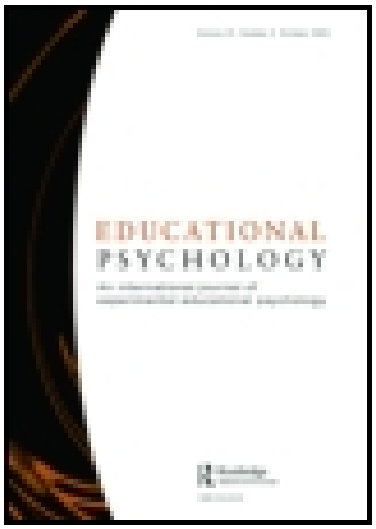

Educational Psychology: An International Journal of Experimental Educational Psychology

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/cedp20

Experimental longitudinal test of the influence of autonomy-supportive teaching on motivation for participation in elementary school physical education

Elisavet T. Leptokaridou[a], Symeon P. Vlachopoulos[a] & Athanasios G. Papaioannou[b]

[a] Department of Physical Education and Sport Science at Serres, Aristotle University of Thessaloniki, Serres, Greece

[b] Department of Physical Education and Sport Science, University of Thessaly, Trikala, Greece

Published online: 20 Aug 2014.

To cite this article: Elisavet T. Leptokaridou, Symeon P. Vlachopoulos & Athanasios G. Papaioannou (2014): Experimental longitudinal test of the influence of autonomy-supportive teaching on motivation for participation in elementary school physical education, Educational Psychology: An International Journal of Experimental Educational Psychology, DOI: 10.1080/01443410.2014.950195

To link to this article: http://dx.doi.org/10.1080/01443410.2014.950195

Educational Psychology, 2014
http://dx.doi.org/10.1080/01443410.2014.950195

Experimental longitudinal test of the influence of autonomy-supportive teaching on motivation for participation in elementary school physical education

Elisavet T. Leptokaridou[a], Symeon P. Vlachopoulos[a]* and Athanasios G. Papaioannou[b]

[a]*Department of Physical Education and Sport Science at Serres, Aristotle University of Thessaloniki, Serres, Greece;* [b]*Department of Physical Education and Sport Science, University of Thessaly, Trikala, Greece*

(*Received 21 February 2014; final version received 10 July 2014*)

The present study examined the efficacy of autonomy-supportive teaching during elementary school physical education (PE) in influencing pupils' enjoyment, fear of failure, boredom and effort. A sample of 54 pupils attending fifth and sixth grades comprised the control group (typical instruction; $n = 27$) and the experimental group (autonomy-supportive instruction; $n = 27$). Pupils' responses were provided four times during a school trimester on perceived autonomy-support provided by the PE teacher, fulfilment of psychological needs for autonomy, competence and relatedness, behavioural regulations for PE participation, enjoyment, fear of failure, boredom and effort. In the autonomy-support condition, levels of the positive motivational indexes remained relatively stable during the trimester. Motivational deterioration was evident for the control group, and especially during the middle and the end of the trimester. Autonomy-supportive teaching leads to enhanced levels of motivation compared to non-autonomy-supportive teaching that may lead to gradual decline of motivation for PE participation.

Keywords: self-determination theory; autonomy support; motivation; children; physical activity

Promoting physical activity (PA) among children and adolescents to counteract rising levels of obesity (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010) and promote an array of physiological and psychological health benefits (Janssen & LeBlanc, 2010) has been a valued goal of school-based physical education (PE) (Cale & Harris, 2013; Cawley, Frisvold, & Meyerhoefer, 2013). However, data reveals that a large percentage of children in the USA do not meet the national PA recommendations of 60 min or more of moderate to vigorous PA per day (Strong et al., 2005; Troiano et al., 2008) with similar trends appearing in the European region (World Health Organization Europe, 2009). To achieve an increase in children's PA, the identification of methods to promote optimal functioning of children in PE settings has been important. Self-determination theory (SDT: Ryan & Deci, 2002) has contributed in this direction holding that individuals function better when others who are important to them support their autonomy rather than control their behaviour. In

*Corresponding author. Email: vlachop@phed-sr.auth.gr

the context of SDT, autonomy is viewed as a basic psychological need that can be fulfilled by significant others in the individual's environment. In educational contexts, fulfilment of students' autonomy by teachers' autonomy supportive behaviours has been found to facilitate positive educational outcomes both in the classroom (Niemiec & Ryan, 2009; Reeve, Jang, Carrell, Jeon, & Barch, 2004; Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005) and in the PE settings (Chatzisarantis & Hagger, 2009; Gillison, Standage, & Skevington, 2013; Ntoumanis & Standage, 2009; Van den Berghe, Vansteenkiste, Cardon, Kirk, & Haerens, 2014).

Autonomy support means finding ways to enhance pupils' freedom to bring into line their inner motivational resources with the way they spend their time in the class (Reeve, 2006). According to Reeve, Nix, and Hamm (2003), autonomy support refers to what significant others say and do to enhance one's internal perceived locus of causality, perceived choice during the activity and volition. Autonomy-supportive teaching involves nurturing inner motivational resources, providing explanatory rationales, using non-controlling language, being patient to allow students the time needed to achieve self-paced learning, and acknowledging and accepting expressions of negative emotional reactions (Reeve, 2009). Vallerand (1997) in his Hierarchical Model of Intrinsic and Extrinsic Motivation (HMIEM) has outlined the mechanism via which autonomy-supportive behaviours may lead to desired motivational outcomes. In line with the HMIEM, autonomy supportive teacher behaviours are held to facilitate the fulfilment of the need for autonomy (one of the three basic psychological needs for autonomy, competence and relatedness) that when fulfilled lead to more self-determined motivation for enacting a behaviour. Fulfilment of the need for autonomy reflects feeling like the origin of one's behaviour. The need for competence is satisfied when individuals feel that they interact effectively with their environment and experience a sense of competence via producing desired outcomes and preventing undesired ones. Satisfaction of the need for relatedness reflects the experience of authentic relationships with significant others and a sense of belonging in a social milieu (Vallerand, 1997). Fulfilment of these needs is held to enhance self-determined forms of behavioural regulations and specifically identified regulation (i.e. enacting a behaviour because it is considered important by the individual), and intrinsic motivation (i.e. enacting a behaviour because it is fun and interesting); diminish controlling forms of behavioural regulation such as external regulation (i.e. partaking in the lesson to avoid punishment) and introjected regulation (i.e. participating to avoid feelings of guilt and shame); and diminish amotivation. Amotivation is a state of lacking the intention to participate in the activity or simply going through the motions (Ryan & Deci, 2002). Stronger self-determined forms of regulation and weaker controlling forms of regulation and amotivation are held to lead to more positive motivational consequences of a cognitive, affective and behavioural nature (Vallerand, 1997). Important motivational outcomes that have been linked to fulfilment of the basic psychological needs and levels of self-determined motivation in PE have been concentration, preference for challenging tasks, reduced boredom, effort, positive affect and greater likelihood to participate in optional PE classes the subsequent school year (Ntoumanis, 2001, 2005; Standage, Duda, & Ntoumanis, 2005).

A number of experimental studies have investigated the efficacy of autonomy-supportive teaching in influencing desired educational outcomes in PE settings. The studies in PE which have been mainly conducted with middle school and high school students have generally shown that autonomy-supportive teaching positively

influenced outcomes such as autonomous motivation, psychological need fulfilment for autonomy, competence and relatedness, intention for PA involvement, lesson engagement and skill development (Chatzisarantis & Hagger, 2009; Cheon & Reeve, 2013; Cheon, Reeve, & Moon, 2012; Tessier, Sarrazin, & Ntoumanis, 2010). Further, lack of provision of choice to the students, aligned with less positive perceptions of autonomy-support by the students was found to be related to less in-class PA (How, Whipp, Dimmock, & Jackson, 2013). Lonsdale et al. (2013) in a cluster randomised controlled trial with adolescents have demonstrated that among the four teaching strategy conditions of (a) explaining relevance, (b) providing choice, (c) complete free choice and (d) usual practice it was the free choice that increased accelerometer-assessed PA while providing choice and free choice interventions decreased sedentary behaviour. These interventions did not influence students' motivation. Further, in elementary PE, Erwin, Stellino, Beets, Beighle, and Johnson (2013) manipulated student groupings and type of choice. They examined the influence of four types of choice during four different PE lessons (i.e. team choice, team no choice, individual choice and individual no choice) and they found no situational motivation differences but they found differences by lesson in objectively assessed PA.

