



Towards a better understanding of the role of perceived task variety in Physical Education: A self-determination theory approach

Ángel Abós^{a,*}, Luis García-González^b, Alberto Aibar^c, Javier Sevil-Serrano^b

^a Faculty of Social and Human Sciences, Physical Education and Physical Activity Promotion Research Group, University of Zaragoza, Spain. Calle Ciudad Escolar, 44003 - Teruel Spain

^b Faculty of Health and Sport Sciences, Physical Education and Physical Activity Promotion Research Group, University of Zaragoza, Spain. Plaza Universidad, 3, 22001 - Huesca Spain

^c Faculty of Human Sciences and Education, Physical Education and Physical Activity Promotion Research Group, University of Zaragoza, Spain. Valentin Carderera, 4, Huesca, 22003 Spain

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ABSTRACT

Grounded in self-determination theory (SDT), perceived task variety has been related to motivational outcomes and physical activity-related behaviors in exercise settings. However, no studies have examined the role of perceived task variety in Physical Education (PE) from an SDT perspective. This cross-sectional study aspires to expand the role of perceived task variety from the context of exercise to the field of PE via multi-study: Study 1, in a sample of 210 students ($M_{age} = 13.07 \pm 0.64$), aims to validate the Perceived Task Variety in Physical Education (PTVPE) questionnaire; Study 2, in a sample of 908 students ($M_{age} = 14.35 \pm 1.54$), aims to examine whether perceived task variety in PE predicts additional variance in physical activity intention when assessed alongside satisfaction of the basic psychological needs, through the mediating effect of self-determined motivation. In Study 1, results showed that PTVPE is a valid and reliable questionnaire to measure perceived task variety in PE, displaying a one-factor structure invariant across gender. Perceived task variety in PE was found to be empirically distinct from the satisfaction of the other three basic psychological needs. In addition, perceived task variety predicted variance in autonomous motivation in PE, in addition to that explained by the satisfaction of the three basic psychological needs. In Study 2, results indicated that perceived variety in PE, alongside need satisfaction, explained autonomous motivation and amotivation, and that it indirectly benefited intention to be physically active. The PTVPE is the first valid and reliable instrument to measure students' perceptions of task variety in PE lessons using an SDT approach. Taken together, these findings contribute to further understanding the role of perceived task variety on students' motivational outcomes in PE and physical activity intention.

1. Introduction

Despite the benefits of physical activity, almost 80% of adolescents worldwide are not sufficiently active (Guthold, Stevens, Riley, & Bull, 2020). Consequently, a great deal of research has been focused on identifying which factors influence adolescents' physical activity behavior (Rhodes, Janssen, Bredin, Warburton, & Bauman, 2017). Motivational experiences in Physical Education (PE) have been identified as one of the most important correlates (Curran & Standage, 2017) that may facilitate physical activity engagement inside and outside school (Hagger & Chatzisarantis, 2016). In addition, grounded in

self-determination theory (SDT), perceived task variety (i.e., to experience a combination of novel and familiar tasks in a given context) has recently been proposed as a psychological experience related to motivational outcomes and physical activity-related behaviors in an exercise setting (Sylvester, Gilchrist, O'Loughlin, & Sabiston, 2020; Sylvester, Jackson, & Beauchamp, 2018). However, despite students having pointed out in different qualitative studies the importance of activity variety in PE (Pedersen, Thornquist, Natvik, & Råheim, 2019; White et al., 2021), the predictive effects of perceiving task variety in PE lessons have not been examined from an SDT perspective thus far.

Grounded in SDT (Deci & Ryan, 1985; Ryan & Deci, 2020), the

* Corresponding author. Faculty of Social and Human Sciences, Physical Education and Physical Activity Promotion Research Group, University of Zaragoza, Spain. Calle Ciudad Escolar, Teruel, 44003 Spain.

E-mail addresses: aabosc@unizar.es, aabosc@unizar.es (Á. Abós), lgarciag@unizar.es (L. García-González), aibar@unizar.es (A. Aibar), jseviles@unizar.es (J. Sevil-Serrano).

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current research aspires to expand previous evidence of perceived task variety from the context of exercise to the domain of PE. Importantly, the PE context could be considered different from the exercise domain because, first and foremost, it is mandatory for students and has different objectives. In this sense, the perception of task variety in the context of PE and exercise might play a different role in the one's motivation process. Thus, it seems necessary to extend previous knowledge by examining the role of task variety within PE classes. To fill this gap, the first aim of this research is to adapt and validate the Perceived Variety in Exercise (PVE) questionnaire (Sylvester, Standage, Dowd, et al., 2014) to the PE setting (Study 1). The next aim is to examine whether perceived task variety in PE (alongside autonomy, competence, and relatedness needs satisfaction) contributes to explaining both self-determined motivation in PE and students' physical activity intention (Study 2).

1.1. Self-determination theory: basic psychological needs and perceived task variety

SDT provides a useful insight into why and how psychological experiences may explain human behavior, including physical activity intention (Ntoumanis, Thørgersen-Ntoumani, Quested, & Chatzisarantis, 2018). This theory postulates that individuals have three innate and universal basic psychological needs (i.e., autonomy, competence, and relatedness), which are essential ingredients for psychological growth, integrity, and well-being (Ryan & Deci, 2017). Autonomy refers to feeling volitional and responsible in one's choices and behaviors. Competence refers to the individual's desire to feel effective in one's actions. Finally, relatedness refers to the individual's desire to feel connected with significant others (Vansteenkiste, Ryan, & Soenens, 2020). Systematic reviews and meta-analyses conducted in the PE context support the notion that students' need satisfaction for autonomy, competence, and relatedness may lead to positive motivational and behavioral outcomes (Hagger & Chatzisarantis, 2016; Vasconcellos et al., 2020). Nevertheless, past (Sheldon, 2011) and recent SDT-based research (Vansteenkiste et al., 2020), have also suggested that some additional psychological experiences may help to better understand the individual's behavior. One of these psychological experiences, which has received substantial attention in the last decade in exercise settings to explain physical activity behavior, is perceived task variety (Juvancic-Heltzel, Glickman, & Barkley, 2013; Sylvester et al., 2020; Sylvester, Jackson, & Beauchamp, 2018). Perception of task variety refers to the extent to which a person feels as though they experience diverse (i.e., novel and/or alternating between familiar) tasks and opportunities within a certain social context (Sylvester, Standage, Dowd, et al., 2014). Within PE lessons, students might perceive task variety when they engage in multiple novel and familiar activities in each lesson, experience diverse teaching units based on both ordinary (e.g., basketball) and trendy (e.g., Kinball) sports contents, or when given the opportunity to practice with a wide range of different materials.

