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Perceived physical competence towards physical activity, and motivation and enjoyment in physical education as longitudinal predictors of adolescents' self-reported physical activity

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Abstract

Objectives: The aim of the study was to investigate if adolescents' perceived physical competence towards physical activity (PA), and autonomous motivation and enjoyment in physical education (PE) during early adolescence can predict amount and intensity of self-reported physical activity six years later.

Design: This study utilized a 6-year longitudinal data set collected within Finnish school settings. Students responded to questionnaires measuring their perceived physical competence towards physical activity, and autonomous motivation and enjoyment in PE during their first year at middle school (Grade 7), and their PA engagement during their last year in high school (Grade 12).

Methods: A sample of 333 students (200 girls, 133 boys; M age = 12.41, years, SD = .27) participated in the study. Perceived physical competence in physical activity was assessed by the sport competence dimension of the Physical Self-Perception Profile, autonomous motivation in PE was assessed by the Sport Motivation Scale and enjoyment in PE by the Sport Enjoyment Scale. Students' self-reported metabolic equivalent (MET) and PA intensity (light [LPA], moderate [MPA], vigorous [VPA]) was calculated from the short form of International Physical Activity Questionnaire.

Results: Perceived physical competence towards physical activity significantly predicted total METs (β = .28), MPA (β = .18) and VPA (β = .29) six years later. Autonomous motivation and enjoyment in PE at Grade 7, however, were not significant predictors of later PA.

Conclusions: The results of this study support the proposition that self-perception of an individual's abilities arising from interactions with the environment related to PA during early puberty has an influential effect on later PA behaviour.

Keywords: physical activity; motivation, enjoyment; competence; physical education

1. Introduction

The health benefits from the optimal amount and intensity of physical activity (PA) are considerable for school-aged children.¹ The current recommendations on health-enhancing PA focus on sufficient amount and intensity of PA, suggesting that children and adolescents should participate in at least 60 minutes per day of moderate or vigorous intensity PA (MPA or VPA). Habitual PA is commonly conceptualized as “*any bodily movement that results in energy expenditure*”.² This study operationalized and measured PA based on amount as indicated in metabolic equivalents (METs), and different intensity levels, that are light (LPA), moderate (MPA), and vigorous (VPA) intensities.

Adolescence is an important period when individuals may adopt a physically active lifestyle.³ Adolescents engage in PA experiences within different contexts such as school physical education, sport clubs, and being active with their families and peers. All these encounters shape their own self-competency perceptions within activities related to PA. In fact, systematic reviews have surmised that positive perceived physical competence towards PA is one of the most important correlates of PA during adolescence.^{4,5} A widely applied description of perceived competence is an assessment of personal ability that generalizes across domains, such as physical activity, scholarship, or work.⁶ In this study, perceived competence is explained as the perception of individual's abilities cumulating from interactions within different PA environments.⁷

School physical education (PE) is an important context promoting positive PA experiences among youth because it involves access to a large adolescent cohort.⁸ Evidence-based PE programs in early adolescence can provide students with positive motivational and affective experiences, which will promote their later engagement in PA.⁹ In an effort to investigate this association, this study also examined the role of autonomous motivation and enjoyment in PE in predicting later PA engagement.

The underpinning description of PE motivation in the current research utilized the Goal Content Theory (GCT) which is a microtheory of the self-determination theory¹⁰. According to the GCT, motivation exists on a continuum ranging from amotivation through

four types of extrinsic motivation (external regulation, introjected regulation, identified regulation and integrated regulation) to intrinsic motivation.¹⁰ Descriptions of each regulation are given in Table 1. The essential premise of the GCT is that the autonomy of an individual increases towards the intrinsic motivation end of the continuum.¹⁰ Autonomy is detailed as a quality of human functioning that involves the experience of choice and perception of internal perceived locus of causality.¹⁰ Research has indicated that autonomous motivation (intrinsic motivation, integrated and identified regulation) in PE is positively linked with adolescents' PA engagement in PE¹¹, PA participation during leisure-time^{12,13}, and in total PA participation¹⁴. In contrast, results reported in these studies revealed that non-autonomous motivation (amotivation, external and introjected regulation) was negatively or not significantly associated with these consequences.