Although that experimental studies have been conducted to examine the efficacy of autonomy-supportive teaching in PE to influence important motivational outcomes with middle school and high school students, no such studies have systematically been conducted with elementary students and specifically fifth and sixth graders. Furthermore, while various studies have examined the links between SDT variables including students' perceptions of autonomy support with outcomes such as PE enjoyment, effort, fear of failure and boredom, no study to our knowledge has examined the experimental effects of autonomy support on these motivational outcomes in elementary students. Given the plea for more experimental studies on the effectiveness of autonomy support in influencing a broader set of educational outcomes in PE (Van den Berghe et al., 2014), the purpose of the present study was to examine the effects of autonomy supportive teaching (a) on the motivational outcomes of enjoyment, effort, fear of failure and boredom in a sample of fifth and sixth grade pupils; and (b) on key SDT mediating variables such as fulfilment of the needs for autonomy, competence and relatedness, and the behavioural regulations of amotivation, external regulation, introjected regulation, identified regulation and intrinsic motivation (see Figure 1 for the hypothesised path of the influence of the intervention on outcome variables). It was hypothesised that the pupils attending PE where autonomy support principles were used by the PE teacher would report higher

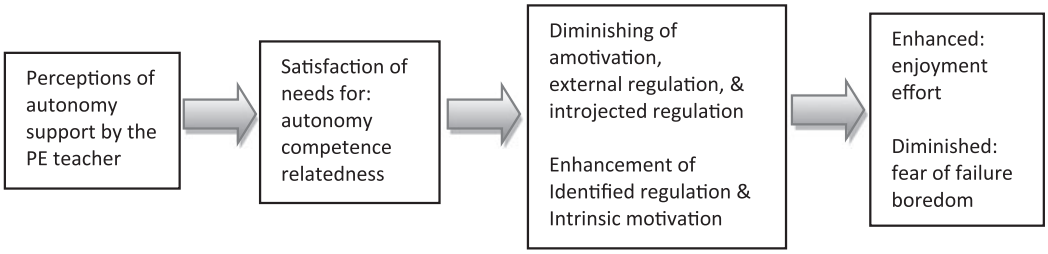

Figure 1. SDT mechanism explaining the effects of autonomy-supportive teaching on motivational consequences.

levels of enjoyment and effort and lower levels of fear of failure and boredom compared to the pupils attending PE using a typical (non-autonomy-supportive) instructional style over the course of a school trimester.

Method

Participants

The sample comprised 54 pupils attending four classes, two fifth-grade classes and two sixth-grade classes (29 boys; 53.7% and 25 girls; 46.3%) aged 11 and 12 year from an urban school in a town in northern Greece. The control group comprised pupils from a fifth-grade class and a sixth-grade class (n = 27; 14 boys and 13 girls) while the same was the case for the experimental group (n = 27; 15 boys and 12 girls). Class selection within each grade for inclusion in the respective group (control or experimental) was randomly implemented. Detailed demographic characteristics by group are presented in Table 1. The type of school in which the study was conducted is characterised as an 'experimental elementary school'. The pupils attending this particular type of school have been selected in a random fashion from the total number of pupils attending school in the wider geographical area. Such schools are granted a greater flexibility by the government to conduct educational research of a calibre greater than allowed in typical elementary schools. Hence, the pupils attending this type of school are considered largely representative of the wider pupil population of the greater geographical area.

Measures

Perceived autonomy support by the PE teacher

Contextual perceptions of autonomy support were measured via the six-item version of the Health Care Climate Questionnaire (Williams, Grow, Freedman, Ryan, & Deci, 1996) modified for PE. Following the stem 'In general in PE …' students responded to items such as 'I feel that my PE teacher provides me with choices and options with regard to the way I participate in PE' and 'My PE teacher encourages me to ask questions'. These autonomy support items were employed as they have been extensively used in motivational research in PE. An alpha value (Cronbach, 1951) of .83 has emerged with Greek fifth and sixth graders (Vlachopoulos, Katartzi, & Kontou, 2011). Pupils provided their responses on a seven-point Likert scale anchored by 1 (*Strongly disagree*) and 7 (*Strongly agree*).

Table 1. Demographic characteristics of the control and the experimental groups.

	Control group				Experimental group			
Variables	Min.	Max.	*M*	SD	Min.	Max.	*M*	SD
Height (cm)	130	168	150.55	9.75	133	170	154.37	1.74
Weight (kg)	28	66	46.11	10.18	30	62	44.2	9.50
Weekly frequency of sport participation	0	4	1.70	1.70	0	7	2.29	2.09
Training duration	0	120	53.3	52.18	0	180	66.6	58.44

Note: Control group (n = 27); experimental group (n = 27).

Psychological need fulfilment

The extent to which pupils' psychological needs for autonomy, competence and relatedness were fulfilled in PE in general was measured via the Basic Psychological Needs in Physical Education Scale (BPN-PE; Vlachopoulos et al., 2011). The instrument comprises 12 items tapping the three needs with four items per subscale. For need for autonomy, sample items include ('I feel that the way PE is taught is the way I would like it'), for competence (e.g. 'I feel that I perform correctly even if the tasks are considered difficult by most of the children') and for relatedness (e.g. 'I feel like a valued member of a group of close friends'). Pupils following the stem 'In general in PE …' provided their responses on a seven-point Likert scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). Initial evidence has emerged in favour of the internal reliability, factor structure via confirmatory factor analysis (CFA) (robust comparative fit index [robust CFI] = .972, robust root mean squared error of approximation [robust RMSEA] = .046), nomological validity and measurement invariance across Greek fifth and sixth graders, boys and girls, and pupils who participated or not in out-of-school sports activities (Vlachopoulos et al., 2011).

Behavioural regulations for participation in PE

Behavioural regulations for PE participation were measured using the Revised Perceived Locus of Causality in Physical Education scale (PLOC-R; Vlachopoulos, Katartzi, Kontou, Moustaka, & Goudas, 2011). The PLOC-R comprises 19 items measuring unidimensional amotivation (e.g. 'I don't see why we should have PE'), external regulation (e.g. 'Because in this way I will not get a low grade'), introjected regulation in the form of the motive to avoid low contingent self-worth (e.g. 'Because I would feel bad about myself if I didn't'), identified regulation (e.g. 'Because it is important to me to do well in PE') and intrinsic motivation (e.g. 'Because PE is enjoyable'). Following the stem 'I take part in PE …' pupils provided their responses on a seven-point Likert scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). Psychometric evidence has supported the factor structure via CFA (robust CFI = .940; robust RMSEA = .048), internal reliability, simplex-like correlational pattern, nomological validity and measurement invariance across Greek fifth- and sixth-grade pupils, boys and girls, and across pupils who either participated or not in out-of-school sports (Vlachopoulos, Katartzi, Kontou, et al., 2011).

Enjoyment

Levels of enjoyment in PE were assessed using four items used by Scanlan, Simons, Carpenter, Schmidt, and Keeler (1993) to measure sport enjoyment as conceptualised by Scanlan and Simons (1992) in the context of the Sport Commitment Model. In the present study, the sport-related items 'Do you enjoy/are you happy/do you have fun/do you like playing in (programme) this season' were modified to refer to PE. Students' responses were provided on a five-point scale anchored by 1 (*not at all*), 2 (*a little bit*), 3 (*sort of*), 4 (*pretty much*) and 5 (*very much*).

