

Research article

The relationship between teaching styles and motivation to teach among physical education teachers

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Abstract

This study aims to investigate how teachers' motivation to teach is related to different teaching styles. A hundred and seventy six physical education teachers from five European countries participated in the study. Teachers' motivation was measured using an instrument developed by Roth et al. (2007) based on the Self-Determination Theory (Deci and Ryan, 1985) which was tested for suitability for use with physical education teachers. The use of teaching styles was assessed through teachers' self-reported data according to the description of teaching styles presented by Curtner-Smith et al. (2001). The revised confirmatory factor model of the teachers' motivation instrument, with three factors, met the criteria for satisfactory fit indices. The results showed that teachers were more intrinsically motivated to teach than externally. Cross-cultural comparison indicated that the Spanish teachers were more intrinsically motivated whilst Lithuanian teachers were more externally motivated than teachers from the other four countries. Teachers from all five countries reported a more frequent use of reproductive styles than productive styles. The results of the present study confirmed the hypotheses that teachers' autonomous motivation is related to the student-centered or productive teaching styles whilst non-autonomously motivated teachers adopt more teacher-centered or reproductive teaching styles. Intrinsic and introjected motivation was significantly higher among teachers who more frequently employed productive teaching styles than teachers who used them less frequently. Intrinsically motivated teachers using more productive teaching styles can contribute more to the promotion physical activity among students.

Key words: Physical Activity, motivation, self-determination, teaching styles.

Introduction

There has been growing concern in recent years about the low level of young people's participation in physical activity (PA). Significantly, there has also been a substantial increase in studies investigating students' motivation to participate in Physical Education (PE) and other types of PA, we may speculate therefore about possible links between levels of motivation and participation. This study highlights the key role of PE teachers in seeking to redress the apparent disaffection of young people with engaging in physical activities, which may lead to lifelong benefits. If people are to enjoy the benefits of physical health and wellbeing from school days throughout their adult life, it is imperative that schools establish a strong

foundation in PA by impressing upon young people the importance of life-long PA. In preparing the students for lifelong PA (Corbin, 2002) asserts that teachers must educate and motivate students by encouraging them to engage in PA during their leisure-time. Several studies have shown a strong correlation between students' motivation for PA in a school PE context being transferred into a leisure-time PA context (Hagger et al., 2003; 2005; 2007; 2009). The autonomy-supportive behavior of teachers has an important role in this transfer of skills and motivation. Reeve and Jang (2006) noted that autonomous support is the interpersonal behavior one person engenders to engage and nurture another person's inner motivational resources. The characteristics of autonomy-supportive and controlling teaching behaviors have been identified by several authors (Assor et al., 2005; Reeve and Jang, 2006; Reeve et al., 2004). For instance, taking into account student preferences, offering encouragement, and allowing them to work independently are characteristics of autonomy-supportive behavior (Reeve and Jang, 2006). Assor et al. (2005) have described the autonomy-supportive teacher as responsive (e.g. acknowledges the students' feelings and perspectives), supportive (e.g. praises the quality of performance) and explicative (e.g. provides a rationale for tasks). They provide choices and opportunities for initiative taking and independent work, and they encourage discussion. In contrast, controlling teachers use commands to direct students towards correct solutions and motivate through pressure (e.g. threats, criticism and deadlines). Taking into account that ideally the teaching-learning process is based on a mutual relationship between teacher and student, investigating teachers' motivation to enhance, reinforce and consolidate students' motivation to learn, may contribute to our knowledge of how to promote PA among young adolescents. Whereas the relationships between different teaching styles and pupils' motivation have been widely reported (Mosston and Ashworth, 2002; Papaioannou and Goudas, 1999; Papaioannou and Kouli, 1999), to our knowledge the relationships between teacher motivation and teaching styles have not been analyzed to date.

