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## Prediction model of healthy lifestyles in physical education students based on self-determination theory<sup>☆</sup>

Marta Leyton<sup>a</sup>, Marco Batista<sup>b</sup>, and Ruth Jiménez-Castuera<sup>c,\*</sup><sup>a</sup> Sports Studies Center. Rey Juan Carlos University, Paseo Artilleros s/n, Madrid, 28032, Spain<sup>b</sup> Sport, Health and Exercise Research Unit (SHERU) - Polytechnic Institute of Castelo Branco, Castelo Branco, Portugal. Av. Pedro Alvares Cabral 12, 6000-084 Castelo Branco, Portugal<sup>c</sup> Didactic and Behavioural Analysis in Sport Research Group. Faculty of Sport Sciences, University of Extremadura, Av. de la Universidad s/n., Cáceres, 10003, Spain

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## ABSTRACT

The main objective of this study was to analyze the predicted effect that motivational processes have with regards adopting healthy lifestyle habits among adolescents during physical education classes. The sample consisted of 214 Secondary Education students in Portugal, aged between 15 & 19 years old ( $M = 16.46$ ,  $SD = .96$ ), of both genders (104 boys and 110 girls). The following questionnaires were administered: The Perceived Locus of Causality Scale for Physical Education, the Basic Psychological Needs in Exercise Scale, The Healthy Lifestyle Questionnaire & the Scale of Measurement of Intention to be Physically Active. An analysis of structural equations was used which revealed that satisfaction with basic psychological needs can predict an intrinsic motivation which, in turn, predicted the variables related to healthy lifestyles, both positively & significantly. This study highlights the importance of developing self-determined motivation via satisfying basic psychological needs in physical education classes to promote a healthy lifestyle in students.

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### Modelo de predicción de los estilos de vida saludables a través de la teoría de la autodeterminación de estudiantes de educación física

## RESUMEN

El objetivo principal de este estudio es analizar la predicción que los procesos motivacionales tienen en la adopción de hábitos de estilos de vida que realzan la salud en adolescentes, en las clases de Educación Física. La muestra se compone por 214 estudiantes de Enseñanza Secundaria en Portugal, entre los 15 y 19 años ( $M = 16.46$ ,  $DT = .96$ ), de ambos sexos (104 chicos y 110 chicas). Se administran los siguientes cuestionarios: Escala del Locus Percibido De Causalidad en Educación Física, Escala de medición de las necesidades psicológicas básicas, el Cuestionario de Estilos de Vida Saludables y la Escala de Medida de la Intencionalidad para ser Físicamente Activo. Se utiliza un análisis de ecuaciones estructurales, y se muestra que la satisfacción de las necesidades psicológicas básicas predice la motivación intrínseca, y ésta a su vez, predice las variables relacionadas con los estilos de vida que realzan la salud, ambas predicciones de forma positiva y significativa. Se destaca la relevancia de desarrollar la motivación más autodeterminada a través de la satisfacción de las necesidades psicológicas básicas en las clases de Educación Física para fomentar estilos de vida saludables en el alumnado.

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\* Corresponding authors.

E-mail address: [ruthji@unex.es](mailto:ruthji@unex.es) (R. Jiménez-Castuera).

## Introduction

The promotion of healthy lifestyles, especially those regarding the practice of physical activity (PA) & the development of appropriate eating habits, constitute one of the main endeavors of physical education professionals (Usán et al., 2018).

In physical education (PE) settings, youth perform physical exercise in an environment where motivation is promoted, together with a dedication to practice sports during after-school hours (Franco, Coterón, Gómez, Brito, & Martínez, 2017). Physical education teachers are one of the principal promoters of PA practice (Egan & Webster, 2018), playing a crucial role in motivating students to increase their practice of PA (Yilmaz et al., 2017). Thompson et al. (2014), have determined that teachers are the prime motivators behind attitudes towards PA among students, ensuring that they remain active & committed to obtaining healthy habits, & highlighting the importance of motivation as a factor that promotes an active & healthy lifestyle.

One of the theories that helps explain the motivation of students in PE classes is the Self-Determination Theory (SDT) (Deci & Ryan, 1985; Ryan & Deci, 2000). The SDT proposes that motivation is framed within a continuum in which the following specific levels are distinguished (Vansteenkiste et al., 2006; Vansteenkiste et al., 2010): intrinsic motivation (the most self-determined, performing an activity for your own pleasure), extrinsic motivation (performing an activity for a reward or external recognition) & demotivation (the least self-determined) (Deci & Ryan, 2000).