Fear of failure

Fear of failure in PE was tapped using the short-form of the Performance Failure Appraisal Inventory (Conroy, Willow, & Metzler, 2002) modified for PE. Sample

items include 'When I am failing in PE, I am afraid that I might not have enough talent in sport;' 'When I am failing in PE, I am afraid that I might not do well in PE in the future;' 'When I am not succeeding in PE, other kids and the PE teacher are less interested in me;' 'When I am failing in PE, other people important to me are disappointed;' 'When I am failing in PE, I worry about what others think about me'. Student responses were provided on a five-point Likert scale ranging from 1 (*I do not believe it at all*) to 5 (*I believe it 100% of the time*).

Boredom

Levels of boredom reported by students in PE were assessed using the effort subscale employed by Duda, Fox, Biddle, and Armstrong (1992). The scale consists of three items measuring boredom, modified for PE. Boredom indicators are 'In PE, I often daydream instead of thinking what I am doing,' 'When doing PE, I am usually bored,' and 'When doing PE, I wish the class would end quickly'. Students' responses were provided on a seven-point Likert scale anchored by 1 (*Strongly disagree*) to 7 (*Strongly agree*).

Effort

Effort was measured via four items adapted from the Effort/importance subscale of the Intrinsic Motivation Inventory (McAuley, Duncan, & Tammen, 1989) after being modified for PE. Sample items included 'I put a lot of effort in PE' and 'I try very hard in PE'. Students provided their responses on a seven-point Likert scale ranging from 1 (*Strongly disagre*e) to 7 (*Strongly agree*). The validity and reliability of this scale with Greek pupils has been supported (e.g. Digelidis & Papaioannou, 1999; Goudas, Dermitzaki, & Bagiatis, 2000; Marsh, Papaioannou, Martin, & Theodorakis, 2006).

Procedures

Permission to conduct the study was granted by the School Supervisory Council. The intervention lasted for two months in the context of the third school trimester. Each class attended PE twice per week. Each lesson lasted for 45 min. The intervention was applied to nine consecutive PE lessons. In this trimester, all the PE lessons scheduled to be taught according to the school programme were used for the implementation of the intervention.

The educational material taught in both conditions was identical and in accord with guidelines on the compulsory sports activities to be taught in fifth- and sixth-grade pupils provided by the Greek Ministry of Education. One of the aims of the Greek PE curriculum for elementary school PE is the development of motor skills through which the cultivation of pupils' physical abilities and competencies are to be achieved. Such competencies are thought to contribute to the development of a positive attitude towards sport involvement and maximise the possibilities for the adoption of an active lifestyle during adulthood. The content of the lessons for the particular trimester comprised teaching basic sports skills related to basketball and handball. For each PE lesson, the first 10 min were spent on warming up, also including play activities and repetition/refinement of skills that had been taught in previous PE lessons. Then, 20 min of both individual- and group-based instruction

followed which formed the main part of the lesson. This part aimed at learning new sports skills in basketball and handball. The next 10–12 min was time spent playing the sport currently taught and applying the sports skills learned. The last 3–5 min were spent on cooling down, reviewing the material taught in the current lesson, and what was to follow in the next PE lesson. The specific sports skills taught in these nine lessons were for both handball and basketball dribbling, shooting, individual defence and drive to the basket (for basketball). Teachers' offering of goals, expectations, rules, directions, prompts and examples during the lesson were provided in an equivalent fashion across the two conditions.

The PE lessons were held in the same location (i.e. school yard), always during the morning teaching zone. Four waves of data were collected. The first assessment took place after the first two PE lessons of the trimester and before initiation of the intervention. The second assessment took place two lessons after initiation of the intervention. The third assessment took place after the sixth PE lesson. The fourth assessment took place the day after the ninth PE lesson. Questionnaire completion always took place in a quiet classroom environment, not during PE, and lasted for about 20 min. After completion of the questionnaire, the principal investigator checked the questionnaire for missing responses, and in such a case the student was prompted to fill in the missing responses. Students' names were initially matched to a code number and this number was placed on each questionnaire to protect anonymity. Participants were informed that they would take part in a study examining reasons for PE participation. During data collection, students were told that there were no 'right or wrong' answers, that only the principal investigator would have access to the responses, that responses would be treated in a group fashion and not individually, and that they had the right to withdraw from the study at any time. All participants from both conditions agreed to participate in the study.

Description of the intervention

Autonomy support condition

To support pupils' autonomy, a number of teacher behaviours suggested by Reeve (2006) were employed. These behaviours were (1) listening carefully, (2) creating opportunities for pupils to practice in their own way, (3) providing opportunities for pupils to participate, (4) arranging learning materials so students actively engage in the lesson rather than passively watching and listening, (5) encouraging effort and persistence, (6) praising improvement, (7) offering hints aimed at enabling progress when pupils were stuck, (8) being responsive to pupils' questions and (9) acknowledging pupils' perspectives. Additionally, meaningful rationales were provided for the activities taught and neutral language was used during interpersonal communication (Reeve, 2006; Williams et al., 1996). Thus, the PE teacher provided choices as to the size and material of the ball to be used by the pupils as well as to the distance at which shooting the ball would be executed. The students were provided with choice in spending more time on the task at hand, while learning a new skill. If the effort was met with difficulty, the student was allowed to perform the task in a different and easier way. For instance, if dribbling while running was difficult for the student, she/he was allowed to dribble while walking. Further, a meaningful rationale was provided for the activities taught. For instance, 'skillful control of the ball during the game facilitates greater speed of the player and more effectively attending the court without having to concurrently attend to the ball'. The PE teacher also

used neutral language (e.g. used 'may' and 'could' rather than 'must' and 'should'), provided positive feedback related to participants' effort rather than performance, and acknowledged the difficulty experienced by the students during the lesson.

Typical instruction condition

In the control condition (labelled 'lack of autonomy support'), the teaching style adopted was characterised by a lack of an emphasis on autonomy-supportive behaviours. An environment is considered to be controlling when authority figures (e.g. PE teachers) do not provide choice for the activities and meaningful rationales, and do use pressuring language (Deci, Eghrari, Patrick, & Leone, 1994). In the control condition, no rationales and no choices were provided by the PE teacher; instead, she used neutral but no pressuring language. In the SDT sport literature, five dimensions of a controlling interpersonal environment have been proposed: (a) controlling use of rewards, (b) negative conditional regard, (c) intimidation, (d) excessive personal control and (e) judging and devaluing (Bartholomew, Ntoumanis, & Thogersen-Ntoumani, 2010). In the present study, a controlling teaching style was not used in the control group. However, it was expected by the pupils to perform the sports skills in the ideal way while corrections took place immediately when this was not the case.

Manipulation check

Pupils were asked at the end of each of the PE lessons during the intervention, to indicate for that lesson on a questionnaire, the extent to which the PE teacher (a) provided choices and created opportunities for students to work in their own way, (b) encouraged effort and provided progress-enabling hints when pupils were stuck, (c) encouraged students to ask questions, (d) listened carefully and was responsive to students' questions and (e) acknowledged students' perspectives. Responses were provided on a seven-point Likert scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). These data were used as a control of the fidelity of the implementation of the intervention. This method has also been used in other settings (e.g. physical fitness centres) and behaviours (e.g. exercise behaviour) as a control of the fidelity of the implementation of autonomy-supportive instruction (Moustaka, Vlachopoulos, Kabitsis, & Theodorakis, 2012). The PE classes in both conditions were led by the same PE teacher (a female professional with 13 years of elementary PE teaching experience) who was familiar with SDT and the principles of autonomy-supportive teaching.

Statistical analysis

Initially and in order to investigate the fidelity of the implementation of the intervention, an examination was done on whether the pupils of the experimental group perceived the PE teacher's behaviour as more autonomy-supportive compared to the PE teacher's behaviour in the control group. Thus, a one-way MANOVA was computed using the two groups as the independent variable and the nine composite scores of the autonomy-supportive behaviours (one composite score for each one of the nine PE lessons) as the dependent variables. Descriptive statistics were computed for this composite score for every PE lesson.

