The Physical Educator Vol. 72 • pp. 340–358 • 2015

PEDAGOGY

Secondary School Students' Physical Activity Participation Across Physical Education Classes: The Expectancy-Value Theory Approach

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Abstract

The primary purpose of this study was to analyze the link between students' expectancy beliefs, subjective task values, out-of-school activity, and moderate to vigorous physical activity (MVPA) participation across secondary school physical education (PE) classes. The sample comprised 96 students (58 girls, 38 boys; M_{age} = 15.03, SD = .94) from schools located in Northeast Finland. The self-report questionnaire was modified to address the domain-specific questions for Finnish PE. Accelerometers were used for the objective assessment of students' MVPA across the PE classes and during out-of-school activities. The findings show that perceived importance indicates MVPA involvement for girls and attainment value and out-of-school MVPA for boys. Boys were more physically

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active than girls across PE classes. In contrast, girls received more out-of-school activity across the 7 days. The major cause of concern arising from the current findings was that girls engaged in up to 26.2% and boys 33.6% of their weekly MVPA during only two 45-min PE classes. A higher priority needs to be placed in schools on encouraging young people to engage in daily physical activity and providing guidance that makes it easy to find activities in which girls and boys have opportunities to be successful and feel competent. Schools should also use PE as a mean to promote greater physical activity outside of school.

Maintaining the positive promotion of physical activity (PA) among children and youth has become a universal challenge (Coulter &Woods, 2011). In previous research, it has been revealed that adolescents' level of moderate to vigorous physical activity (MVPA) declines during adolescence as they transit from childhood into adulthood (Corbin, Pangrazi, & Le Masurier, 2004; World Health Organization, 2008; Yli-Piipari, 2011). This is concerning as less active youth are at greater risk for developing overweight or obesity, type 2 diabetes, or cardiovascular disease, which may impact overall health and quality of life (Haskell et al., 2007). Fortunately, schools are a unique venue where youth can meet the activity recommendations, as the faculty in these institutions are capable of providing PA knowledge and skills to the target population at minimal additional cost to the community (McKenzie, 2007).

Expectancy-value theory is a useful framework for predicting PA behavior (Cox & Whaley, 2004; Gao, Lee, Solmon, & Zhang, 2009; Xiang, McBride, & Bruene, 2006; Yli-Piipari, 2011). The theory addresses whether children desire to participate in an activity and how much effort they are prepared to put into the activity (Eccles et al., 1983; Wigfield & Eccles, 2000). The level of persistence and performance in the activity are determined by their beliefs about how well they will perform the activity (expectancy beliefs) and values they attach to the activity (subjective task values). The approach is highly valuable to envisage the link between students' expectancy-related beliefs and subjective task values to their actual PA performance within physical education (PE) classes, as the beliefs and values have been found to be critical factors in predicting students' performance in school PE (Cox & Whaley, 2004; Gao et al., 2009; Xiang et al., 2006; Yli-Piipari, 2011). In previous research based on expectancy-value theory, PE classes have generally been

considered as potential functions to increase secondary school students' daily PA; however, students' MVPA was not an objectively assessed variable within these studies (Cox & Whaley, 2004; Gao et al., 2009; Xiang et al., 2006; Yli-Piipari, 2011).

Beliefs about ability are defined as individuals' beliefs about their competence in performing or learning achievement tasks, whereas expectancies for success are how individuals view their probability for success at a specific task. Cox and Whaley (2004) reported that 14- to 19-year-old students' expectancy beliefs were positively associated with effort and persistence in basketball. The association between beliefs and intentions to future participation in an elementary PE running program was addressed among 7- to 10-year-old children in Texas (Xiang, McBride, & Bruene, 2006). Similarly, in a longitudinal Finnish study, students' expectancy-related beliefs toward PE decreased across Grades 6 to Grade 9 (Yli-Piipari, 2011).

