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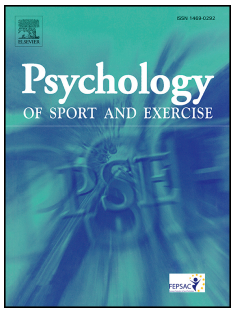

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Students' Perceptions of Autonomy-Supportive Versus Controlling Teaching and Basic Need Satisfaction Versus Frustration in Relation to Life Skills Development in PE

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Students' Perceptions of Autonomy-Supportive Versus Controlling Teaching and Basic Need Satisfaction Versus Frustration in Relation to Life Skills Development in PE

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Abstract

Objectives: The aim of this study was to examine the relationships between perceived teacher autonomy support versus control and students' life skills development in PE, and whether students' basic need satisfaction and frustration mediated these relationships.

Design: Cross-sectional study.

Method: English and Irish students (N = 407, Mage = 13.71, SD = 1.23) completed measures assessing perceived autonomy-supportive and controlling teaching, basic need satisfaction and frustration (autonomy, competence, and relatedness), and life skills development in PE (teamwork, goal setting, social skills, problem solving and decision making, emotional skills, leadership, time management, and interpersonal communication).

Results: On the bright side of Self-Determination Theory (SDT), correlations revealed that perceived teacher autonomy support was positively associated with students' basic need satisfaction and life skills development in PE. On the dark side of SDT, perceived controlling teaching was positively related to students' basic need frustration, but not significantly related to their life skills development. Mediational analyses revealed that autonomy and relatedness satisfaction mediated the relationships between perceived teacher autonomy support and students' development of all eight life skills. Competence satisfaction mediated the relationships between perceived teacher autonomy support and students' development of teamwork, goal setting, and leadership skills.

Conclusions: Our findings indicate that satisfaction of the needs for autonomy, competence, and relatedness are important mechanisms that in part explain the relationships between perceived teacher autonomy support and life skills development in PE. Therefore, teachers may look to promote students' perceptions of an autonomy-supportive climate that satisfies their three basic needs and helps to develop their life skills.

Keywords: positive youth development; psychosocial skills; PE teaching.

Throughout the world, the personal development of students is seen as a key aim of the PE curriculum (Hardman, 2011). Such personal development can be conceptualised in terms of the life skills young people learn through PE (Goudas, 2010). Life skills are defined as the skills required to deal with the demands and challenges of everyday life (Hodge & Danish, 1999). In line with Danish, Forneris, and Wallace (2005), we viewed life skills as behavioral, cognitive, interpersonal, and intrapersonal competencies that can be learned, developed, and refined. Examples of life skills include teamwork, goal setting, leadership, and social skills. These life skills are important for young people to develop as they are viewed as individual capital which enhances people's educational attainment, quality of life, and future economic prosperity (Bailey, Hillman, Arent, & Petitpas, 2013).

PE has been proposed as a good setting for students to develop their life skills (Goudas, 2010). Such a proposition seems likely as numerous researchers have found that a range of different sports (like those experienced in PE) can help young people to develop their life skills (for review articles, see Holt et al., 2017; Johnston, Harwood, & Minniti, 2013). Like sport, it is probable that the interactive (e.g., working with others), social (e.g., socialising with peers), and emotional (e.g., dealing with frustration) nature of PE provides opportunities for development (Danish, Forneris, Hodge, & Heke, 2004; Hellison, Martinek, & Walsh, 2008; Fraser-Thomas, Côté, & Deakin, 2005). Supporting this idea, several researchers have suggested that the demands and experiences of the sports participated in during PE provide opportunities for students' life skills development (Goudas, 2010; Gould & Carson, 2008). Based on the research literature (e.g., Bean, Kramers, Forneris, & Camiré, 2018), life skills also need to be actively taught or promoted during PE for students' life skills development to be optimised. The proposition that students develop their life skills through PE is also supported by some research studies. For instance, researchers have found that student-centered models of learning (i.e., the Sport Education Model and Cooperative

Learning) help students develop the following life skills: teamwork, communication, social skills, leadership, and problem solving and decision making (Dyson, Griffin, & Hastie, 2004; Smither & Zhu, 2011). Common among these forms of PE are activities which allow students to make decisions that affect their PE classes, organise and manage the lessons, work cooperatively in small groups, help peers to learn, and take on leadership roles (Dyson et al., 2004). Goudas and Giannoudis (2008) also demonstrated that life skills programs implemented in PE can help students to learn goal setting and problem solving skills. In a recent study, Cronin, Allen, Russell, and Mulvenna (2018) found that students' perceptions of teacher autonomy support were directly related to the development of the following life skills in PE: teamwork, goal setting, social skills, problem solving and decision making, emotional skills, leadership, time management, and interpersonal communication. Nonetheless, when compared to sport, the research on life skills development in PE is far less extensive and, as a result, we know little about why students may develop particular life skills through PE. Therefore, it is important that researchers conduct theory-based studies that investigate the mechanisms by which young people may develop specific life skills through PE.

A theory that lends itself to investigating life skills development is SDT (Ryan & Deci, 2017; Hodge, Danish, & Martin, 2012). Through SDT, Ryan and Deci (2017) propose that people have inherent tendencies towards development and optimal functioning if certain environmental conditions are present (Vansteenkiste & Ryan, 2013). One key aspect of the PE environment is a teacher's interpersonal style (Liu, Bartholomew, & Chung, 2017), which can be conceptualised in terms of autonomy-supportive and controlling teaching (Reeve, 2006). Autonomy-supportive behaviors refer to the teacher adopting a student's perspective, providing choice in the activities, acknowledging students' feelings, promoting the use of initiative and problem solving, encouraging students to work together and independently, and providing a rationale for particular tasks (De Meyer et al., 2016; Mageau & Vallerand, 2003).

Conversely, controlling teaching involves the teacher instructing in a way that pressures students into thinking, feeling, and behaving in teacher-prescribed ways (Reeve, 2016). Via SDT, Ryan and Deci (2017) suggest that taking part in any activity can have positive effects on people's development when combined with autonomy support; whereas, controlling behaviors can have detrimental effects (Reeve, Deci, & Ryan, 2004). Several researchers have found that students' perceptions of teacher autonomy support are positively related to a range of outcomes in PE including: greater student engagement (De Meyer et al., 2016); autonomous motivation (Standage & Gillison, 2007); subjective vitality (Liu et al., 2017); prosocial behavior (Cheon, Reeve, & Ntoumanis, 2018); and life skills development (Cronin et al., 2018). In contrast, perceptions of controlling teaching have been negatively associated with PE students' engagement (De Meyer et al., 2016), autonomous motivation (Haerens et al., 2015), subjective vitality (Liu et al., 2017), and prosocial behavior (Cheon et al., 2018). In a recent study, Haerens et al. (2018) also showed that a combination of a high level of perceived teacher autonomy support and a low level of perceived control leads to the best outcomes for PE students. Based on the above findings, autonomy support is viewed as an important interpersonal/communication skill for PE teachers to learn and develop (Curran & Standage, 2017; Ntoumanis, Quested, Reeve, & Cheon, 2017).

Within SDT, Ryan and Deci (2017) highlight that a second key aspect of the PE environment is the degree to which students' three basic needs for autonomy, competence, and relatedness are satisfied or frustrated (Haerens, Aelterman, Vansteenkiste, Soenens, & Van Petegem, 2015). Autonomy satisfaction involves the student feeling empowered and self-directed in their behavior, competence satisfaction refers to the student feeling effective in the PE environment, and relatedness satisfaction involves the student having warm and caring relationships with fellow students and the teacher/s (Cheon, Reeve, & Song, 2016). Conversely, autonomy frustration pertains to the student feeling pressured or forced to take

part in activities, competence frustration involves feeling ineffective or inadequate in PE, and relatedness frustration refers to the student feeling rejected or excluded by fellow students or the teacher/s (Cheon et al., 2016). Importantly, satisfaction of the three needs are seen as necessary nutriments for young people's psychological development (Curran & Standage, 2017). Within their conceptual model of life skills development, Hodge et al. (2012) also articulated that satisfaction of the three needs are the key underlying mechanisms that contribute to peoples' life skills development. Specifically, these researchers outlined possible relationships between the three basic needs and peoples' teamwork, social, problem solving and decision making, and interpersonal communication skills.

Both the positive and negative aspects of SDT have been highlighted by several researchers applying the theory to sport and PE (e.g., Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Cheon, Reeve, & Ntoumanis, 2018; Haerens et al., 2015). As part of SDT, Jang, Kim, and Reeve (2016) suggested that the dual-process model illustrates the 'bright' and 'dark' side of the theory which involves two parallel processes (Cheon et al., 2016). The first process involves a bright pathway which indicates that teacher autonomy support satisfies students' needs for autonomy, competence, and relatedness; which, in turn, has positive effects on students' adaptive outcomes in PE. In other words, teacher autonomy support fosters an individual's development because it nurtures their needs for autonomy, competence, and relatedness (Vansteenkiste & Ryan, 2013). The second process involves a dark pathway which indicates that controlling teaching frustrates students' needs for autonomy, competence, and relatedness; and, in turn, has negative effects on students' adaptive outcomes in PE. Supporting these propositions, researchers have shown that the bright pathway is positively associated with adaptive student outcomes in PE such as increased engagement (Cheon et al., 2016; Jang et al., 2016), autonomous motivation (Haerens et al., 2018; Standage, Duda, & Ntoumanis, 2005), self-esteem (Standage &

Gillison, 2007), and subjective vitality (Liu et al., 2017). Researchers focusing on youth swimming and soccer have also found positive associations between the coaching climate, need satisfaction, and participants' development of goal setting, leadership, and emotional skills (Coatsworth & Conroy, 2009; Taylor & Bruner, 2012). Although fewer studies have been conducted on the dark pathway (Haerens et al., 2015), researchers have highlighted that the dark pathway can have inverse relationships with positive outcomes in PE such as students' engagement (De Meyer et al., 2016), autonomous motivation (Haerens et al., 2015), and subjective vitality (Liu et al., 2017). Such findings align with Vansteenkiste and Ryan's (2013) overview of SDT, which highlighted that need frustration can serve to hinder a person's growth and development. More specifically, Cheon et al. (2018) proposed that the dual-process model predicts mild but significant cross-over effects that include controlling teaching and need frustration diminishing positive outcomes in PE.