Then, potential group differences were examined in relation to pupils' height, weight, weekly frequency and duration of participation in out-of-school sports, and contextual measures of perceived autonomy support, basic psychological needs, behavioural regulations, enjoyment, fear of failure, boredom and effort for the first measurement occasion (T1). In case of no group differences in this occasion, univariate analyses of variance with repeated measures were used to analyse the data. Mauchly's test of sphericity was employed to determine whether statistically significant differences existed between the variances of the differences across measurement occasions. When the test of sphericity suggested that such differences did exist, and that a conventional *F*-test would be biased, the Greenhouse–Geisser correction to the *F*-test was used to remove the bias. Repeated measures ANOVAs (2 × 4) were computed to examine the interaction terms between the two groups (experimental and control) and measurement occasions (measure 1, measure 2, measure 3 and measure 4) for each one of the dependent variables. Given statistically significant interaction 'group × time' terms, *post hoc* tests were used to examine the between-group and the within-group mean differences.

Results

Descriptive statistics and correlations

No missing data were observed owing to the data collection protocol used. Descriptive statistics and Cronbach's α values were computed for all variables for the first measurement occasion (Table 2). Alpha values ranged .74–.86 for T1 measurement, .68–.88 for T2, .71–.90 for T3 and .73–.91 for T4 measurement. Pearson correlations greater than |.28| were found significant at $p < .05$ ($N = 54$). Perceived autonomy support by the PE teacher was positively correlated with fulfilment of all three needs for autonomy, competence and relatedness. Non-significant correlations emerged in a positive direction with identified regulation ($r = .23$) and intrinsic motivation ($r = .16$). Positive significant correlations emerged with enjoyment and effort. Non-significant negative correlations emerged with fear of failure ($r = -.22$) and boredom ($r = -.18$). The three needs were positively correlated with identified regulation and intrinsic motivation. Further, they were positively correlated with enjoyment and effort, and negatively with boredom and fear of failure. The correlations between behavioural regulations approached a simplex-like pattern with adjacent variables correlating positively and more strongly, compared to more distal regulations on the self-determination continuum. Self-determined types of regulations were positively correlated with enjoyment and effort, and negatively with boredom. Introjected regulation was non-significantly correlated with fear of failure ($r = .23$) and negatively with intrinsic motivation ($r = -.20$) (Table 2).

Fidelity of the implementation of the intervention

A one-way MANOVA using the two groups as the independent variable and the nine composite scores of perceived autonomy support measured at the situational level of generality for each of the nine PE lessons as the dependent variables resulted in a significant multivariate effect for group (Pillai's trace = .988, $F_{(9,\ 42)} = 391.16$, $p = .000$, eta squared = .98). That was followed by nine ANOVAs showing significant group differences for all nine PE lessons with eta squared values

Table 2. Means, standard deviations and Pearson's correlations between the study variables on T1 measurement occasion.

Variables	α	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Perceived autonomy support	.74	5.22	1.07	–											
2. Autonomy	.79	5.07	1.31	.32*	–										
3. Competence	.83	5.22	1.24	.45**	.76**	–									
4. Relatedness	.84	5.43	1.39	.41**	.76**	.67**	–								
5. Amotivation	.76	2.31	1.40	−.08	−.11	−.09	−.08	–							
6. External regulation	.78	2.98	1.64	.01	−.01	.04	.06	.60**	–						
7. Introjected regulation	.69	3.81	1.34	.09	.11	.01	.28*	.45**	.49*	–					
8. Identified regulation	.74	5.73	1.09	.23	.57**	.58**	.50**	−.25	−.00	−.33*	–				
9. Intrinsic motivation	.86	5.68	1.38	.16	.55**	.46**	.50**	−.32*	.01	−.31*	.80**	–			
10. Enjoyment	.86	4.50	.69	.41**	.31*	.29*	.39**	−.19	−.06	−.21	.42**	.39**	–		
11. Fear of failure	.75	1.95	.83	−.22	−.20	−.08	−.28*	.04	−.07	.23	−.07	−.20	−.25	–	
12. Boredom	.86	1.75	.96	−.18	−.38**	−.40**	−.31*	.40**	.46**	.25	−.40**	−.35**	−.26	.25	–
13. Effort	.77	5.87	1.19	.55**	.56**	.66**	.50**	−.30**	−.50**	−.10	.69**	.59**	.39**	−.05	−.35**

Note: $N = 54$; α = Cronbach's alpha. *Sig. at $p < .05$.
**Sig. at $p < .01$.

ranging .77 – .94. The experimental group means were higher for all nine PE lessons compared to the control group means (Figure 2). These findings provided support to the fidelity of the implementation of the intervention.

Group differences at pre-intervention measurement occasion

A one-way MANOVA was computed to examine possible group differences on pupils' height, weight, weekly frequency and duration of participation in out-of-school sports, perceived autonomy support, basic psychological needs, behavioural regulations, enjoyment, fear of failure, boredom and effort for the first measurement occasion (T1). No multivariate effect emerged indicating no group differences for these variables (Pillais' trace = .466, $F_{(17,\ 36)} = 1.84$, $p = .060$, eta squared = .46).

Repeated measures ANOVA on perceived autonomy support

A 2 × 4 repeated measures ANOVA indicated a significant interaction term for PAS ($F_{(2.61,\ 136.08)} = 40.83$, $p = .000$, partial eta squared = .44) between the experimental and the control group across the four measurement occasions. Given statistical significance of the Mauchly's test of sphericity, the Greenhouse–Geisser index was used to judge significance of the F value. An eta squared value of .01 corresponds to a small effect size, a value of .05 to a medium effect size and a value of .13 to a large effect size (Cohen, 1988).

The Student–Newman–Keuls (S–N–K) *post hoc* test led to no significant differences between the control and the experimental groups for T1, T2 and T3. However, a significant difference emerged for the fourth measurement occasion where the perceived autonomy support mean for the experimental group was significantly greater than the control group mean (diff. = 2.77, $d = 2.45$; Table 3; Figure 3). A d value of .20 represents a small effect size, .50 a medium effect size, and .80 a large effect size (Cohen, 1988). In terms of within group comparisons, for the control group, there was a gradual decline in PAS from T1 to T3 (diff. = .95, $d = 1.04$) and from T3 to T4 (diff. = 1.8, $d = 1.25$). For the experimental group, no within group

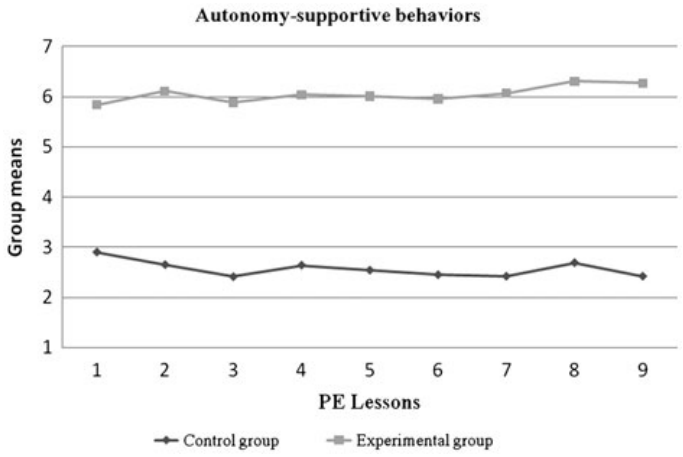

Figure 2. Mean differences on the composite score of situational perceived autonomy-supportive behaviours within each condition during the intervention for each of the nine PE lessons.

Table 3. Means and standard deviations of study variables for each measurement occasion across the control and experimental groups.