Teaching styles: Mosston's Spectrum of teaching styles (Mosston and Ashworth, 2002) established a framework of possible options in the relationship between teacher and learner and was based on the central importance of decision-making. The authors grouped these into pre-impact, impact and post-impact categories and pro-

posed that these govern all teaching. The pre-impact set is concerned with decisions made at the preparation stage before teaching, and involves subject matter, learning objectives, organization and presentation. The impact set includes decisions relating to performance and execution while the post-impact set includes evaluation of performance and feedback from learner to teacher. The Spectrum (Mosston and Ashworth, 2002) incorporates ten teaching styles based on the degree to which the teacher or the student assumes responsibility for what occurs in a lesson. This describes a continuum, where at one extreme is the direct, teacher-led approach (reproductive style) and at the other lies a much more open-ended and student-centered style (productive style) where the teacher acts only as facilitator. Student-centered teaching styles can also be considered as autonomy-supportive behavior and teacher-centered teaching styles as controlling behavior.

Morgan et al. (2005) investigated the influence of teacher behavior in relation to teaching styles on motivational climate and showed that the pupil-centered reciprocal and guided discovery styles resulted in more mastery and less performance focused teaching behaviors than the traditional command or practice styles. Recently, Sicilia-Camacho and Brown (2008) described the revised concept of the Spectrum of teaching styles. Accordingly, the conceptual basis of Spectrum has moved away from setting one teaching style against another, or from a versus to a non-versus style. In short, there is no single superior teaching style or teaching-learning approach (Mosston and Ashworth, 2002). All teaching styles, when used appropriately, contribute to human development in different ways. Consequently, the use and significance of each individual style will be determined by the teaching objectives. A plethora of studies has dealt with the effects of different teaching styles on widely recognized objectives of PE like motor skill acquisition, affective state, cognition and social skills (see for reviews Chatoupis, 2009; Chatoupis and Vagenas, 2011). Chatoupis (2009) highlighted the need to investigate the outcomes and contributions of different teaching styles, for a given period of time, to teach content rather than to compare one style against another. According to the same author, in a typical school lesson most teachers use several teaching styles to meet different objectives. To date, only a few studies have examined how frequently PE teachers use different teaching styles. For example, using teachers' self-reported data, Cothran et al., (2005), and Kulinna and Cothran (2005) showed that teachers use more reproductive than productive teaching styles. Command and practice styles were the most preferred reproductive styles, whereas guided discovery, convergent discovery and divergent production styles were the most employed productive teaching styles.

Cothran et al. (2005) also investigated cross-cultural differences in the use of the different teaching styles in seven countries (Korea, Australia, France, England, Portugal, Canada and U.S.) and found differences ranging from minor to substantial across those countries. All countries were significantly different in the use of the command style. Korean teachers differed in all styles from the other six countries. The teachers from England, Australia, and Canada reported the more frequent use of

productive styles than Korean and Portuguese teachers. Given these cross-cultural findings, the present study also aims to compare the self-reported data relating specifically to the use of teaching styles in Eastern European countries with Western and Southern European countries with different cultural backgrounds.

Self-determination theory: Self-determination theory (SDT) is a theory of human motivation in the 'organismic' or humanistic tradition (Deci and Ryan, 1985, 2000). Central to the theory is the distinction between autonomous and controlling forms of motivation. This distinction is usually viewed on a continuum reflecting the perceived origin or cause of an individual's motivated behavior in a given context (Ryan and Connell, 1989). Autonomous motivation reflects acting to satisfy personally relevant goals. The prototypical form of autonomous motivation is *intrinsic motivation*, which lies at one end of the continuum and represents behavioral engagement for no external contingency or reinforcement. *Identified regulation* is a motivational construct that lies adjacent to intrinsic motivation on the continuum and represents motivation to engage in a behavior because it services intrinsic or personally relevant goals. Conversely, *external regulation* reflects the prototypical form of controlling motivation. Located opposite intrinsic motivation on the continuum, it reflects engaging in behavior induced by external reinforcement such as obtaining a reward or avoiding punishment. Adjacent to external regulation lies *introjected regulation* which reflects behavioral engagement induced by perceived internal pressures like avoiding shame or guilt, or gaining contingent self-worth or pride. The location of the motivational types on the continuum is similar to the location of teaching styles on the continuum reflecting the levels of autonomous behavior and decision-making process.