Enjoyment can also be seen as an important positive motive for PA behavior.^{15,16} Enjoyment is defined as a multidimensional construct incorporating excitement, affect, and perceptions of competence. More specifically, it is defined as a positive affect related to feelings of pleasure, liking and fun.¹⁷ Previous studies have demonstrated that enjoyment in PE is linked with PA engagement in PE^{15,16} and leisure time^{5,16} within adolescent populations.

Overall, this study is framed on previous empirical findings that indicated perceived competence in PA, and PE motivation and enjoyment are significant antecedents of PA participation during adolescence^{4,11,15}. It should be acknowledged that for this study perceived competence reflects the general perception of ability in PA (i.e., PA contexts including PE) whereas motivation and enjoyment specifically denote cognitive and affective perceptions within the PE context. In this study, competence was measured at the domain specific level (general competence towards PA) because domain specific competence is affected by many specific contextual competencies. For example, domain specific competence in PA in general is affected by specific competencies in areas such as sport and PE. Harter⁷ and Fox⁶ suggested that a person's self-worth is built upon hierarchical structure of competencies in which specific competencies cumulate on more general competence. For

example, different specific competencies in different PA areas contribute to general PA competence. Enjoyment and autonomous motivation, instead, are constructs which are considered to be context specific and it is recommended these are also measured and analyzed in relation to the context representative of the research focus.¹⁸

Although students' perceived physical competence regarding PA and motivational and affective experiences in PE are acknowledged as important correlates of PA^{4,11,15}, a notable shortcoming of previous research is that there are no studies investigating if these variables predict self-reported PA over the adolescent stage of human development. Previous longitudinal research in the area has previously assessed similar PA related characteristics in middle school students, across intervals of two to three years.^{13,14} As an extension to these investigations, the aim of the current study was to examine if perceived physical competence towards PA, and autonomous motivation and enjoyment in PE measured at Grade 7 would predict a) total amount of PA (total METs) and b) the amount of different PA intensities (LPA, MPA, VPA) of self-reported PA six years later. Sex was controlled in the analyses as confounding variable. We hypothesize that perceived physical competence towards PA and autonomous motivation and enjoyment in PE would positively predict higher amount and intensity (MPA, VPA) type of PA engagement.^{4,12,16}

2. Methods

This study utilized the 6-year longitudinal data collected from schools located in central Finland. Whereas the previously published study of Jaakkola et al.¹⁹ reported the findings related to young adolescents' fundamental movement skills and physical fitness and their later PA, the findings presented here are focusing on the examination of relationships between students' motivational experiences in PE during their first year of middle school and their PA engagement six years later. A convenience sample of 333 Grade seven students (200 girls, 133 boys; *M* age = 12.41, years, *SD* = .27) was selected based on their middle school affiliation. A cohort of 224 participants (67%; 149 girls, 75 boys) of the initial group responded to questionnaires 6 years later. The Ethics Committee (Institutional Review

Board) of the local university along with students and their parents/guardians approved the study.

The short form of the Finnish version of the International Physical Activity Questionnaire (IPAQ)²⁰ was utilized to examine students' PA. IPAQ asked participants to report frequency and duration of their LPA, MPA, and VPA performed in bouts greater than 10 minutes in length. Weekly minutes of LPA, MPA, and VPA were calculated separately by multiplying the number of days/week by the duration on an average day. Reported minutes per week in each category were weighted by a MET resulting in a PA estimate independent of body weight, expressed in MET-minutes/week and computed by multiplying METs by minutes/week. The short form of IPAQ has shown acceptable reliability and validity within large scale research that investigated the measurement properties of the instrument in 12 countries.²¹

Perceived physical competence towards PA was measured by the Finnish version of the sport competence dimension of the Physical Self-Perception Profile.²² Each of the five items were rated on a five-point Osgood scale from (1) "I'm among the best when it comes to athletic ability" to (5) "I'm not among the best when it comes to athletic ability". The individual item stem of the scale was "What am I like?" Results presented by Gråsten²³ indicated that the Finnish version of the sport competence dimension of the Physical Self-Perception Profile has satisfactory reliability (Cronbach's alpha coefficient .90) and construct validity (confirmatory factor analysis; TLI = .97, CFI = .98, RMSEA = .074).