Taking into account the research outlined above, the present study extended these findings on the bright and dark sides of SDT into the less researched area of life skills development in PE. This is an important contribution as Van den Berghe, Vansteenkiste, Cardon, Kirk, and Haerens (2014) suggested in their review of the SDT in PE literature that investigating a broader set of learning outcomes would be an important step forward for PE research and teaching. Life skills development is a particularly novel outcome as Van den Berghe et al. (2014) highlighted that most studies have focused on the following learning outcomes: motor outcomes, affective outcomes, engagement, effort, and activity levels. The current study is the first to investigate if the bright and dark side of SDT help explain the mechanisms by which students may develop their life skills through PE.

The Present Study

The purpose of this study was to investigate students' life skills development in PE using SDT as a theoretical framework. Our first aim was to investigate whether perceived

teacher autonomy support was positively related to students' basic need satisfaction and life skills development in PE (i.e., to assess the bright side of SDT). Based on the propositions of various researchers (e.g., Hodge et al., 2012; Vansteenkiste & Ryan, 2013) and findings from youth sport (e.g., Taylor & Bruner, 2012), we hypothesized that basic need satisfaction would mediate the positive relationships between students' perceptions of teacher autonomy support and their life skills development in PE. Our second aim was to assess whether perceived controlling teaching and basic need frustration were negatively related to students' life skills development in PE (i.e., to assess the dark side of SDT). Based on previous research (e.g., De Meyer et al., 2016; Liu et al., 2017), we hypothesized that basic need frustration would mediate the negative relationships between students' perceptions of controlling teaching and their life skills development in PE.

Methods

Participants

The participants were 407 PE students (M_{age} = 13.71, *SD* = 1.23, range = 12–17 years) who completed measures of perceived autonomy-supportive and controlling teaching, basic need satisfaction and frustration, and life skills development in PE. The sample included male (*n* = 217) and female (*n* = 189) students (one student failed to indicate their gender) from five schools in England and one school in Ireland. Participants were predominantly English (70.0%) and Irish (17.0%), with a small number of other ethnicities included in the sample (e.g., Indian, Pakistani, and Filipino). The students took part in PE for an average of 2.05 hours per week (*SD* = 0.76) and 28.7% of the sample were taking PE as an exam subject. In total, 39 teachers and 44 classes were included in the sample with an average of 9.3 students per class. Although the pedagogical approach of the teachers was not assessed, none of the PE departments indicated that their teachers focused on life skills in their lessons. In PE lessons, the students participated in a wide range of sports including soccer, cricket,

Gaelic football, gymnastics, dance, basketball, volleyball, track and field, swimming, tennis and badminton. Overall, 78.2% of students took part in sport outside of PE, which included students participating in between 1–7 different sports (M_{sports} = 1.5, *SD* = 1.21) for an average of 4.54 hours per week. In terms of exercise, 71.8% of students engaged in other forms of exercise (e.g., walking, cycling, going to the gym) for an average of 3.12 hours per week. Outside of PE, 19.7% of students participated solely in sport, 13.3% participated solely in exercise, 58.5% participated in sport and exercise, and 8.6% did neither sport nor exercise.

Measures

Autonomy-supportive and controlling teaching. Students' perceptions of autonomy-supportive teaching were assessed using a 10-item scale (see supplementary materials). Five items in this scale were created based on Mageau and Vallerand's (2003) review article outlining the definition and components of coach autonomy support; three items were drawn from Appleton, Ntoumanis, Quested, Viladrich, and Duda's (2016) Empowering and Disempowering Motivational Climate Questionnaire; and two items were from the Sport Climate Questionnaire (Deci, 2001). Example items in the autonomy support scale included "Gives students choices and options" and "Encourages students to ask questions". Students' perceptions of controlling teaching were assessed using the 10-item controlling subscale of the Empowering and Disempowering Motivational Climate Questionnaire (Appleton et al., 2016) which was modified for the PE setting. Example items included "Is less supportive of students when they are not performing well in PE" and "Threatens to punish students to keep them in line during PE classes". The item stem used for both scales was "My PE teacher…" and participants responded on a scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Appleton et al. (2016) previously evidenced the validity and reliability of the controlling scale with youth sport participants. After removing one controlling item ("Mainly uses rewards/praise to make students complete all the tasks

he/she sets during PE classes") with a poor factor loading (< .40), confirmatory factor analysis (CFA) indicated that a two-factor model (including perceived autonomy-supportive and controlling teaching) provided an adequate fit according to Marsh, Hau, and Wen's (2004) recommendations for assessing model fit (see supplementary materials). The alpha values for the two scales were as follows: autonomy-supportive teaching (α = .94) and controlling teaching (α = .90).

Basic needs satisfaction and frustration. Need satisfaction and frustration were assessed using the PE version (Haerens et al., 2015) of the Basic Needs Satisfaction and Frustration Scale (Chen et al., 2015). This 24-item scale has the following item stem "During PE lessons..." Using four items for each factor, the scale assesses autonomy satisfaction ("I feel a sense of choice and freedom in the things I undertake"), competence satisfaction ("I feel competent I can do the exercises well"), relatedness satisfaction ("I feel close and connected with the class members that are important to me"), autonomy frustration ("I feel obligated to do certain things"), competence frustration ("I feel insecure about my abilities"), and relatedness frustration ("I feel excluded from the group I want to belong to"). Participants responded on a scale ranging from 1 (*not true at all*) to 7 (*completely true*). Haerens et al. (2015) have provided evidence for the validity and reliability of this scale. Our CFA analysis demonstrated that a model consisting of two higher-order factors (need satisfaction and frustration) and six lower-order factors (autonomy, competence, and relatedness satisfaction; and autonomy, competence, and relatedness frustration) provided an adequate fit (see supplementary materials). The alpha values for the six subscales – along with total need satisfaction and frustration – ranged from .85 to .92.

Life skills development. The 43-item Life Skills Scale for Sport (Cronin & Allen, 2017) was used to measure students' perceived life skills development. As the measure was originally developed for sport, the adapted item stem was: "PE classes have taught me to…"

Example items included: teamwork (7 items; “work well within a team/group”), goal setting (7 items; “set challenging goals”), social skills (5 items; “get involved in group activities”), problem solving and decision making (4 items; “think carefully about a problem”), emotional skills (4 items; “use my emotions to stay focused”), leadership (8 items; “organise team/group members to work together”), time management (4 items; “manage my time well”), and interpersonal communication (4 items; “speak clearly to others”). Participants responded on the following scale: 1 (*not at all*), 2 (*a little*), 3 (*some*), 4 (*a lot*), and 5 (*very much*). The factorial validity and internal consistency reliability of this scale has been supported with PE students (Cronin et al., 2018). In the present sample, CFA indicated that an eight-factor model including all eight life skills provided an adequate fit (see supplementary materials). The alpha values for the eight subscales ranged from .90–.94.

Procedures

Following approval from Edge Hill University’s ethics committee (approval number = SPA-REC-2016-366), schools were recruited, and the data collection took place in PE lessons and form classes (i.e., classes used to take attendance and prepare for the school day) during the middle of the autumn school term. Prior to students completing the survey, informed consent was obtained from either the student (if > 16 years) or the student’s parent or guardian (if < 16 years). Students completed the survey after the researcher gave a standardised introductory statement which explained the purpose of the study, that neither their name nor their teacher’s name was required, there were no right or wrong answers, and all information would be kept confidential. The survey took approximately 15–20 minutes to complete.