Evidence in the context of exercise has indicated that task variety is theoretically and empirically distinct from the other three basic psychological needs (Sylvester, Standage, Ark, et al., 2014; Sylvester, Standage, Dowd, et al., 2014). To illustrate, in the PE setting, the teacher could propose a lesson in which the students had to individually carry out a series of diverse tasks. These students would perceive that the types of tasks are varied. Yet, this perceived variety of tasks would not necessarily imply that students feel they can choose these activities based on their own interests (i.e., autonomy satisfaction), that they feel skilled and capable of performing those tasks (i.e., competence satisfaction), or that they must interact with their peers (i.e., relatedness satisfaction). Therefore, although perceived variety in the tasks could help to satisfy the other basic psychological needs, it does not necessarily have to be the case (Sylvester, Jackson, & Beauchamp, 2018). In addition, task variety has been related to a set of positive outcomes in exercise settings such as vitality or physical activity behavior (Sylvester

et al., 2016; Sylvester, Standage, Ark, et al., 2014). Accordingly, to expand the study of variety effects to the PE context seems warranted, an unexplored issue to date on researchers' agendas.

1.2. What could perceived task variety in PE add to students' motivation and physical activity behavior?

SDT postulates that the degree to which people experience need satisfaction may lead to different types of motivation, which vary along a continuum of self-determination (Ryan & Deci, 2020). Intrinsic, integrated, and identified regulations are considered autonomous forms of motivation. For example, when students engage in PE because they mainly enjoy and perceive the benefits and values that PE may have for their lives and for themselves. Introjected and external regulations represent controlled forms of motivation. For instance, when students participate in PE to avoid feeling guilty, or because they are looking for an internal or external reward, such as making their parents proud of the good grades they get. Finally, amotivation represents the total absence of either autonomous or controlled reasons to engage in a certain activity, for example, in PE lessons (Ryan & Deci, 2020). Based on SDT, need satisfaction is postulated to have direct and indirect effects on adaptive outcomes, through the different types of motivation (Ryan & Deci, 2017). Need satisfaction has been positively related to autonomous motivation in PE, and consequently, autonomous motivation has shown to positively explain adaptive outcomes such as physical activity intention (Kalajas-Tilga, Koka, Hein, Tilga, & Raudsepp, 2020; Sicilia et al., 2016). Conversely, students' need satisfaction has commonly shown null or negative associations with the less self-determined forms of motivation, hindering students' positive outcomes in PE lessons (Kalajas-Tilga et al., 2020; Koka, Tilga, Kalajas-Tilga, Hein, & Raudsepp, 2019). Such SDT predictions have been largely supported in prior systematic reviews and meta-analyses conducted in the PE setting (Vasconcellos et al., 2020).

Reaching a high self-determined motivation degree in students has often been considered one of the most difficult challenges in teaching (Bennie & Langan, 2015; Deci, Ryan, Vallerand, & Pelletier, 1991). All activities are not autonomously motivating, but in turn, they may be transcendent to students' development and learning. It is at this point where perceived task variety in PE, alongside need satisfaction, could contribute to reaching higher levels of self-determination motivation among students. Such prediction has been empirically tested in the context of exercise (Sylvester, Jackson, & Beauchamp, 2018). When examined together with the satisfaction of the three basic psychological needs, perceived task variety explained both additional and unique variance in exercise behavior via autonomous motivation, but none via controlled motivation (Sylvester, Standage, Ark, et al., 2014). Furthermore, Sylvester, Curran, Standage, Sabiston, and Beauchamp (2018) showed that perceived task variety may contribute to autonomous motivation and exercise behavior when individuals perceive low levels of need satisfaction in the exercise context, further reinforcing the predictive role of perceived task variety.

1.3. The present research

Grounded in SDT, a growing body of research has revealed the predictive role of perceived task variety on motivational and behavioral outcomes in the exercise context (Sylvester, Jackson, & Beauchamp, 2018). However, while PE might also be considered an exercise context, it should be considered differently, mainly because it is mandatory for students to attend PE lessons. Moreover, one of the main aims of PE is to promote active lifestyles, whereas the aim of exercise programs can be different (e.g., aesthetic, performance). In this sense, perhaps the perception of task variety in the context of PE and exercise could play a different role in the motivational process. For example, athletes may prefer not to vary their exercises in order to have a routine and optimize their performance in a technical gesture, while students may prefer a

variety of tasks in PE (White et al., 2021).

So, this study aims to expand previous evidence of perceived task variety from the exercise context to the domain of PE. Importantly, a recent systematic review of qualitative studies supports that students who perceived variety in their exercises stated greater autonomous motivation and enjoyment (White et al., 2021). These authors stated that not varying the exercises or having repetitive routines in PE lessons can lead students to boredom and amotivation. Then, perceived task variety could help to prevent amotivation, and consequently, to develop autonomous motivation. However, the role of variety has not yet been examined in this field from an SDT perspective via quantitative methodology. Accordingly, a scale for measuring perceived task variety has not been validated in the domain of PE, either.

In Study 1, we aim to validate the Perceived Task Variety in Physical Education (PTVPE) questionnaire by examining its factor structure, reliability, measurement invariance across gender, as well as its convergent, discriminant, and predictive validity. The PTVPE is based on an adaptation of the one-factor PVE questionnaire, previously developed by Sylvester, Standage, Dowd, et al. (2014) in the exercise context. The PVE questionnaire has shown adequate psychometric properties to assess perceived task variety both in adolescents and adults (e.g., Sylvester et al., 2016, 2020; Sylvester, Curran, et al., 2018) in the exercise context. Consistent with the three basic psychological needs, perceived task variety may also be conceptualized as a psychological experience that contributes independently to explaining autonomous motivation (Sylvester, Standage, Dowd, et al., 2014). Therefore, in line with previous validation studies using the SDT framework (González-Cutre, Sicilia, Sierra, Ferriz, & Hagger, 2016), the psychometric properties of the PTVPE are examined at the same level of causality as the three basic psychological needs in the hypothesized model. However, it is noteworthy that this study has not aimed to test perceived task variety as a candidate need, given the multiple criteria that must be fulfilled for this purpose (Vansteenkiste et al., 2020). Overall, based on previous research in the exercise context (Sylvester, Standage, Dowd, et al., 2014), the results are expected to provide evidence in terms of validity and reliability of the PTVPE questionnaire.

In Study 2, we aim to examine whether students' perceptions of task variety in PE (alongside need satisfaction) prospectively predict additional variance in physical activity intention through autonomous motivation, controlled motivation, and amotivation in the PE context. Importantly, while the mediating effects of autonomous and controlled motivation between perceived task variety and physical activity behavior has been examined in prior research in exercise settings, no study has investigated the mediating effects of amotivation in this relationship, thus far. In the current study, based on systematic reviews of SDT research in PE (Vasconcellos et al., 2020; White et al., 2021), and prior research in the exercise context (Sylvester, Curran, et al., 2018; Sylvester, Standage, Ark, et al., 2014), it is posited that perceived task variety in PE (alongside need satisfaction) would explain additional variance in autonomous motivation and physical activity intention. It is also hypothesized that variance in physical activity intention would be mediated by autonomous motivation. In addition, perceived task variety is also expected to have a null or negative effect on controlled motivation and amotivation (Sylvester, Standage, Ark, et al., 2014). Likewise, those less self-determined forms of motivation would also have a non-significant or negative effect on physical activity intention (Vasconcellos et al., 2020). In line with SDT and past research in the exercise domain (Sylvester, Standage, Ark, et al., 2014), the mediating effects of controlled motivation and amotivation in the relationship between perceived task variety and physical activity intentions would be non-significant or very low.

