can be found in Table 1. The correlation between intrinsic motivation and identified regulation was very high; therefore, we took the conceptually and statistically defendable decision to calculate the mean of the two scores to create an 'autonomous motivation' variable. Table 2 shows the Cronbach's alpha coefficients at each time point and the amount of variance in the study variables associated with each level of analysis. The Cronbach's alpha coefficients suggested that all scales demonstrated acceptable internal consistency. The intercept-only models indicated that most of the variance in the study variables was associated with the intraindividual level; however, a substantial level of variance was also associated with the interindividual level. Smaller amounts of variance in the study variables were associated with the primary and secondary class levels; however, we retained these levels of analysis in our multilevel models to remain faithful to the ecological structure of the data (Nezlek, 2008).

Patterns of Changes in the Study Variables

Results from the unconditional growth models can be seen in Table 3. Perceived need support from the teacher and autonomous motivation towards PE generally decreased across the course of the study, but a positive shift (i.e., an increase) occurred over the school transition. Peer task-climate and physical self-concept also decreased linearly but no transitional shift occurred. Physical activity also showed no linear change, but a significant negative shift (i.e., a decrease) from primary to secondary school was observed. No changes were observed in peer ego-climate, introjected regulation, external regulation, and amotivation.

Interpersonal Predictors of Physical Self-Concept and Physical Activity

As shown in Table 4 (left side), perceptions of teachers' need support positively predicted physical self-concept and the relationship was stable over time and school transition. Neither facet of the peer environment predicted physical self-concept; however, peer task-climate positively predicted self-reported physical activity. This relationship was constant over time and school transition. Need support from the teacher and peer ego-climate did not predict physical activity. Calculation of the R_1^2 values indicated that the models explained 6% and 14% of the intraindividual variance in physical self-concept and physical activity, respectively.

Motivational Predictors of Physical Self-Concept and Physical Activity

The results shown in Table 4 (right side) reveal that only autonomous motivation positively predicted physical self-concept, and the significant positive time × autonomous motivation term indicated that this relationship became stronger over the course of the study. Autonomous motivation also positively predicted physical activity, as did amotivation, and both of these relationships were stable over time and school. R_1^2 values indicated that the models explained 11% and 15% of the intraindividual variance in physical self-concept and physical activity, respectively. The positive relationship between amotivation and physical activity was contrary to theoretical postulates; therefore, to further explore this relationship we constructed a multilevel model with just amotivation entered as a predictor variable. The slope coefficient was small and not statistically significant (b = .002, p = .912)[1].

Discussion

Within the present study, we aimed to investigate the temporal patterns of children's physical self-concept, self-reported physical activity, motivation towards PE, and their perceptions of the motivational environment created by their peers and teachers over the transition from primary to secondary school. This is the first study to describe these trends by

differentiating between linear patterns and abrupt transitional shifts. We also examined which aspects of the motivational environment and specific motives for PE were important correlates of children's physical self-concept and physical activity over this period and whether these associations vary over time. Worryingly, some of the interpersonal and motivational variables which are theorized to produce adaptive consequences declined over the course of the study. Moreover, declines in children's physical self-concept and self-reported physical activity were also observed. These two important health outcomes were associated with children's changing perceptions of the PE environment and motivation towards PE.

The general decline in perceived support for students' psychological needs may be associated with children's changing needs during adolescence leading to different perceptions concerning the quality of teacher-student relationships, in a similar manner to parent-child-relationships (Collins & Laursen, 2004). However, this broad decline coincided with an incremental step-change in perceptions across the transition, which may be a consequence of changes to actual teaching behavior from primary to secondary school teaching in the UK (e.g., more emphasis on skill learning, specialist PE teachers). These distinct patterns highlight the need for the nuanced analysis of change carried out in the present study. Children's perceptions of the peer-created task environment and physical self-concept also declined over the course of the study, yet the linear trend indicates that the school transition *per se* may not be responsible for these changes but they may reflect more general developmental challenges. The influential work of Nicholls (1989) proposed that at approximately the age of 12-years old, children become capable of differentiating between ability, effort and luck. This development may lead to shifting perceptions of the motivational environment and sense of physical self during this period.

