

## Motivation and well-being in school physical education A cross-national study of self determination theory

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*The aim of the study was to examine the effect of SDT's variables on students' well-being indices within the context of PE. In particular the present study was designed to investigate the invariance of the motivational process linking autonomy support in PE, need satisfaction in PE and students' affect and subjective happiness across different populations. Seven hundred forty-three Greek and UK elementary and secondary school students participated in the study. Students completed a survey including measures of motivational climate, psychological need satisfaction, affect and subjective happiness. The results of the path analysis supported the positive relation of autonomy support and need satisfaction with students' well-being. The association of the motivational processes with the well-being indices was largely invariant across the two countries. The findings of the study are in line with self-determination theory and support the positive relation of autonomy support with students' well-being.*

KEY WORDS: Affect, Happiness, Motivational climate, Need satisfaction, Physical education.

### Introduction

Current trends in the study of childhood and the movement for children's rights that started evolving in the 1990s and influenced research and

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policy-making, the study of children's and adolescents' subjective well-being is timely and important (Navaro et al., 2017). In the school context, subjective well-being has been largely investigated under the lens of a broader perspective through large health promoting school frameworks, and linkages between educational and health promotion outcomes (Konu & Lintonen, 2006). However, Konu and Lintonen (2006) acknowledged that more research is needed to identify the appropriate set of determinants in order to better comprehend subjective well-being. Past evidence suggested that motivation-related constructs strongly influence aspects of subjective well-being (Bartholomew, Ntoumanis, & Ryan, 2011a, 2011b; Mouratidis, Vansteenkiste, Sideridis, & Lens, 2011). To further contribute to this line of research, the present study aims to investigate the effect of perceptions of autonomy support and need satisfaction on school-aged children's subjective well-being.

Well-being is a multi-dimensional construct and a unique definition that offers the exact meaning of the term remains unclear. Most of the existing research efforts mainly "describe" the construct of well-being rather than define it (Dodge, Daly, Huyton, & Sanders, 2012). As McDowell (2010, p. 70) suggests 'At its core, well-being refers to contentment, satisfaction, or happiness derived from optimal functioning'. Dimensions like individuals' emotional state, subjective happiness, affect, as well as the capacity for self-determination are involved in most of the proposed models (Ryff & Keyes, 1995). Very often they are connected with subjective well-being in the existing theoretical frameworks (Dodge, Daly, Huyton, & Sanders, 2012) and several of them are considered as typical indices of subjective well-being (Diener, 2006; Ryan, Huta, & Deci, 2008). However, past evidence has largely used single indices of subjective well-being which limits its assessment, whereas measures assessing different conceptions of subjective well-being are deemed more suitable (McDowell, 2010).

Importantly, existing evidence suggests that societal characteristics can influence citizens' subjective well-being (Oishi, 2012). Such societal characteristics go beyond wealth and income and can include rules about law and human rights, lower corruption, efficient and effective governments, and freedom and autonomy (Diener, Oishi, & Lucas, 2015). In this line, Bradshaw, Martorano, Natali and De Neubourg (2013) found that an association between subjective well-being and other domains at a country level and suggested that subjective well-being indicators should be compared across countries as they are influenced by several cultural factors. This was further corroborated by Klocke, Clair and Bradshaw (2014) who indicated that the effects of child characteristics on subjective well-being vary across countries.

This evidence suggests that the form of societal structures, e.g., the school structure, may influence children's perceptions of subjective well-being. To address this issue, the present study investigated subjective well-being across two countries, Greece and UK, with notable differences in their school systems. More specifically, the present study aims to investigate the determinants of two indices of subjective well-being in school children in Greece and UK.

### *Self-determination theory*

Self-determination theory (SDT; Ryan, 1995; Deci & Ryan, 2000; Ryan & Deci, 2017) is one of the theories that have been widely used to understand the functions which keep people moving towards an action. According to SDT there are three innate and inborn psychological needs which have to be satisfied by people in order to achieve psychological growth, integrity and mental health. The satisfaction of these needs underlies human goal-directed behavior and determines the individual's effort and persistence on a task.

