

MOTIVATION AND PHYSICAL SELF-CONCEPT AS INDICATORS OF STUDENTS' PHYSICAL ACTIVITY IN PHYSICAL EDUCATION CLASSES

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Abstract. *The main purpose of this article is to determine which motivational orientation (MO) of primary school students (n=240) and their physical self-concept (PSC) contribute to the intensity of students' physical activity and volume of physical activity in a physical education (PE) class. They were estimated using the pedometer and heart rate sensor. MO is measured using a modified Self-Regulation Questionnaire. PSC was measured using subscales of the Self-perception Profile for Children. In boys, PSC and motivation present better predictors of physical activity in PE elementary school classes ($p < 0.01$), than in girls. Intrinsic Motivation and Athletic Competence have a high predictive function. Boys with a higher level of sport competence and intrinsic motivation are physically more active in a PE classes. PE classes could enhance MO and PSC by supporting basic different psychological aspect of children.*

Key words: *Behavior and Behavior Mechanisms, Self-Assessment, Exercise, Physical Education and Training*

INTRODUCTION

Physical activity (PA) presents the most important feature of physical education (PE) classes (Zapatero & Agustin, 2020). Effective PE teaching relies on student engagement (Wang, Tang, & Luo, 2017). Engagement in this context is primarily measured by intensity as well as volume of PA (Hussey, Bell, & Gormley, 2007). Research suggests that active students form health-enhancing habits, develop motor skills and competencies, improving

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positive experiences about exercise, build self-confidence, and interact with other students (Extremera, Gómez-López, Granero Gallegos, & Ortiz Camacho, 2015; Chen, Hammond-Bennett, & Hypnar, 2017). The long-term benefits of PA are dependent on frequency and intensity (Gao et al., 2017), which can deliberately be developed through school PE programs (Lahti, Rosengren, Nilsson, Karlsson, & Karlsson, 2018). Recommendations by Kim and Lochbaum (2017) suggest that children in a PE class should experience moderate-to-vigorous PA 50% of the lesson time, i.e., of the total duration of a PE class. Despite these recommendations, the level of students' PA in PE classes is consistently low in everyday teaching practice (Kremer, Reichert, & Hallal, 2012). For example, a study that utilized direct observation of PE classes in more than 1000 schools, found that students' PA in PE lesson time averaged 37% (Thomas, James, & Philip, 1992). In some classes the total duration of PA was as low as 8.6% of the total duration of a PE class, which is significantly less than the 50% recommended by educational and professional sport institution (Ridgers, Stratton, & Fairclough, 2006; Wadsworth, Rudisill, Hastie, Irwin, & Rodriguez-Hernandez, 2017).

Numerous factors have a correlation with PA levels of students in free time and in PE classes (Crocker, Eklund, & Kowalski, 2000; Ferrer-Caja & Weiss, 2000; Carroll & Loumidis, 2001; Harrison & Narayan, 2003; Pavlović, Marinković, Đorđić, & Pelemiš, 2017). Personal factors like physical self-concept and motivation have been indicated as factors that have been a manifestation of PA in PE classes in a school environment. The physical self-concept, especially a positive one, can determine the activity level but also the potential for positive development of motor skills and acquisition in PE classes (Guérin, Marsh, & Famose, 2004; Klomsten, Skaalvik, & Espnes, 2004; Marsh & Craven, 2006). Self-evaluation of physical competence in obese and less agile children also can be compromised in PE classes (Morgan, Okely, Cliff, Jones, & Baur, 2008; Morrison, Cairney, Eisenmann, Pfeiffer, & Gould, 2018). For this reason, these students prefer "less active" roles in a class, for example the goalkeeper position in football or handball. Perceived competence is key to students' engagement in PE, peculiarly for students who have less experience in sport activities (Leisterer & Jekauc, 2019). Students, who have previous positive experiences with feelings of physical competence, are inclined to consider PE more engaging and fun, and also want to involve themselves in active roles during the PE class to develop their sports skills i.e., they possess self-determined motivation-SDM (Viira & Koka, 2012; Harvey, Gil-Arias, Smith, & Smith 2017). Teachers and PE teachers should strive to increase motor skills and also the physical self-concept during lessons (Marsh & Craven, 2006). PE classes that purely aim to develop motor skills, without having an impact on student confidence, will have limited long-term benefits. Regarding the reciprocal effects model, physical self-concept (PSC) is a motivator for, and an effect of physical exercise and the student's sense of achievement (Marsh & Craven, 2006; Lazarević, Radisavljević, & Milanović, 2008).