Another essential element of expectancy-value theory is subjective task values, which are defined as individuals' incentives for doing tasks. Eccles et al. (1983) demonstrated that subjective task values are a function of four distinct components: attainment value (importance), intrinsic value (interest), utility value (usefulness), and cost. Attainment value is the importance to do well on a given task and includes identity issues, as tasks are important when individuals view them as central to their own sense of self and allow them to express or confirm important aspects of self (Eccles et al., 1983). Intrinsic value is the enjoyment a person gains from doing the task. When individuals intrinsically value an activity, they often become deeply engaged in it and can persist at it for a long time (Deci & Ryan, 2000; Eccles et al., 1983). Utility value or usefulness is how a task fits into an individual's future plans, for instance, taking a PE class to fulfill a need for social interaction. Thus, utility value is similar to extrinsic value because when an activity is done out of utility value, the activity is a means to an end rather than an end in itself. Utility value is also connected to personal goals and sense of self and thus has ties to intrinsic motivation (Deci & Ryan, 2000). Cost is what the individual has to give up to do a task, as well as the anticipated effort the person will need to complete the task (Eccles et al., 1983). Cox and Whaley (2004) found that subjective task values, such as beliefs, were positively associated with high school students' effort and persistence in basketball. Particularly, the 1-mile run was more strongly associated with attainment value than intrinsic or utility value in the elementary school running program

study (Xiang et al., 2006). Yli-Piipari (2011) reported that Finnish children aged 11 to 13 years who valued PE highly became more physically active across Grades 6 to 9 based on self-report MVPA scores.

Gender differences have been observed in PE in expectancy beliefs (Xiang et al., 2006; Xiang, McBride, Guan, & Solmon, 2003; Yli-Piipari, 2011) and subjective task values (Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002; Eccles, Wigfield, Harold, & Blumenfeld, 1993; Yli-Piipari, 2011), with boys scoring higher. In contrast, gender differences have not been observed in other studies (Cox & Whaley, 2004; Xiang et al., 2006). Several researchers have suggested that differences may be a result of participation in gender-appropriate activities, when expectancy beliefs increase as a result (Shen, Chen, Tolley, & Scrabis, 2003; Solmon, Lee, Belcher, Harrison, & Wells, 2003). Differences have, therefore, been found more regularly in gender-preferenced activities, such as dance or ice hockey, as girls and boys often tend to value activities that they perceive as appropriate for their gender (Gao & Xiang, 2008). In addition, boys have been found to be more physically active than girls in PE (Flohr, Todd, & Tudor-Locke, 2006) and out of school (Flohr et al., 2006; Tammelin, Laine, & Turpeinen, 2013). Flohr et al. (2006) suggested that MVPA participation could be increased with enhanced opportunities for out-of-school activities in girls and boys.

Previous school-based studies in which self-reports of PA were used have shown these instruments lack measurement precision, and this makes it difficult to assess PA accurately, particularly in relation to PE (Gråstén, Watt, Jaakkola, & Liukkonen, 2012; Riddoch et al., 2004). In a systematic review of school-based randomized controlled trials to promote PA in adolescents, it was revealed that an objective method was used in only one study (direct observation) to assess PE-related levels of PA (Sluijs, McMinn, & Griffin, 2007). Furthermore, only a small number of studies in which accelerometers have been used in PE lessons have been reported (Dudley, Okely, Perason, & Cotton, 2011; Lonsdale, Sabiston, Raedeke, Ha, & Sum, 2009). This introduces the potential for substantial methodological variation to be introduced in PA levels in PE reported in the literature. The present study is the first attempt to examine associations of objectively measured MVPA scores and expectancy beliefs and subjective task values across PE classes in a sample of secondary school students.

The primary purpose of this study was to analyze the link between Finnish secondary students' expectancy beliefs, subjective task values, and out-of-school MVPA and their actual MVPA participation across two 45-min PE classes. On basis of the framework, it was hypothesized that expectancy beliefs and subjective task values, especially attainment value (Xiang et al., 2006; Yli-Piipari, 2011) and out-of-school activity (Stodden et al., 2008), would play a positive role in students' MVPA level during PE classes when using accelerometer scores. The second purpose of this study was to investigate associated gender differences. Based on previous studies, it was assumed that boys would report higher scores in expectancy beliefs and attainment, intrinsic, and utility values (Eccles et al., 1993; Jacobs et al., 2002; Xiang et al., 2006; Xiang et al., 2003; Yli-Piipari, 2011) and also demonstrate greater MVPA in PE and out-of-school MVPA (Tammelin et al., 2013; Yli-Piipari, 2011). In addition, a structure of the measurement model of expectancy beliefs and subjective task values was tested.

