



## Self-determined motivation and students' physical activity during structured physical education lessons and free choice periods

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### ABSTRACT

**Objective.** Various organizations have suggested that physical education (PE) should play a central role in increasing adolescents' physical activity (PA) levels. The purpose of this study was to examine relationships between students' self-determined motivation and their PA behavior during a structured PE lesson led by their teacher and a free-choice period in which they were not required to be active.

**Methods.** 528 Hong Kong students (mean age=15.78 years) participated in this study in April and May 2007. Situational Motivation Scale scores were used to form high and low self-determined motivation groups. Students wore a pedometer during a 20-minute structured basketball lesson and a 20-minute free choice period, during which they did not receive instruction.

**Results.** ANOVA revealed that self-determined motivation and PE class environments which provided students opportunities to make choices were related to greater PA. Furthermore, the difference in PA between the high and low self-determined groups was greater in the free-choice condition than the structured lesson, suggesting that self-determined motivation is especially important when students are not supervised.

**Conclusion.** Findings indicated that promoting self-determined motivation may be an effective means of ensuring that PE programs are able to increase PA levels, foster self-initiated PA behaviors, and enhance adolescents' health.

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### Introduction

School-based physical education (PE) is a forum for teaching youth effective motor skills, psychosocial adjustment, and general health knowledge (e.g., Monti, 2004; The Curriculum Development Council and the Hong Kong Examinations and Assessment Authority, 2007). Furthermore, various organizations recommend that PE should play a central role in increasing youths' physical activity (e.g., U.S. Department of Health and Human Services, 2000). This role is important as many youth do not achieve recommended amounts of physical activity (PA) (Sallis & Owen, 1999).

Ideally, PE can provide an opportunity for students to acquire a substantial portion of the recommended amount of daily PA (Scruggs et al., 2003). One objective based on Healthy People 2010 (U.S. Department of Health and Human Services, 2000) is for students to

spend at least 50% of the total PE class time being active. However, some students exert little effort during PE lessons (Ntoumanis et al., 2004), while others avoid participation altogether (Brooks & Magnusson, 2006). These students are unlikely to gain health benefits from school-based PE programs and may be less active when they are no longer supervised by a teacher (Kirk, 2005). Thus, students' motivation may be a critical determinant of the success or failure of PE as a means of promoting adolescents' PA. The current investigation was based on self-determination theory and was conducted to evaluate the relationship between students' motivation and PA obtained during a PE lesson. This is the first study to examine motivation towards PE alongside objectively-measured PA.

Self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2002) is a prominent framework used to understand the antecedents and outcomes of PA-related motivation (Chatzisarantis et al., 2003; Hagger & Chatzisarantis, 2007). SDT allows for exploration of not only the amount of motivation towards PE, but also the extent to which motivation is self-determined in nature. Deci and Ryan (1985) suggested that motivation can be experienced at both the global (i.e., across different life contexts) and situational levels. While global

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self-determination impacts motivation, we were particularly interested in how situational motivation (specific to a PE lesson) and features of the class environment influenced PA levels.

Deci and Ryan (1985) suggested that behavioral regulations (i.e., reasons for participation) can be ordered on a continuum according to the extent to which motivation is self-determined (see Fig. 1). Amotivation exists when individuals lack a sense of intention to participate and feel as though they are 'going through the motions'. External regulation refers to participation in order to satisfy external demands. Introjected regulation operates when individuals participate in order to avoid feeling guilt or to protect self-worth. Identified regulation exists when individuals participate in order to obtain benefits they deem important. Integrated regulation occurs when individuals view these benefits as being in line with their core values and beliefs. Intrinsic motivation exists when individuals participate because of an inherent enjoyment or interest in the activity. A combined score on the range of motives along the continuum provides a measure of the extent to which motivation emanates from the self and is often referred to as a self-determination index (e.g., Lemyre et al., 2006).