Within the SDT framework Pelletier et al. (2002) showed that teacher self-determination mediated the influence of teachers' perception of constraints from school authorities and student self-determination toward school on teacher provision of autonomy support. Roth et al. (2007) pointed out that the effect of teachers' motivation on student motivation could be the direct result of the teaching styles of the teacher. When the teacher uses productive styles, then the role of learner independence in the decision making process is highlighted. In this case we might consider the use of the productive styles by the teacher as students' autonomy-supportive teaching.

Autonomous motivation for teaching promotes autonomy-supportive teaching in various ways (Roth et al., 2007). Firstly the authors suggest that autonomously motivated teachers possess expert knowledge in their specialist field and of the methods they use; secondly, the teachers fully understand and are sympathetic to autonomous motivation and its benefits and thirdly, these teachers exhibit greater resilience to the pressures of achievement, are less concerned with image and favor supportive teaching methodology.

Based on these considerations and aforementioned similarities in respect of the continuum we assume the existence of relations between teaching styles and teachers' motivation to teach.

Measures of teacher motivation: Unfortunately, there has been little research on teacher motivation to teach (Butler, 2007; Retelsdorf et al., 2010; Roth et al., 2007; Taylor et al., 2008). Butler (2007) and Retelsdorf et al. (2010) investigated teacher motivation with an instrument based on Achievement Goal Theory (AGT), whereas studies by Roth et al. (2007) and Taylor et al. (2008) used instruments based on SDT. The instrument developed by Roth et al. (2007) was specially designed to study the autonomous motivation for teaching. However, to date, according to our knowledge, only Taylor et al. (2008) have investigated PE teachers' motivation toward work. They used the Work Motivation Inventory (WMI; Blais et al., 1993) to determine the antecedents for teachers' motivation. The result of their study showed that perceptions of students' self-determination motivation and teachers' autonomous orientation positively predicted teachers' psychological need satisfaction, which in turn influenced teachers' motivation. The WMI reflects the general motives of teachers towards work and showed an appropriate factorial validity. In addition, the goodness of fit indices of the developed AGT based instrument indicated the existence of factor validity (Butler, 2007; Retelsdorf et al., 2010).

Despite the rigor of the analysis presented by Roth et al. (2007) in their development of the special instrument to measure teacher's motivation to teach, no other study has adopted a confirmatory analysis (CFA) to examine its construct validity. Since CFA enables a priori specification and tests its adequacy against observation, it is considered an appropriate method for the evaluation of the construct validity in psychometric inventories (Hu and Bentler, 1999). CFA also tests the discriminant validity of construct through the inter-correlation among the factors (Bagozzi and Kimmel, 1995). We therefore attempt to provide further support for the validity of the instrument developed by Roth et al. (2007) adopting the CFA approach in the present study.

This study aims to test whether the motivational dimensions developed by Roth et al. (2007) on the basis of SDT will be appropriate for PE teachers from different European countries and how these are related with teachers' perception of their teaching styles. In terms of specific hypotheses, it is expected that the teachers' autonomous motivation is linked to the student-centered styles, and that non-autonomously motivated teachers adopt more teacher-centered styles.

Methods

Participants

A hundred and seventy six PE teachers with qualification certificate from high institution (85 females and 84 males, 7 did not specify their gender) from five European countries volunteered to participate in the study. All participants (Estonian: N = 51, M age = 46.4, SD = 10.6, teaching experience = 20.0, SD = 11.9; Hungarian: N = 22, M age = 44.4, SD = 8.1, teaching experience = 19.4, SD = 9.9; Latvian: N = 22, M age = 31.8, SD = 17.9, teaching experience = 17.1, SD = 11.3; Lithuanian: N = 23, M age = 43.9, SD = 11.1, teaching experience = 19.6, SD = 10.9; Spanish: N = 58, M age = 39.2, SD = 9.2, teaching ex-

perience = 13.5, SD = 9.9) were recruited from government-run basic and high schools. They all taught students from 13 to 18 years of age.