Furthermore, three Basic Psychological Needs (BPN) are established: autonomy (committing to activities by one's own choice), competence (interacting efficiently with the environment to acquire competence) & social relations (feeling part of a group) (Deci & Ryan, 2000; Ryan & Deci, 2000). In SDT, BPN constitute the psychological mediators that will influence the three main types of motivation (Deci & Ryan, 1985; Ryan & Deci, 2000). Numerous studies use BPN as mediators which positively predict the most self-determined forms of motivation (González-Cutre et al., 2011; McDonough & Crocker, 2007; Standage et al., 2006).

The Hierarchical Model of Motivation (HMM) (Vallerand, 1997, 2001) associates BPN with SDT (Deci & Ryan, 2002). This model proposes that social aspects of the environment (background variables) influence motivation according to whether, or not, a series of BPN are fulfilled (autonomy, competence & social relations). Fulfillment of the same increases the level of intrinsic motivation (forms of self-determined motivation) (Deci & Ryan, 2000; Ryan & Deci, 2000) which will lead to positive consequences on a cognitive, affective & behavioral level (consequent variables) which correspond to the healthy lifestyle variables analyzed.

Students who display a greater fulfillment of BPN have shown to develop a higher self-determined motivation (González-Cutre et al., 2014). The motivational processes developed by students in PE contexts act as determinants for the behaviors developed during classes (Charchaoui et al., 2017). The study of motivational processes in PE is of great interest seeing as motivation has been understood as being a determining factor for maintaining behaviors that support health (Ntoumanis et al., 2017).

However, what is considered a healthy lifestyle? A universal consensus exists which involves all aspects related to appropriate nutrition, performing PA, proper habits, and personal hygiene for promoting healthy behavior; also, stress, the lack of rest, cigarette smoking, a sedentary lifestyle & alcohol &/or psychoactive substance abuse, all constitute health risks (Casado-Pérez et al., 2015).

Fernández-Ozcorta, Almagro, and Sáenz-López (2015), affirm that students who have satisfied their BPN & with a more self-determined motivation will have a greater intention of continuing to be physically active in the future. Along these lines, Franco, Coterón, Gómez, and Laura (2017), also confirm that intrinsic

motivation can predict the intention of performing physical activity in the future.

Several research studies have determined that the use of specific strategies by the teacher, involving positive psychological aspects, such as by increasing the intrinsic motivation of students in PE classes, support the development and consolidation of healthy behaviors related with physical activity (Aspano et al., 2016; Sánchez-Oliva et al., 2017; Standage et al., 2005; Taylor et al., 2010), as well as appropriate eating and rest habits (Giménez et al., 2015; Jiménez et al., 2007).

Therefore, considering the importance of student motivation in PE classes for the development of healthy habits, the main aim of this study was to analyze the prediction that motivational processes have on the adoption of lifestyle habits that enhance health in PE classes. The hypothesis is that satisfaction with BPN on behalf of the student will positively predict intrinsic motivation and that this, in turn, will predict the variables related with healthy lifestyles (balanced diet, respecting meal times, proper rest habits and the intention of being physically active).

## Method

### Research design

This is a quantitative empirical study, more specifically, it is a descriptive population study based on surveys (Montero & León, 2007).

### Participants

The participants were students in their last three years of secondary school from various public education centers in Setúbal, Sesimbra and Lisbon (Portugal). This study comprised 214 subjects of both sexes (104 boys and 110 girls) aged between 15 and 19 years ( $M = 16.46$ ,  $SD = .96$ ). In total, 83 students were in their 7th year, 23 were in their 8th year, and 105 were in their 9th year of studies. Participant selection was performed via a deliberate cluster sampling approach (Azorín & Sánchez-Crespo, 1986). Each cluster comprised a classroom of 19–23 students, with a total of ten clusters.

### Instruments

The variables used in this study are presented below, together with the measurement tool used for analysis.

#### Level of motivation

To measure the level of motivation of students in PE classes, we used the *Perceived Locus of Causality Scale for Physical Education* (PLOC Scale). Concretely, the Portuguese validation of the *Perceived Locus of Causality Scale* by Goudas, Biddle, and Fox (1994) was used (Fernandes & Vasconcelos-Raposo, 2005). This consists of 20 items, divided into five factors. In the present study, the intrinsic motivation factor is used, comprising five items. The goodness of fit indexes for the present scale, after the confirmatory factorial analysis (CFA), are acceptable (Hu & Bentler, 1999):  $\chi^2 = 142.55$ ,  $p = .00$ ,  $\chi^2/df = 2.04$ , CFI = .97, IFI = .97, GFI = .92, SRMR = .03, RMSEA = .07.

*Satisfaction of Basic Psychological needs the Basic Psychological Needs in Exercise Scale (BPN)* was used (Vlachopoulos & Michailidou, 2006), adapted and validated to Portuguese by Pires, Cid, Borrego, Alves, and Silva (2010). This consists of 12 items, divided into three factors: autonomy, competence and social relations. The goodness of fit indexes for adjustment in the CFA are acceptable (Hu & Bentler, 1999):  $\chi^2 = 111.59$ ,  $p = .00$ ,  $\chi^2/df = 2.07$ , CFI = .97, IFI = .97, GFI = .92, SRMR = .06, RMSEA = .07.