2. Study 1

2.1. Method

2.1.1. Participants and procedure

An initial intentional sample of 225 students from two secondary schools in [details removed for peer review] were invited to participate in this first study. Participants were informed about the voluntariness and confidentiality of the study, and written informed consent was required from both the adolescents and their parents. The final sample (93% valid response rate) was comprised of 210 students (105 per school) aged from 12 to 14 years ($M_{age} = 13.07 \pm 0.64$; 48% boys). They were distributed into 11 classrooms with an average classroom size of 19.1 ± 6.15 students. Participants filled out a paper-and-pencil survey in a quiet classroom setting without the presence of the PE teacher. The study was approved by the Ethical Committee of [details removed for peer review].

2.1.2. Instruments

Perceived Task Variety Satisfaction in PE. Students' perceptions of task variety in PE were measured using an adaptation to the PE context of the one-factor PVE questionnaire (Sylvester, Standage, Dowd, et al., 2014). Following the procedures of the International Test Commission (Muñiz, Elosua, & Hambleton, 2013), four experts in SDT-based research and validation studies adapted, and subsequently translated into Spanish, the items from an exercise setting to PE lessons. The Spanish version of the PTVPE questionnaire and its English translation are reported in Table 1. Following the stem "In PE lessons ...", responses were provided on a 6-point scale ranging from 1 ("strongly disagree") to 6 ("strongly agree").

Basic Psychological Need Satisfaction in PE. Students' perceptions of autonomy, competence, and relatedness satisfaction in PE were assessed using the Spanish version in PE of the Basic Psychological Needs in Exercise Scale (BPNES) (Moreno-Murcia, González-Cutre, Chillón, & Parra, 2008). Following the stem: "In my PE lessons ..." this scale includes 12 items (four per need) assessing autonomy satisfaction (e.g., "I feel that the activities I do in PE fit in with my interests"; $\alpha = 0.91$), competence satisfaction (e.g., "I feel that in PE I perform the activities effectively"; $\alpha = 0.94$), and relatedness satisfaction (e.g., "I feel that in PE lessons I can communicate openly with my classmates"; $\alpha =$

Table 1
Item descriptive statistics, skewness, kurtosis, standardized factor loadings (λ), and uniquenesses (δ) of the PTVPE questionnaire.

| Items (range 1–6) | <i>M</i> (<i>SD</i>) | Skewness | Kurtosis | λ | δ |
|---|------------------------|----------|----------|-----------|----------|
| Stem = English: 'In PE lessons ...' /Spanish: 'En las clases de Educación Física ...' | | | | | |
| 1. I feel like I engage in a variety of exercises or tasks | 3.99 (1.20) | -.37 | -.10 | .76 | .41 |
| <i>Siento que participo en una variedad de ejercicios o actividades</i> | | | | | |
| 2. I feel like I try a range of exercises or activities | 3.99 (1.26) | -.34 | -.25 | .81 | .34 |
| <i>Siento que pruebo una variedad de ejercicios o actividades</i> | | | | | |
| 3. I feel like I change the types of exercise or task that I do | 4.06 (1.24) | -.34 | -.40 | .78 | .39 |
| <i>Siento que cambio los tipos de ejercicios o actividades que yo hago</i> | | | | | |
| 4. I feel like the exercises or tasks that we do are varied | 4.00 (1.26) | -.46 | -.28 | .79 | .36 |
| <i>Siento que los ejercicios o actividades que realizamos son muy variados</i> | | | | | |
| 5. I feel like I experience variety in my exercises or tasks | 3.82 (1.15) | -.16 | .72 | .86 | .26 |
| <i>Siento que experimento variedad en mis ejercicios o actividades</i> | | | | | |

0.90). Responses were given on a 5-point scale ranging from 1 (“strongly disagree”) to 5 (“strongly agree”).

Autonomous Motivation in PE. Students’ perceptions of autonomous motivation in PE were assessed using the Spanish version in PE of the Perceived Locus of Causality Scale (PLOC) (Ferriz, González-Cutre, & Sicilia, 2015). In this first study, we only assessed the three factors that make up autonomous motivation (four items per motivational regulation): intrinsic motivation (e.g., “... because PE is enjoyable”), integrated regulation (e.g., “... because I consider that PE is in line with my values”), and identified regulation (e.g., “... because it is important for me to do well in PE”). Following the stem: “I engage in PE lessons ...”, students were asked to rate each item on a 7-point scale ranging from 1 (“strongly disagree”) to 7 (“strongly agree”). Based on SDT and previous studies in PE (e.g., Haerens, Aelterman, Vansteenkiste, Soenens, & Van Petegem, 2015), average values of intrinsic, integrated, and identified regulations were used to calculate a composite variable of autonomous motivation ($\alpha = 0.90$).

2.1.3. Data analysis

Prior to performing the main analyses, descriptive statistics, skewness, and kurtosis of the task variety items were calculated using IBM SPSS 25. To examine the construct validity, a one-factor confirmatory factor analysis (CFA) with the five items of the PTVPE questionnaire was performed. Then, to examine the convergent and discriminant validity between perceived task variety and the three basic psychological needs, a four-factor correlated CFA and models from an exploratory structural equation modeling (ESEM) were examined. Convergent validity is accepted when theoretically-related constructs are positively and significantly correlated. Inversely, discriminant validity is supported when correlations between constructs are less than unity by an amount greater than 1.96 times (assuming alpha is set at 5%) the standard error. Both the CFA and the ESEM models were performed via weighted least squares mean and variance adjusted estimator (WLSMV) using Mplus 8.0. To evaluate the models’ fit, the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA) were selected. Higher values of 0.90 and 0.95 for CFI and TLI indicate good and excellent fit, respectively. Likewise, values of 0.08 and 0.06 or less for RMSEA indicate adequate and excellent fit, respectively (Marsh, Hau, & Wen, 2004). Next, the reliability of the PTVPE questionnaire was tested by calculating McDonald’s omega coefficient, Cronbach’s alpha coefficient (α), and Average Variance Extracted (AVE). Both McDonald’s omega and Cronbach’s alpha values were above 0.60 and 0.70, respectively, and AVE values were above 0.50, thus being considered acceptable (Dunn, Baguley, & Brunsten, 2014).

To test the measurement invariance of the PTVPE questionnaire across gender, the following four-step sequence was conducted (Morin, Arens, & Marsh, 2016): (1) configural; (2) weak (i.e., factor loadings/cross-loadings); (3) strong (i.e., factor loadings/cross-loadings, and intercepts); and (4) strict (i.e., factor loadings/cross-loadings, intercepts, and uniquenesses). Each model was compared to the previous model by considering changes in the fit indices (Δ). Greater decreases than 0.010 in CFI and TLI, and greater increases than 0.015 in RMSEA indicate a lack of invariance across groups (Chen, 2007). Finally, to test the predictive validity of the PTVPE questionnaire, a multiple linear regression analysis was performed to investigate whether students’ perceptions of task variety predicted autonomous motivation in PE, independent of autonomy, competence, and relatedness satisfaction.