Measures

Autonomous motivation for teaching: In order to measure teachers' motivation to teach, the instrument developed by Roth et al. (2007) was used. This instrument based on SDT measures four types of motivation, each varying in the degree of autonomy on a continuum ranging from high to low autonomy. The types of motivation are: *intrinsic motivation* (e.g., "When I invest effort in my work as a teacher, I do so because I enjoy creating connections with people."), the prototypical form of autonomous motivation representing behavioral engagement for no external contingency or reinforcement; *identified regulation* (e.g., "When I invest effort in my work as a teacher, I do so because it is important for me to feel that I help people."), a highly autonomous form of motivation representing motivation to engage in a behavior because it services goals that are intrinsic and salient to the self; *introjected regulation* (e.g., "When I invest effort in my work as a teacher, I do so because otherwise I would feel guilty."), a less autonomous form of motivation reflecting behavioral engagement due to perceived internal pressures like avoiding feelings of shame or guilt or gaining inherent self-worth or pride; and *external regulation* (e.g., "When I invest effort in my work as a teacher, I do so because I do not want the principal to follow my work too closely."), the prototypical form of extrinsic motivation, and therefore the least autonomous, reflecting engaging in behaviors due to external reinforcement such as obtaining a reward or avoiding punishment. Four items assessed each motivation type and responses were made on five-point Likert type scales ranging from 1 (*not true at all*) to 5 (*very true*).

Teaching styles: The use of teaching styles was estimated by teachers' self-reported data according to the description of teaching styles presented by Curtner-Smith et al. (2001). The common direction for each teaching style was, "Read the description of each teaching style and estimate how often you use this teaching style." The response options for each style range from 1 (*never*) to 5 (*very often*). An example of the description for one of the reproductive teaching styles (teacher-centered) is: "Pupils practice teacher-prescribed task. The teacher demonstrates or describes a task and the pupils practice the task at their own pace. The teacher provides pupils with performance feedback. Example: The teacher demonstrates cartwheel and then gives feedback to pupils as they practice". An example for the productive style (student-centered) is: "The teacher asks a question or sets a physical problem to which there are many possible answers or solutions. The pupils then set about finding and evaluating alternative answers and solutions. Examples: (1) The teacher provides the class with an assortment of suitable equipment and asks groups of pupils to design their own striking/fielding game. (2) During a track and field lesson, the teacher asks pupils to come up with different strategies that they might try if engaged in a 1500-metre race".

The teachers completed the paper version of the questionnaires on the local meetings organized for PE

teachers or during visits to schools. The completion of the questionnaires lasted approximately 20 minutes.

Translation procedures

Language-specific questionnaires for use with the Estonian, Hungarian, Latvian, Lithuanian, and Spanish samples were developed using standardized back-translation procedures by independent bilingual translators (Brislin, 1986). Two criteria were applied for recruiting the bilingual translators in each participating country. First, all the native speakers that we enrolled had translation experience and they owned an academic degree in sports sciences. They were asked to translate the items from English to their native language. Second, the bilingual translators that back-translated the items to English were native English speakers and had teaching experience in school or in high education. The back-translation procedure was repeated iteratively until the original and back-translated English versions of the questionnaires were virtually identical.

Data analysis

Data was analyzed in two parts. In the first instance, CFA was run to test the construct validity of the teachers' motivation instrument that was used. The adequacy of the measurement CFA was estimated using the LISREL 8.8 statistical software and a maximum likelihood estimation method was employed (Jöreskog et al., 2001). Goodness-of-fit of the CFA model was evaluated using multiple recommended indices of good-fit: the Comparative Fit Index (CFI), the Non-Normed Fit Index (NNFI), the Standardized Root Mean Squared Residuals (SRMSR) and Root Mean Square Error of Approximation (RMSEA). According to Hu and Bentler (1999) a good model fit is indicated when CFI and NNFI values reach at least 0.95 or higher and values for SRMSR and RMSEA are 0.08 and 0.06 or less, respectively. Also descriptive statistics and internal reliability coefficients were calculated for all scales.