Methods

Participants

Participants were recruited from secondary schools located in Northeast Finland through direct contact with the school principals. Students in each PE class were invited to participate. The sample comprised 96 students (58 girls, 38 boys) aged 12 to 16 years (M = 15.03, SD = .94). The human participants' approval statement was obtained from the ethics committee of the local university, and consent to participate in the study was obtained from participants and their parents. Participation in this study was voluntary, and no extra credit was awarded for participation.

Instruments

Beliefs about ability, expectancies for success, and subjective task values. The self-report questionnaire, originally developed by Eccles et al. (1983), was modified to address the domain-specific questions for Finnish PE (Yli-Piipari, 2011). Beliefs about ability and expectancies for success were used as a combination, similar to the one used by Xiang et al. (2003). For the purpose of this study, the attainment, intrinsic, and utility value dimensions of subjective task values were measured. The introduction preceding the items was, "When you think about your school physical education classes."

Responses were given on 5-point Likert-scales anchored by *totally disagree* (1) and *totally agree* (5). Xiang et al. (2003) demonstrated acceptable validity and reliability scores using these self-reports with elementary school children in PE.

Objective MVPA. Accelerometers were used for the objective assessment of students' MVPA in PE classes, recess, and out of school. Specifically, Polar activity monitors were chosen to investigate the patterns of MVPA in PE on a minute-by-minute basis (Polar Electro, 2011). The monitors are light, small, and worn on the wrist. The electronic monitors detected the intensity of the movements at 10-s intervals and displayed minutes spent in the moderate to vigorous activity zone. For the purpose of this study the manufacturer's protocols were followed to determine MET minutes as the representation of MVPA including two 45-min PE classes, and out-of-school activity (recess and leisure time) across 7 days. The Polar monitors have been validated in children and adolescents (Virtanen, 2011). A validation study conducted in a sample of Finnish 6- to 15-year-old children and adolescents (n = 20), revealed MET values for playing games, walking, and running had a high correlation with MET values from indirect calorimetry (r = .91), whereas the correlation was low for sitting activities (r = .31; Virtanen, 2011). In another study, the correlation between monitors and indirect calorimetry (r = .86) was similar to the correlation between Actigraph accelerometers and indirect calorimetry (r = .84) for seven activities (sitting quietly, seated playing a video game, a standing warm-up, walking, jumping rope, video-led kickboxing, and running for 30 min in a sample of 23 Finnish 11- to 17-year-old children and adolescents (Virtanen, 2011).

Procedure

The current data are part of a larger 4-year research project aimed at promoting PA and health among children and youth. The researchers collected the self-reports during the school's allotted 45-min lessons in April 2011. Girls and boys were taught in gender groups by one female and two male teachers. The participants were told that their involvement was voluntary, and the scores were kept confidential. In addition, the participants were encouraged to ask for help if they did not understand the instructions or the clarity of a particular item. To minimize students' tendency to give socially desirable responses, students were encouraged to answer honestly and were assured that their responses were confidential. Objectively

measured MVPA data were collected for 7 days, including two 45-min PE classes for each student. The MET minutes of the two lessons were calculated and used as the students' MVPA in PE scores. The activities (warm-up: gymnastics, ball games: volleyball, badminton, and floor hockey) represent the essential contents of Finnish PE classes from Grades 5 to 9 (Finnish National Board of Education, 2004). Girls and boys had similar classes at each grade. Consequently, MVPA comparisons between grades were not appropriate. Out-of-school MVPA was obtained by subtracting PE class activity out of total MVPA. The researchers gave instructions on how to use the activity monitors at the beginning of the lessons. The researchers entered the students' demographic details to calibrate the monitors (age, gender, height, and weight). The PE teachers collected the monitors, and the researchers downloaded the data to a computer. Only students who received complete data for 7 days were entered into the data analyses.