The first of these needs is the freedom individuals experience when they feel that their actions are endorsed by them (*autonomy*); the second is the sense of the possession of a required skill, the sense of qualification or sufficient knowledge of a task, or the sense of ability (*competence*); and the last reflects the need to feel connected to others, love and care others as well as being loved and cared for (*relatedness*). Therefore, SDT suggests that people have a tendency to try to achieve goals, and to be involved in relationships or domains which fulfill their needs. Depending on the degree they are able to come across such opportunities they experience or they do not experience, positive psychological effects (Deci & Ryan, 2000; Ryan & Deci, 2017). Contexts which do not facilitate conditions that support feelings of volition, feelings of success at challenging tasks and feelings of belonging and experiencing affection in a reference group, reduce the sense of need satisfaction and diminish growth and well-being (Bartholomew, Ntoumanis, & Ryan, 2011a; Healy, Ntoumanis, Veldhuijzen Van Zanten, & Paine, 2014; Gunnell, et al., 2013).

Moreover, SDT proposes that the amount and the quality of need satisfaction also activate different types of motivation (i.e., autonomous vs controlled motivation) which in turn are related to cognitive, affective and behavioral responses. Autonomous motivation reflects engagement in a behavior due to personal choice, personal endorsement, interest, and satisfaction, whereas controlled motivation, refers to behavior engagement for gaining rewards approval from others or avoiding punishment and negative

feelings (Hagger et al., 2014). Autonomy satisfaction conditions steer to self-directed forms of motivation, whereas autonomy thwarting ones steer to controlled forms of motivation (Ryan, & Deci, 2000a; Ryan & Deci, 2008). Similarly, competence and relatedness need satisfaction are considered to be essential for both self-determined and controlled forms of motivation (Ntoumanis, 2001). Therefore, the theory suggests that an autonomy need satisfaction can also enable beneficial effects for the needs for competence and relatedness (Baard, Deci, & Ryan, 2004; Deci et al., 2001).

Existing studies following psychological needs approach, have already proved the association of the needs' fulfilment with happiness and well-being in various social contexts and cultures (Deci & Ryan, 2008). For example, Tay and Diener (2011) noticed that the satisfaction of the three psychological needs described in self-determination theory was strongly linked with high positive feelings and the reduction of negative feelings in eight different cultures. Moreover, Chirkov (2007, 2009) and Lynch (2010) focusing on the need for autonomy, detected its universal beneficial role for people's psychological well-being, emotional state and positive functioning and Ratelle with her colleagues (2013), who investigated the effects of autonomy's satisfaction in university domains, also stressed the importance of autonomy satisfaction for students' emotional state and for life satisfaction in general.

In addition, the structure and the teacher initiated climate was found to be an important determinant of students' need satisfaction. Past evidence showed that the way physical educators behave, the teaching styles they use (*i.e.*, *student-centered/teacher-centered, productive/reproductive*; Mosston, & Ashworth, 1986), and the decision-making opportunities they provide to students, are related to students' perceptions about the lesson and support or not, their sense of volition and autonomy (Cheon, Reeve & Moon, 2012). Similarly, by taking into account the students' self-referenced standards to decide about the difficulty of the tasks at hand and by providing useful feedback and instructions, teachers can also help students experience feelings of competence and improve performance. In this line, when teachers demonstrate caring and personal interest for every student, they support the fulfillment of students' need for relatedness (Reeve, 2009; Reeve & Jang, 2006; Van den Berghe, Vansteenkiste, Carbon, Kirk, & Haerens, 2014).

Adopting this line of evidence, a large body of research focused on the utility of SDT on various educational settings, aiming at the construction of effective learning environments and better understanding pupils' motivation and behaviour (e.g. Deci Hodges, Pierson, & Tomassone, 1992; Guay & Vallerand, 1996; Liu, Wang, & Ryan, 2016; Ryan & Deci, 2013; Yu, Li, Wang, & Zhang, 2016). In this line, several studies evidenced that in autonomy sup-

porting environments people experience more need satisfaction, which in turn positively affects their responses and psychological wellness (Adie, Duda, & Ntoumanis, 2008; 2012; Baard, Deci, & Ryan, 2004; Deci et al., 2001; Reinboth, Duda, & Ntoumanis, 2004). This positive influence of autonomy support on need satisfaction has been also verified in educational settings (Niemec & Ryan, 2009; Standage, Duda, & Ntoumanis, 2005). Furthermore, autonomy support and need satisfaction successfully predicted students' and athletes' cognitive and behavioural responses (e.g. Delrue, et al., 2017; Frederick & Ryan, 1995; Hagger & Chatzisarantis, 2007; Niven & Markland, 2016; Ntoumanis, 2001; Ntoumanis & Standage, 2009; Sebire, Jago, Fox, Edwards, & Thompson, 2013; Standage Duda, & Ntoumanis, 2005, 2006).