	Time 1 (pre-intervention)				Time 2 (Week 2)				Time 3 (Week 6)				Time 4 (Week 9)			
	Control		SDT		Control		SDT		Control		SDT		Control		SDT	
Variables	*M*	SD	*M*	SD	*M*	SD	*M*	SD	*M*	SD	*M*	SD	*M*	SD	*M*	SD
Perceived autonomy support	5.53	.91	4.91	1.14	5.53	.89	5.11	1.09	4.58	1.43	5.36	1.12	2.78	1.13	5.55	1.27
Autonomy	4.88	1.56	5.26	.99	5.12	1.06	5.41	1.15	4.48	1.55	5.61	1.20	3.23	.85	5.79	1.26
Competence	5.28	1.34	5.16	1.15	5.49	1.04	5.15	1.39	4.66	1.51	5.33	1.40	3.13	.82	5.54	1.30
Relatedness	5.33	1.54	5.53	1.25	5.63	1.23	5.43	1.33	4.53	1.60	5.56	1.41	3.31	.93	5.83	1.41
Amotivation	2.25	1.18	2.37	1.61	2.82	1.56	2.78	1.80	3.75	1.85	2.43	1.54	5.16	.70	2.00	1.26
External regulation	2.90	1.50	3.07	1.79	3.02	1.38	3.37	2.19	3.83	1.73	3.00	1.69	5.25	.76	2.34	1.46
Introjected regulation	3.89	1.28	3.74	1.42	3.93	1.22	3.87	1.83	4.12	1.47	4.15	1.77	4.04	.64	4.00	1.75
Identified regulation	5.64	1.19	5.81	.99	5.29	1.20	5.97	.98	4.36	1.80	5.88	1.14	3.02	.82	6.21	.95
Intrinsic motivation	5.41	1.68	5.94	.96	5.27	1.37	5.85	1.14	4.26	1.62	5.84	1.19	3.09	.88	6.12	1.08
Enjoyment	4.42	.81	4.58	.55	4.38	.74	4.55	.57	3.55	1.10	4.46	.72	2.32	.90	4.45	.97
Fear of failure	1.95	.78	1.95	.90	1.83	.86	2.11	1.02	2.60	1.21	2.20	1.14	2.65	.86	1.89	1.00
Boredom	1.71	1.08	1.79	.84	1.97	1.27	1.96	1.46	3.45	1.70	2.24	1.53	5.44	1.22	2.03	1.47
Effort	5.81	1.09	5.93	1.31	5.60	1.42	6.08	1.14	5.27	1.23	6.07	1.00	2.90	1.08	6.00	1.45

Note: Control = control group.

differences emerged across the four measurement occasions indicating stability of perceived autonomy support over the trimester (Table 3; Figure 3).

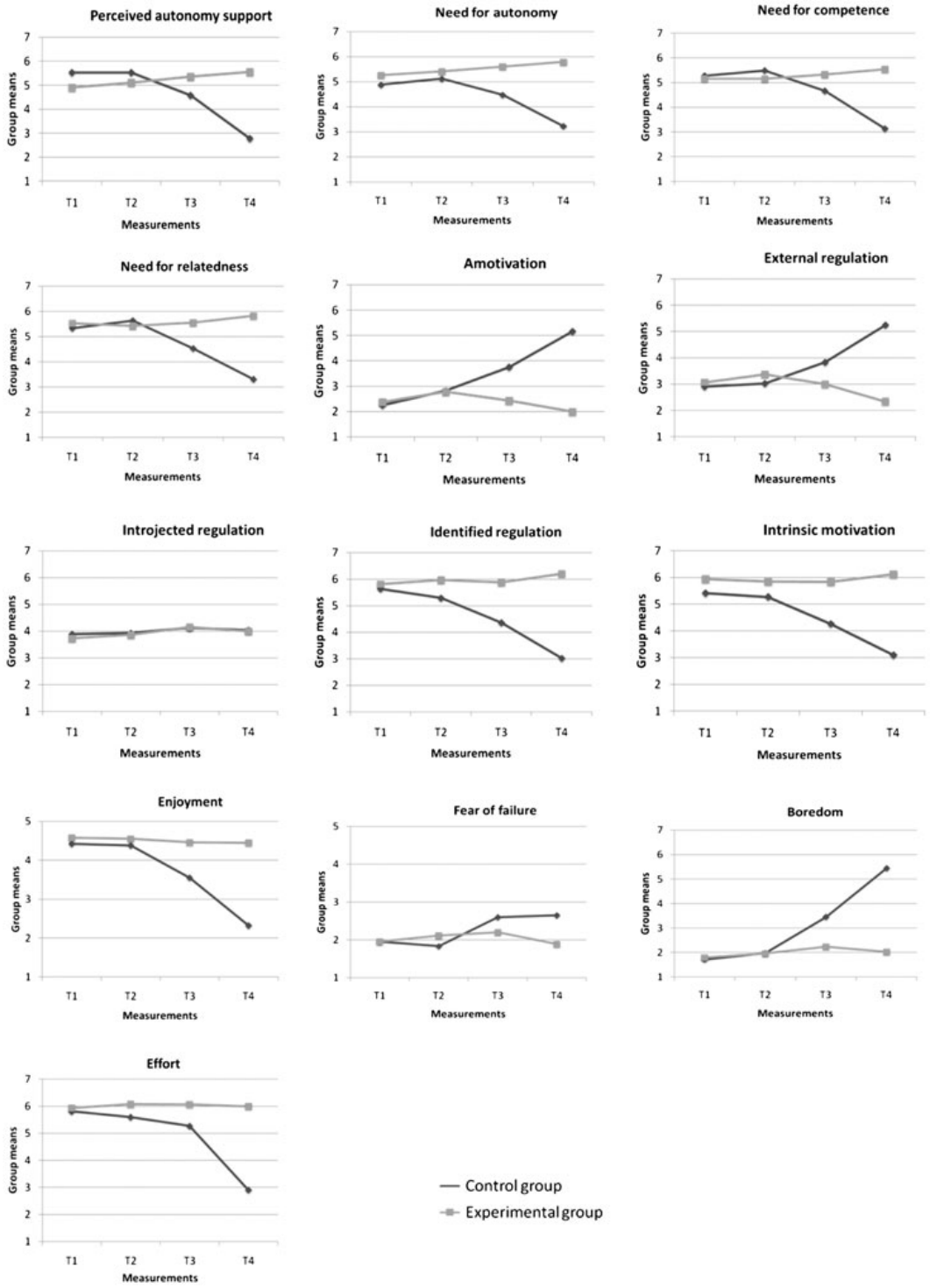

Figure 3. Diagrams depicting variable means across the four measurement occasions for each of the two groups.

Repeated measures ANOVAs on basic psychological needs

Repeated measures ANOVAs led to significant interaction terms for the needs for autonomy ($F_{(2.53,\ 131.91)} = 15.92$, $p = .000$, partial eta squared = .23), competence ($F_{(3,\ 156)} = 23.79$, $p = .000$, partial eta squared = .31) and relatedness ($F_{(2.53,\ 131.62)} = 20.15$, $p = .000$, partial eta squared = .27).

Need for autonomy

Regarding the need for autonomy, the S–N–K test revealed no significant differences between the control group and the experimental group means for T1, T2 and T3. A significant mean difference was found for T4 where the experimental need for autonomy mean was significantly greater than the control group mean (diff. = 2.56, $d = 3.01$; Table 3; Figure 3). The same mean difference direction emerged for T2 and T3 but the differences were not statistically significant (Table 3). In terms of within group comparisons, for the control group, a significant decline emerged from T2 to T3 (diff. = .64, $d = .60$) and from T3 to T4 assessment (diff. = 1.25, $d = .80$). No mean change was observed for the experimental group across the four measurement occasions indicating relative stability of the high need for autonomy mean scores (Table 3; Figure 3).

Need for competence

In terms of need for competence, the S–N–K test revealed no significant differences between the control and the experimental groups for T1, T2 and T3. A significant difference was found for T4 where the need for competence mean for the experimental group was significantly greater than the control group mean (diff. = 2.41, $d = 2.93$; Table 3). The same mean difference direction emerged for T3 but the difference was not statistically significant (Table 3). In terms of within group comparisons, for the control group, a statistically significant decline emerged from T2 to T3 assessment (diff. = .83, $d = .79$) and from T3 to T4 (diff. = 1.53, $d = 1.01$). No mean difference was observed within the experimental group across the four measurement occasions reflecting relative stability of the high levels of need for competence fulfilment over the trimester (Table 3; Figure 3).