Data Analysis

The data were analyzed in several steps. Prior to statistical analyses, the distribution, missing values, and outliers of the data were examined. The variables were approximately normally distributed, and no missing values or outliers were found using the standardized values (± 3.29) and Mahalanobis distance ($p < .001$) procedures (Tabachnick & Fidell, 2007). A confirmatory factor analysis (CFA) was conducted on 11 items measuring expectancy beliefs and subjective task values to examine the four-factor structure of the measure scores. The data were entered as a covariance matrix, and the analysis was performed using the MPlus version 6.12 software with a maximum likelihood estimation procedure. To determine the goodness of fit of the proposed model with the data, the model chi-square value (χ^2), chi-square degrees of freedom, the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR) indices were used. The associations of expectancy beliefs, subjective task values, and objectively measured MVPA were examined using correlation matrix and logistic regression analysis. MANOVA was used to study gender differences in expectancy beliefs, subjective task values, MVPA in PE classes, and out-of-school MVPA. For logistic regression analysis, the manufacturer's activity levels for the classification of MVPA scores were used (Polar Electro, 2011). Students' performance was considered

physically active if they engaged in more than 600 MET min of activity over two 45-min lessons. Those who engaged in fewer than 600 MET min were categorized as physically inactive. Stepwise logistic regression analysis was completed using SPSS 19.0 software.

Results

Confirmatory Factor Analysis

A four-factor model of expectancy-value theory was tested following procedures outlined by Xiang et al. (2003). The resulting CFA model did not yield an acceptable fit for the data based on the selected fit indices, $\chi^2(38) = 85.367$, $p < .001$, CFI = .93, TLI = .89, RMSEA = .114, SRMR = .045. The next step was to modify the factor model for secondary school adolescents using a theory-based rationale. The measurement errors of items "How good are you in PE classes?", "Compared to other students, how good are you in PE classes?", "How well do you expect to learn new skills in PE classes next year?", and "How well do you expect to do in PE classes next year?" were allowed to correlate because some of the shared variance in the indicators was due to the latent factor or an outside cause. In the final CFA (Figure 1), a good fit was revealed for the modified model, $\chi^2(36) = 53.938$, $p < .05$, CFI = .97, TLI = .96, RMSEA = .072, SRMR = .035. In addition, composite reliability for the factor loadings for the expectancy beliefs (.92), attainment value (.97), intrinsic value (.96), and utility value (.99) factors indicated satisfactory internal consistency. Based on the results of the final CFA, we concluded that the measures of expectancy beliefs and subjective task values demonstrated adequate reliability and validity. A summary of intercorrelations, means, standard deviations, and Cronbach's alpha coefficients for all factors based on the CFA are presented in Table 1.

Gender differences

The values of skewness ranged from −.86 to .35, indicating that the variables were approximately normally distributed. In contrast, the Box M test revealed a violation of the assumption of homogeneity of covariance matrices for intrinsic value ($F = 4.70$, $p < .05$) and PA in PE lessons ($F = 20.19$, $p < .05$). When the within-group covariance matrices were not equal, Pillai's trace criterion, $F(5, 90) = 4.06$, $p < .05$, Pillai's tr = .184, partial $\chi^2 = .18$, was used to detect significant gender differences (Anderson, 2003). Based on the

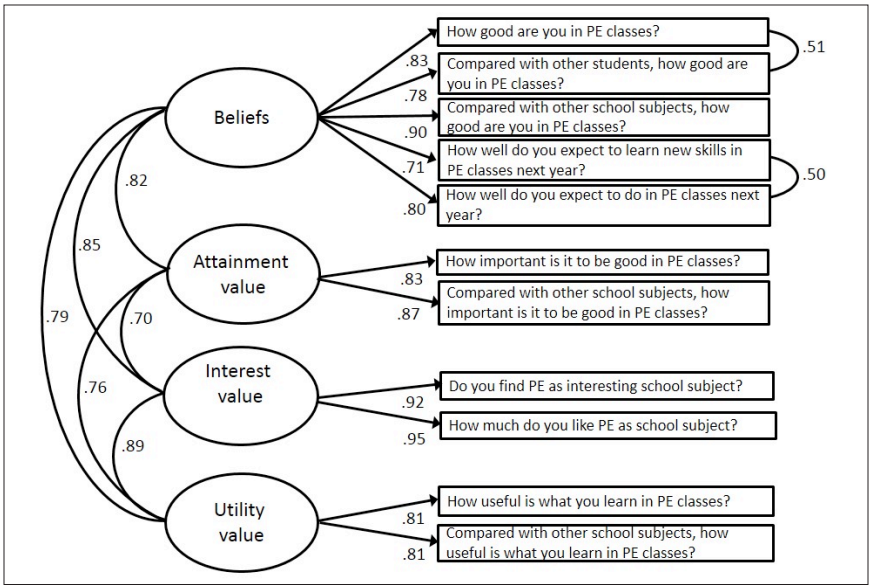

Figure 1. Measurement model (CFA) of the four-factor structure of expectancy beliefs and subjective task values.