Autonomous motivation in PE was assessed by the Finnish version of the Sport Motivation Scale (SMS).²⁴ The SMS included five dimensions; intrinsic motivation, identified regulation, introjected regulation, external regulation and amotivation. All subscales are comprised of four items rated on a five-point Likert scale (1 = does not correspond at all... 5 = correspond exactly). The SMS had individual item stem of "Why I'm currently participating in physical education?". The Relative Autonomy Index (RAI) as suggested by Vallerand¹⁸ was calculated using subscale scores of each dimension. The RAI was calculated by weighting the scores of the each dimension as to derive a single score. Intrinsic motivation

(+2) and identified regulation (+1) positively. Introjected regulation and external regulation were summed up and weighed negatively (-1). Amotivation was also weighed negatively (-2). The score of the RAI indicates the amount of autonomy in an activity. It can be either positive or negative; positive value reflects autonomous motivation whereas negative score represents non-autonomous motivation. Previous research has shown that the Finnish version of the SMS demonstrated adequate construct validity and reliability. More specifically, the study by Gråsten²³ conducted in Finnish PE, supported reliability (Cronbach's alpha coefficients of all motivational regulations above .70) and construct validity (confirmatory factor analysis; TLI = .89, CFI = .90, RMSEA = .031) of the Finnish version of the SMS.

Enjoyment in PE was analyzed by the Finnish version of the Sport Enjoyment Scale.²⁵ The scale included four items (e.g., "I have fun in PE lessons") and it has the individual item stem of "In my PE class". All items necessitated reporting on a five-point Likert scale (1 = does not correspond at all... 5 = corresponds exactly). Gråsten²³ reported that the Finnish version of the Sport Enjoyment Scale has satisfactory reliability (Cronbach's alpha coefficient .93) and construct validity (confirmatory factor analysis; TLI = 1.00, CFI = 1.00, RMSEA = .031).

IBM SPSS Statistics for Windows, Version 22 (2013 SPSS Inc.; IBM Corp.; Armonk, NY) were used for the analyses and only the data from students ($n = 224$) who responded to both phases of the data collection were included. First, normality of the data and descriptive statistics were assessed. Second, hierarchical multiple regression analysis were conducted to test the predictive strength of perceived physical competence towards PA and autonomous motivation and enjoyment in PE on MET, LPA, MPA, and VPA. Sex was set as a covariate in the analyses (females were coded as 0 and males 1) and it was entered as the first step in the hierarchical regression analysis. Perceived physical competence towards PA and autonomous motivation and enjoyment in PE were set on the second step in the analysis.

3. Results

Details of the mean values, standard deviations, and correlations associated with the study variables are represented in Table 2. Normality analyses showed that skewness and kurtosis values ranged within the limits of -2 to +2. Pearson's product moment correlation coefficients showed that perceived physical competence towards PA correlated positively and significantly with METs, MPA, and VPA. The relationship was strongest for higher intensity PA. Enjoyment in PE was positively and significantly related to perceived physical competence towards PA, autonomous motivation in PE, MET, and VPA, and autonomous motivation in PE was related to perceived physical competence towards PA.

The results of hierarchical multiple regression analyses specifying the predictive strength of perceived physical competence, enjoyment, and autonomous motivation on PA (after accounting for participants' sex) are presented in Table 3. Sex had a statistically significant explanatory strength only for VPA, indicating that boys were engaged more in VPA. Secondly, PE enjoyment and autonomous motivation did not have a statistically significant role in predicting any of the PA variables. Subsequently, perceived physical competence towards PA predicted MET ($\beta = .28$), MPA ($\beta = .18$) and VPA ($\beta = .29$). Finally, the practical significance of the results was assessed by examining R^2 s. The predictor variables did not have a significant effect on LPA but had a weak effect on students' MET ($R^2 = .12$), MPA ($R^2 = .06$), and VPA ($R^2 = .15$) six years later.

4. Discussion

The aim of the study was to investigate the extent to which perceived physical competence towards PA, and autonomous motivation and enjoyment in PE during early adolescence predict PA engagement six years later. The current results extend knowledge drawn from previous cross-sectional research^{4,5,12,13} that investigated the relationships between students' motivational experiences and later PA participation through adolescence. The results of the current study revealed that perceived physical competence towards PA measured at Grade 7 was the only statistically significant predictor of later PA engagement. More specifically, it predicted total METs, MPA and VPA. Although significant associations were found, it should be noted that the beta coefficient values were small. Additionally,

results of this study indicated that autonomous motivation and enjoyment in PE measured at Grade 7 did not predict PA six years later.