Highly self-determined motives are associated with cognitive and affective benefits, including greater concentration in PE, less boredom, and greater enjoyment (Ntoumanis, 2002, Ntoumanis, 2001, Standage et al., 2005). Students' self-determined PE motivation has also been associated with self-reported PA during leisure-time (Hagger et al., 2005; Chatzisarantis & Hagger, in press) and the decision to enroll in PE as an optional subject (Ntoumanis, 2005). However, research has not examined whether self-determined motivation towards PE is related to objectively-measured PA accumulated within PE classes. The association between students' PE motivation and their PA levels is important if PE is to be promoted as a method for increasing adolescents' activity.

SDT perspectives suggest that maintenance of self-determined motivation depends in part on social-contextual factors. Specifically, a subcomponent of SDT, Cognitive Evaluation Theory (CET; Deci & Ryan, 1985, Ryan & Deci, 2002), suggests that the level of intrinsic motivation experienced is dependent on whether the social environment supports the individual's needs for autonomy and competence. One contextual PE factor that may influence PA levels is whether the class takes place in a controlling or autonomous social environment. For example, PE is a context in which external control (i.e., teacher instructions) might provide sufficient motivation for non self-determined students to maintain a modest level of PA. However, when this control is removed (i.e., during free choice periods), it is likely that non self-determined individuals would decrease their level of PA. Thus, CET provides a template on which to explore the relationship between self-determined motivation for PE and actual PA levels in controlling and more autonomous contexts.

The purpose of this study was to examine relationships between students' self-determined motivation and their PA behavior during a structured PE lesson led by their teacher and a free-choice portion of the class in which they were not required to be active. We hypothesized that, compared to students with low self-determined motivation, highly self-determined students would exhibit greater PA

regardless of the presence or absence of teachers' instructions (i.e., structured lesson vs. free-choice conditions). We also hypothesized that motivation and lesson condition would interact such that the magnitude of the difference in PA between high and low self-determined motivation groups would be greater in the free-choice condition than in the structured lesson.

## Method

### Participants

Participants were 528 Chinese students ( $n=296$  females,  $n=232$  males) enrolled in mandatory Secondary 4 PE classes (10th grade equivalent). Students (mean age=15.78 years,  $SD=.91$  years) were recruited from 18 different same-sex classes taught by 12 different teachers at seven schools across Hong Kong.

### Measures

Students completed the Situational Motivation Scale (SIMS) (Guay et al., 2000), including subscales designed to measure amotivation, external regulation, identified regulation, and intrinsic motivation. The SIMS does not include introjected or integrated regulation subscales. The 14-item SIMS has produced scores with acceptable reliability and factorial validity in the PE context (Standage et al., 2003). The questionnaire was translated into Chinese and then independently back-translated into English (Van Widenfelt et al., 2005).

Given that SIMS subscales assess motivation types from across the range of the self-determination continuum, a self-determination index (SDI) can be calculated. In this study, the SDI was formed by multiplying each subscale score on the SIMS by a factor representing the construct's position on the self-determination continuum ( $SDI=2*\text{intrinsic motivation}+\text{identified regulation}-\text{external regulation}-2*\text{amotivation}$ , e.g., Lemyre et al., 2006).

The situational context for the present study was a basketball lesson, so all SIMS items were reported based on reasons for participating in an upcoming "basketball class". Basketball was chosen because all students had received previous instruction in this activity.

Yamax Digi-Walker DW-700 pedometers were used to measure students' PA. These instruments have been shown to produce valid assessments of youths' PA during various sport activities, including basketball (Kilanowski et al., 1999).

### Procedures

University research ethics board approval was obtained prior to participant recruitment. Principals and teachers from seven of the nine schools that we contacted agreed to participate in the study. Consent forms were distributed to parents of all Secondary 4 students in these schools. These forms provided parents and students the opportunity to decline participation. Following permission and consent protocols, the researchers entered PE classes that were pre-determined to include basketball activities. Each class included a 20-minute structured basketball lesson that was led by the teacher and a 20-minute free-choice period. The order of the structured lesson and the free choice period was counter-balanced across the 18 classes.