Statistical Analyses

SPSS Version 25.0 (IBM Corporation, 2017) was used for our preliminary analyses, descriptive statistics, and to calculate correlations between the study variables. MLwiN

Version 3.01 (Rasbach, Steele, Browne, & Goldstein, 2017) was used to assess whether multilevel analyses would be appropriate with the data. Specifically, we calculated intraclass correlation coefficients (ICCs) at the school and class level for all variables. ICCs greater than .10 (Preacher, Zhang, & Zyphur, 2011) indicate that a considerable portion of the variance is at the school or class level and multilevel modelling is appropriate. For the mediation analyses, we firstly assessed whether there were significant correlations between our predictor, mediator and criterion variables before proceeding with our analyses. In line with the recommendation that one "looks for mediators if there is already a strong relation between a predictor and an outcome and one wishes to explore the mechanism behind that relation" (Frazier, Tix, and Barron, 2004, p. 117), our main criteria for pursuing mediation analyses was that the predictor variable was significantly related to our criterion variable (Mathieu & Taylor, 2006). Additionally, we looked at whether the predictor variable was significantly correlated with the mediator variables and the mediator variables were significantly related to the criterion variables. When conducting the mediation analyses, we used model number four of the PROCESS macro for SPSS (Hayes, 2013) with 20,000 bootstrap resamples and a 95% bias corrected confidence interval (CI). This analysis allows for an estimation of direct and indirect effects in models with multiple mediators and performs better than other techniques in terms of statistical power and Type I error control (Hayes, 2009). In line with Mathieu and Taylor's (2006) distinction between mediation and indirect effects, we first assessed whether mediation was occurring before assessing the indirect effect of each potential mediator. Full mediation occurs when a statistically significant regression coefficient ($p < .05$) for the total effect reduces to a non-significant regression coefficient ($p > .05$) for the direct effect when the mediators are entered into the model. Partial mediation occurs when a significant regression coefficient ($p < .05$) for the total effect reduces in value, but is still statistically significant for the direct effect, when the

mediators are entered into the model. There is an indirect effect when zero is not included within the lower and upper bound CI and $p < .05$ for each potential mediator. Researchers have investigated mediation in past studies using the same approach (e.g., Felton & Jowett, 2013) and Hayes, Montoya, and Rockwood (2017) found that the PROCESS macro and structural equation modelling (SEM) programs produce results that are substantively identical. In the present study, we compared our PROCESS macro results with results using SEM for one complete model and found that they were practically identical (results available upon request from the lead author). In terms of effect sizes within our analyses, correlations were judged as small ($r = \pm .10$ to $\pm .29$), medium ($r = \pm .30$ to $\pm .49$), or large ($r > \pm .50$) based on Cohen's (1988) criteria. R^2 values for each mediation model were also converted to Cohen's f^2 (an effect size measure) using the following formula (R^2 divided by 1 - R^2) and can be judged as small ($f^2 \geq .02$), medium ($f^2 \geq .15$), or large ($f^2 \geq .35$) based on Cohen's (1988) guidelines.

Results

Preliminary Analyses

Missing value analysis indicated that each individual item was left blank an average of one time across the sample of 407 participants ($SD = 1.53$; range = 0–9) and the data was missing at random. As the percentage of missing data was very low (0.2%) and we wanted to minimise lost data, a mean substitution was performed. The main study variables were then assessed for normality, with skewness values ranging from -0.59 to 0.94 and kurtosis values ranging from -1.12 to 0.22, indicating reasonable normality (Tabachnick & Fidell, 2013). We then assessed potential gender, age group (12–14 versus 15–17 year olds), and country (England versus Ireland) differences on all variables. Results showed that there were gender and country differences for the study variables, whereas there were no age group differences (see supplementary materials). Therefore, we controlled for gender and country in our

mediation analyses. Our analyses to assess if multilevel modeling would be appropriate revealed that the mean ICC at the school-level was .02 (Range = 0–.10; *SD* = .03) and at the class-level was .02 (Range = 0–.06; *SD* = .02). As these values were less than the criteria for multilevel analysis to be appropriate (Preacher et al., 2011), we proceeded with our analyses at the individual level.

Descriptive Statistics

Table 1 presents the means, standard deviations, reliability coefficients, and correlations for the study variables. The mean scores for perceived teacher autonomy support and controlling teaching indicated that the students felt their PE teachers were displaying moderately high levels of autonomy support and moderately low levels of controlling behaviors. The mean scores for basic need satisfaction and frustration showed that participants scored moderately high on need satisfaction and moderately low on need frustration. Mean scores on the LSSS indicated that participants perceived they were developing all of the life skills through PE to 'some' extent (3 on the response scale). The correlations between perceived teacher autonomy support and students' basic need satisfaction (*r* range = .44–.58) and the eight life skills (*r* range = .45–.51) were significant and positive. Satisfaction of the three basic needs and total need satisfaction were also positively related to all eight life skills (*r* range = .42–.75). The correlations between perceived controlling teaching and students' basic need frustration (*r* range = .34–.44) were significant and positive. However, perceived controlling teaching was not significantly related to any of the eight life skills and 19 of the 24 possible correlations between autonomy, competence, and relatedness frustration and the eight life skills were not significant. The exceptions were three small significant positive relationships between autonomy, competence, and relatedness frustration and emotional skills (*r* range = .11–.19), and two small significant positive relationships between autonomy and competence frustration and problem solving and decision making

(both *r* coefficients = .12). Likewise, total need frustration had small significant positive relationships with only emotional skills (*r* = .17) and problem solving and decision making (*r* = .12). The correlational results meant that we only conducted mediation analyses on the bright side of SDT. In line with the recommendations of several researchers (e.g., Frazier et al., 2004; Mathieu & Taylor, 2006), we did not conduct mediation analyses on the dark side as there were no statistically significant relationships between students' perceptions of controlling teaching (i.e., the predictor variable) and the eight life skills (i.e., the criterion variables). Of additional importance was the lack of consistent relationships between frustration of the three basic needs (i.e., the potential mediating variables) and the eight life skills (i.e., the criterion variables).

Mediation Analyses

Prior to conducting our mediation analyses, we assessed the structural model fit of the bright side models. As can be seen in Table A of the supplementary materials, these models had an adequate fit based on Marsh et al.'s (2004) recommendations for assessing model fit. Figure 1 displays unstandardized regression coefficients for each of the mediation models. In all models, perceived teacher autonomy support was included as the predictor variable. Satisfaction of the needs for autonomy, competence, and relatedness were included as parallel mediators. Teamwork, goal setting, social skills, problem solving and decision making, emotional skills, leadership, time management, and interpersonal communication were included as criterion variables. Results of the indirect effects of perceived teacher autonomy support on each life skill through the three mediators can be seen in Table 2. From this table, we can see whether there is a total indirect effect and what effect, if any, each of the mediators is having. The total indirect effect also represents the indirect effect of total need satisfaction, as it is the sum of the indirect effects for each mediator. Lastly, Figure 2 displays the mediation models when total need satisfaction was included as a sole mediator.

The mediational models in Figure 1 showed that perceived teacher autonomy support was positively associated with the three mediators: autonomy, competence, and relatedness satisfaction. In terms of the mediators, autonomy satisfaction and relatedness satisfaction were positively related to all eight life skills. Competence satisfaction was only positively associated with teamwork, goal setting, and leadership skills.

The total effect of perceived teacher autonomy support on teamwork was significant (Model A). When the mediators were entered into the model, the direct effect of perceived teacher autonomy support on teamwork was still significant although reduced, suggesting partial mediation. The indirect effects of perceived teacher autonomy support on teamwork, via autonomy, competence, and relatedness satisfaction, were positive and significant.

The total effect of perceived teacher autonomy support on goal setting was significant (Model B). When the mediators were entered into the model, the direct effect of perceived teacher autonomy support on goal setting was still significant although reduced, suggesting partial mediation. The indirect effects of perceived teacher autonomy support on goal setting, via autonomy, competence, and relatedness satisfaction, were positive and significant.

The total effect of perceived teacher autonomy support on social skills was significant (Model C). When the mediators were entered into the model, the direct effect of perceived teacher autonomy support on social skills was still significant although reduced, suggesting partial mediation. The indirect effects of perceived teacher autonomy support on social skills, via autonomy and relatedness satisfaction, were positive and significant.

The total effect of perceived teacher autonomy support on problem solving and decision making was significant (Model D). When the mediators were entered into the model, the direct effect of perceived teacher autonomy support on problem solving and decision making was still significant although reduced, suggesting partial mediation. The indirect effects of perceived teacher autonomy support on problem solving and decision

making, via autonomy and relatedness satisfaction, were positive and significant.

The total effect of perceived teacher autonomy support on emotional skills was significant (Model E). When the mediators were entered into the model, the direct effect of perceived teacher autonomy support on emotional skills was not significant, suggesting full mediation. The indirect effects of perceived teacher autonomy support on emotional skills, via autonomy and relatedness satisfaction, were positive and significant.

The total effect of perceived teacher autonomy support on leadership was significant (Model F). When the mediators were entered into the model, the direct effect of perceived teacher autonomy support on leadership was still significant although reduced, suggesting partial mediation. The indirect effects of perceived teacher autonomy support on leadership, via autonomy, competence, and relatedness satisfaction, were positive and significant.

The total effect of perceived teacher autonomy support on time management was significant (Model G). When the mediators were entered into the model, the direct effect of perceived teacher autonomy support on time management was still significant although reduced, suggesting partial mediation. The indirect effects of perceived teacher autonomy support on time management, via autonomy and relatedness satisfaction, were positive and significant.

The total effect of perceived teacher autonomy support on interpersonal communication skills was significant (Model H). When the mediators were entered into the model, the direct effect of perceived teacher autonomy support on interpersonal communication skills was still significant although reduced, suggesting partial mediation. The indirect effects of perceived teacher autonomy support on interpersonal communication skills, via autonomy and relatedness satisfaction, were positive and significant.

Finally, we analyzed models which had total need satisfaction as the sole mediator (Figure 2, Models A–H). These models showed that perceived teacher autonomy support

was positively associated with total need satisfaction and total need satisfaction was positively related to all eight life skills. For all models, when total need satisfaction was entered as a mediator, the direct effect of perceived teacher autonomy support on all eight life skills was reduced but still significant. Furthermore, the results from Table 2 indicate total indirect effects for each model (which represents total need satisfaction). Combined, these results showed that total need satisfaction partially mediated the relationships between perceived teacher autonomy support and students' life skills development in PE.