MANOVA, statistically significant differences were found between girls and boys on expectancy beliefs, $F(1, 5) = 8.09$, $p < .01$; attainment value, $F(1, 8) = 7.38$, $p < .01$; intrinsic value, $F(1, 14) = 12.78$, $p < .001$; utility value, $F(1, 6) = 7.71$, $p < .01$; MVPA in PE classes, $F(1, 653135) = 11.94$, $p < .001$; and out-of-school MVPA, $F(1, 455773) = 4.04$, $p < .05$).

Logistic Regression Analysis

The results of the stepwise logistic regression analysis are shown in Table 2. Results indicated that MVPA participation in girls' PE lessons was predicted by attainment value ($R^2 = .22$, $B = .76$, $OR = 2.13$, $p < .05$), and in boys' lessons by attainment value ($R^2 = .24$, $B = 1.15$, $OR = 3.14$, $p < .05$) and out-of-school MVPA ($R^2 = .21$, $B = -.00$, $OR = 1.00$, $p < .05$). The model fit resulted in a 74.1% correct overall prediction for active or inactive girls in PE lessons and 70.4% for MVPA participation. In an equal analysis of boys, an 84.2% correct overall prediction and 92.6% for MVPA participation was revealed. Taken together, stepwise logistic regression analysis showed that MVPA in PE lessons was affected by attainment value (importance) in girls' classes and attainment value and out-of-school MVPA in boys' classes. Neither expectancy beliefs, utility value, nor intrinsic value entered into the equation.

Table 1
Summary of Intercorrelations, Means, Standard Deviations, and Cronbach's Alpha Coefficients for All Variables

Variable list	1	2	3	4	5	6	*M*	*SD*	α	Grand *M*
1. Expectancy beliefs	–	.493***	.706***	.612***	-.013	.144	3.61	.82	.91	3.85
2. Attainment value	.896***	–	.554***	.560***	.195	.050	3.22	1.05	.79	3.45
3. Interest value	.758***	.688***	–	.736***	.104	.250	3.66	1.18	.92	3.97
4. Utility value	.632***	.656***	.765***	–	.147	.152	3.65	.93	.79	3.85
5. MVPA[a]	.185	.310	.317	.322*	–	−.126	567.61	161.37	–	651.95
6. MVPA[b]	.041	.055	−.047	−.066	−.551***	–	1,595.60	306.68	–	1,525.16
M	4.14	3.80	4.45	4.16	736.28	1454.71				
SD	.80	1.02	.85	.80	314.37	376.26				
α	.92	.88	.93	.74	–	–				

Note. Intercorrelations for girls (n = 58) are presented above the diagonal, and intercorrelations for boys (n = 38) are presented below the diagonal. Means, standard deviations, and Cronbach's alphas for girls are presented in vertical columns, and means, deviations, and Cronbach's alphas for boys are presented in horizontal columns. Grand mean of the target sample (n = 96) is presented in the last vertical column on right.

[a]Total MVPA in physical education classes (MET minutes). [b]Total out-of-school MVPA (MET minutes).

*$p < .05$. ***$p < .001$.

Table 2
Logistic Regression Analysis Results (N = 96, df = 1)

	R^2	*B*	Exp (*B*)	*SE*	Wald	*p*
Girls (*n* = 58)						
Constant		.65	1.92	1.75	.14	.710
Attainment value	.22	.76	2.13	.30	6.24	.012*
Boys (*n* = 38)						
Constant		2.92	18.45	2.79	1.09	.296
Attainment value	.24	1.15	3.14	.50	5.35	.021*
MVPA[a]	.21	-.00	1.00	.00	5.84	.016*

[a]Out of school.
*$p < .05$.