In the second part of the data analysis, the use of teaching styles was estimated. The Pearson correlation analysis between the teachers' motivation and teaching styles was used. Also, partial correlation controlling the effects of age and teaching experiences on these relationships was performed. The Tamhane post-hoc test of ANOVA was used to investigate effects of the different countries. In order to compare the differences in the frequency of using teaching styles related with motivation, teachers were divided twice into two groups. In the first case on the basis of high and low frequency of the use of reproductive styles and in the second case on the basis of high and low frequency of the use of productive styles. The frequency of the use of the command and practice styles was summarized and the mean calculated. Also, the frequency of the use of the guided discovery and divergent styles was

summarized and the mean calculated. The Independent Sample Test was used to test the differences.

Results

Prior to testing the main hypotheses, to support the fit of the measures used in this study, CFA analysis was conducted. Goodness-of-fit of the initial CFA model indicated that there is scope for improvement (Satorra-Bentler (χ^2 (98) = 193.28; $p < 0.001$; CFI = 0.97; NNFI = 0.96; SRMSR = 0.09; RMSEA = 0.075; 90% CI of RMSEA = 0.059 - 0.090). The composite reliability coefficients for each latent factor (for extrinsic, 0.74; for introjected, 0.60; for identified, 0.64 and for intrinsic, 0.77) exceeded the recommended minimum of 0.60 (Bagozzi and Kimmel, 1995). However, deleting one item from the external scale and from the identified scale resulted in an increase of these values up to 0.82 and 0.71, respectively.

Inspection of the factor loadings and modification indices for instrument and reliability of scales suggested the removal of some of the items. Specifically, one item from the external scale "When I invest effort in my work as a teacher, I do so in order to prevent disruptions and discipline problems during the lessons." was removed due to low factor loading (0.37) and another item from identified scale "When I devote time to individual talks with students, I do so because I can learn from them what happens in the classroom." was eliminated due to low reliability coefficient. Also an inspection of the modification indices, which indicated a crossloading of the items from intrinsic and identified scales, suggested a three factors model instead of four.

Several previous studies (Hagger et al., 2002; Ryan and Connell, 1989) have also found that these two constructs are highly correlated and difficult to differentiate in factor analysis. Therefore these two dimensions (identified and intrinsic) were combined to present self-determined motivation. The revised CFA model (Figure 1) approached the criteria for satisfactory fit indices proposed by Hu and Bentler (1999): Satorra-Bentler (χ^2 (72) = 100.75; $p < 0.014$; CFI = 0.99; NNFI = 0.99; SRMSR = 0.08; RMSEA = 0.048; 90% CI of RMSEA = 0.022 to 0.069). In addition, factor correlations of the revised CFA model were significantly different from unity according to the criteria specified by Bagozzi and Kimmel (1995), supporting the discriminant validity of the constructs.

Further, a composite score was calculated for each scale by adding the scores of the respective items and dividing the sum by the number of items. Overall means, standard deviations and also the according values for each national group are presented in Table 1.

The results reveal that teachers are more intrinsically motivated to teach than externally. The teachers from the five countries that comprised our sample differed

Table 1. Means (\pm standard deviations) of teachers' motivation.