2.2. Results and brief discussion

2.2.1. Construct, convergent, discriminant validity, and reliability of the PTVPE questionnaire

The CFA model of the PTVPE questionnaire exhibited good fit to the data ($\chi^2(5, n = 210) = 6.269, p < .05$; CFI = 0.997; TLI = 0.994; RMSEA = 0.035; 90% CI = 0.000-0.095). As observed in Table 1, the five items

presented acceptable values for skewness and kurtosis (i.e., > -2 and < 2) and high factor loadings ($\lambda = 0.76$ – 0.86 ; $M = 0.80$; $p < .01$) (Marsh et al., 2004).

In addition, the four-factor correlated CFA and ESEM models comprising the PTVPE questionnaire, and three latent variables referring to autonomy, competence, and relatedness satisfaction, displayed acceptable fit indices (four-factor CFA: $\chi^2(113, n = 210) = 233.731, p < .001$; CFI = 0.950; TLI = 0.940; RMSEA = 0.071; 90% CI = 0.058-0.079; four-factor ESEM: $\chi^2(74, n = 210) = 200.521, p < .001$; CFI = 0.948; TLI = 0.905; RMSEA = 0.090; 90% CI = 0.075-0.105). As observed in Table 2, both the four-factor CFA ($\lambda = 0.76$ – 0.85 ; $M = 0.80$; $p < .01$) and ESEM ($\lambda = 0.73$ – 0.88 ; $M = 0.79$; $p < .01$) models revealed high and significant factor loadings in the five items of the perceived task variety factor. These results provided support for the construct validity of the PTVPE questionnaire.

Latent factor correlations of CFA and ESEM models are reported at the bottom of Table 2. Moderate associations were found between perceived task variety and autonomy ($\varphi_{CFA} = 0.49, p < .001$; $\varphi_{ESEM} = 0.47, p < .001$), competence ($\varphi_{CFA} = 0.40, p < .001$; $\varphi_{ESEM} = 0.49, p < .001$), and relatedness satisfaction in PE ($\varphi_{CFA} = 0.55, p < .001$; $\varphi_{ESEM} = 0.55, p < .001$). In line with prior research in the exercise context (Sylvester, Standage, Ark, et al., 2014; Sylvester, Standage, Dowd, et al., 2014), these latent factors correlations support the convergent validity of the PTVPE questionnaire. On the other hand, the ESEM model also revealed reasonably low cross-loadings ($|\lambda| = 0.00$ – 0.07 ; $M = 0.03, p > .05$) between items of the PTVPE and the items of the basic psychological needs (Table 2). Moreover, both the factor correlations of the CFA and ESEM were less than unity by 1.96 times the standard error of the correlation. Altogether, these findings support the discriminant validity of this instrument in the PE context. Finally, the PTVPE questionnaire exhibited excellent composite reliability ($\omega = 0.90$) and internal consistency ($\alpha = 0.89$), as well as acceptable AVE values (0.64).

2.2.2. Invariance across gender

As observed in Table 3, the four-step sequence invariance across gender reported that none of the four steps fell below the recommended guidelines (ΔCFI and $\Delta TLI > .010$; $\Delta RMSEA \geq 0.015$). Further, all measurement invariance models indicated adequate model fit according to CFI, TLI, and RMSEA. Taken together, these results provide evidence of measurement invariance of the PTVPE questionnaire across gender (Chen, 2007).

2.2.3. Predictive validity analysis

The multiple regression analysis was conducted in two steps, first introducing the three needs as independent variables and, subsequently, perceived task variety. Preliminary steps showed that autonomous motivation positively correlated with task variety ($r = 0.58, p < .001$), autonomy ($r = 0.46, p < .001$), competence ($r = 0.59, p < .001$), and relatedness satisfaction ($r = 0.50, p < .001$). In the first step, autonomous motivation was positively predicted by autonomy ($\beta = .12, p < .001$), competence ($\beta = 0.38, p < .001$), and relatedness satisfaction ($\beta = 0.24, p < .001$), with 39.7% of explained variance. The findings of the second step showed that autonomous motivation was positively predicted by competence ($\beta = .30, p < .001$) and relatedness satisfaction ($\beta = 0.14, p < .001$) and, in addition, by perceived task variety ($\beta = 0.32, p < .001$), explaining the 45.5% of the variance. Autonomy satisfaction did not significantly predict autonomous motivation in the second step ($\beta = 0.03, p = .301$). According to SDT and past studies (Sylvester, Standage, Dowd, et al., 2014), these results provide initial evidence for the predictive validity of the PTVPE questionnaire due to their additional prediction of autonomous motivation.

Table 2
Standardized Factor loadings (λ), Uniquenesses (δ), Composite Reliability (ω), and Latent Correlations for the Four-Factor ESEM and CFA of the PTVPE and BPNES.

| Indicator | Four-correlated factor ESEM | | | | | - | Four-correlated factor CFA | |
|--------------------------|-----------------------------|--------------------|----------------------|-----------------------|-------------|---|----------------------------|----------|
| | Variety λ | Autonomy λ | Competence λ | Relatedness λ | δ | | λ | δ |
| Perceived task variety | | | | | | | | |
| 1 | .80 | <i>-.01</i> | <i>-.07</i> | <i>.00</i> | 0.40 | | .76 | .41 |
| 2 | .78 | <i>.01</i> | <i>.01</i> | <i>.02</i> | 0.34 | | .81 | .34 |
| 3 | .73 | <i>.02</i> | <i>.04</i> | <i>.00</i> | 0.38 | | .78 | .38 |
| 4 | .74 | <i>.01</i> | <i>.06</i> | <i>.03</i> | 0.35 | | .80 | .35 |
| 5 | .88 | <i>.01</i> | <i>-.02</i> | <i>-.05</i> | 0.26 | | .85 | .28 |
| Autonomy satisfaction | | | | | | | | |
| 1 | <i>.00</i> | .79 | <i>.03</i> | <i>.00</i> | 0.33 | | .82 | .32 |
| 2 | <i>-.03</i> | .90 | <i>-.01</i> | <i>-.01</i> | 0.22 | | .87 | .24 |
| 3 | <i>-.04</i> | .86 | <i>.01</i> | <i>.01</i> | 0.19 | | .89 | .19 |
| 4 | <i>.02</i> | .80 | <i>-.02</i> | <i>.01</i> | 0.34 | | .81 | .33 |
| Competence satisfaction | | | | | | | | |
| 1 | <i>-.01</i> | <i>.08</i> | .85 | <i>.01</i> | 0.22 | | .88 | .22 |
| 2 | <i>-.04</i> | <i>.04</i> | .92 | <i>-.01</i> | 0.14 | | .92 | .14 |
| 3 | <i>-.01</i> | <i>-.04</i> | .94 | <i>.02</i> | 0.14 | | .92 | .14 |
| 4 | <i>.07</i> | <i>-.07</i> | .85 | <i>-.02</i> | 0.28 | | .84 | .24 |
| Relatedness satisfaction | | | | | | | | |
| 1 | <i>.07</i> | <i>-.04</i> | <i>.00</i> | .81 | 0.30 | | .83 | .30 |
| 2 | <i>-.03</i> | <i>.04</i> | <i>.01</i> | .88 | 0.22 | | .87 | .22 |
| 3 | <i>-.07</i> | <i>.05</i> | <i>-.02</i> | .88 | 0.27 | | .84 | .28 |
| 4 | <i>.06</i> | <i>-.05</i> | <i>.01</i> | .79 | 0.34 | | .81 | .28 |
| | | Variety | Autonomy | Competence | Relatedness | | | |
| Variety | | - | .47 (.07) | .40 (.07) | .55 (.07) | | | |
| Autonomy | | .49 (.07) | - | .40 (.08) | .40 (.08) | | | |
| Competence | | .41 (.07) | .41 (.08) | - | .30 (.08) | | | |
| Relatedness | | .55 (.07) | .41 (.08) | .30 (.08) | - | | | |