Discussion

The primary purpose of this study was to analyze the link between students' expectancy beliefs, subjective task values, out-of-school activity, and MVPA participation across Finnish secondary school PE classes. The findings indicate that expectancy beliefs are not a strong factor for MVPA participation in PE classes, whereas importance is a factor for MVPA involvement for girls and attainment value and out-of-school MVPA for boys. Students reported that PE was an important, interesting, and useful school subject, with boys scoring higher than girls. Finally, boys were more physically active than girls across PE classes; MET minutes based on the accelerometer scores showed that intensity of activities ranged from moderate to vigorous. In contrast, girls received more out-of-school MVPA across 7 days.

The results show that the associations between expectancy beliefs and MVPA participation, as well as subjective task values and MVPA participation, are comparatively weak, ranging from negligible to low. This was the first attempt to examine the associations with the accelerometer scores in a sample of Finnish secondary school students. Previous studies from other countries in which objective measure scores were used were not found. The current findings are unexpected as expectancy-related beliefs and values have been found to be crucial factors in predicting individuals' performance in school PE (Cox &Whaley, 2004; Gao et al., 2009; Xiang et al., 2006). A plausible reason for the inconsistent associations may

be that two objectively measured 45-min periods for each student was contextually limited. In earlier studies, performance was analyzed using more extensive questionnaires (Yli-Piipari, 2011) or via a timed 1-mile run (Xiang et al., 2006). Yli-Piipari (2011) investigated total PA using the protocol of the World Health Organization (2004, 2008), measuring self-reported MVPA across 7 days, including PE and leisure activity. In the running-program study, PE performance was measured using the structured test run, in which the children were encouraged to run as fast as they were able (Xiang et al., 2006). The MVPA scores of the current study were derived only from PE class activity, and students performed without additional stimulation. Additionally, Gråstén et al. (2012) suggested that different MVPA measurement methods can result in a full range of outcomes, which may also have an impact on the differences in these studies based on the expectancy-value theory. The association of beliefs and values with objective outcomes such as MVPA in PE classes may require a longer period of assessment or several measurement techniques to be fully elucidated. Health and well-being–related beliefs or values may also be sensitive with respondents reluctant to provide exact details (Brener, Billy, & Grady, 2003). In addition, the level of performance in the activity is determined by students' beliefs about how well they will perform the activity and the values they attach to the activity (Eccles et al., 1983; Wigfield & Eccles, 2000). Hence, two 45-min classes for each student may be too contextual for self-evaluation such as an activity experience to internalize beliefs about their personal MVPA levels, when beliefs and values were not assessed immediately after PE class but in the same week.

The associations between expectancy beliefs and subjective task values ranged from moderate to high. The present finding is similar to previous studies concerning PE in secondary school and middle school students (Gao et al., 2009; Yli-Piipari, 2011). The results indicate that students who score higher on expectancy-related beliefs in PE classes tend to see it as more useful, important, and interesting than students who score lower on expectancy beliefs. In other words, if students do well and believe they are competent on the tasks, they view PE classes as more useful, important, and interesting (Gao et al., 2009).

Both physically active girls and boys valued PE classes as more important than inactive students did, who valued classes as less important. The current finding is similar to other studies. For example,

Xiang et al. (2006) found that attainment value was more strongly associated with 1-mile run performance than intrinsic or utility value in an elementary school running program. Unexpectedly, in the present study, neither expectancy beliefs, intrinsic value, nor utility value was significant when entered into the logistic regression equation for secondary school students. The latter finding may be a consequence of a decrease in expectancy beliefs or relatively stable subjective task values across the secondary school years (Yli-Piipari, 2011). The outcomes of these studies are not equal; consequently, the corresponding conclusions are restricted on the basis of the findings without additional information. The differences indicate a possibility that expectancy beliefs and subjective task values for MVPA in certain PE classes are different to those that activate students in structured PE programs or overall PA across the secondary school years. In addition, out-of-school activities related with boys' MVPA participation in PE classes. This finding is not unexpected, as Flohr et al. (2006) suggested that MVPA participation could be increased by providing enhanced opportunities for out-of-school activities. Additionally, PE should be used in schools as a means to promote greater PA outside of school (Hagger et al., 2009).