Types of motivation	All teachers (n = 176)	Estonia (n = 51)	Spain (n = 58)	Hungary (n = 22)	Latvia (n = 22)	Lithuania (n = 23)
External	2.26 (.94)	2.15 (.69) ^{d,e}	2.51 (.97) ^{c,d}	1.80 (.95) ^{b,e}	1.58 (.49) ^{a,b,e}	2.94 (1.04) ^{a,c,d}
Introjected	3.51 (.85)	2.93 (.64) ^{b,e}	4.25 (.57) ^{a,c,d,e}	3.31 (.65) ^b	3.09 (.71) ^b	3.52 (.76) ^{a,b}
Intrinsic	4.48 (.51)	4.09 (.48) ^{b,e}	4.90 (.24) ^{a,c,d,e}	4.37 (.32) ^b	4.32 (.48) ^b	4.49 (.45) ^{a,b}

Note. Significantly different ($p < 0.05$) from the respective value: ^a- in Estonia, ^b- in Spain, ^c- in Hungary, ^d- in Latvia, ^e- in Lithuania.

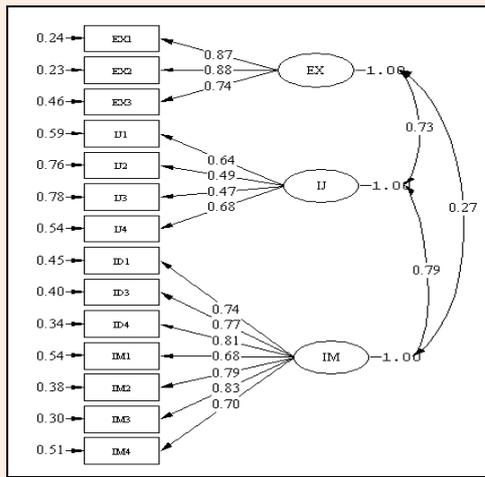


Figure 1. Confirmatory factor model for the revised teacher motivation. Note. EX = External Motivation; IJ = Introjected Motivation; IM = Intrinsic Motivation. Covariance between ID1 and IM1 was 0.27, and between IM3 and IM4 0.15.

significantly in intrinsic motivation ($F(4,171) = 30.72, p < 0.000, \eta^2 = 0.418$), introjected motivation ($F(4,171) = 31.94, p < 0.000, \eta^2 = 0.428$), and in external motivation ($F(4,171) = 9.65, p < 0.000, \eta^2 = 0.186$). The Levene test for homogeneity showed unequal variances in intrinsic and external but not in introjected types of motivation. Therefore, Tamhane’s post-hoc test was used to determine the differences in motivation types among teachers from different countries. The results showed that the Spanish teachers were more intrinsically motivated than teachers from the other four countries. The same happened in relation to introjected types of motivation. Lithuanian teachers were more externally motivated than other teachers.

Means and standard deviations for teachers’ use of teaching styles by country are presented in Table 2. Teachers from the observed countries differed in the use of all reproductive styles. Significant differences were found for command style ($F(4,171) = 5.32, p < 0.000, \eta^2 = 0.111$), practice style ($F(4,171) = 7.31, p < 0.000, \eta^2 = 0.146$), self-check style ($F(4,171) = 5.86, p < 0.000, \eta^2 = 0.121$), inclusion style ($F(4,171) = 2.64, p < 0.036, \eta^2 = 0.058$), and reciprocal style ($F(4,171) = 2.26, p < 0.065, \eta^2 = 0.050$). No differences were found for guided discovery and divergent styles ($F(4,171) = 1.38, p > 0.244, \eta^2 = 0.031$ and ($F(4,171) = 0.45, p > 0.773, \eta^2 = 0.010$), respectively. However for productive styles, a significant differ-

ence was recorded in the use of learners’ designed program style ($F(4,171) = 5.39, p < 0.000, \eta^2 = 0.112$).

The Levene test for homogeneity also showed unequal variances of all teaching styles except for reciprocal style. The multiple comparisons with the Tamhane post-hoc test were used to determine which teachers’ self-reported teaching style differs from the others by country. The results are presented in Table 2.

The differences between teachers’ groups with high and low frequency use of reproductive and productive styles in relation to external, introjected and intrinsic motivation is presented in Table 3. The frequency of use of the command and practice styles was summarized and the mean calculated. The low frequency group was composed of teachers scoring 3.5 and lower ($n = 31$) and the high frequency group by teachers scoring 3.5 and higher ($n = 50$). Intrinsic and introjected motivation was significantly higher among teachers who did not frequently use reproductive teaching styles than teachers who employed them more often.