Note. Bold = target factor loadings. Non-significant parameters ($p \geq .05$) are marked in italics. ESEM latent correlations are displayed above the diagonal. CFA latent correlations are displayed below. Standard error of the correlations is shown between brackets.

Table 3
Multigroup invariance across gender of the PTVPE questionnaire.

| Model | χ^2 (df) | CFI | TLI | RMSEA [90% CI] | CM | $\Delta\chi^2$ (df) | Δ CFI | Δ TLI | Δ RMSEA |
|---------------------------|---------------|-------|-------|---------------------|----|---------------------|--------------|--------------|----------------|
| M1. Configural invariance | 9.09 (10) | 1.000 | 1.000 | 0.000 [0.000–0.099] | - | - | - | - | - |
| M2. Weak invariance | 12.80 (14) | 0.999 | 0.999 | 0.007 [0.000–0.087] | M2 | 3.75 (4) | - 0.001 | - 0.001 | +0.007 |
| M3. Strong invariance | 18.87 (18) | 0.998 | 0.998 | 0.015 [0.016–0.091] | M3 | 6.44 (4) | - 0.001 | - 0.001 | +0.008 |
| M4. Strict invariance | 18.89 (23) | 0.999 | 0.999 | 0.000 [0.000–0.062] | M4 | 0.61 (5) | +0.001 | +0.001 | - 0.015 |

Note. χ^2 = scaled chi-square test of exact fit, df = degrees of freedom. CFI = comparative fit index. TLI = Tucker-Lewis index. RMSEA = root mean square error of approximation. RMSEA [90% CI] = 90% confidence interval of the RMSEA. CM = comparison model. Δ = change in fit information relative to the CM.

3. Study 2

3.1. Method

3.1.1. Participants and procedure

A convenience sample of 928 secondary school students from four of the eight secondary schools in [details removed for peer review] were invited to participate in Study 2. Participation was voluntary and confidentiality was guaranteed. After obtaining the written informed consent from both adolescents and their parents (97% valid response rate), the final sample consisted of 908 students aged from 12 to 18 years old ($M_{age} = 14.35 \pm 1.54$; 50% boys). Participants came from four different secondary schools ($M_{students} = 227 \pm 99.36$) and were distributed into 41 different classrooms with an average classroom size of 22.1 ± 5.77 students. A paper-and-pencil survey was administered in a quiet classroom environment without the presence of the PE teacher. Ethical approval for this study was obtained from the Ethics Committee of [details removed for peer review].

3.1.2. Instruments

Perceived Task Variety in PE. Students' perceptions of task variety satisfaction in PE were assessed by means of the Spanish version of the PTVPE questionnaire. For further details of the validation of this one-factor instrument, see the instruments section of Study 1 and Table 1.

Basic Psychological Need Satisfaction in PE. Students' perceptions of need satisfaction in PE were measured using the Spanish version in PE of the BPNES (Moreno-Murcia et al., 2008). The scale begins with the stem "In my PE lessons ..." followed by 12 items assessing autonomy, competence, and relatedness satisfaction (for further details, see Study 1). Consistent with prior SDT research in PE (e.g., Haerens et al., 2015), a composite variable of need satisfaction was calculated for parsimony reasons. Autonomy, competence, and relatedness satisfaction were highly positively correlated to each other (see Table 4).

Types of Motivation in PE. Students' perceptions of different motivational regulations in PE were measured via the Spanish version of the PLOC (Ferriz et al., 2015). This scale starts with the stem "I engage in PE lessons ..." followed by 24 items (four per factor) measuring intrinsic motivation (e.g., "... because PE is enjoyable"), integrated regulation (e.g., "... because I consider that PE is in line with my values"), identified regulation (e.g., "... because it is important for me to do well in PE"), introjected regulation (e.g., "... because I want the teacher to think that I am a good student"), external regulation (e.g., "... because I will have problems if I do not"), and amotivation (e.g., "... but I really feel that I am wasting my time in PE"). Responses were registered on a 7-point scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"). According to SDT and most previous research in PE (e.g., Haerens et al., 2015), composite scores for autonomous (i.e., using average values of intrinsic, integrated, and identified regulations) and controlled

Table 4
Descriptive statistics, Cronbach's alpha coefficients, and Pearson's correlations of the variables of the study 2.

| Study variables | M (SD) | α | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---------------------------------|-------------|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| 1. Perceived task variety | 4.13 (1.17) | .85 | – | | | | | | | | | | | | | |
| 2. Need satisfaction | 3.62 (0.80) | .89 | .69* | – | | | | | | | | | | | | |
| 3. Autonomy satisfaction | 3.21 (1.04) | .81 | .59* | .87* | – | | | | | | | | | | | |
| 4. Competence satisfaction | 3.64 (0.91) | .77 | .63* | .89* | .69* | – | | | | | | | | | | |
| 5. Relatedness satisfaction | 4.00 (0.82) | .76 | .57* | .81* | .52* | .63* | – | | | | | | | | | |
| 6. Autonomous motivation | 5.17 (1.44) | .93 | .63* | .65* | .51* | .64* | .54* | – | | | | | | | | |
| 7. Intrinsic motivation | 5.31 (1.63) | .92 | .61* | .64* | .52* | .62* | .53* | .84* | – | | | | | | | |
| 8. Integrated regulation | 4.90 (1.82) | .91 | .50* | .51* | .39* | .51* | .43* | .86* | .58* | – | | | | | | |
| 9. Identified regulation | 5.30 (1.66) | .89 | .51* | .51* | .40* | .49* | .42* | .84* | .57* | .57* | – | | | | | |
| 10. Controlled motivation | 3.41 (1.54) | .88 | -.22* | -.32* | -.25* | -.30* | -.29* | -.22* | -.23* | -.21* | -.13* | – | | | | |
| 11. Introjected regulation | 3.81 (1.80) | .88 | -.10* | -.22* | -.18* | -.21* | -.18* | -.10* | -.13* | -.12* | .02 | .87* | – | | | |
| 12. External regulation | 3.01 (1.74) | .88 | -.29* | -.34* | -.27* | -.31* | -.32* | -.30* | -.28* | -.24* | -.24* | .86* | .49* | – | | |
| 13. Amotivation | 1.98 (1.52) | .91 | -.59* | -.65* | -.52* | -.60* | -.59* | -.76* | -.76* | -.54* | -.60* | .27* | .12* | .35* | – | |
| 14. Physical activity intention | 5.08 (1.66) | .88 | .42* | .44* | .33* | .45* | .39* | .59* | .53* | .52* | .45* | -.29* | -.23* | -.28* | -.53* | – |

Note. * $p < .001$.

motivation (i.e., using average values of introjected and external regulations) were calculated for parsimony reasons. Intrinsic, integrated, and identified regulations, as well as introjected and external regulations, respectively, were highly positively correlated to each other (see Table 4).