Students completed the SIMS immediately prior to class in reference to the upcoming "basketball" class. They were not informed that the class would include a structured lesson portion and a free choice portion. After completing the survey, the PE teachers asked that all students gather to receive instructions on how to affix the pedometer to their waistband at the right hip. Then, they either began the structured basketball lesson or the free-choice session.

In the structured lesson portion of the class, students participated in a 20-minute basketball shooting lesson led by the teacher. The same

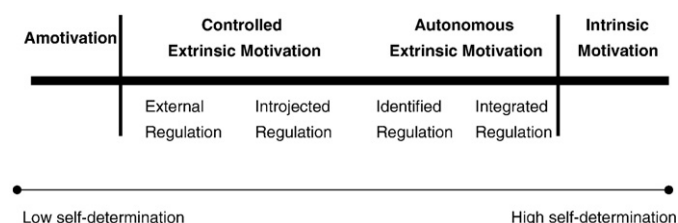


Fig. 1. The self-determination continuum.

**Table 1**  
SIMS observed score correlations

Subscale	Mean (SD)	Range	1	2	3	4
1. Intrinsic motivation	4.08 (1.31)	1.00–7.00	<i>.80 (.77–.83)</i>			
2. Identified regulation	3.96 (1.14)	1.00–7.00	.81	<i>.83 (.80–.85)</i>		
3. External regulation	4.04 (1.16)	1.00–7.00	.51	.62	<i>.77 (.74–.80)</i>	
4. Amotivation	3.49 (1.12)	1.00–7.00	–.36	–.30	–.11	<i>.92 (.91–.93)</i>

Note. All correlations are significant at  $p < 0.05$ . Alpha coefficients (with 95% confidence interval) are listed in italics on the diagonal. Data collected from Chinese secondary school ( $n=528$ ) students in April–May 2007 in Hong Kong.

lesson plan (Yates, 2006) was used by all teachers and included a demonstration of correct shooting form (1–2 min), shooting drills (4–5 min), and a game in which students worked together to score as many baskets as possible (13–15 min). All students were able to participate in the activities simultaneously.

In the free choice portion of each class, students were told that the teacher needed to organize some materials and that they would have “20 min of free time” to do whatever they chose. Basketballs were made available, but no further instruction or equipment was provided. For safety reasons, the teacher remained in the class vicinity, but did not interact with the students and was asked to appear uninterested in their activities.

#### Statistical analyses

We conducted a tertile split on the self-determination index (SDI) scores to identify students with low and high levels of self-determined motivation. Data from the middle tertile were not included in the remaining analyses. For the main analyses, we conducted a  $2 \times 2$  repeated measures ANOVA. The between-subjects factor was the SDI score tertile. Lesson condition was the within-subject factor. Steps-per-minute was the dependent variable. We did not control for teacher-effects in the analysis because the same teacher was used for both the structured lesson and free-choice portions of each class, thereby reducing systematic error variance.

## Results

#### Preliminary analyses

Less than .02% of the SIMS data points contained missing values, and with no pattern apparent, we replaced these values using an Expectation Maximization algorithm. SIMS scores were univariately normally distributed and no multivariate outliers ( $p < 0.001$ ) were evident. Descriptive statistics can be viewed in Table 1.

To ensure the high and low self-determined motivation groups differed, a  $t$ -test was conducted and revealed that the high self-determination group ( $n=178$ ,  $M=5.81$ ,  $SD=2.98$ ) had significantly higher SDI scores ( $t [358]=30.16$ ,  $p < 0.01$ ) than the low group ( $n=182$ ,  $M=-3.26$ ,  $SD=2.72$ ). This represented a large effect size ( $d=3.18$ ).