### *School structure in Greece and UK*

Although the educational systems of the two countries share several common principles, such as the development of the fundamental motor skills, socialization, engagement in sports activities, either individually or within a team, there are still notable differences. In Greece, physical education is mandatory throughout all the educational grades. Elementary school students are involved in 3 hours of PE per week in grades 1 to 4 and in 2 hours per week in grades 5 and 6. Accordingly, junior high school students participate in 2 hours of PE per week in grades 7 to 9 while senior high school students in 2 hours per week in grades 10 and 12 and in 1 hour per week in grade 11 (Greek Ministry of Education and Religious Affairs, 2019). In the UK there is no mandatory requirement for teaching of PE but instead it is only "strongly suggested" that all elementary school students should receive 75 min of PE within the curriculum and secondary students 90 min per week. The only statutory requirement within the National PE Curriculum is swimming. All students should be able to swim confidently and proficiently over a distance of at least 25 metres and use a range of strokes effectively (Gov. UK, 2019; Walker, 2019). Moreover, in Greece physical education is taught only by certified physical education teachers. According to law, general education teachers are not considered qualified to teach physical education, hence, they are not allowed to do so, apart from a few extreme cases like very small schools in remote areas (Greek Ministry of Education and Religious Affairs, 2019). On the other hand, in UK's elementary schools, physical education is typically taught by classroom teachers. Nowadays to a greater extent, classroom teachers who can cover physical education demands are displaced by sports coaches, who, although in many cases, have

received awards for excellence in sports they lack the pedagogical background of the lesson (Griggs & Randall, 2019; Randall, 2016; Smith, 2015).

### *The present study*

The above mentioned literature indicated that numerous studies commented on the positive association of SDT's needs satisfaction on motivational and behavioural variables within the context of PE. Still, only limited number of studies has investigated the association of autonomy support and need satisfaction in PE lesson on indices of students' psychological well-being. For instance, Mouratidis et al (2011) found that students reported higher levels of vitality in a need supportive PE lesson as compared to a typical lesson. Similarly, several studies have confirmed the positive relation between autonomy support and need satisfaction in PE on students' vitality (Bartholomew et al., 2011a; 2011b; Taylor & Lonsdale, 2010). On the other hand, there is rather limited evidence on other indices of well-being such as affect (Bartholomew, et al., 2011b) and life satisfaction (Diseth & Samdal, 2014). The present study aims to address this gap by investigating the association of motivation with indices of well-being that haven't been tested in the past in the physical education lesson (i.e., positive and negative affect, and happiness), although there is supporting literature in other contexts. Based on the previous literature on self-determination theory and subjective well-being, we hypothesized that the perceptions of autonomy support in the PE lesson would significantly relate to the satisfaction of students' needs for autonomy, competence and relatedness which in turn would positively relate to students' subjective happiness and affect (Figure 1).

Furthermore, existing research on subjective well-being indicated that country based differences may exist due to the structure of entities, such as school. On the other hand, past evidence under the lens of self-determination theory advocated for the universal utility of autonomy support and need satisfaction in positively influencing well-being indices (Taylor & Lonsdale, 2010). This approach is also in line with the universalist assumption in the study of quality of life (Herdman, Fox-Rushby, & Badia, 1998) arguing for the existence of genuine universal processes. However, several scholars adopt a more relativistic approach on the application of motivational dynamics suggesting that motivational processes largely rely on the interaction of several determinants (see Vansteekiste & Mouratidis, 2016).

The present study aims to contribute to this debate by further investigating the motivational process linking autonomy support, need satisfaction and well-being indices across two countries. This is among the few studies