Motivation for participation in PE classes represents an important element for the quality realization of teaching and the curriculum. For students, PE is their favourite class in school, but for some other students PE classes present a cause of stress and an important factor for non-attendance (Roberts & Treasure, 2012). Sources of motivation vary and include teachers (Reeve, Jang, Carrell, Jeon, & Barch, 2004; Ntoumanis, 2005) and peers (Hohepa, Scragg, Schofield, Kolt, & Schaaf, 2007; Slingerland, Haerens, Cardon, & Borghouts, 2013). An important premise of the Self-determination theory refers to differentiated approach to motivation. Namely, individuals differ in the level of motivation, orientation of that motivation and type of motivation (Ryan & Deci, 2000). Self-determination

theory (SDT) categorizes different motivation types according to level of autonomy, whereby individuals with who are most autonomous have the most positive outcomes. SDT is also a theory based on elements of human wellness and self-development (Ryan & Deci, 2008).

Figure 1 provides a simplified visual representation of a model suggested by Ryan and Deci (2008), with motivation and regulatory styles. SDT introduces the notion that behaviour is potentially more likely to continue if people are self-motivated. Motivation and regulatory styles (see figure 1) are described as being on a scale with amotivation and intrinsic motivation on the endpoints and different levels of Extrinsic motivation (External, Introjected, Identified, Integrated), Amotivation, and Intrinsic motivation.

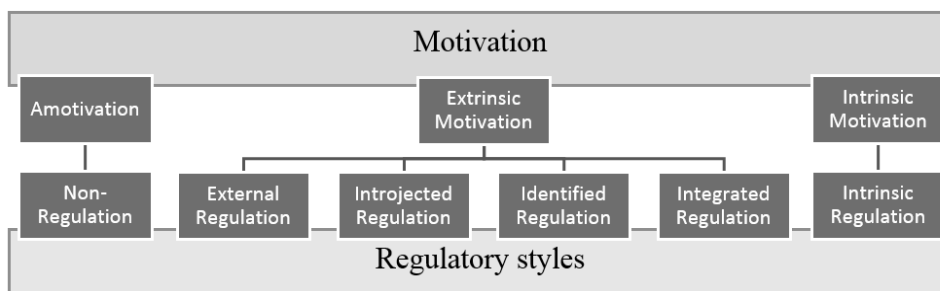


Fig. 1 Simplified structural of Self-Determination concept with motivation and regulatory styles

Individuals intrinsically motivated engage in a particular activity with elements of pleasure, challenge or satisfaction immanent in the activity itself. Intrinsic motivation is in essence a self-determined activity, as participation is voluntary, internally initiated and regulated (also known as “internal locus of causality”), supported by a pleasant experience of fun and entertainment (Ryan & Deci, 2002). As the individual gets more internally motivated, her/his behaviour gets self-determined to a larger extent, which is a basis of psychological wellness and health. Furthermore, young students’ interest in participation in PE classes decreases over time, which poses a challenge to PE teaching (Sliwa et al., 2017). For example, there is a notable decline in attendance in PE classes during adolescence, especially among female students (National Center for Health Statistics, US, 2001). Also, some students have been encouraged by PE classes, although others have stopped attending them (Brooks & Magnusson, 2007). Negative experiences, such as boredom, feeling incompetent and negative peer evaluation are the main reasons for reduced activity in PE classes.

The main purpose of this article is to determine which motivational orientation (MO) of primary school students and PSC contributes to the intensity of students' physical activity and volume of physical activity in a PE class.

METHODS

Participants

The study was conducted on 240 third and fourth grade students (age 10±1.5 years; male, N=130, female, N=110). Participants usually attended PE classes three times a week at school. The classes were delivered in line with the National PE curriculum

created by the Ministry of Education, Science and Technological Development of the Republic of Serbia for the 2017/18 school year. Parents and the school authorities were familiar with the aim of research and gave their written consent in compliance with the WMA Declaration of Helsinki.

The study was conducted during the spring of 2018. All of the respondents regularly attended school and PE classes. During the PE classes, the station work method was used, with six groups of students and six stations, carrying out various motor tasks according to the plan, program and curriculum. After class, students completed questionnaires in the classrooms.