**Table 2**

Repeated measures ANOVA of step/minute with SDI group as the between subjects factor and lesson condition as the within subjects factor ( $n=360$ )

Source	df	F	$\eta^2$	p
<i>Between subjects</i>				
SDI group	1	28.25	.07	<0.01
SDI group error	358	(668.45)		
<i>Within subjects</i>				
Condition	1	398.06	.53	<0.01
Condition $\times$ SDI group	1	10.58	.03	<0.01
Condition $\times$ SDI group error	358	(255.25)		

Note. SDI=Self-determination index. Data collected from Chinese secondary school students in April–May 2007 in Hong Kong. Group 1 ( $n=178$ )=high self-determination students. Group 2 ( $n=182$ )=low self-determination students.

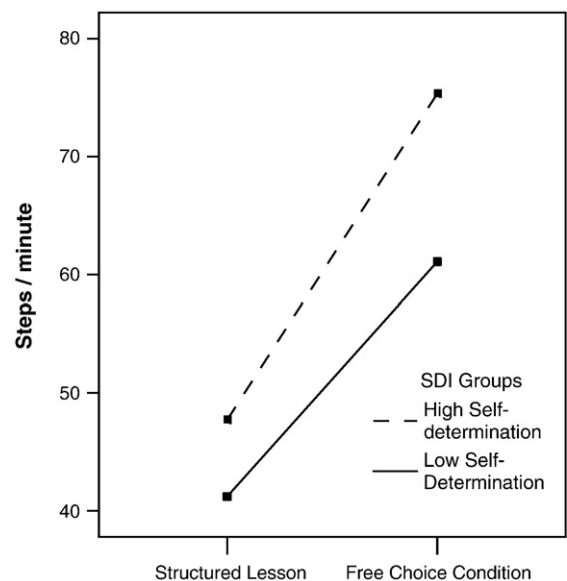
#### Substantive analyses

ANOVA (see Table 2) revealed a significant between-subjects main effect for motivation groups. Overall, step counts for students in the high self-determination group ( $M=61.53$  steps min<sup>-1</sup>,  $SD=18.16$ ) were significantly higher ( $t [358]=5.31$ ,  $p < 0.01$ ) than students in the low self-determination group ( $M=51.15$  steps min<sup>-1</sup>,  $SD=18.88$ ) across both class conditions. This effect size was moderate ( $d=.56$ ). We also found a significant within-subject main effect of lesson condition. Overall, step counts were significantly higher ( $t [359]=19.66$ ,  $p < 0.01$ ) in the free choice condition ( $M=68.14$  steps min<sup>-1</sup>,  $SD=27.45$ ) than in the structured lesson ( $M=44.12$  steps min<sup>-1</sup>,  $SD=16.16$ ). This represented a large effect ( $d=1.07$ ).

A significant motivation group  $\times$  condition interaction effect was also observed (see Table 2), suggesting that between-group differences in step counts were not equal across the two conditions (see Fig. 2). In the structured lesson condition, the difference between high and low self-determined students' steps min<sup>-1</sup> was small (mean difference=6.51 steps min<sup>-1</sup>,  $t [358]=4.01$ ,  $p < 0.01$ ,  $d=.42$ ). However, in the free choice condition this difference was moderate (mean difference=14.25 steps min<sup>-1</sup>,  $t [358]=5.10$ ,  $p < 0.01$ ,  $d=.54$ ).

#### Discussion

School PE experiences may play a critical role in increasing adolescents' PA levels by influencing PA behaviors at school (Scruggs et al., 2003), during leisure time (Hagger et al., 2005), and in later life (Kirk, 2005). Consequently, it is important to understand the personal and environmental factors that influence students' PE involvement. We examined relationships between students' motivation for PE and



**Fig. 2.** High ( $n=178$ ) and low ( $n=182$ ) self-determination students' step counts per minute in structured lesson and free-choice conditions. Data collected from Chinese secondary school students in April–May 2007 in Hong Kong.

their PA levels during a teacher-led lesson and a free-choice period. As hypothesized, self-determined PE motivation was related to higher levels of PA in both the structured and free-choice conditions. Adolescents also had higher step counts in the free-choice condition compared to the structured lesson. Finally, the difference in PA between the high and low self-determined students was greater in the free-choice condition than the structured lesson, thus providing preliminary evidence that the benefits of self-determined PE motivation may be magnified in unstructured contexts.