Discussion

The purpose of the present study was to assess students' life skills development in PE using SDT (Ryan & Deci, 2017) as a theoretical framework. On the bright side of SDT, our correlational results indicated that students' perceptions of teacher autonomy support were positively associated with their basic need satisfaction and development of all eight life skills. Additionally, satisfaction of the three basic needs was positively related to students' life skills development. Such findings are similar to past research showing that perceptions of autonomy-supportive teaching and basic need satisfaction are positively associated with PE students' engagement (Cheon et al., 2016), autonomous motivation (Haerens et al., 2018), self-esteem (Standage & Gillison, 2007), and subjective vitality (Liu et al., 2017). Given that researchers interested in SDT in PE have focused primarily on motor outcomes, affective outcomes, engagement, effort, and activity levels, our positive findings in relation to life skills development addresses the call for an examination of a wider range of outcomes (Van den Berghe et al., 2014) and provides an impetus for future research in this area.

On the dark side of SDT, our correlational results indicated that students' perceptions of controlling teaching were only associated with basic need frustration and had no significant relationships with students' life skills development. Thus, our hypothesis that the negative relationships between students' perceptions of controlling teaching and their life

skills development would be mediated by basic need frustration could not be supported. Interestingly, the only significant relationships between need frustration and the eight life skills were small positive relationships between frustration of the three basic needs and students' emotional skills, and between autonomy and competence frustration and students' problem solving and decision making skills. Similarly, total need frustration had small positive relationships with both emotional skills and problem solving and decision making. An explanation for these unexpected positive relationships comes from the coping literature, where numerous researchers have shown that two methods that adolescents use to cope with negative experiences, stressful situations, or frustrations are problem and emotion-focused coping (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001; Hampel & Petermann, 2005; Zimmer-Gembeck & Skinner, 2011). As such, it is possible that students learn to cope with need frustration in PE by utilizing and developing their emotional and problem solving skills. The proposition that negative experiences can lead to positive outcomes is also supported by Dworkin and Larson (2007) who suggested that negative experiences in organized youth activities (including sport) can lead to positive development, if the student learns to confront the emotion or solve the problem that created the negative experience. Additionally, when outlining their principles of need satisfaction and frustration, Vansteenkiste and Ryan (2013) expressed the idea that need frustration can sometimes lead to positive outcomes such as resilience in people. Overall, the general lack of associations we found between students' perceptions of controlling teaching/need frustration and the eight life skills contrasted with previous studies which showed that perceptions of controlling teaching/need frustration can have negative relationships with adaptive student outcomes in PE such as increased engagement (De Meyer et al., 2016), autonomous motivation (Haerens et al., 2015), and subjective vitality (Liu et al., 2017). This may have been due to differences between the life skills measured in the current study and the positive outcomes measured in

previous studies. Specifically, students' perceptions of controlling teaching and need frustration may have greater effects on behaviors, cognitions, or feelings directly experienced during PE lessons such as student engagement, autonomous motivation, and subjective vitality, as compared to students' life skills development in PE which may occur in a more subtle or implicit manner. Future research is needed to further investigate this proposition and test possible indirect effects between students' perceptions of controlling teaching, needs frustration, and emotional skills and problem solving and decision making. Additionally, we must note that researchers have found positive relationships between perceptions of controlling teaching/need frustration and negative outcomes in PE such as amotivation (Cheon et al., 2016), antisocial behavior (Cheon et al., 2018), oppositional defiance (De Meyer et al., 2016), and negative affect (Behzadnia, Adachi, Deci, & Mohammadzadeh, 2018; Liu et al., 2017;). Such findings indicate that despite having no negative associations with life skills development in the present study, negative effects may still result from students' perceptions of controlling teaching and need frustration in PE.

Following on from the correlational results on the bright side, our mediational analyses showed that both autonomy and relatedness satisfaction mediated the positive relationships between perceived teacher autonomy support and the development of all eight life skills. Competence satisfaction only mediated the relationships between perceived teacher autonomy support and the development of teamwork, goal setting, and leadership skills. In other words, when teachers are perceived as providing autonomy support in PE, students are likely to develop teamwork, goal setting, and leadership skills because their needs for autonomy, relatedness, and competence are satisfied. In addition, when teachers are perceived as providing autonomy support in PE, students are likely to develop social skills, problem solving and decision making, emotional skills, time management, and interpersonal communication skills, because their needs for autonomy and relatedness are

satisfied. These findings indicated that despite being viewed as crucial to a PE teacher's role (Curran & Standage, 2017; Ntoumanis, 2012), satisfaction of students' competence plays less of a part in students' development of certain life skills as compared to autonomy and relatedness satisfaction. In PE classes with students possessing a wide range of abilities, it may be the case that feeling autonomous in PE and relating well with one's peers and the teacher is more important in terms of developing social skills, problem solving and decision making, emotional skills, time management, and interpersonal communication skills as compared to competence satisfaction. This may be the case as there are close parallels between autonomy and relatedness satisfaction and these specific life skills. For example, there are clear links between relatedness satisfaction and the development of social skills and between autonomy satisfaction and the development of problem solving and decision making skills. This being said, our findings also provided support for the idea that perceptions of autonomy-supportive teaching fosters students' life skills development through the nurturing of the three basic needs combined (Hodge et al., 2012). Future qualitative research should explore in greater detail how perceptions of specific autonomy-supportive teaching behaviors (e.g., encouraging students to work together) leads to the development of particular life skills (e.g., social skills) through the satisfaction of specific needs (e.g., relatedness satisfaction).

Practical Implications

In practical terms, our findings indicated that the provision of autonomy support is a particularly important skill for PE teachers to develop. Should PE teachers wish to promote students' perceptions of teacher autonomy support, they could look to exhibit the following autonomy-supportive behaviors in their lessons: (a) listening carefully, (b) creating opportunities for curiosity and initiative, (c) providing opportunities for peer learning and cooperation, (d) arranging learning environments that encourage active participation, (e) encouraging effort, (f) praising development and mastery, (g) offering progress-enabling

feedback, (h) responding consistently to students' questions and queries, and (i) communicating a clear acknowledgement of students' perspectives (Reeve, 2006). Based on our findings, such behaviors should help students to develop specific life skills in PE. For instance, a teacher could create opportunities for curiosity and initiative in their lessons to promote students' autonomy satisfaction; and, in turn, help students to develop their problem solving and decision making skills. Research also suggests that teachers could endeavor to exhibit behaviors that promote students' needs for competence and relatedness (Standage et al., 2005). For example, suitably challenging learning activities and constructive feedback could promote students' competence satisfaction; whereas, peer-learning groups (e.g., students demonstrating skills to each other) or cooperative games may promote students' relatedness satisfaction. Needs-supportive teaching is not only likely to satisfy the three basic needs, but may also develop students' life skills through role modelling particular life skills (e.g., interpersonal communication and social skills), facilitating the practice of specific life skills (e.g., goal setting and teamwork), and supporting the development of other life skills (e.g., time management and leadership).

Limitations and Future Directions

One limitation of the present study is that all data was collected via student self-report, which has limits in terms of memory recall, response accuracy, social desirability, and common method variance (Brenner & DeLamater, 2014; Donaldson & Grant-Vallone, 2002). As such, future studies could assess autonomy-supportive and controlling teaching using trained classroom observers – an approach used successfully in recent research (Cheon et al., 2018) – and assess life skills development via alternative parent, peer, or teacher ratings. A second limitation was that we did not assess other aspects of SDT which may be important for students' life skills development. For example, future studies could assess how PE teachers' provision of structure and interpersonal involvement (Ntoumanis, 2012) influence

the extent to which students' needs for competence and relatedness are satisfied and, in turn, impact upon students' life skills development. A third limitation of our cross-sectional study is that it does not allow for causal interpretations of the findings. Additionally, some researchers (e.g., García-Bengoechea & Johnson, 2001) propose that youth development can be further understood if studied over time. As such, building on our initial positive findings, future SDT research investigating life skills development in PE should look to utilize both longitudinal and experimental research designs. Moreover, given the success of interventions designed to help PE teachers become more autonomy supportive and less controlling (e.g., Cheon et al., 2016), future research could investigate the effect of such an intervention on students' life skills development in PE. A fourth limitation of our research is that we focused solely on positive outcomes within our study (i.e., the development of eight life skills). In this regard, it is likely that students' perceptions of teacher autonomy support and basic need satisfaction are related to positive outcomes in PE; whereas, their perceptions of controlling teaching and need frustration are associated with negative outcomes. Given that other researchers have included both positive and negative outcomes when investigating the bright and dark side of SDT in their studies (e.g., De Meyer et al., 2016; Behzadnia et al., 2018), future research could investigate potential negative outcomes alongside life skills development in PE.

Conclusion

Within the present study, our findings indicated that English and Irish students perceived that to some extent they are developing teamwork, goal setting, social skills, problem solving and decision making, emotional skills, leadership, time management, and interpersonal communication skills through PE. Grounded in SDT (Ryan & Deci, 2017), our novel findings showed that students' perceptions of teacher autonomy support are related to their life skills development in PE through the satisfaction of the needs for autonomy,

competence, and relatedness. These findings demonstrate the potential for future studies to investigate PE students' life skills development via the bright side of SDT. In practice, our findings indicate that PE teachers seeking to foster students' life skills development may endeavor to create an autonomy-supportive climate that satisfies students' three basic needs.

References

Appleton, P. R., Ntoumanis, N., Quested, E., Viladrich, C., & Duda, J. L. (2016). Initial validation of the coach-created Empowering and Disempowering Motivational Climate Questionnaire (EDMCQ-C). *Psychology of Sport and Exercise, 22*, 53–65.

Bailey, R., Hillman, C., Arent, S., & Petitpas, A. (2013). Physical activity: An underestimated investment in human capital? *Journal of Physical Activity and Health, 10*(3), 289–308.