Instruments

Physical self-concept was measured using the corresponding subscales of the *Self-Perception Profile for Children-SPPC* (Harter, 1982). The SPPC has proven metric properties and is widely used in similar research (Crocker et al., 2000; Jambunathan & Counselman, 2004; Mantzicopoulos, 2006; Murcia, González-Cutre, & Garzón, 2009; Kolovelonis, Mousouraki, Goudas, & Michalopoulou, 2013), and therefore considered as an applicable measure for this study. The SPPC assesses the domain (specific) perception (self) in children; and global self-worth (six subscales in total). We used the Athletic Competence subscale and Physical Appearance subscale, each of them containing six items. Athletic competence items refer to a child's competence to do well at sports, while Physical Appearance items deal with a child's perception about his/her appearance. The items are presented in the structured alternative format, i.e., as two-part sentences, with one part referring to competent behaviour of students, and the other aspects referring to incompetent behaviour (e.g., "*Some kids do very well at all kinds of sports but other kids don't feel that they are very good when it comes to sports*"). The child first chooses which part describes him/her better, and then decides if that applies to him fully or just to some extent. In this way, each item is scored on a four-point scale (from 1 to 4, where 1 indicates the lowest self-perceived competence, and 4 indicates the highest level of competence). The mean value was calculated for the subscale.

Motivational orientations were measured by the modified Self-Regulation Questionnaire (Ryan & Connell, 1989), and used for this study in PE classes in the form presented by Goudas and associates (Goudas, Biddle, & Fox, 1994). The questionnaire has been widely used among the school-age population and can be regarded as a relevant questionnaire for this research (Fernandes & Vasconcelos-Raposo, 2005; Barkoukis, Ntoumanis, & Nikitaras, 2007; Murcia et al., 2009). It has five measuring scales for different aspects of motivation in Theory of Self-Determination (Deci & Ryan, 1985) presented as: intrinsic motivation, external, introjected and identified regulation, and amotivation. Items belonging to different subscales alternate across the questionnaire and answers are given on a 5-point scale (ranging from 1 as strongly disagreement to 5 strongly agreement). A score on each subscale is calculated by averaging responses to the items that form that subscale.

Students' *PA* was evaluated with the Coach Gear pedometer (*Coach Gear*) as well as Hear rate monitor (*Suunto Memory Belt*). Previous research determined the intensity zones (Falgairette, Gavarry, Bernard, & Hebbelinck, 1996; Pate, Baranowski, Dowda, & Trost, 1996).

As a representative intensity indicator of the students' activity during a PE class, the total time spent by the student in the zone of intense, i.e., vigorous physical activity (VPA) was used for further analyses.

Statistical analysis

For statistical analysis the Statistical Package for Social Studies SPSS (v21.0., SPSS Inc., Chicago, IL) was used. Prior to the multiple regression analyses, normality of the distribution of variables was examined by the Kolmogorov-Smirnov (KS) test. Separate multiple regression analyses were applied to resolve the relation between predictor variables (physical self-concept and motivational orientations) and two criterion variables (volume and intensity of PA during PE class). Both regressions were applied for the subsamples of different genders with the significance level set to $p \leq 0.01$.

RESULTS

This study examines the hypothesis that self-concept and motivation contribute as prediction factors to the students' volume as well as intensity of PA in a PE class. The hypothesis was upheld. The descriptive statistics results are summarized separately for the subsamples in Table 1. Based on the coefficients of variation, both subsamples are homogenous when it comes to intrinsic motivation (CV% 5.38-6.52%). The greatest individual deviations are found in amotivation in girls, and external regulation in boys.

Table 1 Result of descriptive parameters and normality of distribution for all variables in terms of gender

	Group	AS	S	Min	Max	%CV	K-S
Sport competence	Boys	2.87	.59	1.50	4	20.48	.09
	Girls	2.80	.58	1.33	4	20.64	.09
Physical appearance	Boys	3.46	.59	1.83	4	16.96	.09
	Girls	3.42	.58	1.16	4	17.04	.09
Amotivation	Boys	3.03	.69	11	3	14.36	.08
	Girls	3.59	1.67	12	3	28.61	.03
External regulation	Boys	3.21	2.95	18	6	22.15	.06
	Girls	3.47	3.11	17	6	21.49	.08
Introjected regulation	Boys	4.01	4.59	8	20	10.54	.09
	Girls	3.81	4.28	8	20	10.11	1.00
Identified regulation	Boys	3.52	1.59	7	20	9.97	.15
	Girls	3.52	1.71	8	20	7.79	.19
Intrinsic motivation	Boys	4.25	.45	7	15	6.52	.22
	Girls	4.01	.69	6	15	5.38	.25
Physical activity volume (number of steps)*	Boys	2321.10	436.29	609	3346	18.79	.09
	Girls	2224.15	345.43	1352	3008	15.53	.08
VPA (min)*	Boys	22.05	4.67	8.11	34.51	21.17	.08

Legend: AS-Arithmetic Mean; S-Standard Deviation; Min-Minimum Value; Max-Maximum Value; %CV-Coefficient of Variation; K-S-Kolmogorov-Smirnov Test; VPA-Vigorous Intensity Physical Activity.