Need for relatedness

The S–N–K test indicated no significant differences between the control and the experimental groups for T1, T2 and T3. A significant difference emerged for T4 where the need for relatedness mean was significantly greater for the experimental compared to the control group mean (diff. = 2.52, $d = 2.70$; Table 3). The same mean difference direction emerged for T3 but the difference was not statistically significant (Table 3). In terms of within group comparisons, for the control group, a gradual decline in relatedness was observed from T2 to T3 (diff. = 1.1, $d = .89$) and from T3 to T4 (diff. = 1.22, $d = .76$). No changes in relatedness means emerged for the relatively high levels of relatedness need satisfaction within the experimental group (Table 3; Figure 3).

Repeated measures ANOVAs on behavioural regulations

Repeated measures ANOVAs revealed significant interaction terms for amotivation ($F_{(3, 156)}$ = 19.23, p = .000, partial eta squared = .27), external regulation ($F_{(3, 156)}$ = 20.69, p = .000, partial eta squared = .28), identified regulation ($F_{(2.43, 126.43)}$ = 28.59, p = .000, partial eta squared = .35) and intrinsic motivation ($F_{(2.44, 126.88)}$ = 23.01, p = .000, partial eta squared = .30) but not for introjected regulation ($F_{(3, 156)}$ = .07, p = .974, partial eta squared = .01).

Amotivation

Regarding amotivation, the S–N–K test demonstrated no significant differences between the control and the experimental groups for T1, T2 and T3. A significant difference emerged for T4 where the amotivation mean was significantly lower for the experimental group compared to the control group mean (diff. = 3.16, d = 4.51; Table 3; Figure 3). The same mean difference direction emerged for T2 and T3 but the differences were not statistically significant (Table 3). In terms of within group comparisons, for the control group, a gradual significant increase in amotivation was observed from T2 to T3 (diff. = .93, d = .59) and from T3 to T4 (diff. = 1.41, d = .76). No changes in amotivation were observed for the relatively low amotivation levels within the experimental group (Table 3; Figure 3).

External regulation

For external regulation, no significant differences emerged between the control and the experimental groups for T1, T2 and T3. A significant difference was found for T4 where the external regulation mean was significantly lower for the experimental group compared to the control group mean (diff. = 2.91, d = 3.82; Table 3; Figure 3). The same mean difference direction emerged for T3 but the difference was not statistically significant (Table 3). In terms of within group comparisons, for the control group, a gradual significant increase in external regulation was observed from T3 to T4 (diff. = 1.42, d = .82). For the experimental group, a significant decrease of external regulation occurred from T2 to T4 (diff. = 1.03, d = .47; Table 3; Figure 3).

Introjected regulation

In regard to introjected regulation, no statistically significant mean differences emerged either between the control and the experimental groups for any time point or within any of the groups. Therefore, no intervention effects were observed in relation to pupils' introjected regulation levels for PE participation (Table 3; Figure 3).

Identified regulation

In terms of identified regulation, no significant differences emerged between the control and the experimental groups for T1 and T2. A significant difference was found for T3 (diff. = 1.52, d = .84) and T4 (diff. = 3.19, d = 3.89) where identified regulation means for the experimental group were significantly greater than the respective control group means (Table 3; Figure 3). In terms of within group comparisons, for the control group, a statistically significant decrease emerged from T2

to T3 (diff. = .93, d = .77) and from T3 to T4 (diff. = 1.34, d = .74) assessment. No mean differences were observed within the experimental group across the four measurement occasions indicating relative stability of the relatively high levels of identified regulation means over the trimester (Table 3; Figure 3).

Intrinsic motivation

For intrinsic motivation, no significant differences emerged between the control and the experimental groups for T1 and T2. A significant difference emerged for T3 (diff. = 1.58, d = .97) and T4 (diff. = 3.03, d = 3.44) with intrinsic motivation means for the experimental group being significantly greater than the respective control group means (Table 3; Figure 3). The same mean difference direction emerged for T2 but the difference was not statistically significant (Table 3). Regarding within group comparisons, for the control group, a statistically significant decline was found from T2 to T3 (diff. = 1.01, d = .73) and from T3 to T4 (diff. = 1.17, d = .72) assessment. No mean differences were found within the experimental group across the four measurement time points revealing relative stability of the high levels of intrinsic motivation over the course of the trimester (Table 3; Figure 3).

Repeated measures ANOVAs on motivational consequences

Repeated measures ANOVAs led to significant interaction terms for enjoyment ($F_{(2.29, 119.51)}$ = 32.20, p = .000, partial eta squared = .38), fear of failure ($F_{(2.55, 132.83)}$ = 5.64, p = .002, partial eta squared = .09), boredom ($F_{(2.59, 134.83)}$ = 27.47, p = .000, partial eta squared = .34) and effort ($F_{(3, 156)}$ = 27.03, p = .000, partial eta squared = .34).

Enjoyment

In terms of enjoyment, no significant differences emerged between the control and the experimental groups for T1, T2 and T3. A significant difference was found for T4 where the enjoyment mean for the experimental group was significantly greater than the control group mean (diff. = 2.13, d = 2.36; Table 3; Figure 3). The same mean difference direction emerged for T2 and T3 but the differences were not statistically significant (Table 3). In terms of within group comparisons, for the control group, a statistically significant decline emerged from T2 to T3 (diff. = .83, d = 1.12) and from T3 to T4 assessment (diff. = 1.23, d = 1.11). No mean difference was found within the experimental group across the four measurement time points indicating relative stability of the high levels of PE enjoyment mean scores over the trimester (Table 3; Figure 3).

Fear of failure

For fear of failure, no significant differences emerged between the control and experimental group for any of the measurement occasions although that for T3 and T4 measurements, the direction of differences was in line with the hypothesis (Table 3; Figure 3). In terms of within group comparisons, for the control group, a statistically significant increase of fear of failure emerged from T2 to T3 (diff. = .77, d = .89) but not from T3 to T4 assessments. No mean difference was observed within the

experimental group across the four measurement occasions reflecting relative stability of the relatively low levels of fear of failure over the trimester (Table 3; Figure 3).

Boredom

In regard to boredom, no significant differences were found between the control and the experimental groups for T1 and T2. A significant difference was found for T3 (diff. = 1.21, d = .71) and T4 (diff. = 3.41, d = 2.79) with the boredom means for the experimental group being significantly lower than the control group means, respectively (Table 3; Figure 3). In terms of within group comparisons, for the control group, a statistically significant increase of boredom emerged from T1 to T3 and from T3 to T4 assessment. No mean difference was observed within the experimental group across the four measurement occasions reflecting relative stability of the low levels of pupils' boredom over the trimester (Table 3; Figure 3).

Effort

For effort, no significant differences emerged between the control and the experimental groups for T1, T2 and T3. A significant difference was found for T4 where the effort mean for the experimental group was significantly greater than the control group mean (diff. = 3.1, d = 2.87; Table 3; Figure 3). The same mean difference direction emerged for T2 and T3 but the differences were not statistically significant (Table 3). In terms of within group comparisons, for the control group, a statistically significant decline of effort emerged from T3 to T4 assessment (diff. = 2.37, d = 1.92). No mean difference was observed within the experimental group across the four measurement time points reflecting relative stability of the high levels of reported effort over the trimester (Table 3; Figure 3).

Discussion

The present study examined the efficacy of autonomy-supportive behaviors in the context of teaching PE in fifth- and sixth- grade pupils in elementary school to promote motivation for PE participation. The main hypothesis of the study was that pupils attending the PE lessons taught using the autonomy-supportive principles would report greater levels of positive indexes of motivation for participation in PE (e.g. enjoyment and effort) and lower levels of negative indexes of motivation (e.g. fear of failure and boredom). Given that the psychological mechanism used to explain such effects were changes in key SDT constructs such as perceived autonomy support by the PE teacher, fulfilment of the psychological needs for autonomy, competence and relatedness, and the behavioural regulations of amotivation, external regulation, introjected regulation, identified regulation and intrinsic motivation, respective changes were also hypothesised for these variables.