Physical Activity Intention. Students' perceptions of physical activity intention were measured using the three items (e.g., "I intend to do active sports and/or physical activities during my leisure-time in the next 5 weeks ...") of the Theory of Planned Behavior Questionnaire (Hagger et al., 2009). Responses were given on a 7-point scale ranging from 1 ("strongly agree") to 7 ("strongly disagree").

3.1.3. Data analysis

Prior to performing the main analyses, the descriptive statistics (M and SD), Pearson's correlations, and Cronbach's alpha reliability were calculated using IBM SPSS 25. Next, a multilevel structural equation modeling (SEM) based on WLSMV estimation was conducted using Mplus 8.0. Point estimates and 95% bias-corrected bootstrap confidence intervals (95% CI_{BC}) with 5000 bootstrap samples were calculated and reported for each of the proposed direct and indirect pathways (Hayes & Scharkow, 2013). As in Study 1, the model fit was evaluated by means of CFI, TLI (>0.90), and RMSEA (<0.08) values (Marsh et al., 2004).

3.2. Results and brief discussion

3.2.1. Preliminary descriptive and correlational results

Table 4 shows the descriptive statistics and Pearson's correlations for the variables of Study 2, which were in line with a recent SDT-based systematic review and meta-analysis conducted in the PE context (Vasconcellos et al., 2020).

3.2.2. Multiple mediation analysis

Because in this study 908 students were nested within 41 classrooms and four schools, we proceeded to control the multilevel nature of the data prior to conducting the SEM (Preacher, Zhang, & Zyphu, 2011). Accordingly, the variances at school and classroom level were estimated. Three-level models indicated that there was no significant variance at school level (all $\chi^2(1) = 1.10, p > .05$). Then, we proceeded by estimating two-level models with students nested within classrooms. Classroom-level variance was significant for need satisfaction ($\chi^2(1) = 2.97, p < .01$; ICC = 0.15), perceived task variety ($\chi^2(1) = 2.98, p < .01$; ICC = 0.22), autonomous motivation ($\chi^2(1) = 2.63, p < .01$; ICC = 0.22), amotivation ($\chi^2(1) = 3.25, p < .01$; ICC = 0.42), but not for controlled motivation ($\chi^2(1) = 1.46, p = .14$; ICC = 0.07), or physical activity intention ($\chi^2(1) = 1.53, p > .05$; ICC = 0.09). Consequently, we controlled the multilevel nature of the data at classroom level in the SEM.

The theory-based model, which included direct paths from perceived

task variety and need satisfaction to physical activity intention through autonomous motivation, controlled motivation, and amotivation, showed good fit to the data ($\chi^2(569, n = 908) = 981.265, p < .001$; CFI = 0.955; TLI = 0.951; RMSEA = 0.028; 90% CI = 0.025-0.031). In addition, this proposed model was previously compared with another model that did not include perceived task variety to ensure the predictive capacity of perceived task variety in PE alongside basic psychological needs. However, while this previous model also revealed good fit to the data ($\chi^2(414, n = 908) = 801.453, p < .001$; CFI = 0.952; TLI = 0.947; RMSEA = 0.032; 90% CI = 0.029-0.035), it showed lower values of CFI (i.e., $\Delta = -0.002$) and TLI (i.e., $\Delta = -0.004$), and lower values of RMSEA (i.e., $\Delta = +0.04$) when compared with the proposed model that includes perceived task variety. In addition, the explained variance was also lower in all dependent variables, showing a reduction of 4% in autonomous motivation, 1% in controlled motivation, 3% in amotivation, and 5% in physical activity intention, offering support to maintain the proposed model with variety. Going back to the theory-based model, as observed in Table 5 and in Fig. 1, perceived task variety positively predicted autonomous motivation ($\beta = 0.35, p < .001$) and negatively predicted amotivation ($\beta = -0.27, p < .001$), whereas need satisfaction positively predicted autonomous motivation ($\beta = 0.43, p < .001$), and negatively predicted controlled motivation ($\beta = -0.47, p < .001$) and amotivation ($\beta = -0.56, p < .001$). Moreover, physical activity intention was positively predicted by autonomous motivation ($\beta = 0.39, p < .001$), and negatively predicted by controlled motivation ($\beta = -0.15, p < .001$) and amotivation ($\beta = -0.28, p < .01$). Importantly, the shared variance between perceived task variety and need satisfaction was controlled ($r = 0.70, p < .001$) as observed in Fig. 1.

With regard to indirect effects, perceived task variety displayed indirect effects on physical activity intention through autonomous motivation ($\beta = 0.14, p < .001$) and amotivation ($\beta = 0.08, p < .05$), whereas need satisfaction showed specific indirect effects on physical activity intention via autonomous motivation ($\beta = 0.16, p < .01$), controlled motivation ($\beta = 0.08, p < .01$), and amotivation ($\beta = 0.16, p < .01$). After controlling for the effects of the mediators, the direct effects of perceived task variety ($\beta = 0.01, p = .824$) and need satisfaction ($\beta = -0.02, p = .740$) on physical activity intention were non-significant, providing evidence of mediation. Consistent with previous studies that have examined the role of task variety in the exercise context (Sylvester, Standage, Ark, et al., 2014), these results provide initial support to state that perceived task variety in PE may complement the basic psychological needs in the prediction of autonomous motivation and amotivation, as well as, indirectly, in physical activity intention.

4. General discussion

Grounded in SDT, this research aimed to validate the PTVPE

Table 5
Multiple-mediation model of perceived task variety and need satisfaction on physical activity intention through different types of motivation.