Table 2 summarizes the results of the regression analyses and different power of prediction power of models. Physical Self Concept (PSC) and motivational orientations (MT); volume as well as intensity of participants' PA in PE classes were tested. Boys' physical self-concept and motivation had better predictor values of PA in a PE class, than the girls'.

Table 2 Regression analysis of predictors of students' PA during PE classes

	PA Volume		PA Intensity	
	Boys R ²	Girls R ²	Boys R ²	Girls R ²
Physical Self-Concept	9.4% (8.0%)	1.4% (1.2%)	9.7% (8.2%)	2.1% (2%)
Sport competence (β)	.25*	.09	.26*	.11
Physical appearance (β)	.16	.07	.20	.14
Motivation	6% (5.5%)	2% (1.9%)	6.5% (6.9%)	3.9% (3.8%)
Amotivation (β)	.14	.15	.13	.15
External regulation (β)	.22	.22	.25	.18
Introjected regulation (β)	.19	.08	.08	.17
Identified regulation (β)	.09	.17	.10	.21
Intrinsic motivation (β)	.29*	.19	.28	.22

Legend: β -Value of the Standardized β (Beta) Coefficient, and Corrected β (Beta) Coefficient;

*Relations with Statistical Significance.

As shown in Table 2, the predictor system of the physical self-concept in boys explains 9.4% (PA volume in class) and 9.7% (PA intensity). The presented systems have a most powerful predictive values compared to motivation that explains 6% of the PA volume variance and 6.5% of the PA intensity of boys in a PE class. The most significant PA predictors in boys are sport competence and intrinsic motivation. Boys with a higher level of sport competence and intrinsic motivation are physically more active in a PE class. Unlike boys, physical self-concept and motivation in girls are not significant predictors of PA in a PE class.

DISCUSSION

This study analysed the predictive power of students' physical self-concept and motivational orientations in explaining PA volume and intensity in PE classes. PA was assessed by the number of steps made (volume) and heart rate (intensity). Previous studies of PA and PE have consistently indicated a correlation between types of SDM (intrinsic motivation, identified regulation) and positive consequences: greater activity in the structured and free-will (unsupervised) part of PE classes (Lonsdale, Sabiston, Raedeke, Ha, & Sum, 2009), commitment (Ntoumanis, 2001), positive emotions (Standage, Duda, & Ntoumanis, 2005), interest (Goudas et al., 1994), perseverance and concentration (Ntoumanis, 2005), self-esteem (Standage & Gillison, 2007), preferences to do challenging tasks (Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008; Standage et al., 2005), a healthy lifestyle (Standage & Gillison, 2007), and an increase in PA during leisure period (Hagger & Orbell, 2003; Standage et al., 2005).

Children who identify themselves as highly competent in sports are less inclined to be externally motivated or amotivated in a PE class (Ntoumanis, 2001). Those who perceive that they lack physical competence usually consider that PE is meaningless (amotivation), and they only participate in a PE class because it is mandatory or because of fear of punishment (external regulation). Intrinsic motivation in PE classes and positive experiences of students are predictors for choosing the students' leisure-time PA (Ntoumanis, 2005). On the other hand, controlling motivation (external and introductory regulation) and amotivation are in correlation with negative outcomes, such as boredom, dissatisfaction, lack of commitment, and lack of motive to be physical active in a situation like leisure time (Ntoumanis, 2001; Standage & Gillison, 2007; Mouratidis et al., 2008).

However, our results show that physical self-concept and motivational orientations provide great insight into students' PA in a PE class only in boys. This finding suggest that

girls' PA might be influenced by some factors which were not monitored in this research (attitudes about physical exercise, economic and social status, etc.). In the *PSC* predictor system, self-perception of athletic proficiency was identified as a significant contributor for volume and intensity of PA in boys during a PE class. Boys with more favourable perceptions of their athletic competence made more steps and spent more time in vigorous PA during a PE class. The *Physical appearance* variable, was not a great and significant predictor of the criterion variables. However, this might be related to the age of the respondents who may not have a sufficiently established criteria for self-assessment. Also, self-evaluation of sport competence can have a long-term (cumulative or delayed) effect on the level of PA among children and youth populations (Jaakkola, Yli-Piipari, Anthony, & Jarmo, 2015).