The findings of the present study appear to be highly consistent across all the variables measured, that is, both the motivational consequences and the SDT constructs. Specifically, it was found that significant differences between the experimental and the control groups emerged almost always during the T4 assessment of the variables which took place near the end of the school trimester. Significant mean differences were also observed in the same direction for some variables in T3 assess-

ment (i.e. identified regulation, intrinsic motivation, boredom). What is noteworthy is that the pattern of the differences found, originated from a deterioration of the control group near the middle and the end of the trimester rather than an increase of variable means for the experimental group. An element contributing to this finding is the initially high levels of the positive motivational variables and the low levels of the negative motivational variables at the beginning of the trimester. Such levels of the variables at the beginning of the trimester may be explained by the possibility that the teaching approach of the PE teacher who implemented the intervention included elements of autonomy-supportive teaching. In relation to this, however, the Greek elementary educational system would not allow for a different PE teacher to implement the intervention, given that a PE teacher in elementary school has to teach pupils of a particular class following the pupils from the first grade till the sixth grade in school. Another factor that may explain the initial high levels of pupils' motivation may be the fact that fifth and sixth graders almost always expect to enjoy PE and hold a relatively positive attitude towards PE. The important finding from the present data seems to be that the lack of the use of autonomy-supportive principles during the trimester led to a deterioration of motivational indices and this was statistically evident near the end of the trimester. Thus, it seems that lack of use of autonomy-supportive principles takes some time before the negative motivational effects become evident.

Generally, the present findings are in agreement with findings of other experimental studies showing greater motivational benefits for students taught by autonomy supportive PE teachers. For instance, Chatzisarantis and Hagger (2009) found that pupils who were taught by autonomy-supportive teachers reported stronger intentions to exercise during leisure time and displayed more frequent participation in leisure time PAs compared to their control group counterparts. Cheon et al. (2012) found with middle school students in a semester-long study that students who were taught by autonomy supportive teachers reported greater levels of need satisfaction, autonomous motivation, skill development, future intentions for PA and academic achievement with such effects becoming evident at the middle and the end of the semester. It is noteworthy that the effects of autonomy support on improving positive motivational indexes and diminishing negative indexes in the present study became evident by mid-trimester with stronger effects appearing near the end of the trimester. Hence, it seems that the autonomy supportive principles that are used when teaching PE, take some time to exert their influence on students' motivation. Also, given the possible effects of the end of the trimester on students' responses, it is believed that such effects on students' responses have been equivalent across groups, hence, allowing the intervention to become the source of score differences. Additionally, and given that a female PE teacher delivered the intervention in the present study may lead to questions relatively to the effect of the gender of the individual offering autonomy support on students' perceptions of autonomy support. Indeed, research has emerged demonstrating the influence of maternal support of children's sense of autonomy, competence and relatedness on children's interest in math and reading and their mastery orientation during primary school (Aunola, Viljaranta, Lehtinen, & Nurmi, 2013).

Limitations and future directions

The present findings apply to fifth- and sixth-grade pupils attending elementary school PE. These findings cannot be readily generalised to younger children given that younger children may process achievement information differently (Nicholls, 1989) and this may be a reason as to why fourth-grade children report greater levels of PE enjoyment compared to sixth-grade children (Prochaska, Sallis, Slymen, & McKenzie, 2003). Another limitation of the present study is that no independent observers were employed to examine the fidelity of the implementation of the intervention which was inferred by pupils' perceptions of the PE teacher's behaviours for each PE lesson separately. Furthermore, although the same PE teacher taught in both the control and the experimental groups, the teacher's training on principles and practice of autonomy-supportive teaching combined with the differential responses of pupils to the extent to which autonomy-supportive behaviours were enacted in each class, leads to increased confidence as to the fidelity of the intervention. Also, despite the relatively small sample size, the fact that standard deviations were similar for all variables and in combination with the systematic pattern of the differences found and the relatively strong effect sizes, leads to enhanced confidence about the accuracy of the findings. However, it would be desirable that future studies replicate the present findings using a larger sample size. Future research might examine the links of autonomy-supportive principles during PE instruction in elementary students with objective PA and other objective indices quantifying pupils' behaviour in terms of learning and/or improving in various sports skills in line with the goals of the respective curriculum. Moreover, in future research the effects of the gender of the individual offering need support on various indexes of motivation and behaviour in school PE may be examined in an attempt to better understand the role of the PE teacher's gender in these motivational processes. In general, research findings on the efficacy of implementing autonomy-supportive principles in PE seems promising in improving pupils' motivation for PE participation. Such motivation is potentially linked to the concomitant benefits deriving from children's increased PA and improved physical and psychological health.

References

Aunola, K., Viljaranta, J., Lehtinen, E., & Nurmi, J. (2013). The role of maternal support of competence, autonomy and relatedness in children's interests and mastery orientation. *Learning and Individual Differences, 25*, 171–177. http://dx.doi.org/10.1016/j.lindif.2013.02.002

Bartholomew, K. J., Ntoumanis, N., & Thogersen-Ntoumani, C. (2010). The controlling interpersonal style in a coaching context: Development and initial validation of a psychometric scale. *Journal of Sport and Exercise Psychology, 32*, 193–216.

Cale, L., & Harris, J. (2013). 'Every child (of every size) matters' in physical education! Physical education's role in childhood obesity. *Sport, Education and Society, 18*, 433–452. http://dx.doi.org/10.1080/13573322.2011.601734

Cawley, J., Frisvold, D., & Meyerhoefer, C. (2013). The impact of physical education on obesity among elementary school children. *Journal of Health Economics, 32*, 743–755. http://dx.doi.org/10.1016/j.jhealeco.2013.04.006

Chatzisarantis, N. L. D., & Hagger, M. S. (2009). Effects of an intervention based on self-determination theory on self-reported leisure-time physical activity participation. *Psychology and Health, 24*, 29–48. doi:10.1080/08870440701809533

Cheon, S. H., & Reeve, J. (2013). Do the benefits from autonomy-supportive PE teacher training programs endure? A one-year follow-up investigation. *Psychology of Sport and Exercise, 14*, 508–518. http://dx.doi.org/10.1016/j.psychsport.2013.02.002

Cheon, S. H., Reeve, J., & Moon, I. S. (2012). Experimentally based, longitudinally designed, teacher-focused intervention to help physical education teachers be more autonomy supportive toward their students. *Journal of Sport and Exercise Psychology, 34*, 365–396.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.

Conroy, D. E., Willow, J. P., & Metzler, J. N. (2002). Multidimensional fear of failure measurement: The performance failure appraisal inventory. *Journal of Applied Sport Psychology, 14*, 76–90. doi:10.1080/10413200252907752

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*, 297–334.

Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. (1994). Facilitating internalization: The self-determination theory perspective. *Journal of Personality, 62*, 119–142.

Digelidis, N., & Papaioannou, A. (1999). Age-group differences in intrinsic motivation, goal orientations and perceptions of athletic competence, physical appearance and motivational climate in Greek physical education. *Scandinavian Journal of Medicine and Science in Sports, 9*, 375–380.

Duda, J. L., Fox, K. R., Biddle, S. J. H., & Armstrong, N. (1992). Children's achievement goals and beliefs about success in sport. *British Journal of Educational Psychology, 62*, 313–323.

Erwin, H. E., Stellino, M. B., Beets, M. W., Beighle, A., & Johnson, C. E. (2013). Physical education lesson content and teacher style and elementary students' motivation and physical activity levels. *Journal of Teaching in Physical Education, 32*, 321–334.