From a motivational perspective, the transition from primary to secondary school was associated with a positive shift in autonomous motivation, which is in line with previous research proposing that the novelty of joining a new school may lead to enhanced motivation for some students (Delamont & Galton, 1986). Nonetheless, this shift took place during developmental declines in autonomous motivation over the course of the study, which corresponds to similar trends in adolescence (Ntoumanis et al., 2009). Self-determination theorists propose that individuals hold a natural disposition to internalize and move towards self-determined action; however, as may be the case here, the social context has the potential to influence this process (Deci & Ryan, 2000).

We found no evidence of the oft-cited developmental declines in PA (Brodersen et al., 2007); however, a negative transitional shift in self-reported physical activity was found in our sample. The transition from primary to secondary school may offer logistical and environmental opportunities to increase physical activity (e.g., active travel; Cooper et al., 2012). However, in the present sample these may not have been salient, or were perhaps overridden by interpersonal and individual factors that also influence the degree of physical activity (as well as physical self-concept) during childhood. Our subsequent analysis attempted to shed light on these factors.

Of the three interpersonal facets of the PE class motivational environment, we found that only the teacher was directly associated with physical self-concept and this association was equally important in primary and secondary school. From a self-determination theory perspective, psychological need supportive teaching provides children with clear guidelines and opportunities to demonstrate competence, allows them to feel connected and valued, and allows them to act volitionally (Taylor & Ntoumanis, 2007). Measurements of autonomy support, which have also captured elements of structure and involvement, have been indirectly correlated to physical self-concept in secondary school pupils (Standage et al.,

2012). Our results build on this by implying that teachers have an important role to play in helping to stall general declines in physical self-concept in younger children. The novel intraindividual focus within the present study holds value for the future design of interventions by showing that *changes* in children's perceptions of autonomy support, structure and involvement from their typical levels may be associated with positive developmental patterns in physical self-concept.

Variations in both task- and ego-involving aspects of the peer-created motivational environment did not predict physical self-concept. On reflection, however, neurocognitive evidence exists that peers may influence children's sense of self to a greater degree following pubertal changes to neural structures, as opposed to the early adolescence epoch measured in the present study (Sebastian, Burnett, & Blakemore, 2008). As a result, the findings offer inadequate support for suggesting that interventions over the school transition focusing on peer-created motivational environments will be directly effective in shielding children's physical self-concept from commonly observed declines (as reported in the present study and Marsh, 1989). Nonetheless, it would be premature to discount the effects of peers as perceptions of the task-involved peer environment were associated with self-reported physical activity. These findings imply that significant consideration of the specific outcome may be required in future intervention work, although the two outcomes are no doubt related. If the protection of children's sense of self over the school transition is the aim, then peers may not represent the best direct mechanism for achieving success and teaching practices should be targeted. However, if children's physical activity behavior is the central focus, then facilitating an environment where children emphasize effort, learning, and improvement may have developmental worth. This latter point is corroborated by the body of evidence concerning the central influence of peers on physical activity behavior (e.g., Finnerty, Reeves, Dabinett, Jeanes, & Vogele, 2010).

In addition to interpersonal elements of the PE class transition, we also explored motivational constructs grounded in SDT. Supporting our hypothesis, we found that autonomous motives for PE (i.e., intrinsic and identified motives) were positively associated with physical self-concept. This relationship has been observed previously in cross sectional work (Standage et al., 2012), however, this relationship grew stronger over the course of the present study, implying that allowing students to function autonomously has greater consequences for self-concept as they age. Our findings also show that facilitating autonomous motives in PE may also be associated with enhanced self-reported physical activity (Taylor et al., 2010). Results from previous research imply that this can be achieved by conducting teacher training interventions that focus on assisting teachers to provide a psychological need satisfying environment (Cheon et al., 2012).