Similar to the predictor system of physical self-concept, motivational variables explain a small part of the variance of the criterion variables (around 6%) and this is, again, the case only in boys. Within this predictor system, the most significant single predictor is students' intrinsic motivation. Boys who are more internally motivated are more active in a PE class. In general, boys are significantly more intrinsically motivated to participate in PE classes compared to girls, and this is a relevant fact for PE teachers. Motivation largely contributes to the achievement of students in the classroom, which includes PE lessons as well (Jackson-Kersey & Spray, 2013). In a previous study (Chen, Wang, Wang, & Zhou, 2020), intrinsic motivation presented one of motivations in the line with the level of PA of the students. Kalajas-Tilga, Koka, Hein, Tilga, and Raudsepp (2020) reported that SDM positively correlates with objectively measured MVPA during leisure-time and PE. Aelterman and associates (2012) and Claver, Martínez-Aranda, Conejero, & Gil-Arias (2020) suggested that autonomous motivation is positively correlated with students' MVPA in PE. In order to stimulate intrinsic motivation in students, which means participating in activity for its own sake, it is necessary that PE classes be adjusted to the students' interests, planned and implemented in an innovative way, dynamic, diverse, and adapted to the students' abilities.

The results that indicate that physical self-concept and motivation to participate in a PE class are not significant predictors of PA in female students in a PE class, are not congruent with some previous research (Jaakkola & Digelidis, 2007; Mouratidis et al., 2008; Lonsdale et al., 2009). Although the results did not fully confirm the significance of physical self-concept and motivational orientations of female students, for them to be active in a PE class, it is important to support basic psychological needs of female students (needs for competence, autonomy, relatedness) and forms of SDM through teaching. A recent qualitative study demonstrated and confirmed that students enjoy PE classes when they feel themselves competent; when a controlled and positive, non-threatening physical and social environment is established (Lewis, 2014). Providing choice positively affects students' physical and sedentary activity during a PE class, resulting in increased student autonomy, which is in accordance with SDT (Kalajas-Tilga et al., 2020). The station format used in our study provided some control and choice to students which might mediate the correlation between motivation and PA during a PE class. When interpreting the results, one has to bear in mind developmental trajectories of controlled and autonomous motivations for PA as reported by Dishman et al. (Dishman, McIver, Dowda, Saunders, & Pate, 2015), so longitudinal data might be needed.

CONCLUSION

From the research that has been conducted, the self-determined behaviour of students in elementary school is in correlation with numerous positive consequences (psychological, behavioural, cognitive) in PE classes and can contribute to the greater engagement of

students in PE classes. The findings suggest that it is necessary to provide high quality PE in schools, aimed at the formation of the students' active lifestyle, the development of motor skills and competencies, formation of a positive attitude, values and self-confidence, and acquiring knowledge necessary for participation in regular PA. Summing up the results, it can be concluded that PE classes could enhance MO and PSC by supporting basic different psychological aspects of children.

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FIZIČKI SAMOKONCEPT I MOTIVACIJA KAO POKAZATELJI FIZIČKE AKTIVNOSTI UČENIKA TOKOM ČASOVA FIZIČKOG VASPITANJA

Cilj ovog istraživanja je da se utvrdi koji tip motivacijske orijentacije učenika osnovnih škola (N=240) i fizičkog self-koncepta doprinose intezitetu i obimu fizičke aktivnosti učenika na času fizičkog vaspitanja. Intezitet i obim fizičke aktivnosti su merene pomoću pedometra i pulsmetra. Kako bi se procenio fizički samokoncept primenjivana je skala kao merni instrument prilagođen za decu a za procenjivanje motivacionih orijentacija samih učenika na času primenjivan je prilagođeni model upitnika vazan za samoregulaciju. Rezultati su pokazali da su motivacione orijentacije i fizički self-koncept bolji prediktori fizičke aktivnosti kod dečaka ($p < 0.01$). Unutrašnja (intrinzična) motivacija i sportska kompetencija imaju visoku prediktivnu vrednost. Dečaci sa višim nivoom sportske kompetencije i suštinske motivacije su fizički aktivniji na časovima fizičkog vaspitanja. Na časovima fizičkog vaspitanja se mogu poboljšati motivacijska orijentacija i fizički self-koncept podržavanjem osnovnih različitih psiholoških aspekata dece.

Ključne reči: vežbanje, fizičko vaspitanje, ponašanje i mehanizmi ponašanja