| | Standardized estimates "β" | Standard error | p-values | 95% CI _{BC} |
|--|----------------------------|----------------|----------|----------------------|
| <i>Direct effects on autonomous motivation</i> | | | | |
| Perceived task variety | .35*** | .06 | <.001 | (.24, .45) |
| Need satisfaction | .43*** | .06 | <.001 | (.32, .52) |
| <i>Direct effects on controlled motivation</i> | | | | |
| Perceived task variety | .07 | .08 | .399 | (-.07, .20) |
| Need satisfaction | -.47*** | .08 | <.001 | (-.62, -.47) |
| <i>Direct effects on amotivation</i> | | | | |
| Perceived task variety | -.27*** | .07 | <.001 | (-.39, -.27) |
| Need satisfaction | -.56*** | .06 | <.001 | (-.67, -.45) |
| <i>Direct effects on physical activity intention</i> | | | | |
| Autonomous motivation | .39*** | .05 | <.001 | (.30, .48) |
| Controlled motivation | -.15*** | .03 | <.001 | (-.22, -.09) |
| Amotivation | -.28** | .08 | .001 | (-.43, -.15) |
| Perceived task variety | .01 | .07 | .824 | (-.09, .13) |
| Need satisfaction | -.02 | .08 | .740 | (-.18, .10) |
| <i>Indirect effects of perceived task variety on physical activity intention</i> | | | | |
| Total indirect | .21*** | .04 | <.001 | (.12, .28) |
| Specific indirect via autonomous motivation | .14*** | .03 | <.001 | (.09, .19) |
| Specific indirect via controlled motivation | -.01 | .01 | .438 | (-.03, .01) |
| Specific indirect via amotivation | .08* | .03 | .013 | (.03, .13) |
| <i>Indirect effects of need satisfaction on physical activity intention</i> | | | | |
| Total indirect | .40*** | .06 | <.001 | (.30, .52) |
| Specific indirect via autonomous motivation | .16*** | .03 | <.001 | (.11, .23) |
| Specific indirect via controlled motivation | .08** | .02 | .003 | (.04, .12) |
| Specific indirect via amotivation | .16** | .05 | .003 | (.08, .26) |

Note. *p < .05, **p < .01, ***p < .001. 95% CIBC = 95% bias-corrected bootstrap confidence interval.

questionnaire and, subsequently, to explore the extent to which perceived task variety in PE prospectively predicts physical activity intention through different types of motivation in PE. The main findings revealed that: 1) the PTVPE questionnaire was valid and reliable to assess perceived task variety in PE; 2) task variety in PE was empirically distinct from the other three basic psychological needs; 3) perceived task variety in PE complemented need satisfaction in the prediction of autonomous motivation; 4) perceived task variety in PE was an indirect positive predictor of physical activity intention, and autonomous motivation and amotivation mediated this association; and 5) need satisfaction indirectly predicted physical activity intention through autonomous motivation, controlled motivation, and amotivation. The current findings are consistent with most prior studies in exercise settings (Sylvester, Curran, et al., 2018; Sylvester, Standage, Ark, et al., 2014; Sylvester, Standage, Dowd, et al., 2014). These results shed new light in the field of PE on the role of perceived task variety in relation to students' self-determined motivation and physical activity intention.

In line with the validation of the PVE questionnaire in the exercise context (Sylvester, Standage, Dowd, et al., 2014), the CFA of the PTVPE

questionnaire exhibited excellent fit values, high factor loadings, and excellent reliability. In addition, the PTVPE questionnaire showed evidence of invariance across gender, a gap that had not yet been addressed in the exercise setting. Based on our findings, we suggest that boys and girls have similar interpretations of the items on the PTVPE questionnaire, which is a key requirement to validate an instrument (Millsap, 2011). According to past studies, which have examined the role of task variety in exercise settings (Sylvester, Standage, Ark, et al., 2014; Sylvester, Standage, Dowd, et al., 2014), latent correlations of CFA and ESEM models, and cross-loadings also revealed that although perceived task variety was positively associated with autonomy, competence, and relatedness satisfaction, it was also empirically distinct from these three basic psychological needs. These findings were also in line with an exercise intervention study in which the provision of different levels of activity variety affected the amount of variety that participants experienced, but not how autonomous, competent, or related they felt (Sylvester, Standage et al., 2016). Overall, these findings offer support for discriminant and convergent validity of the PTVPE questionnaire, suggesting that the experience of alternating novel and familiar tasks in PE lessons (i.e., perceived task variety) is conceptually different from feeling volitional or self-endorsed (i.e., autonomy satisfaction), efficient or skilled (i.e., competence satisfaction), and connected to or integrated with classmates (i.e., relatedness satisfaction).

Finally, results from the predictive validity test, in line with variety-related research in exercise (Sylvester, Curran, et al., 2018; Sylvester, Standage, Ark, et al., 2014), showed that the PTVPE questionnaire provides additional explanatory capacity to satisfaction of autonomy, competence, and relatedness in the prediction of students' autonomous motivation in PE. These results are consistent with prior studies that have examined the role of novelty satisfaction, which is conceptually closely related to perceived task variety (Bagheri & Milyavskaya, 2020). For example, González-Cutre et al. (2016) showed that novelty satisfaction in PE (i.e., students' feeling of experiencing something new or unusual) positively predicts students' intrinsic motivation. Such findings support the claims of Sheldon (2011) and Vansteenkiste et al. (2020), emphasizing that the three basic psychological needs might be an incomplete subset of the types of psychological experiences that may be involved in promoting the more self-determined forms of motivation. A previous systematic review of qualitative studies in the PE setting also revealed that students who perceived task variety stated greater autonomous motivation and enjoyment (White et al., 2021). Then, students' perceptions of task variety could help to prevent amotivation, and, consequently, to develop autonomous motivation. Importantly, these results highlight the significance that perceived task variety may have in enhancing students' autonomous motivation in PE, which is still considered a challenge for PE teachers (Bennie & Langan, 2015). In addition, according to evidence in exercise settings (Sylvester, Curran, et al., 2018), perceived task variety in PE might be even more useful to promote the internalization of the more self-determined types of motivation in students with low levels of need satisfaction. Nevertheless, further research using moderation analyses is required to verify these findings in PE.

On the other hand, consistent with past variety-related research in exercise settings (Sylvester, Curran, et al., 2018; Sylvester, Standage, Ark, et al., 2014), perceived task variety in PE complemented need satisfaction by explaining additional variance in the prediction of autonomous motivation in PE and, indirectly, in physical activity intention. According to Dimmock, Jackson, Podlog, and Magaraggia (2013), the notion that perceived task variety in exercise settings may promote autonomous motivation, and consequently physical activity, may provide a useful explanation to our findings. Thus, such an experience of perceived task variety in PE could also be valuable in increasing physical activity levels outside school (Hagger & Chatzisarantis, 2016; Ntoumanis et al., 2018), which is a serious public health problem among youth (Guthold et al., 2020). Overall, it seems that it is particularly important for PE teachers to provide students with a wide