The frequency of the use of the guided discovery and divergent styles was also summarized and again the mean was calculated. The low frequency group was constituted of teachers scoring 2 and lower ($n = 38$), and the high frequency group by teachers scoring 3.5 and higher ($n = 50$). Intrinsic and introjected motivation was significantly higher among teachers who used more frequently productive teaching styles than teachers who used them infrequently.

Pearson correlation coefficients showed that intrinsic motivation was positively related with productive teaching styles ($r = 0.15, p < 0.05$) and negatively with reproductive styles ($r = -0.26, p < 0.001$). Also, negative correlation was found between introjected motivation and reproductive styles ($r = -0.27, p < 0.001$). However, controlling the effects of age and teaching experiences resulted only in decrease of significant level of correlation between intrinsic motivation and productive teaching styles ($r = 0.13, p < 0.1$). Partial correlation controlling the effects of age and teaching experiences was $r = -0.22, p < 0.01$ between intrinsic motivation and reproductive teaching styles and between introjected motivation and reproductive styles $r = -0.24, p < 0.01$.

Discussion

The purpose of this research was to gain better knowledge of the teachers’ motivation to teach and how their motivation is related with the use of the different teaching styles.

Table 2. Means (± standard deviations) for teachers’ use of teaching styles by country.

Styles	All countries (N= 176)	Estonia (n=51)	Spain (n=58)	Hungary (n=22)	Latvia (n=22)	Lithuania (n=23)
Command	3.67 (.98)	4.02 (.73) ^b	3.22 (1.08) ^a	3.77 (1.19)	3.59 (.66)	3.82 (.89)
Practice	4.06 (.82)	4.27 (.63) ^b	3.66 (1.00) ^{a,c}	4.55 (.60) ^b	4.05 (.65)	4.13 (.55)
Reciprocal	3.04 (.90)	3.25 (.68) ^b	2.79 (.93) ^a	3.00 (1.02)	3.27 (.98)	3.00 (.95)
Self-check	2.70 (.93)	3.00 (.69) ^b	2.31 (.98) ^{a,d,e}	2.45 (1.10)	3.00 (.69) ^b	2.96 (.93) ^b
Inclusion	3.19 (1.02)	3.47 (.81) ^b	2.89 (1.13) ^a	3.04 (1.29)	3.27 (.77)	3.39 (.89)
Guided Discovery	2.88 (.93)	3.05 (.79)	2.84 (1.07)	2.55 (1.01)	3.00 (.76)	2.78 (.85)
Divergent	2.80 (.92)	2.84 (.70)	2.74 (1.05)	2.68 (.95)	2.77 (.87)	3.00 (1.04)
Learner’s designed program	2.80 (.94)	2.84 (.81)	2.57 (.98) ^e	2.36 (1.18) ^{d,e}	3.18 (.80) ^c	3.35 (.65) ^{b,c}

Note. Significantly different ($p < 0.05$) from the respective value: ^a- in Estonia, ^b- in Spain, ^c- in Hungary, ^d- in Latvia, ^e- in Lithuania.

Table 3. The differences between teachers' groups with high and low frequency using reproductive (command and practice) and productive (guided discovery and divergent) teaching styles. Data are means (\pm SD).

Types of motivation	Group 1 (n = 31)	Group 2 (n = 50)	t	p	Group 3 (n = 38)	Group 4 (n = 30)	t	p
External	2.29 (1.01)	2.16 (.92)	.58	.06	2.21 (.86)	2.43 (1.00)	-1.12	.27
Introjected	4.01 (.61)	3.27 (.85)	4.6	.00	3.68 (.91)	3.75 (.73)	-.43	.67
Intrinsic	4.79 (.35)	4.34 (.51)	4.7	.00	4.45 (.60)	4.67 (.44)	1.99	.06

Group 1 – the teachers with low frequency in use of reproductive styles

Group 2 – the teachers with high frequency in use of reproductive styles

Group 3 – the teachers with low frequency in use of productive styles

Group 4 – the teachers with high frequency in use of productive styles

At first, we tested whether the motivational dimensions developed by Roth et al. (2007) on the base of SDT would be appropriate for use with PE teachers.