The main finding of the study was that perceived physical competence towards PA predicted amount and intensity of PA, supporting the correlational findings of previous research.^{4,5} This finding is in line with Harter's⁷ competence motivation theory that proposed individuals with high perceived competence persist longer in physical activities in comparison to individuals who do not perceive themselves as competent. This current result, therefore, support Harter's⁷ theoretical assumption showing that positive perception of students' abilities arising from interactions with the PA environment in early puberty have long lasting effects on PA behaviour later in adolescence. Interestingly, perceived physical competence towards PA predicted VPA and MPA but not LPA. Adolescents with higher perceptions of physical competence towards PA are likely to be engaged in recreational and organized sports and more likely exposed to additional opportunities for vigorous activity. These findings are also consistent with the limited level of physical competency necessitated by LPA, as it mainly consists of walking or other low intensity physical activities. Considering the greater health benefits of high and moderate intensity PA compared to light intensity PA²⁶, continuing efforts to increase adolescents' perceived of competence towards PA are warranted.

The results of this study also demonstrated that autonomous motivation and enjoyment in PE did not significantly predicted students' later PA engagement, whereas previous cross-sectional studies have shown PE motivation^{12,13} and enjoyment^{15,16} to be related to engagement in PA. It may be that motivational and enjoyable events experienced in PE do not have a longitudinal effect on their PA due to changes in PE contexts. Although the relationship pattern, whereby motivational experiences may transfer across different contexts (e.g., between PE and exercise contexts)²⁴ has been supported in previous research, the findings observed in the current results infer that PE experiences at the high school level over shadow the experiences at early middle school level. Additionally, it should be recognized that PE is only one possibility for adolescents to engage in experiences

related to PA. Other organized PA contexts, peers and families have roles in facilitating adolescents' opportunities to participate in PA and extend their knowledge base regarding PA.

Although physical competence towards PA in early adolescence was a significant predictor of students' METs, MPA, and VPA, the sizes or effects were weak (adjusted R^2 ranging from 6% to 15%). Previous research, however, supports the influential role of physical performance variables such as motor skills and physical fitness in PA engagement. Barnett et al.²⁷ study demonstrated that 10-year-old students with proficient manipulative skills had a 10–20% higher likelihood to be engaged in VPA when they reached 16 years of age. Similar positive associations have been found between physical fitness measured in childhood and PA data collected in adolescence.²⁸ Barnett et al.²⁷ have also shown that perceived sport competence mediates the relationship between motor skill proficiency and PA explaining 18% of the change in the variance of PA. Taking into account these previous findings^{27,28}, and the complex web of determinants that lead to PA participation, the magnitudes of effect sizes are understandable.

This study extends the findings of previous school related PA research through the examination of the longitudinal contribution of students' perceived PA competence and the psychological characteristics associated with participation in PE, to their self-reported PA engagement, intensity of PA, and total amount of PA during the last phase of high school. Although this study revealed that autonomous motivation and enjoyment in PE were not significant predictors of later PA engagement, previous researchers have demonstrated relationships between these variables^{4,5,12,13}, and support should remain for further investigation of the important role of autonomous motivation and enjoyment in PE on general PA. Future studies are also needed to further clarify the role of perceived physical competence as a possible mediator between PE motivation and enjoyment and PA.

A limitation of this study is the use of the self-report format to analyse PA engagement. Scholars have advocated the use of objective methods, such as accelerometers and pedometers to strengthen the legitimacy and generalizability of the

claims made in relation to adolescent PA behaviour.²⁹ It should be acknowledged, however, that the validity and reliability of the IPAC has been shown to be acceptable when measuring children's and adolescents' PA.²⁰

5. Conclusion

Our findings highlight the role of perceived PA competence of children in the early stages of puberty as a predictor of their daily METs, MPA, and VPA as older adolescents. Specifically, young adolescents' perceptions of physical competence, arising from interactions within the social environment related to PA contexts, have a long lasting influence on high intensity PA. Results of this study also demonstrated that although PE programs aim to promote a physically active lifestyle through motivating and enjoyable experiences, these occurrences are not necessarily effective in promoting PA in young adulthood.