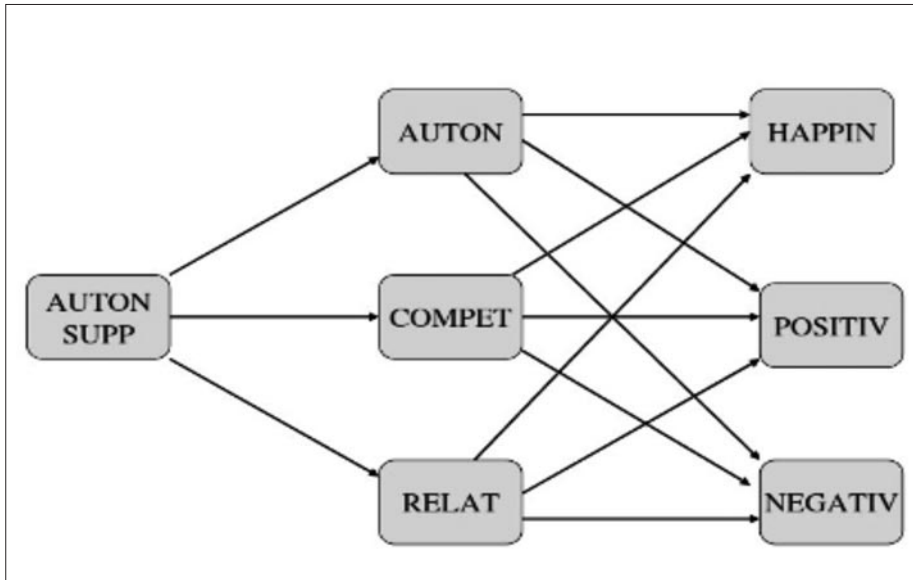


Fig. 1. - Initial postulated model.

that have compared such a model in school physical education across countries. Therefore, two countries representing different educational systems in physical education were compared, namely Greece and UK. Based on the above-mentioned literature on the universalism of motivational processes and despite the differences in the educational structures, it was hypothesized that the relation of autonomy support with need satisfaction and subjective well-being will be similar across the two countries.

## Method

### PARTICIPANTS

Seven hundred forty-three students (*boys* = 394, *girls* = 335, 14: *did not declare gender*) participated voluntarily in the study. The participants were elementary ( $N = 377$ ) and junior high school ( $N = 366$ ) students (*mean age*:  $11.95 \pm 1.57$ ) from Greece ( $N_{GR} = 381$ ) and UK ( $N_{UK} = 362$ ). The study was part of the “Pupil Health and Well-Being - an Education Priority for Europe’s Schools” KA2, Erasmus+ project.



## MEASURES

### *Need satisfaction in PE*

A measure used by Ntoumanis et al. (2017) was appropriately modified to measure students' need satisfaction in PE lessons. The scale includes items derived from three different measures to assess students' satisfaction of the three psychological needs of autonomy (5 items, e.g., "I have some choice in what I want to do in PE lessons"; Standage, Duda & Ntoumanis, 2003), competence (5 items, e.g., "I think I am pretty good at PE lessons"; McAuley, Duncan, & Tammen, 1989) and relatedness (5 items, e.g., "When participating in PE lessons I feel supported"; Richer and Vallerand, 1998). Participants responded on a 5-point Likert scale ranging from "*strongly disagree*" (1) to "*strongly agree*" (5). The scale has shown adequate psychometric properties in Greek language too (Ntoumanis et al., 2017).

### *Happiness*

The Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999) was used to measure students' perceptions of happiness. The scale comprises four items measuring global happiness and participants rate each item on a Likert scale, ranging from "*strongly disagree*" (1) to "*strongly agree*" (5). In the first item participants are asked to respond whether they consider themselves in general and compared to most of their peers. In the third and fourth items participants were asked to rate the extent to which the following descriptions apply to them: 'Some people enjoy life regardless of what is going on. They are getting the most out of everything' and 'Some people are generally not very happy. Although they are not depressed, they never seem as happy as they might be'. Participants were asked to 'circle the point on the scale that you feel is most appropriate in describing you'. The scale has shown adequate validity and reliability in the Greek language (Karakasidou, Pezirkianidis, Stalikas, & Galanakis, 2016).

### *Autonomy support in PE*

The Perceived Autonomy Support Scale for Exercise Settings (PASSSES; Hagger et al., 2007) was used to measure students' perceptions of autonomy support in PE lessons. The scale includes 12 items (e.g. "I feel that my PE teacher makes sure I really understand the goals of the lesson and what I need to do"). Students were asked to rate the extent to which their teacher supported their autonomy learning in the PE lesson. Responses were anchored on a 5-point scale ranging from "*strongly disagree*" (1) to "*strongly agree*" (5). The scale has been used in the past with Greek students and demonstrated satisfactory psychometric properties (Barkoukis, Hagger, Lambropoulos & Tsorbatzoudis, 2010).

### *Affect*

The Positive Affect Negative Affect Schedule (PANAS; Watson, Clark, & Tellegan, 1988). PANAS includes 20 items describing different affective experiences, namely afraid, scared, nervous, jittery, irritable, hostile, guilty, ashamed, upset, and distressed for negative affect and active, alert, attentive, determined, enthusiastic, excited, inspired, proud, strong and interested for positive affect. Participants were asked to report the extent to which they experienced each descriptor in the preceding week. Responses were made on a 5-point Likert scale ranging from "*not at all*" (1) to "*extremely*" (5). The scale has shown satisfactory psychometric properties with Greek populations (Daskalou & Syngolitou, 2012).