As assumed, expectancy beliefs, subjective task values, especially interest value, are higher for boys. This pattern is in line with previous findings, in which more physically active students scored higher than less active students on expectancy beliefs (Xiang et al., 2006; Xiang et al., 2003; Yli-Piipari, 2011) and subjective task values in PE (Eccles et al., 1993; Jacobs et al., 2002; Yli-Piipari, 2011). Gender differences in expectancy beliefs and subjective task values may have been the result of participation in gender-appropriate activities, whereby expectancy beliefs and values increase as a result (Shen et al., 2003; Solmon et al., 2003). In the present study, the activities undertaken in PE classes such as volleyball, badminton, and floor hockey may have been more appropriate for boys. According to a recent Finnish study (Finnish Sports Federation, 2010), 13- to 18-year-old girls were most likely to participate in gymnastics and dance classes, whereas boys tended to prefer ball games (i.e., soccer, ice or floor hockey), which require relatively high ball handling skills. Stodden et al. (2008) suggested that competency increased the likelihood of participating in physical activities. Therefore, it is not surprising that boys scored higher on the belief and value variables, as girls and boys tend to value activities that they perceive as gender oriented or specific (Gao & Xiang, 2008).

Additionally, boys engaged in more MVPA in PE classes than girls did. This particular result is consistent with earlier findings based on pedometers used to detect overall MVPA in school PE (Flohr et al., 2006). In contrast, girls were involved in more out-of-school MVPA than boys. Tammelin et al. (2013) found that Finnish secondary school–aged boys achieved more out-of-school PA than girls did when using self-reports. Furthermore, Trost et al. (2002) highlighted that for overall MVPA, the magnitudes of the gender differences were small when measured objectively with accelerometers. Despite the gender differences, the major cause of concern arising from the current findings is that girls engaged in up to 26.2% and boys 33.6% of their weekly MVPA during only two 45-min PE classes. When out-of-school activity was transformed for total minutes using manufacturer's procedure (5 MET) as the lower limit for MVPA, each student on average engaged in daily out-of-school MVPA for only 44 min. This finding is a concern, especially among the most inactive students. We found no other studies that have used a similar procedure to that used in the current study to measure MVPA. Therefore, the current results show important preliminary insights into the secondary school students' MVPA participation across PE classes and during out-of-school activities.

A key strength of this study was the use of objective means to measure MVPA. Through the use of accelerometers, unique information was found about the associations of expectancy beliefs and subjective task values to secondary school students' actual MVPA across PE classes. The scores were of activity levels in conventional PE lessons without confounding factors, which may have had a significant effect on scores, for example, to exercise motivation. In contrast, the present study was cross-sectional and correlational, and therefore, the associations identified should not be interpreted as cause–effect relationships (Hagger & Chatzisarantis, 2009). Furthermore, the sample size was relatively small due to economic and practical implementation reasons. It was also not possible to measure seasonal variations in activity patterns. There were also limitations in objective measures that should be acknowledged such as that a single technique may not detect the full range of dimensions of PA such as frequency, type, intensity, or duration (Dale, Welk, & Mattews, 2002).

Recent evidence from the World Health Organization (2011) reinforces the strong link between physical activities and continuing positive benefits to health, well-being, and weight control among

elementary school children and secondary school students. School PE classes are a unique venue for students to receive moderate to vigorous activity levels to achieve the health-related benefits (McKenzie et al., 2004). The more efficient use of PE time for PA could be a modest contribution to meeting activity guidelines and helping control the epidemic of overweight and obesity in youth (McKenzie et al., 2004). In the current findings, a particular challenge to educational professionals in secondary schools is to ensure that all students receive opportunities to do well and believe they are competent on the activities (Wigfield & Eccles, 2000; Wigfield, Eccles, Schiefele, Roeser, & Davis-Kean, 2006; Wigfield, Tonks, & Klauda, 2009). The outcomes of this study support the notion that the more value and importance that students attach to PE classes, the more MVPA they would engage in across 45-min classes and in out-of-school activity. Young people clearly cannot be provided with all the PA they need in secondary PE classes alone (McKenzie et al., 2004). In schools, a higher priority needs to be placed on encouraging young people to engage in daily PA and to providing guidance that makes it easy to find activities in which girls and boys have opportunities to be successful and feel competent.

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