The finding from the present study that introjected and external regulations were not associated with physical self-concept or physical activity was contrary to our hypothesis, however, null relationships among these controlling regulations and motivational consequences have been observed at the intraindividual level in previous research (e.g., Taylor et al., 2010). What was more surprising and contrary to theoretical expectations was the positive relationship between amotivation and physical activity. One possible explanation for this finding is statistical suppression, whereby the inclusion of other variables in a regression model increases the predictive utility of another variable (Conger, 1974). Our supplementary analysis supported this possibility; however, we are reticent to rely solely on this statistical justification for the unexpected finding. Alternatively, certain underlying reasons for amotivation in PE may lead children to actively seeking out physical activity in other contexts. For example, children who like physical activity but dislike the teacher and their class mates may report high levels of amotivation within PE yet seek out physical activity after school and at weekends (cf. Ntoumanis, Pensgaard, Martin, & Pipe, 2004).

Overview and Limitations

To summarize, children's physical self-concept and self-reported physical activity behavior were shown to decline in different ways over the period of a school transition. The pattern of physical activity behavior, in particular, implicates the transition itself as a factor in these declines. The school or class environment in secondary school may not be meeting the needs of children as they develop (Meece et al., 2006), and not providing sufficient opportunity for physical activity. This time in a child's life has important developmental implications and should be a central focus in future research and applied practice. The present study outlines interpersonal and motivational correlates that may be important in halting these trends and, in general, these potential influences remain similar in magnitude across this developmental transition period. Although these findings have important implications, the study is not without its drawbacks. First, we relied on self-reports of children's physical activity behavior, therefore, future projects should attempt to use objective measures of behavior. That said, self-report methods were deemed suitable as we focused on patterns of physical activity behavior, rather than actual levels, and wished to obtain a relatively large sample. Second, we could have considered many alternative aspects of the school environment, as well as individual and environmental factors that potentially differ over the school transition, such as the status of sport within the school, amount of homework, cognitive maturation, and seasonal influences. We concentrated on the specific interpersonal and motivational aspects in view of the theoretical support which suggested they may help explain temporal changes; however, scholars may wish to consider alternative correlates in combination with these psychological factors in future work. From a theoretical perspective, scholars may wish to replicate or rebut the positive intraindividual association observed between amotivation in PE and physical activity. For example, if children experience increased absence of motivation in PE, do they seek out other opportunities for physical

activity? Bidirectional influences may also be recognized in future work, whereby physical self-concept and physical activity behavior may influence children's motivation and perceptions of the environment in PE classes. Recognition that the psychological needs support provided by the teacher may influence the motivational environment created by peers may also be beneficial. Finally, it is worth noting the high correlations between the intrinsic and identified motives, which led us to combine the two motivation regulations. This problem has been noted previously (Lonsdale et al., 2011), hence, subsequent psychometric and conceptual research on improving the distinguishability of the two types of motivation may be commendable.

To conclude, the present study highlights several interpersonal and motivational factors that have important implications for the psychological and physical development of children over the period of a school transition. These factors should, therefore, be a target of future intervention to prevent the observed declines in physical self-concept and physical activity behavior.

Footnote

[1] A reviewer recommended that we considered gender in all analyses, however, very few differences were observed when doing so. Girls reported a greater linear decline in psychological need support from the teacher and a greater negative shift across the transition in peer ego-climate. No differences in substantive conclusions were found (and also very little difference in the statistical parameters) in interpersonal and motivational predictors of self-concept and physical activity.

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Table 1

Means, Standard Deviations and Bivariate Correlations of all Study Variables at the Beginning of the Study (i.e., Time 1).