DATA ANALYSIS

Data analysis was conducted using SPSS 22.0 and MPlus 7.3. Descriptive statistics and internal consistency coefficients were estimated using SPSS 22.0. Data were presented as mean ± standard deviation (SD) of each parameter. To test for the effects of motivational climate and need satisfaction on indices of well-being a conceptual path model was created. The goodness-of-fit measures of the path analysis included the chi-square ( $\chi^2$ ), comparative fit index (CFI), the standardized root mean residual (SRMR) and the root mean square error of approximation (RMSEA). A non-significant  $\chi^2$  value denotes good model fit. However,  $\chi^2$  value is heavily influenced by sample size and is not considered as an appropriate cutoff criterion. The comparative fit index (CFI) was used as a focal index of goodness-of-fit, because of its desirable statistical properties, such as its standardized 0-1 range, small sample variability, and stability with various sample sizes (Bentler, 1990). Hu and Bentler (1999) suggested that the CFI scores above .90 represent adequate model fit and scores exceeding .95 show excellent model fit. Also, RMSEA scores below .06 indicate good fit, whereas scores below 0.08 indicate reasonable fit (Hu & Bentler, 1998).

Results

Cronbach alpha coefficients are presented in Table I. The four-item subjective happiness scale revealed low and unacceptable alpha. Instead the two first items demonstrated adequate internal consistency. Thus, in all further analyses these two items were used as an index of subjective happiness. Also, in Table I the means, standard deviations and correlation coefficients among the study's variables separately for the Greek and UK samples are presented. The results of the correlation analysis indicated that subjective happiness and positive affect were positively correlated with all psychological needs vari-

TABLE I  
Means, Standard Deviations, Reliability And Correlation Coefficients For The Study's Variables

	M (SD)	1	2	3	4	5	6	7
1. Autonomy	3.41 (.73) 3.36 (.79)	.72	.42**	.62**	.31**	.57**	.33**	-.10
2. Competence	3.86 (.76) 3.73 (.79)	.36**	.81	.48**	.30**	.40**	.39**	-.25**
3. Relatedness	3.44 (.74) 3.75 (.77)	.50**	.54**	.75	.25**	.58**	.34**	-.27**
4. Happiness	3.88 (.82) 3.84 (.94)	.25**	.24**	.19**	.67	.33**	.31**	-.28**
5. Autonomy support	3.62 (.79) 3.66 (.83)	.55**	.46**	.64**	.29**	.91	.42**	-.26**
6. Positive	3.67 (.82) 3.54 (.83)	.46**	.56**	.42**	.25**	.53**	.86	-.16**
7. Negative	1.74 (.69) 2.03 (.81)	-.08	-.12*	-.19*	-.10	-.18*	-.14*	.85

Note: M = mean, SD = standard deviation for the GR sample; above row and for the UK sample; below row, \*\*  $p < .001$ , \*  $p < .05$ . Cronbach's coefficients for the total sample are presented in the diagonal. Correlations coefficients for the GR sample: left-down and for the UK sample: right-up.

ables and with supportive climate in PE for both Greek and UK samples. On the other hand, negative affect was negatively correlated with competence, relatedness, autonomy support in PE and positive affect for the Greek sample and competence, relatedness, happiness, autonomy support in PE and positive affect for the UK sample. The highest positive correlation in Greek sample was noticed between relatedness and autonomy support in PE (.64) and the highest negative correlation between relatedness and negative affect (-.19). Similarly, the highest positive correlation in UK sample was noticed between autonomy and relatedness (.62) and the highest negative correlation between happiness and negative affect (-.28).

Path analyses were conducted using Mplus version 7.3 (Muthén & Muthén, 2012). The fit of the initial model to the data produced mixed results (Table II). In particular, whereas CFI and SRMR denoted a good fit, RMSEA value was well above the recommended cut-off score. Examination of the model parameters revealed that the paths from “autonomy” to “negative affect” and from “relatedness” to “happiness” were not statistically significant ( $p = .981$  and  $p = .234$  respectively). Moreover, modification indices suggested that the fit of the model could be improved if a direct path from “autonomy support” to “positive affect” introduced to the model. The proposed modifications were largely in line with theoretical predictions (Barkoukis et al., 2010) and, thus, the initial model was re-specified and the analysis was rerun (Modified model 1).