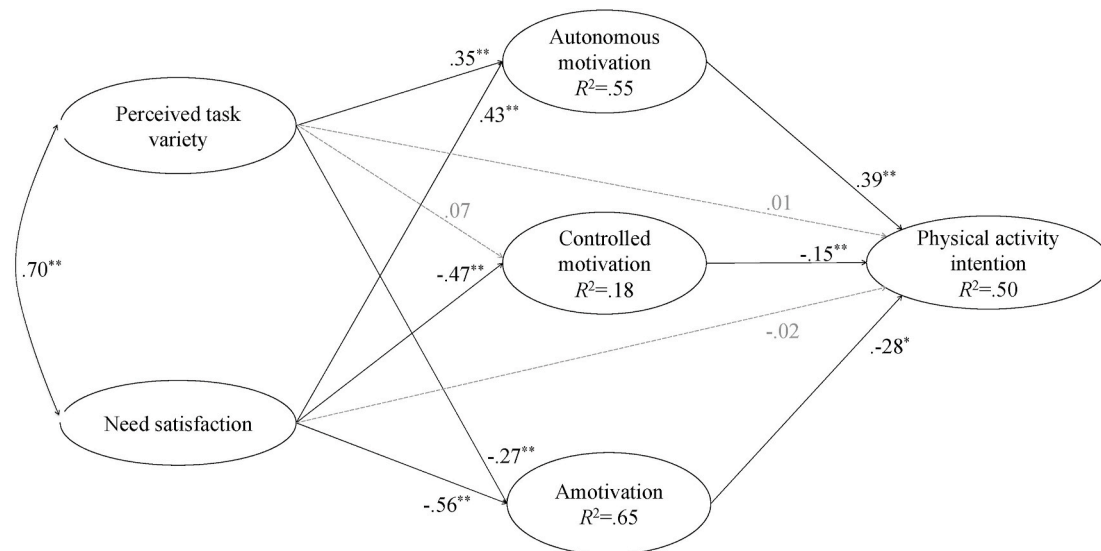


Fig. 1. Graphical representation of the multiple-mediation model assessing the effect of task variety and need satisfaction on students ‘physical activity intention via autonomous motivation, controlled motivation, and amotivation. Gray arrows indicate non-significant associations. For further information of standardized estimates, standard error, p-values, and 95% CIBC of each pathway hypothesized in the model, please see Table 5. Note. *p < .01, **p < .001.

variety of physical activities. However, more longitudinal and experimental research is needed to corroborate our preliminary results. In addition, perceived task variety in PE was not related to controlled motivation. At first sight, it might seem that perceived task variety in PE could only enhance autonomous motivation rather than additionally buffer against the less self-determined forms of motivation. Indeed, this result is in line with prior research in the exercise context (Sylvester, Standage, Ark, et al., 2014), in which the perception of variety of exercises neither promoted nor protected controlled motivation over time. Yet, contrary to controlled motivation, the present research has shown that perceived task variety in PE is negatively related to amotivation which, in line with a recent SDT-based systematic review in PE (Vasconcellos et al., 2020), negatively predicted physical activity intention. Therefore, perceived task variety in PE may not only enhance autonomous motivation, but also buffer the lack of student motivation. Finally, consistent with SDT-related research (Ryan & Deci, 2017, 2020) in PE context (Vasconcellos et al., 2020), our findings suggested that need satisfaction predicted physical activity intention through autonomous motivation, controlled motivation, and amotivation. Overall, it seems that PE teachers should not only support basic psychological needs, but also task variety to enhance autonomous motivation and reduce amotivation, which might help students to adopt an active lifestyle (Hagger & Chatzisarantis, 2016; Ntoumanis et al., 2018; White et al., 2021).

4.1. Practical implications

On the one hand, PE teachers can design specific strategies to increase task variety that do not necessarily have to satisfy autonomy, competence, and relatedness. Based on previous studies (Sylvester et al., 2016; Vazou, Mischo, Ladwig, Ekkekakis, & Welk, 2019), some of the strategies that PE teachers can use to provide a variety of activities are highlighted below. PE teachers can provide a variety of structural and functional elements within the activities (e.g., the number and groups of students, rules, goals, court dimensions, etc.), roles and responsibilities assumed by students (e.g., player, referee, coach, etc.), and materials (e.g., different types of balls, music, self-made, etc.) to encourage students to perceive variety in their tasks. Likewise, PE teachers can propose a combination of novel and familiar tasks, and alternate the learning environment where lessons are held (e.g., in the playground, outside school, in the natural environment, etc.). Finally, PE teachers can provide a wide range of different novel and familiar content areas (e.g.,

corporal expression activities, individual sports, team sports, natural environment, etc.), pedagogical models (e.g., teaching games for understanding model, sport education model, etc.), and teaching styles (e.g., reciprocal, guided discovery, etc.). However, it is important to note that more experimental research is needed to support the effectiveness of these proposed strategies in the PE context.

On the other hand, it is also important to note that some strategies or Motivation and Behavior Change Techniques (MBCTs) to support autonomy, competence, and relatedness (Teixeira et al., 2020) could also increase students’ perceptions of task variety if they are well-targeted. For example, regarding autonomy-support techniques, “explore life aspirations and values”, or “provide choice” (Teixeira et al., 2020) could be related to the variety of tasks. Likewise, knowing students’ interests, preferences, and experiences regarding task variety could be a strategy closer to autonomy support. Moreover, regarding competence-support techniques, “help develops a clear and concrete plan of action” (Teixeira et al., 2020) could favor the design of a wide variety of tasks. Finally, relatedness-support techniques such as “acknowledge and respect perspectives and feelings” (Teixeira et al., 2020) could help students have the confidence to suggest to teachers to vary the tasks. Nonetheless, more experimental research in PE is required to demonstrate the impact of need-support strategies on students’ perceptions of task variety.

4.2. Limitations and perspectives for future research

Balanced against the contributions of this research, limitations should also be noted. First, the cross-sectional design makes it impossible to determine the causal relationship between the study variables examined. Longitudinal and experimental studies are required to examine the causal and long-term effects of perceived task variety in PE on motivational and behavioral outcomes. Second, participants were recruited by means of two intentional samples, which may limit the external validity of the conclusions. Evidence from a representative sample of adolescents is required in future studies to increase the generalizability of these findings. Third, this research was only based on self-reported questionnaires. Using a mixed-methods approach would contribute to further understanding the role of perceived task variety on SDT-related variables in PE lessons. In addition, the use of device-measured physical activity levels would provide more robust data regarding the relationship between perceived task variety in PE and

physical activity, both during and outside PE lessons. Fourth, in this study we only analyzed the role of perceived task variety on SDT-related variables in PE lessons that were integrated in the “bright side” of motivation. Future studies should examine the “dark side” of motivation (Bartholomew, Ntoumanis, Ryan, Bosch, & Thøgersen-Ntoumani, 2011) by examining relationship between need-thwarting behaviors from PE teachers and/or need-frustration, perceived task variety, and maladaptive outcomes in PE. Finally, this research is based exclusively on predictive effects of perceived task variety in PE. While we think that students might perceive a variety of tasks by introducing variety in assessments, methodologies, materials, structural and functional elements within the activities, future studies could also validate a new scale to assess students’ perceptions of variety in a global sense, not referring exclusively to the variety of tasks (e.g., I feel like I experience variety in PE lessons). Moreover, it would also be interesting to validate a new scale of students’ perceptions of variety support from the PE teacher. This would expand knowledge on how PE teachers may increase students’ perceptions of task variety in PE.

5. Conclusions

This research provides a conceptual insight and empirical evidence about the effect of task variety in PE lessons on motivational and physical activity-related outcomes. The PTVPE questionnaire is the first valid and reliable instrument to measure perceived task variety in PE lessons among Spanish adolescents. Moreover, this research shows how students’ perceptions of task variety in PE, when examined alongside need satisfaction, benefits students’ physical activity intentions by increasing their levels of autonomous motivation and decreasing amotivation in PE. To summarize, if PE teachers provide task variety together with need satisfaction, they might make it easier for students to enjoy, value, and discover the benefits of PE. Accordingly, this could boost students’ physical activity intentions.

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Declaration of competing interest

None.

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