Bartholomew, K. J., Ntoumanis, N., Ryan, R. M., & Thøgersen-Ntoumani, C. (2011). Psychological need thwarting in the sport context: Assessing the darker side of athletic experience. *Journal of Sport & Exercise Psychology, 33*(1), 75–102.

Bean, C., Kramers, S., Forneris, T., & Camiré, M. (2018). The implicit/explicit continuum of life skills development and transfer. *Quest, 70*(4), 456–470.

Behzadnia, B., Adachi, P. J., Deci, E. L., & Mohammadzadeh, H. (2018). Associations between students' perceptions of physical education teachers' interpersonal styles and students' wellness, knowledge, performance, and intentions to persist at physical activity: A self-determination theory approach. *Psychology of Sport and Exercise, 39*, 10–19.

Brenner, P. S., & DeLamater, J. D. (2014). Social desirability bias in self-reports of physical activity: Is an exercise identity the culprit? *Social Indicators Research, 117*(2), 489–504.

Chen, B., Vansteenkiste, M., Beyers, W., Boone, L., Deci, E. L., Van der Kaap-Deeder, J.,... Ryan, R. M. (2015). Basic psychological need satisfaction, need frustration, and need strength across four cultures. *Motivation and Emotion, 39*(2), 216–236.

Cheon, S. H., Reeve, J., & Ntoumanis, N. (2018). A needs-supportive intervention to help PE teachers enhance students' prosocial behavior and diminish antisocial behavior. *Psychology of Sport and Exercise, 35*, 74–88.

Cheon, S. H., Reeve, J., & Song, Y-G. (2016). A teacher-focused intervention to decrease PE students' amotivation by increasing need satisfaction and decreasing need frustration. *Journal of Sport & Exercise Psychology, 38*(3), 217–235.

Coatsworth, J. D., & Conroy, D. E. (2009). The effects of autonomy-supportive coaching, need satisfaction, and self-perceptions on initiative and identity in youth swimmers. *Developmental Psychology*, *45*(2), 320–328.

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences*. Hillsdale, NJ: Erlbaum.

Compas, B. E., Connor-Smith, J. K., Saltzman, H., Thomsen, A. H., & Wadsworth, M. E. (2001). Coping with stress during childhood and adolescence: Problems, progress, and potential in theory and research. *Psychological Bulletin, 127*(1), 87–127.

Cronin, L. D., & Allen, J. (2017). Development and initial validation of the Life Skills Scale for Sport. *Psychology of Sport and Exercise, 28*, 105–119.

Cronin, L., Allen, J., Russell, P., & Mulvenna, C. (2018). Life skills development and well-being in physical education: The importance of the teaching climate and the 'pile-up' effect of total life skills. *Physical Education and Sport Pedagogy, 23*(2), 181–196.

Curran, T., & Standage, M. (2017). Psychological needs and the quality of student engagement in physical education: Teachers as key facilitators. *Journal of Teaching in Physical Education, 36*(3), 262–276.

Danish, S., Forneris, T., Hodge, K., & Heke, I. (2004). Enhancing youth development through sport. *World Leisure*, *46*(3), 38–49.

Danish, S. J., Forneris, T., & Wallace, I. (2005). Sport-based life skills programming in the schools. *Journal of Applied School Psychology, 21*(2), 41–62.

Deci, E. L. (2001). *The Sport Climate Questionnaire.* Retrieved from http://selfdeterminationtheory.org/pas-sport-climate/

De Meyer, J., Soenens, B., Vansteenkiste, M., Aelterman, N., Van Petegem, S., & Haerens, L. (2016). Do students with different motives for physical education respond differently to autonomy-supportive and controlling teaching? *Psychology of Sport and Exercise*, *22*, 72–82.

Donaldson, S. I., & Grant-Vallone, E. J. (2002). Understanding self-report bias in organizational behavior research. *Journal of Business and Psychology, 17*(2), 245–260.

Dworkin, J. B., & Larson, R. (2007). Adolescents' negative experiences in organized youth activities. *Journal of Youth Development, 3*(1). Retrieved from http://www.nae4ha.org/directory/jyd/jyd_issues.aspx.

Dyson, B., Griffin, L. L., & Hastie, P. (2004). Sport education, tactical games, and cooperative learning: Theoretical and pedagogical considerations. *Quest, 56*(2), 226–240.

Felton, L., & Jowett, S. (2013). Attachment and well-being: The mediating effects of psychological needs satisfaction within the coach–athlete and parent–athlete relational contexts. *Psychology of Sport and Exercise*, *14*(1), 57–65.

Fraser-Thomas, J. L., Côté, J., & Deakin, J. (2005). Youth sport programs: An avenue to foster positive youth development. *Physical Education and Sport Pedagogy*, *10*(1), 19–40.

Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology research. *Journal of Counseling Psychology, 51*(1), 115–134.

García-Bengoechea, E., & Johnson, G. M. (2001). Ecological systems theory and children's development in sport: Toward a process-person-context-time research paradigm. *Avante, 7*, 20–31.

Goudas, M. (2010). Prologue: A review of life skills teaching in sport and physical education. *Hellenic Journal of Psychology, 7*, 241–258.

Goudas, M., & Giannoudis, G. (2008). A team-sports-based life-skills program in a physical education context. *Learning and Instruction, 18*(6), 528–536.

Gould, D., & Carson, S. (2008). Life skills development through sport: Current status and future directions. *International Review of Sport and Exercise Psychology, 1*(1), 58–78.

Haerens, L., Aelterman, N., Vansteenkiste, M., Soenens, B., & Van Petegem, S. (2015). Do perceived autonomy-supportive and controlling teaching relate to physical education students' motivational experiences through unique pathways? Distinguishing between the bright and dark side of motivation. *Psychology of Sport and Exercise, 16*, 26–36.

Haerens, L., Vansteenkiste, M., De Meester, A., Delrue, J., Tallir, I., Vande Broek, G.,... Aelterman, N. (2018). Different combinations of perceived autonomy support and control: Identifying the most optimal motivating style. *Physical Education and Sport Pedagogy, 23*(1), 16–36.

Hampel, P., & Petermann, F. (2005). Age and gender effects on coping in children and adolescents. *Journal of Youth and Adolescence, 34*(2), 73–83.

Hardman, K. (2011). Global issues in the situation of physical education in schools. In K. Hardman & K. Green (Eds.), *Contemporary issues in physical education* (pp. 11–29). Maidenhead, UK: Meyer & Meyer Sport.

Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs, 76*(4), 408–420.

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY: Guilford Publications.

Hayes, A. F., Montoya, A. K., & Rockwood, N. J. (2017). The analysis of mechanisms and their contingencies: PROCESS versus structural equation modeling. *Australasian Marketing Journal*, *25*(1), 76–81.

Hellison, D., Martinek, T., & Walsh, D. (2008). Sport and responsible leadership among youth. In N. Holt (Ed.), *Positive youth development through sport*, (pp. 49–60). New York, NY: Routledge.

Hodge, K., & Danish, S. (1999). Promoting life skills for adolescent males through sport. In A. M. Horne & M. S. Kiselica (Eds.), *Handbook of counseling boys and adolescent males: A practitioner's guide* (pp. 55–71). Thousand Oaks, CA: Sage.

Hodge, K., Danish, S., & Martin, J. (2012). Developing a conceptual framework for life skills interventions. *The Counseling Psychologist*, *41*(8), 1125–1152.

Holt, N. L., Neely, K. C., Slater, L. G., Camiré, M., Côté, J., Fraser-Thomas, J.,... Tamminen, K. A. (2017). A grounded theory of positive youth development through sport based on results from a qualitative meta-study. *International Review of Sport and Exercise Psychology*, *10*(1), 1–49.

IBM Corporation. (2017). *SPSS Statistics for Windows* (Version 25.0). Armonk, NY: IBM Corporation.

Jang, H., Kim, E. J., & Reeve, J. (2016). Why students become more engaged or more disengaged during the semester: A self-determination theory dual-process model. *Learning and Instruction*, *43*, 27–38.

Johnston, J., Harwood, C., & Minniti, A. M. (2013). Positive youth development in swimming: Clarification and consensus of key psychosocial assets. *Journal of Applied Sport Psychology*, *25*(4), 392–411.

723 Liu, J., Bartholomew, K., & Chung, P. K. (2017). Perceptions of teachers' interpersonal
724 styles and well-being and ill-being in secondary school physical education students:
725 The role of need satisfaction and need frustration. *School Mental Health*, *9*(4), 360–
726 371.
727 Mageau, G. A., & Vallerand, R. J. (2003). The coach–athlete relationship: A motivational
728 model. *Journal of Sports Science, 21*(11), 883–904.
729 Marsh, H. W., Hau, K. T., & Wen, Z. (2004). In search of golden rules: Comment on
730 hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in
731 overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling, 11*(3), 320–341.
732
733 Mathieu, J. E., & Taylor, S. R. (2006). Clarifying conditions and decision points for
734 mediational type inferences in organizational behavior. *Journal of Organizational*
735 *Behavior*, *27*(8), 1031–1056.
736 Ntoumanis, N. (2012). A self-determination theory perspective on motivation in sport and
737 physical education: Current trends and possible future research directions. In G. C.
738 Roberts & D. C. Treasure (Eds.), *Motivation in sport and exercise* (Vol. 3, pp. 91–
739 128). Champaign, IL: Human Kinetics.
740 Ntoumanis, N., Quested, E., Reeve, J., & Cheon, S. H. (2018). Need supportive
741 communication: Implications for motivation in sport, exercise, and physical activity.
742 In B. Jackson, J. A. Dimmock & J. Compton (Eds.), *Persuasion and communication*
743 *in sport, exercise, and physical activity* (pp. 155–169). Abingdon, UK: Routledge.
744 Preacher, K. J., Zhang, Z., & Zyphur, M. J. (2011). Alternative methods for assessing
745 mediation in multilevel data: The advantages of multilevel SEM. *Structural Equation*
746 *Modeling*, *18*(2), 161–182.