Results showed a remarkable reduction in the chi-square value, accompanied by an improvement of all fit indices (Table II). The introduced path from “autonomy support” to “positive affect” yielded a substantial and significant value (standardized value = .253,  $p < .001$ ), which further justified its addition to the model. Inspection of the model parameters revealed that the

TABLE II  
Fit Indices For The Examined Path Models

Models	$\chi^2$	df	RMSEA	90%CI	CFI	SRMR	AIC
Initial	70.14	6	.128	.102-.155	.945	.044	7712.65
Modified 1	40.12	7	.085	.061-.111	.971	.039	7680.64
Modified 2	40.26	8	.078	.055-.103	.972	.039	7678.77
GR	11.53	8	.036	.000-.078	.995	.027	3790.55
GR modified	11.61	9	.029	.000-.071	.996	.028	3788.63
UK	33.07	8	.100	.066-.136	.954	.049	3786.16
UK modified	33.62	9	.093	.061-.128	.955	.050	3784.71
Configural	45.23	18	.068	.043-.093	.978	.040	7573.34
Path invariance	50.88	25	.056	.034-.078	.979	.049	7564.99

path from “relatedness” to “positive affect” was not statistically significant ( $p = .709$ ). This path was excluded from the model and the analysis was rerun (Modified model 2). Despite the fact that the chi-square value did not essentially change, all fit indices were now within the acceptable range. Moreover, the AIC index clearly indicated that the final model should be retained.

At the next step of the analysis the derived model from the above procedure was separately fitted to Greek and UK students. With regards to the Greek sample, results suggested an excellent fit to the data. Examination however of the model parameters showed that the path from “competence” to “negative affect” was not statistically significant ( $p = .780$ ). This path dropped from the Greek sample and the analysis was conducted again. The new fit indices are presented in Table II.

Results regarding the UK sample showed mixed findings. Whereas CFI and SRMR indicated a good fit the RMSEA value was above the accepted cut-off value. Moreover, the path from “autonomy” to “positive affect” did not reach statistical significance ( $p = .480$ ). This path was excluded from the UK sample and the analysis was rerun. Although the fit did not remarkably change it represents the best-fitted model for the UK sample.

The analysis proceeded by simultaneously fitting the model to both UK and Greek sample, with no additional constraints. It should be noted that the two non-significant paths were taken into account. Results showed a reason-

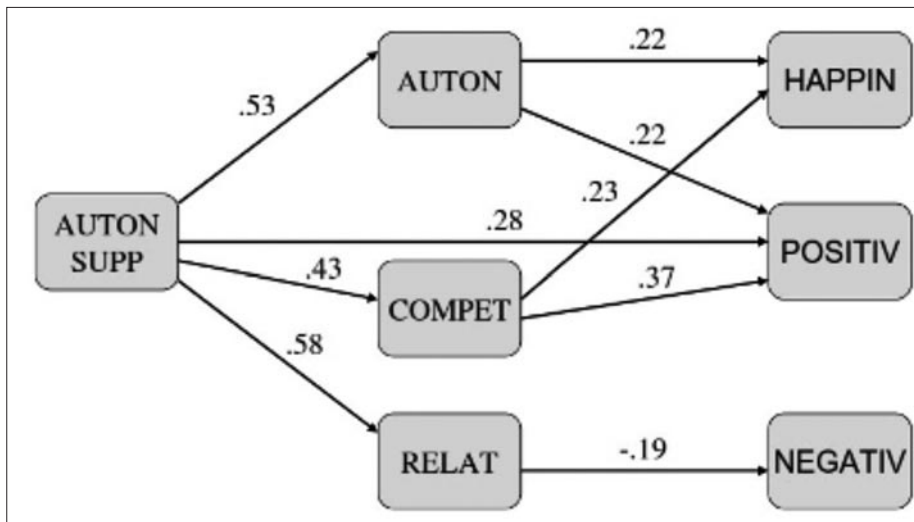


Fig. 2. - Standardized path coefficients for the Greek sample.

TABLE III  
Standardized Path Coefficients For The Greek And UK Students

	GR	UK
Autonomy on Autonomy support	.528	.528
Competence on Autonomy support	.429	.429
Relatedness on Autonomy support	.580	.580
Positive affect on Autonomy support	.276	.276
Happiness on Autonomy	.221	.221
Happiness on Competence	.228	.228
Positive affect on Competence	.366	.366
Negative affect on Relatedness	-.186	-.186
Positive affect on Autonomy	.224	-
Negative affect on Competence	-	-.202

able fit of the model to the data (Table II) suggesting equal form of paths between the two countries. Next, all paths were constrained to be equal among the two nations. Findings indicated an acceptable fit. Moreover chi-square difference was not statistically different from the configural model ( $\Delta\chi^2 = 5.65$ ,  $df = 7$ ,  $p = .419$ ), supporting the invariance of the path coefficients. Table III presents the standardized path values for the examined model. All paths were statistically significant and their direction in line with the theory. The strongest paths were from “autonomy support” to “relatedness” and to “autonomy”, whereas the weakest from “relatedness” to “negative affect”.