These findings supported hypothesized effects and further substantiated consistent reports that self-determined motivation is related to PA effort, choice, and frequency (e.g., Hagger & Chatzisarantis, 2007; Hagger et al., 2005, Ntoumanis, 2005). However, this study is the first to uphold salient theoretical tenets regarding motivation towards PE while objectively measuring adolescent PA.

Regardless of self-determined motivation level, adolescents had higher step counts in the free choice condition compared to the structured condition. The free-choice PE class was likely a setting that facilitated self-determined learning (Ryan & Deci, 2000). Based on CET (Ryan & Deci, 2002), the free choice environment may have satisfied underlying psychological needs of autonomy and competence. Providing free-choice PE would support autonomy perceptions, and students may have chosen activities in which they felt competent. Additionally, the lack of teacher input may have removed feelings of imposed goals, pressure to perform for evaluative means, or the possibility of negative feedback, thereby enhancing intrinsic motivation and PA during this context. Although we did not assess the extent to which competence and autonomy needs were satisfied, evidence in the PE context highlights that need-supportive environments are related to greater self-determined motivation and desirable behavioral and psychological outcomes (Standage et al., 2005). Thus, it is not surprising that students had higher PA during the free-choice condition.

When compared with the structured lesson, the free-choice period led to greater PA for students. As such, our findings suggest it might be important to integrate free-choice periods into PE classes to promote activity and enhance physical fitness (e.g., Halas, 2004). However, it is important to note that PE classes have multiple objectives beyond fitness, including skill development, psychosocial adjustment, and general health education (e.g., Monti, 2004; The Curriculum Development Council and the Hong Kong Examinations and Assessment Authority, 2007). These learning outcomes may not be fostered effectively in free-choice environments. Thus, for adolescents to experience positive youth development through PE, a combination of free-choice and structured lessons that are action-packed and interesting is likely most effective. Recess periods, during which appropriate equipment and playground markings are provided (Ridgers et al., 2007), may also provide opportunities for free play and PA. Beyond free-choice activities, results also highlight the importance of developing strategies to enhance self-determined motivation in PE by fostering psychological need-supportive environments. Self-determined motivation was associated with higher PA levels during structured PE lessons and, to an even greater extent, when students were not supervised by their teacher.

In terms of study limitations, the quasi-experimental design did not allow causal inferences regarding the relationship between self-determined motivation and activity involvement. Future research is needed in which self-determined PE motivation is manipulated (e.g., Hagger & Chatzisarantis, 2007) and the effect on PA is objectively measured during structured lessons and a variety of unsupervised conditions inside and outside PE classes. Also, while our findings supported SDT-based propositions, situational motivation is likely influenced by a combination of the students' global self-determined motivation in addition to their unique experiences in the PE classes (Deci & Ryan, 1985). Therefore, future research should attempt to assess the global (e.g., causality orientations, Deci & Ryan, 1985) as

well as additional situational variables (e.g., teacher feedback, imposed goals, needs satisfaction; see Ryan & Deci, 2000) that may influence self-determined motivation in PE and in turn PA.

## Conclusions

To our knowledge this study is the first that examines the relationship between self-determined motivation and students' objectively measured PA levels during PE classes. Results indicated that self-determined motivation for PE promotes PA. Additionally, PE class environments that provide students with opportunities to make choices are likely to further promote PA behavior amongst adolescents. Finally, our study contributes to the literature on motivation and adolescent PA by showing that self-determined motivation may be especially important when students are not directly supervised by their teacher. As such, promoting self-determined motivation may be an effective means by which to ensure that PE programs increase PA levels, foster self-initiated PA behaviors, and enhance adolescents' health.

## Conflict of interest statement

None of the authors has any financial interest in or arrangements with any company whose product was used in this study or is referred to in the article or any other situations that may have potentially biased the work reported, its conclusions, implications, or opinion statements. The project was initiated and data was analyzed by the lead investigator.

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