Rasbach, J., Steele, F., Browne, W. J., & Goldstein, H. (2017). *A user's guide to MLwiN, version 3.01*. Centre for Multilevel Modelling, University of Bristol.

Reeve, J. (2006). Teachers as facilitators: What autonomy-supportive teachers do and why their students benefit. *The Elementary School Journal, 106*(3), 225–236.

Reeve, J. (2016). Autonomy-supportive teaching: What it is, how to do it. In J. C. Wang, W. C. Liu & R. M. Ryan (Eds.), *Motivation in educational research: Translating theory into classroom practice*. New York, NY: Springer.

Reeve, J., Deci, E. L., & Ryan, R. M. (2004). Self-determination theory: A dialectical framework for understanding the socio-cultural influences on student motivation. In D. McInerney & S. Van Etten (Eds.), *Research on sociocultural influences on motivation and learning: Big theories revisited* (Vol. 4, pp. 31–59). Greenwich, CT: Information Age Press.

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness.* London, UK: Guilford Publications.

Smither, K., & Zhu, X. (2011). High school students' experiences in a Sport Education unit: The importance of team autonomy and problem-solving opportunities. *European Physical Education Review, 17*(2), 203–217.

Standage, M., Duda, J. L., & Ntoumanis, N. (2005). A test of self-determination theory in school physical education. *British Journal of Educational Psychology, 75*(3), 411–433.

Standage, M., & Gillison, F. (2007). Students' motivational responses toward school physical education and their relationship to general self-esteem and health-related quality of life. *Psychology of Sport and Exercise, 8*(5), 704–721.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Boston, MA: Pearson Education Inc.

772 Taylor, I. M., & Bruner, M. W. (2012). The social environment and developmental
773 experiences in elite youth soccer. *Psychology of Sport and Exercise, 13*(4), 390–396.
774 Van den Berghe, L., Vansteenkiste, M., Cardon, G., Kirk, D., & Haerens, L. (2014). Research
775 on self-determination in physical education: Key findings and proposals for future
776 research. *Physical Education and Sport Pedagogy, 19*(1), 97–121.
777 Vansteenkiste, M., & Ryan, R. M. (2013). On psychological growth and vulnerability: Basic
778 psychological need satisfaction and need frustration as a unifying principle. *Journal of*
779 *Psychotherapy Integration, 23*(3), 263–280.
780 Zimmer-Gembeck, M. J., & Skinner, E. A. (2011). The development of coping across
781 childhood and adolescence: An integrative review and critique of research.
782 *International Journal of Behavioral Development, 35*(1), 1–17.
783

Table 1

Mean Scores, Standard Deviations, Reliability Coefficients and Intercorrelations for All Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Autonomy support	–																	
2. Controlling teaching	-.11*	–																
3. Autonomy satisfaction	.58***	.03	–															
4. Competence satisfaction	.45***	.02	.70***	–														
5. Relatedness satisfaction	.44***	.09	.60***	.47***	–													
6. Total need satisfaction	.58***	.05	.90***	.85***	.82***	–												
7. Autonomy frustration	-.12*	.35***	.004	-.04	.13*	.04	–											
8. Competence frustration	.02	.34***	.04	-.22***	.12*	-.02	.59***	–										
9. Relatedness frustration	-.03	.41***	.02	-.13**	-.08	-.07	.46***	.68***	–									
10. Total need frustration	-.05	.44***	.02	-.16**	.06	-.02	.80***	.89***	.85***	–								
11. Teamwork	.50***	-.07	.64***	.57***	.53***	.68***	-.04	-.02	-.09	-.06	–							
12. Goal setting	.46***	-.04	.58***	.54***	.47***	.62***	.02	-.01	-.02	-.003	.69***	–						
13. Social skills	.46***	.01	.60***	.49***	.56***	.64***	.04	.05	.01	.04	.68***	.65***	–					
14. Problem solving	.47***	.07	.59***	.44***	.53***	.61***	.12*	.12*	.07	.12*	.61***	.65***	.75***	–				
15. Emotional skills	.45***	.06	.63***	.42***	.56***	.63***	.11*	.19***	.13**	.17**	.54***	.53***	.68***	.68***	–			
16. Leadership	.51***	.02	.68***	.58***	.64***	.75***	.06	.06	-.02	.04	.75***	.70***	.74***	.72***	.69***	–		
17. Time management	.48***	.01	.67***	.54***	.58***	.70***	.06	.05	.01	.05	.61***	.65***	.66***	.69***	.68***	.76***	–	
18. Communication	.48***	-.06	.64***	.51***	.57***	.67***	.04	.02	.001	.03	.62***	.55***	.72***	.66***	.61***	.72***	.70***	–
Mean score	3.54	2.46	3.06	3.45	3.22	3.24	2.84	2.45	2.09	2.46	3.51	3.27	3.11	2.98	2.66	3.22	2.94	3.21
Standard deviation	0.95	0.97	1.04	1.01	1.08	0.89	1.12	1.14	1.19	0.97	0.88	1.04	1.12	1.07	1.22	1.05	1.18	1.18
Alpha value	.94	.90	.88	.89	.87	.92	.85	.85	.91	.91	.90	.94	.90	.91	.92	.94	.92	.92

Note. $N = 407$. Problem solving = problem solving & decision making; Communication = interpersonal communication skills. All variables were measured on a 1–5 response scale.

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 2
Indirect Effects of Perceived Teacher Autonomy Support on Students' Life Skills Development Through Each Mediator

	Bootstrap effect	Normal effect	Normal theory tests			95% CI
			SE	*z*	*p*	
Teamwork						
Total indirect effect	.34	.34	.03	9.91	<.001	[.27, .41]
Autonomy satisfaction	.17	.17	.04	4.78	<.001	[.09, .26]
Competence satisfaction	.11	.11	.03	3.95	<.001	[.05, .18]
Relatedness satisfaction	.06	.06	.02	2.86	.004	[.02, .11]
Model	$F(10, 396) = 40.63^{***}$, $R^2 = .51$, Cohen's $f^2 = 1.04$					
Goal setting						
Total indirect effect	.36	.36	.04	8.88	<.001	[.29, .45]
Autonomy satisfaction	.16	.16	.04	3.52	<.001	[.05, .27]
Competence satisfaction	.13	.13	.04	3.78	<.001	[.05, .23]
Relatedness satisfaction	.07	.07	.03	2.61	.01	[.01, .14]
Model	$F(10, 396) = 27.45^{***}$, $R^2 = .41$, Cohen's $f^2 = .69$					
Social skills						
Total indirect effect	.41	.41	.04	9.36	<.001	[.32, .52]
Autonomy satisfaction	.20	.20	.05	4.15	<.001	[.10, .31]
Competence satisfaction	.07	.07	.04	1.83	.07	[-.004, .14]
Relatedness satisfaction	.15	.15	.03	4.82	<.001	[.09 .23]
Model	$F(10, 396) = 31.36^{***}$, $R^2 = .44$, Cohen's $f^2 = .79$					
Problem solving						
Total indirect effect	.35	.35	.04	8.47	<.001	[.26, .44]
Autonomy satisfaction	.23	.23	.05	4.83	<.001	[.13, .33]
Competence satisfaction	.02	.02	.03	0.44	.66	[-.05, .08]
Relatedness satisfaction	.12	.12	.03	3.92	<.001	[.06, .18]
Model	$F(10, 396) = 29.38^{***}$, $R^2 = .43$, Cohen's $f^2 = .75$					
Emotional skills						
Total indirect effect	.46	.46	.05	9.61	<.001	[.36, .57]
Autonomy satisfaction	.32	.32	.05	6.11	<.001	[.20, .45]
Competence satisfaction	-.01	-.01	.04	-0.35	.72	[-.09, .06]
Relatedness satisfaction	.17	.17	.03	5.05	<.001	[.10, .25]
Model	$F(10, 396) = 36.73^{***}$, $R^2 = .48$, Cohen's $f^2 = .92$					
Leadership						
Total indirect effect	.46	.46	.04	11.13	<.001	[.38, .55]
Autonomy satisfaction	.20	.20	.04	5.05	<.001	[.12, .29]
Competence satisfaction	.11	.11	.03	3.50	<.001	[.04, .18]
Relatedness satisfaction	.16	.16	.03	5.74	<.001	[.11, .22]
Model	$F(10, 396) = 53.71^{***}$, $R^2 = .58$, Cohen's $f^2 = 1.38$					
Time management						
Total indirect effect	.49	.49	.05	10.45	<.001	[.40, .59]
Autonomy satisfaction	.30	.30	.05	6.15	<.001	[.20, .42]
Competence satisfaction	.05	.05	.03	1.56	.12	[-.02, .14]
Relatedness satisfaction	.15	.15	.03	4.82	<.001	[.09, .22]
Model	$F(10, 396) = 42.64^{***}$, $R^2 = .52$, Cohen's $f^2 = 1.08$					
Communication						