## Discussion

Children’s well-being is an important priority for parents, teachers and the state.

School can play an important role in promoting students’ well-being. Based on SDT, the present study was designed to investigate the association of teacher initiated motivational climate and need satisfaction in physical education on indices of students’ well-being and test the invariance of this motivational model in two countries with different educational systems with respect to physical education. The results of the analyses supported SDT predictions about the positive association of autonomy supportive way of teaching and need satisfaction with students’ well being. These associations were invariant across the two countries, Greece and UK.

More specifically, autonomy support positively predicted students’ need satisfaction. This is in line with theoretical predictions and prior research evidence (Niemec & Ryan, 2009; Standage, Duda, & Ntoumanis, 2005) empha-

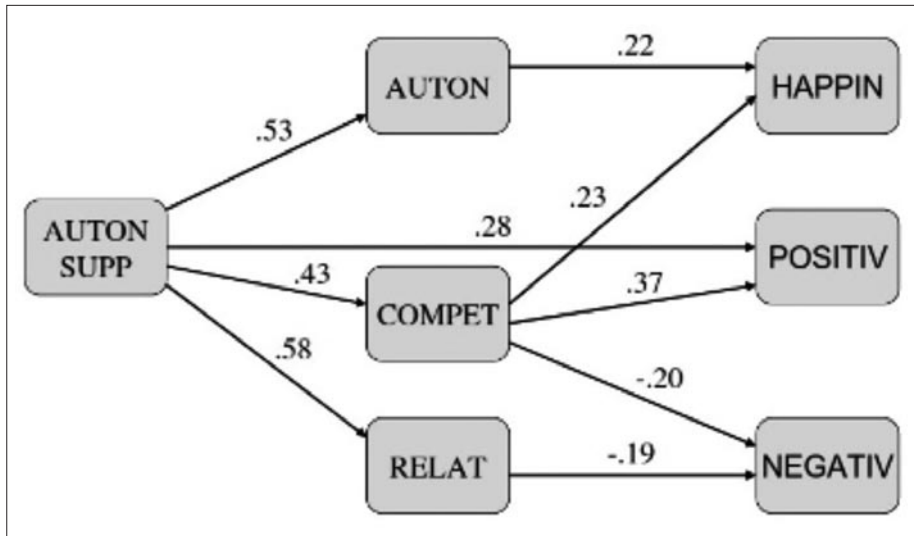


Fig. 3. - Standardized path coefficients for the UK sample.

sizing that the provision of autonomy in educational settings results in the satisfaction of all three basic psychological needs. This finding explicitly shows that physical education teachers should endorse an autonomy supportive interpersonal teaching style in order to achieve students' need satisfaction. Strategies including providing rationales, offering encouragements and hints, being responsive and allowing sufficient time to students to talk and express their experiences have been found effective in promoting students' autonomy support (Reeve & Jang, 2006).

Importantly, autonomy support was directly linked with positive affect. This finding implied that when students feel autonomous they experience more positive feelings during their participation in the lesson. This is consistent with past research indicating that provision of autonomy support in educational settings increases students' enjoyment during the lesson and leisure-time motivational regulations (Barkoukis et al., 2010; Black & Deci, 2000; Grastén, Jaakkola, Liukkonen, Watt, & Yli-Piipari, 2012, Liukkonen, Barkoukis, Watt, & Jaakkola, 2010). Although this effect has been usually mediated by need satisfaction and motivational regulations these findings suggest the strong effect teacher-initiated climate can have on students' emotional responses. These findings further support the benefits of establishing autonomy support in physical education lessons.

In support of the study's hypotheses, need satisfaction positively predicted the well-being indicators that were examined: positive affect, subjective happiness, and negative affect. These findings imply a positive relation between need satisfaction and the dimensions of students' well-being. This is in line with SDT theorizing and past evidence showing that need satisfaction serves as an important determinant of well-being (Deci et al., 2001; Reinboth, Duda, & Ntoumanis, 2004). Furthermore, this finding extended previous evidence reporting a positive effect of need satisfaction on vitality (Bartholomew, Ntoumanis, & Ryan, 2011a; 2011b; Mouratidis, Vansteenkiste, Sideridis, & Lens, 2011; Taylor & Lonsdale, 2010) and suggests a similar positive relationship with other indices of well-being such as subjective happiness and positive affect. Jointly these findings support SDT premises that psychological need satisfaction promotes well-being and psychological growth (Vansteenkiste & Ryan, 2013).