The crossloading of the items from intrinsic and identified scale in the motivation instrument suggested the three factor model rather than the four. The revised CFA model with three factors met the criteria for satisfactory fit indices. A high correlation between identified and intrinsic types of motivation was found which is consistent with several previous findings (Ferrer-Caja and Weiss, 2000; Pelletier et al., 2007). Unexpectedly high and positive correlations were found between introjected and self-determined motivation. This is in contrast to the simplex structure of self-regulations described by Deci and Ryan (1991). Specifically, the correlations between adjacent regulations (e.g., external regulation and introjected) are assumed to be more positively correlated than the more distant regulations (e.g., identified and intrinsic motivation). However, Standage et al. (2003) investigating the motivational responses from secondary school students found that external regulation subscales displayed positive relationships with motivational regulations characterized by high levels of self-determination.

Focusing on the differences in motivation, results indicated that Spanish PE teachers were more intrinsically motivated than PE teachers from the other countries in the sample, the same as in relation to introjected type of motivation. One reason may be that PE teachers' status in Spain is higher in comparison with others countries. Lithuanian PE teachers were more externally motivated than other teachers.

Overall, teachers from all five countries reported a more frequent use of reproductive styles than productive styles. This results support the previous findings reported by Cothran et al. (2005), and Kulinna and Cothran (2005). Also the large diversity in frequencies of the use of teaching styles by teachers from different countries in this study is consistent with results presented by Cothran et al. (2005). The results of the present study confirmed the hypotheses that teachers' autonomous motivation is linked to the student-centered or reproductive teaching styles and that teachers not motivated autonomously adopt more teacher-centered or productive teaching styles. Intrinsic and introjected motivation was significantly higher among teachers who more frequently used productive teaching styles than teachers who used them infrequently.

Recognizing a new concept of the Spectrum of teaching styles in which no styles are considered to be better than others, the use of each style depends of the teaching objectives in PE, which undoubtedly include

motivating students to be physically active even after their school graduation. The use of productive styles seems to be more important than reproductive styles, which are more appropriate for motor skill acquisition. Intrinsically motivated teachers tend to use more productive styles, and therefore can contribute more to the promotion of lifelong PA among students. However, PA is possible when using only some motor skills.

Limitations and future research

This study is not without its limitations and these should be acknowledged. The sample size for each country was not large. Although in data analysis the unequal variances of observed variables were considered, the overall generalization is warranted. The sample size also prevents the possibility to analyze the differences between female and male teachers. Although the three-factor model was confirmed in this study, there is need for further modification of the instrument in order to assess other types of motivation in PE teachers. For future research, the more complex approach involving the students' responses to teachers' motivation, students' motivation and their perceived teaching styles allows us to enhance our knowledge about the process of motivation for teaching.

Conclusion

In general, the present study is the first to provide evidence that autonomous motivation for teaching is associated with the use of teaching styles. More specifically, productive styles were more strongly related to intrinsic motivation and reproductive teaching styles with more external types of motivation. PE teachers have to recognize that for enhancement PA among students the advantage should to give to the productive styles.

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Key points

- PE teachers were more intrinsically motivated to teach than externally.
- Spanish PE teachers were more intrinsically motivated, whereas Lithuanian PE teachers were more externally motivated.
- Teachers from all five countries reported a more frequent use of reproductive styles than productive styles.
- Teachers' autonomous motivation is related to student-centered teaching styles and not autonomously motivated teachers adopt more teacher-centered teaching styles.
- Intrinsic and introjected motivations were significantly higher among PE teachers using frequently productive teaching styles

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