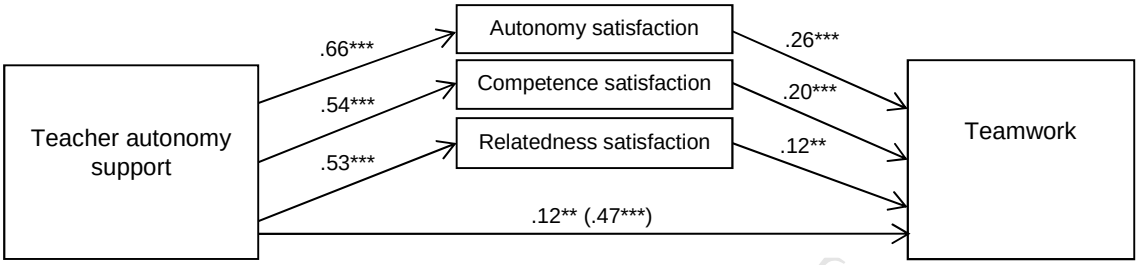
Total indirect effect	.47	.47	.05	10.06	<.001	[.36, .58]
Autonomy satisfaction	.26	.26	.05	5.23	<.001	[.15, .37]
Competence satisfaction	.05	.05	.04	1.46	.14	[-.02, .13]
Relatedness satisfaction	.17	.17	.03	5.22	<.001	[.10, .25]
Model	$F(10, 396) = 38.72^{***}$, $R^2 = .49$, Cohen's $f^2 = .96$					

Note. $N = 406$. Bootstrap generated confidence intervals. Gender, country, controlling teaching, and autonomy, competence, and relatedness frustration were entered as covariates in all models. One participant was omitted as they did not provide their gender. The mediation analyses were not conducted for the dark side due to the non-significant correlations between controlling teaching and the eight life skills, along with the lack of consistent relationships between need frustration and the eight life skills. CI = confidence interval; Problem solving = problem solving & decision making; Communication = interpersonal communication skills.

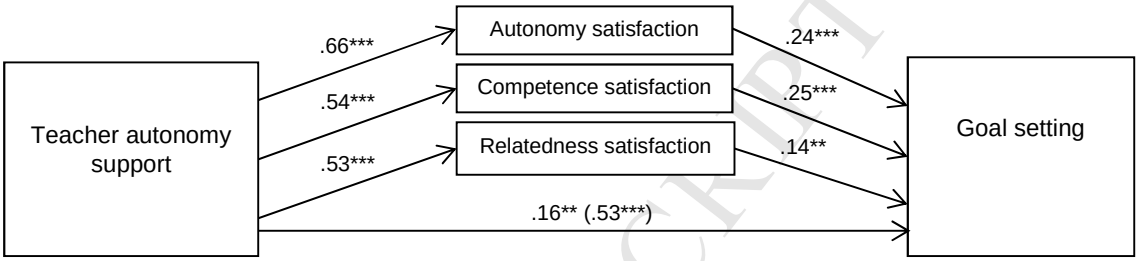
$^{***}p < .001$.

784

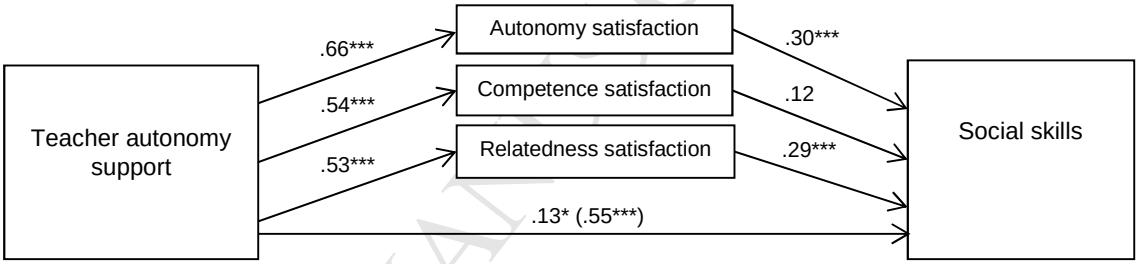
Model A



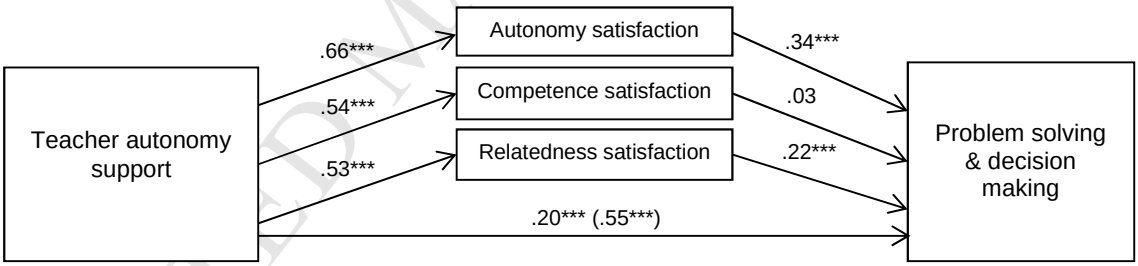
Model B



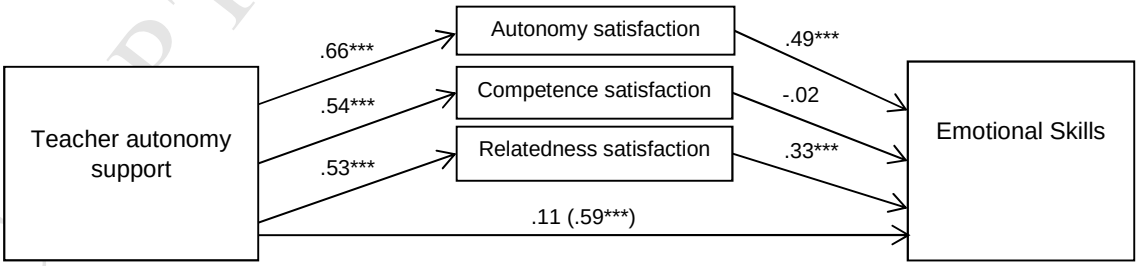
Model C



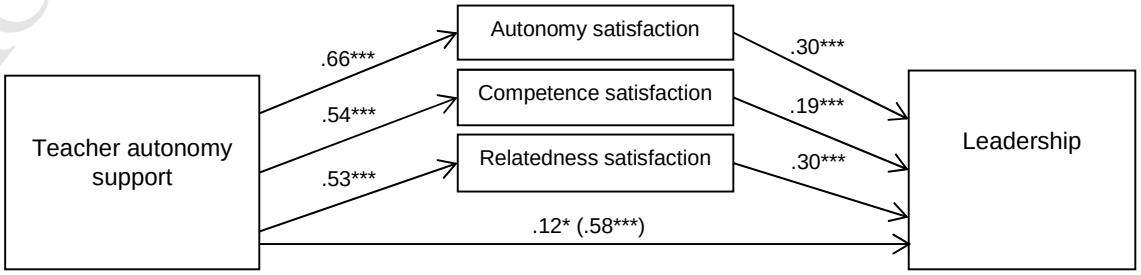
Model D



Model E



Model F



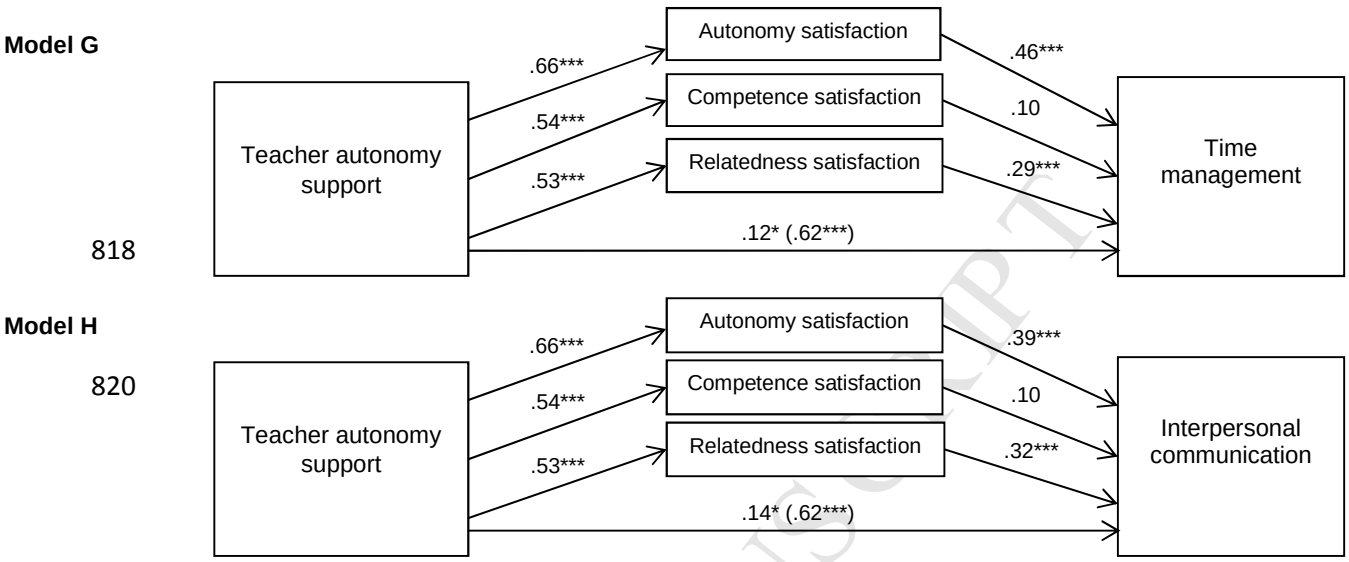


Figure 1. Regression models predicting all eight life skills. Values signify unstandardized regression coefficients. The direct effect of perceived teacher autonomy support on each of the life skills are outside the parentheses. The total effects are inside the parentheses. Gender, country, controlling teaching, and autonomy, competence, and relatedness frustration were entered as covariates in all models. The random number generator was seeded in all eight models to ensure that the bootstrap resamples were the same for each model.