Interestingly, autonomy and competence need satisfaction were positively related with the indicators of well-being that were examined, whereas relatedness need satisfaction was negatively associated with negative affect. Furthermore, relatedness was not associated with positive affect and happiness. According to Howell, Chenot, Hill and Howell (2011) relatedness was positively associated with happiness. However, the Howell et al. (2011) study showed an absence of association between competence need satisfaction and happiness. From a theoretical standpoint, the findings of the present and Howell et al. studies may imply that the satisfaction of different needs produces differential responses during activity engagement. In addition, need satisfaction may differentially relate to well-being in different contexts. If this is the case, future studies should further investigate the satisfaction of each need, or group of needs, separately, on students' functioning in physical education (Mouratidis, Barkoukis, & Tsorbatzoudis, 2015). From a practical point of view, this finding highlights the important role of relatedness need satisfaction in students' responses during the lesson. More specifically, physical education teachers should promote social interactions and cooperation among the students and between the teacher and the students. This way, students' negative affective experiences can be diminished.

Besides investigating a model with predictors of well-being the present study was also designed to test for the model invariance across two countries, Greece and UK. The results of the analyses confirmed model's invariance with the exception of two paths. More specifically, a significant positive path from autonomy need satisfaction on positive affect emerged for the Greek sample, but not the UK one. This finding may imply that for Greek students' feelings of autonomy result in positive affective experiences during the les-

son. Additionally, a significant negative path from competence need satisfaction on negative affect was found in the UK sample but not in the Greek one. This might imply that in UK physical education lessons focus on competence development and, therefore, when students feel competent negative emotions are diminished. Overall, these findings support the universal function of motivation indicators, such as autonomy support and need satisfaction (Taylor & Lonsdale, 2010) and their association with well-being (Herdman et al., 1998). The differences found may be attributed to the different curricula that may have influenced the motivational process. For instance, in UK the lesson is largely taught by sport coaches who focus on competence development which may influence relevant beliefs and emotions, such as pride, self-esteem, and self-worth.

Overall, the results of the analyses supported the universal effect of motivational processes on well-being indices (Taylor & Lonsdale, 2010). Also, they support the universalist assumption in the study of quality of life (Herdman, Fox-Rushby, & Badia, 1998). The model showed a remarkable similarity between the two countries in terms of the common paths and their loadings indicating that this motivational sequence is genuine universal in these countries. In addition, the universal nature of the three psychological needs, their antecedents and consequences was supported (Deci & Ryan, 2014; Ryan & Deci, 2000).

The study is not free of limitations. Firstly, the study is correlational in nature and causal inferences can't be made. Future studies should manipulate motivational climate and investigate its effect on well-being. Also, future studies should test the differentiated relation of the satisfaction of psychological needs with well-being indices. Secondly, we acknowledge that our data have a hierarchical structure, that is students were nested within classrooms. Unfortunately, during the data collection procedure we didn't associate students with their classroom. As a result, we didn't have the necessary information to calculate the intraclass correlation coefficient in order to understand the extent to which a correction of the standardized errors of the estimated parameters is warrant. Ignoring the nested structure of the data underestimates the standard errors, leading to an increase of statistically significant results (Hox, Moerbeek, & Van de Schoot, 2010). The fact that some estimated parameters were not statistically significant despite the relatively large sample sizes might suggest that not taking into consideration the hierarchical structure of the data had a minor effect on the results. Of course, future studies on the same or similar topic should pay close attention on the inherently hierarchical structure of data and examine the need for a multilevel approach. Furthermore, only need satisfaction was measured.



Recent evidence suggested that need thwarting can also relate to well-being and assist in a more complete understanding of the motivational processes underpinning well-being (Bartholomew Ntoumanis, & Ryan, 2011a; 2011b). In addition, only two indices of well-being were measured. Well-being is a global construct that incorporates several facets. Thus, a study testing only a couple of these facets doesn't provide a clear picture of students' well-being. Future studies should measure more indicators of well-being to capture the entirety of the construct. Nevertheless, the present study provided strong evidence on the motivational determinants of well-being suggesting that autonomy support and need satisfaction in physical education are positively associated with students' well-being. Furthermore, this motivational model is invariant across Greek and UK students.

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