6. Practical implications

- PE teachers should continue to concentrate on providing positive experiences of engaging in physical activity to enhance students' physical competence.
- PE classes that focus on adolescents' perceived physical competence should be implemented based principles such as emphasising self-development, effort, co-operation and learning outcomes.
- Special attention should be directed towards facilitating adolescent girls VPA.

Conflict of interest

No competing agreements, professional relationships and financial interests existed where a third party may benefit from the presented results.

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353 Table 1. Definitions of motivational regulations.

Motivational regulation	Definition
Intrinsic motivation	Pleasure and satisfaction resulting from participation regulate behavior.
Integrated regulation	Behavioral regulation when a person has integrated and accepted behavior with other aspects of the self (coherence with other aspects of person's goals and values). For example, perception that physically activity lifestyle is part of me.
Identified regulation	Behavioral regulation when the individual has accepted values and goals of behavior. For example, perception that I want to be physically active.
Introjected regulation	Esteem-based pressures regulate behavior. For example, avoidance of shame or worry about self- and other approval.
External regulation	External factors regulate behavior. For example, constraints, fear of punishments or rewards.
Amotivation	A state in which people lack motivation and intention to behave.

354 Table 2

355 Descriptive summary (n =224).

Variable list	1	2	3	4	5	6	7	8
<i>Criterion Variables</i>								
1 METs	-							
2 LPA	.59***	-						
3 MPA	.63***	.21*	-					
4 VPA	.82***	.15*	.35**	-				
5 Enjoyment	.18*	.07	.11	.19*	-			
6 RAI	.13	.04	.02	.15*	.61***	-		
7 Perceived competence	.29***	.10	.14*	.31***	.53***	.22*	-	
8 Sex	.16*	.04	-.04	.23***	.15*	.13	.18*	-
<i>M</i>	4810.42	448.61	214.63	309.87	3.88	-.39	3.33	1.32
<i>SD</i>	2665.93	290.12	127.17	164.31	1.02	2.72	.87	.47
Range	148.50 - 15646	0 – 1980	0 - 900	0 - 1085	1 - 5	-8.82 - 5.67	1 - 5	1 - 2
Skewness	1.04	1.82	1.57	.71	-.67	-.27	-.31	na
Kurtosis	1.71	1.23	1.54	1.93	-.26	-.19	-.26	na

356 Note. *p < .05; ***p < .001. MET = metabolic equivalent; LPA = light intensity physical activity; MPA = moderate intensity physical activity; VPA = vigorous intensity physical activity, and RAI = relative autonomy index.

357

358 Table 3

359 Results of the hierarchical linear regression analyses.

Variable	MET					LPA				
	<i>B</i>	<i>B SE</i>	β	t-test	p-value	<i>B</i>	<i>B SE</i>	β	t-test	p-value
Step 1										
Sex	261.70	303.31	.06	.87	.388	-9.48	47.06	-.01	.18	.858
Adjusted R^2	.01		1			.00				
Step 2										
Enjoyment	46.86	172.18	.09	.27	.786	6.97	28.17	.02	.24	.805
RAI	-63.216	296.75	-.09	.93	.356	-4.31	10.59	-.04	.42	.686
Perceived Competence	645.07	200.19	.28	3.22	.001**	38.23	31.04	.11	1.17	.220
Total Adjusted R^2	.12					.01				
Variable	MPA					VPA				
	<i>B</i>	<i>B SE</i>	β	t-test	p-value	<i>B</i>	<i>B SE</i>	β	t-test	p-value
Step 1										
Sex	-32.82	20.08	-.12	-1.57	.119	52.60	24.72	.15	2.13	.035*
Adjusted R^2	.02					.03				
Step 2										
Enjoyment	13.27	13.25	.10	1.10	.271	12.38	14.79	.08	.41	.680
RAI	-5.86	20.08	-.12	1.30	.197	-3.20	5.56	-.05	.46	.647
Perceived Competence	27.12	13.25	.18	2.05	.042*	51.43	16.29	.29	3.16	.002**
Total Adjusted R^2	.06					.15				

360 Note. *p < .05, **p < .01. MET = metabolic equivalent; LPA = light intensity physical activity; MPA = moderate intensity physical activity; and VPA = vigorous intensity physical activity.