*$p < .05$, **$p < .01$, ***$p < .001$.

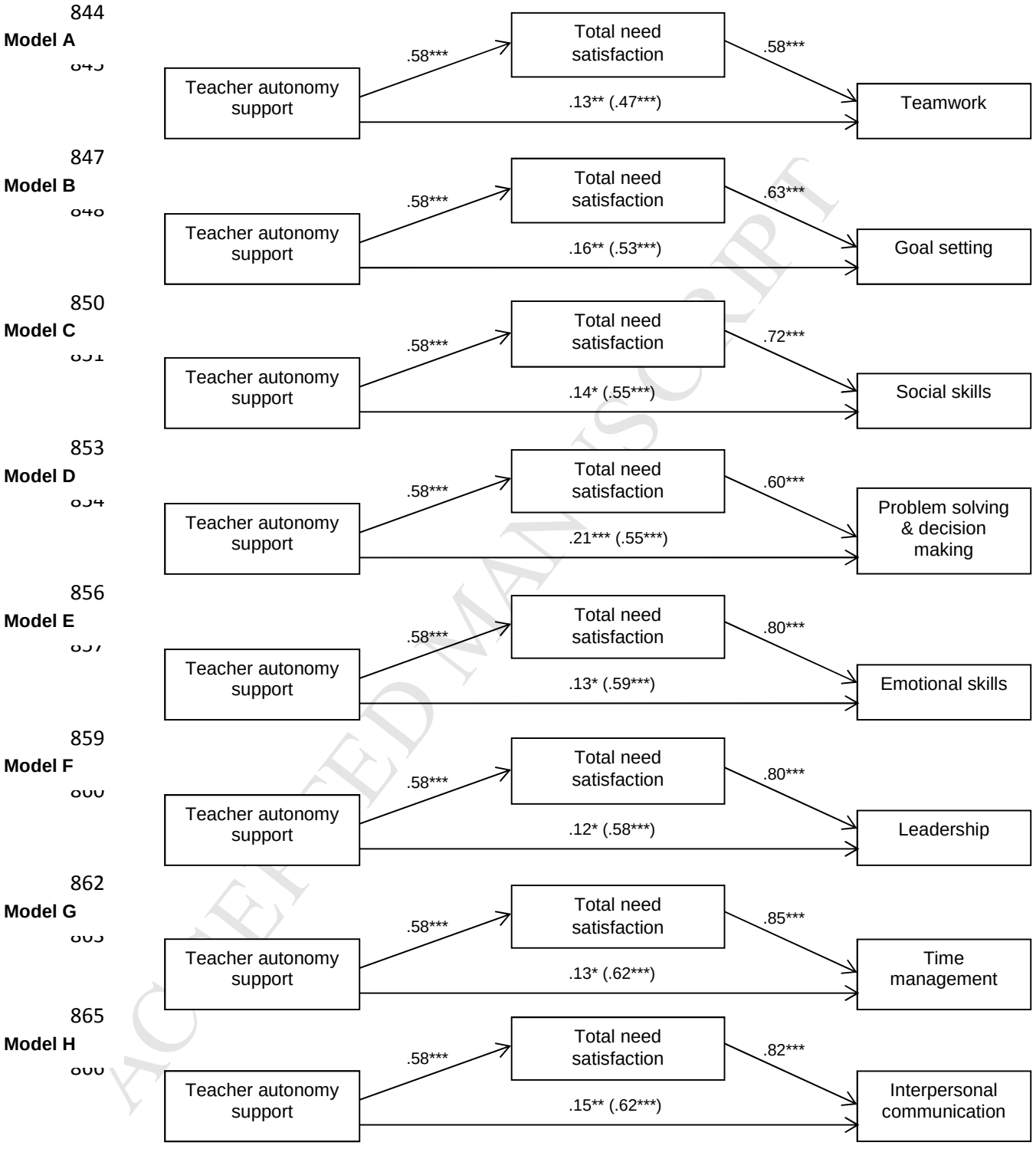


Figure 2. Regression models predicting all eight life skills. Values signify unstandardized regression coefficients. The direct effect of perceived teacher autonomy support on each of the life skills are outside the parentheses. The total effects are inside the parentheses. Gender, country, controlling teaching, and autonomy, competence, and relatedness frustration were entered as covariates in all models. The random number generator was seeded in all eight models to ensure that the bootstrap resamples were the same for each model.

*p < .05, **p < .01, ***p < .001.

876 **Supplementary Materials**

877 **Autonomy-Supportive Teaching Scale**

878 ## Your PE Teacher

879 Directions: PE teachers have different styles of working with young people and we would
880 like to know more about how your teacher works with you. This survey contains items that
881 are related to your experience with your main PE teacher (the person who teaches you most
882 often).
883
884 Using the scale below, indicate how much you agree or disagree with each item by circling
885 the appropriate answer.
886

My PE teacher…	Strongly disagree				Strongly agree
1. Gives students choices and options	1	2	3	4	5
2. Encourages students to ask questions	1	2	3	4	5
3. Provides opportunities for students to work independently or in small groups	1	2	3	4	5
4. Listens to how students would like to do things	1	2	3	4	5
5. Give students a chance to input into class content	1	2	3	4	5
6. Tries to understand how students see things	1	2	3	4	5
7. Encourages students to use their initiative	1	2	3	4	5
8. Encourages students to solve problems for themselves	1	2	3	4	5
9. Ensures students are involved in decision making	1	2	3	4	5
10. Explains why it is good to do what we have been asked to do	1	2	3	4	5

887 *** Please note that these autonomy-supportive items were created/modified based on**
888 **Mageau and Vallerand's (2003) definition and components of coach autonomy support**
889 **and several measures of autonomy support that have been used in sport/PE (e.g.,**
890 **Appleton, Ntoumanis, Quested, Viladrich, & Duda, 2016; Deci, 2001). Items 1, 2, and 10**
891 **came from Appleton et al. (2016), items 4 and 6 came from Deci (2001), and items 3, 5,**
892 **7, 8, and 9 were based on Mageau and Vallerands (2003) article reviewing the**
893 **definitions and components of coach autonomy support.**

Gender, Age Group and Country Differences

Three multivariate analysis of variances (MANOVAs) were conducted to test for any gender, age group, or country differences on the main study variables. For gender, results revealed some differences for the study variables, F (16, 389) = 3.86, Wilk's λ = .86, p < .001. As our participants ranged in age from 12–17 years, participants were split into younger (12–14 years, n = 286) and older (15–17 years, n = 109) age groups (two participants failed to provide their age). Participants were split into these age groups based on Steinberg's (1993) classification of early (11–14 years) and middle (15–18 years) adolescence. Our results revealed no significant age group differences for the study variables, F (16, 388) = 1.03, Wilk's λ = .96, p = .43. When comparing Irish versus English students, our results revealed some differences for the study variables, F (16, 389) = 2.39, Wilk's λ = .91, p = .002. Based on the above results, gender and country were included as covariates in all mediation analyses.

Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis was conducted in Amos Version 25 (Arbuckle, 2017) to assess the factorial validity of the measurement scales, the complete measurement model, and the bright side structural models. The following fit indices were used to assess model fit: Root Mean Square Error of Approximation (RMSEA; Stieger & Lind, 1980), Comparative Fit Index (CFI; Bentler, 1990), and the Tucker Lewis Index (TLI; Tucker & Lewis, 1973). In line with Marsh, Hau, and Wen's (2004) recommendations, an RMSEA value of less than .08 or .05 represented a reasonable or close fit to the data respectively; whereas, CFI and TLI values greater than .90 or .95 indicated acceptable and excellent fit respectively. The results of our CFA analyses are contained within Table A on the next page.

Table A

Indices of Model Fit for the Measurement and Structural Models

Scale	χ^2 (*df*)	χ^2/df	RMSEA	CFI	TLI	FL Range
Autonomy-supportive & controlling teaching scale						
Two-factor model	566.30*** (151)	3.75	.08	.92	.90	.40–.89
Basic need satisfaction & frustration scale						
Higher-order model	775.01*** (245)	3.16	.07	.92	.91	.61–.89
Life skills scale for sport						
Eight-factor model	1671.75*** (832)	2.01	.05	.95	.94	.69–.90
Complete measurement model						
Sixteen-factor model	6220.07*** (3449)	1.80	.04	.90	.90	.40–.90
Bright side structural models						
Teamwork	1163.12*** (421)	2.76	.07	.91	.90	
Goal setting	1226.31*** (421)	2.91	.07	.91	.90	
Social skills	1108.93*** (364)	3.05	.07	.90	.89	
Problem solving & decision making	1011.31*** (337)	3.00	.07	.91	.90	
Emotional skills	991.49*** (337)	2.94	.07	.91	.90	
Leadership	1175.67*** (421)	2.79	.07	.91	.90	
Time management	1003.10*** (337)	2.98	.07	.91	.90	
Interpersonal communication	1015.13*** (335)	3.03	.07	.91	.90	

Note. N = 407. RMSEA = root mean square error of approximation; CFI = comparative fit index; TLI = Tucker-Lewis index; FL = factor loading.

***$p < .001$.

Highlights:

- Students perceived they developed life skills through physical education
- Perceived teacher autonomy support was associated with students' life skills development
- Basic need satisfaction was related to the development of students' life skills
- Controlling teaching was only associated with students' basic need frustration