Gillison, F. B., Standage, M., & Skevington, S. M. (2013). The effects of manipulating goal content and autonomy support climate on outcomes of a PE fitness class. *Psychology of Sport and Exercise, 14*, 342–352. http://dx.doi.org/10.1016/j.psychsport.2012.11.011

Goudas, M., Dermitzaki, I., & Bagiatis, K. (2000). Predictors of students' intrinsic motivation in school physical education. *European Journal of Psychology of Education, 15*, 271–280.

How, Y. M., Whipp, P., Dimmock, J., & Jackson, B. (2013). The effects of choice on autonomous motivation, perceived autonomy support, and physical activity levels in high school physical education. *Journal of Teaching in Physical Education, 32*, 131–148.

Janssen, I., & LeBlanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *International Journal of Behavioral Nutrition and Physical Activity, 7*, 40. http://www.ijbnpa.org/content/7/1/40

Lonsdale, C., Rosenkranz, R. R., Sanders, T., Peralta, L. R., Bennie, A., Jackson, B., Taylor, I. M., & Lubans, D. R. (2013). A cluster randomized controlled trial of strategies to increase adolescents' physical activity and motivation in physical education: Results of the Motivating Active Learning in Physical Education (MALP) trial. *Preventive Medicine, 57*, 696–702. doi:10.1016/j.ypmed.2013.09.003

Marsh, H. W., Papaioannou, A., Martin, A., & Theodorakis, Y. (2006). Motivational constructs in Greek physical education classes: Factor structure, gender and age effects in a nationally representative longitudinal sample. *International Journal of Sport and Exercise Psychology, 4*, 121–148. doi:10.1080/1612197X.2006.9671789

McAuley, E., Duncan, T., & Tammen, V. (1989). Psychometric properties of the Intrinsic Motivation Inventory in a competitive sport setting: A confirmatory factor analysis. *Research Quarterly for Exercise and Sport, 60*, 48–58.

Moustaka, F. C., Vlachopoulos, S. P., Kabitsis, C., & Theodorakis, Y. (2012). Effects of an autonomy-supportive exercise instructing style on exercise motivation, psychological well-being, and exercise attendance in middle-age women. *Journal of Physical Activity and Health, 9*, 138–150.

Nicholls, J. G. (1989). *The competitive ethos and democratic education*. Cambridge, MA: Harvard University.

Niemiec, C. P., & Ryan, R. M. (2009). Autonomy, competence, and relatedness in the classroom: Applying self-determination theory to educational practice. *Theory and Research in Education, 7*, 133–144. doi:10.1177/1477878509104318

Ntoumanis, N. (2001). A self-determination approach to the understanding of motivation in physical education. *British Journal of Educational Psychology, 71*, 225–242.

Ntoumanis, N. (2005). A prospective study of participation in optional school physical education using a self-determination theory framework. *Journal of Educational Psychology, 97*, 444–453. doi:10.1037/0022-0663.97.3.444

Ntoumanis, N., & Standage, M. (2009). Motivation in physical education classes: A self-determination theory perspective. *Theory and Research in Education, 7*, 194–202. doi:10.1177/1477878509104324

Ogden, C. L., Carroll, M. D., Curtin, L. R., Lamb, M. M., & Flegal, K. M. (2010). Prevalence of high body mass index in US children and adolescents, 2007–2008. *Journal of the American Medical Association, 303*, 242–249. doi:10.1001/jama.2009.2012

Prochaska, J. J., Sallis, J. F., Slymen, D. J., & McKenzie, T. L. (2003). A longitudinal study of children's enjoyment in physical education. *Pediatric Exercise Science, 15*, 170–178.

Reeve, J. (2006). Teachers as facilitators: What autonomy-supportive teachers do and why their students benefit. *The Elementary School Journal, 106*, 225–236. doi:10.1086/501484

Reeve, J. (2009). Why teachers adopt a controlling motivating style toward students and how they can become more autonomy supportive. *Educational Psychologist, 44*, 159–175. doi:10.1080/00461520903028990

Reeve, J., Jang, H., Carrell, D., Jeon, S., & Barch, J. (2004). Enhancing students' engagement by increasing teachers' autonomy support. *Motivation and Emotion, 28*, 147–169. doi:10.1023/B:MOEM.0000032312.95499.6f

Reeve, J., Nix, G., & Hamm, D. (2003). Testing models of the experience of self-determination in intrinsic motivation and the conundrum of choice. *Journal of Educational Psychology, 95*, 375–392. doi:10.1037/0022-0663.95.2.375

Ryan, R. M., & Deci, E. L. (2002). An overview of self-determination theory: An organismic-dialectical perspective. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 3–33). Rochester, NY: The University of Rochester Press.

Scanlan, T. K., & Simons, J. P. (1992). The construct of sport enjoyment. In G. C. Roberts (Ed.), *Motivation in sport and exercise* (pp. 195–215). Champaign, IL: Human Kinetics.

Scanlan, T. K., Simons, J. P., Carpenter, P. J., Schmidt, G. W., & Keeler, B. (1993). The sport commitment model: Measurement development for the youth sport domain. *Journal of Sport and Exercise Psychology, 15*, 16–38.

Standage, M., Duda, J. L., & Ntoumanis, N. (2005). A test of self-determination theory in school physical education. *British Journal of Educational Psychology, 75*, 411–433. doi:10.1348/000709904X22359

Strong, W. B., Malina, R. M., Blimkie, C. J. R., Daniels, S. R., Dishman, R. K., Gutin, B., … Trudeau, F. (2005). Evidence based physical activity for school-age youth. *The Journal of Pediatrics, 146*, 732–737. doi:10.1016/j.jpeds.2005.01.055

Tessier, D., Sarrazin, P., & Ntoumanis, N. (2010). The effect of an intervention to improve newly qualified teachers' interpersonal style, students' motivation and psychological need satisfaction in sport-based physical education. *Contemporary Educational Psychology, 35*, 242–253. doi:10.1016/j.cedpsych.2010.05.005

Troiano, R. P., Berrigan, D., Dodd, K. W., Masse, L. C., Tilert, T., & Mcdowell, M. (2008). Physical activity in the United States measured by accelerometer. *Medicine and Science in Sports and Exercise, 40*, 181–188. doi:10.1249/mss.0b013e31815a51b3

Vallerand, R. J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. In M. Zanna (Ed.), *Advances in Experimental Social Psychology* (pp. 271–360). New York, NY: Academic Press.

Van den Berghe, L., Vansteenkiste, M., Cardon, G., Kirk, D., & Haerens, L. (2014). Research on self-determination in physical education: Key findings and proposals for future research. *Physical Education and Sport Pedagogy, 19*, 97–121. http://dx.doi.org/10.1080/17408989.2012.732563

Vansteenkiste, M., Simons, J., Lens, W., Soenens, B., & Matos, L. (2005). Examining the motivational impact of intrinsic versus extrinsic goal framing and autonomy-supportive

versus internally controlling communication style on early adolescents' academic achievement. *Child Development, 76*, 483–501. doi:10.1111/j.1467-8624.2005.00858.x

Vlachopoulos, S. P., Katartzi, E. S., & Kontou, M. G. (2011). The basic psychological needs in physical education scale. *Journal of Teaching in Physical Education, 30*, 263–280.

Vlachopoulos, S. P., Katartzi, E. S., Kontou, M. G., Moustaka, F. C., & Goudas, M. (2011). The revised perceived locus of causality in physical education scale: Psychometric evaluation among youth. *Psychology of Sport and Exercise, 12*, 583–592. doi:10.1016/j.psychsport.2011.07.003

Williams, G. C., Grow, V. M., Freedman, Z. R., Ryan, R. M., & Deci, E. L. (1996). Motivational predictors of weight loss and weight-loss maintenance. *Journal of Personality and Social Psychology, 70*, 115–126.

World Health Organization Europe. (2009). *Percentage of physically active children and adolescents*. Fact sheet 2.4. Code: RPG2_Hous_Ex1. Retrieved January 12, 2014, from http://www.euro.who.int/__data/assets/pdf_file/0012/96987/2.4.-Percentage-of-physically-active-children-EDITED_layoutedV2.pdf