	Mean (SD)			Bivariate Correlations								
Variable	Time 1	Time 2	Time 3	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Psych. Need Support	5.07(1.09)	5.04(0.97)	4.77(1.12)	–								
2. Peer Task Climate	4.92(1.10)	4.77(1.10)	4.50(1.13)	.42**	–							
3. Peer Ego Climate	4.88(0.93)	4.88(0.94)	4.88(0.98)	.27**	.02	–						
4. Intrinsic Motivation	5.33(1.42)	5.45(1.39)	5.13(1.49)	.54**	.39**	.19**	–					
5. Identified Regulation	5.52(1.30)	5.61(1.21)	5.34(1.38)	.53**	.40**	.19**	.81**	–				
6. Introjected Regulation	3.99(1.45)	4.10(1.40)	4.00(1.44)	.25**	.20**	.23**	.33**	.37**	–			
7. External Regulation	3.81(1.63)	3.65(1.69)	3.68(1.70)	-.18**	-.11**	.04	-.30**	-.19**	.33**	–		
8. Amotivation	2.21(1.34)	2.17(1.36)	2.27(1.42)	-.25**	-.19**	.01	-.46**	-.47**	.11*	.42**	–	
9. Physical Self-Concept	4.96(1.11)	4.86(1.15)	4.69(1.27)	.31**	.18**	.05	.44**	.36**	.15**	.07	-.16**	–
10. Physical Activity	3.46(0.76)	3.09(0.74)	3.14(0.80)	.16**	.14**	.10*	.31**	.33**	.15**	-.11*	-.17**	.20**

Note. * $p < .05$, ** $p < .01$. All scales were responded to on a 1-7 scale with the exceptions of physical self-concept (1-6) and physical activity (1-5).

Table 2

Cronbach's Alpha Coefficients and Variance Associated with Each Level of Analysis for All Study Variables

	Cronbach's Alpha			Variance			
	Time 1	Time 2	Time 3	Level 1	Level 2	Level 3 primary	Level 3 secondary
Psych. Need Support	.92	.92	.94	0.68*	0.35*	0.06*	0.06*
Peer Task-Climate	.73	.80	.81	0.78*	0.38*	0.09*	0.03
Peer Ego Climate	.68	.76	.76	0.58*	0.26*	0.02	0.04*
Autonomous Motivation	.91	.91	.93	0.76*	0.78*	0.06	0.09*
Introjected Regulation	.71	.71	.73	1.05*	0.91*	0.07	0.01
External Regulation	.77	.83	.85	1.47*	1.25*	0.07	0.02
Amotivation	.77	.82	.82	1.00*	0.80*	0.05	0.05
Physical Self-concept	.86	.91	.94	0.65*	0.69*	0.00	0.06*
Physical Activity	.75	.76	.81	0.35*	0.22*	0.02	0.03*

Note. * $p < .05$

Table 3

Regression Coefficients Describing Change in Study Variables across Time and School

Variable	Intercept	Linear Time	School Transition
Psychological Need Support	5.07	-.28***	.26**
Peer Created Task-Climate	4.92	-.27***	.12
Peer Created Ego-Climate	4.87	-.02	.02
Autonomous Motivation	5.47	-.30***	.41***
Introjected Regulation	4.03	-.10	.21
External Regulation	3.81	.04	-.21
Amotivation	2.22	.09	-.14
Physical Self-Concept	4.94	-.17***	.08
Physical Activity	3.46	.05	-.43***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 4

Multilevel Models Exploring Motivational (left side) and Interpersonal (right side) Predictors of Physical Self-Concept and Physical Activity

Motivational Predictor Variable	Physical Self-Concept	Physical Activity	Interpersonal Predictor Variable	Physical Self-Concept	Physical Activity
Intercept	4.93***	3.46***	Intercept	4.92***	3.44***
Linear Time	-.07	.08	Linear Time	-.10	.06
School Transition	-.05	-.47***	School Transition	.01	-.42***
Autonomous Motivation (AM)	.16**	.10*	Psychological Need Support (PNS)	.17**	.03
Introjected Regulation (IR)	-.03	-.02	Peer Created Task-Climate (PTC)	-.01	.10**
External Regulation (ER)	-.01	.05	Peer Created Ego-Climate (PEC)	-.03	.02
Amotivation	.08	.09*	PNS × Time	.17	-.03
AM × Time	.20*	.09	PTC × Time	-.02	-.03
IR × Time	-.05	-.02	PEC × Time	-.01	.02
ER × Time	-.05	-.05	PNS × School	.25	.04
Amotivation × Time	-.02	.01	PTC × School	.09	-.04
AM × School	-.17	-.12	PEC × School	.05	-.02
IR × School	.19	.01			
ER × School	.02	-.01			
Amotivation × School	-.03	-.10			

Note. * $p < .05$, ** $p < .01$, *** $p < .00$