### Healthy lifestyle

To determine lifestyle *The Healthy Lifestyle Questionnaire* (EVS) was used, designed by [Wold \(1995\)](#), and translated and validated to Portuguese by [Batista, Jiménez, Leyton, Lobato, and Aspano \(2016\)](#). This consists of 12 items divided into four factors, of which we used: balanced diet, respecting meal times and rest habits. The goodness of fit indexes of the CFA are acceptable ([Hu & Bentler, 1999](#)):  $\chi^2 = 632.68$ ,  $p = .00$ ,  $\chi^2/df = 2.01$ , CFI = .94, IFI = .94, GFI = .92, SRMR = .06, RMSEA = .07.

### Intention of being physically active

The *Measurement of Intention to be Physically Active* (MIFA) was used, created by [Hein, Müür, and Koka \(2004\)](#), and translated and validated to Portuguese by [Jiménez, Leyton, and Batista \(2019\)](#). This scale consists of five items grouped in a single factor. After running the CFA, the goodness of fit indexes of the construct are acceptable ([Hu & Bentler, 1999](#)):  $\chi^2 = 18.81$ ,  $p = .00$ ,  $\chi^2/df = 3.23$ , CFI = .97, IFI = .97, GFI = .97, SRMR = .03, RMSEA = .06.

For all the questionnaires used in this study, each question item is responded based on a Likert type scale of five points, ranging from 0 = completely disagree to 5 = completely agree.

### Procedure

This study was approved by the Ethics Committee of the University of Extremadura. For data collection, the Secondary Education Centers were contacted. Information was given regarding the study aims and permission was sought to enable the students to participate in the research. Informed consent was requested on behalf of the parents/guardians as most of the students were minors. The questionnaires were administrated under the researcher's supervision, without the presence of the teachers in the classroom. Students were informed of the anonymity of their responses and were asked to respond sincerely. The questionnaires were administered in the second semester, during class hours. The time required to complete the questionnaires was approximately 20 minutes.

### Data analysis

First, the normality of the data obtained was verified. For the tests of univariate normality, the indicators of asymmetry and kurtosis of variables were initially used. [Curran, West & Finch \(1996\)](#) establish the limits of asymmetry and kurtosis in absolute values. Values of up to 2 for asymmetry and 7 for kurtosis are considered normal; values between 2 and 3 for asymmetry and between 7 and 21 for kurtosis are considered moderately normal; and values above 7 in asymmetry and 21 in kurtosis are considered non-normal. Thereafter, to confirm the multivariate normality, the Mardia Test was performed ([Mardia, 1970](#)). According to [Bollen \(1989\)](#) this test must be below  $p(p+2)$ , with  $p$  being the number of observed variables.

Thereafter, the CFA was performed to evaluate the construct validity, respecting the criteria of removing items for which the regression weight failed to reach an appropriate value (over .40) ([Revelle, 2014](#)). In addition, the measurement model was found to confirm the validity of the factors included in the Structural Equation Modeling (SEM). The covariance matrix was used as input for the data analysis.

Subsequently, a reliability analysis was performed to verify the internal consistency of the questionnaires. For the reliability analysis, the Cronbach's Alpha was used ( $\alpha$ ), equal or greater than .70 ([Nunnally, 1978](#)), as well as the Omega Coefficient ( $\omega$ ) ([McDonald, 1999](#)), which is also useful for verifying the internal consistency of the variables used in research and, according to

some authors ([Revelle & Zinbarg, 2009](#)), demonstrating evidence of greater exactness. According to The Mc Donald's Omega Coefficient, the established range was between 0 and 1, with more reliable values providing higher values ([Revelle & Zinbarg, 2009](#)). However, according to [Campo-Arias & Oviedo \(2008\)](#), to consider an acceptable reliability value via the Omega Coefficient, this should be greater than .70.

Furthermore, the composite reliability (level of consistency between the indicators in the latent construct) and the main extracted variance (the amount of variance of the indicators captured by the construct, and compared with the variance captured by the measurement error). Regarding the composite reliability, the minimum level is .70, and the mean extracted variance must be greater than .50 to conclude that a substantial amount of the variance is captured by the construct ([Arias, 2008](#)).

It is important to highlight that variables are created, corresponding with the items that display appropriate validity and reliability, and the descriptive statistics are calculated.

The SEM is considered to be the most powerful tool for predicting the causal relationships among variables ([Aron & Aron, 2001](#)). This analysis is performed using the method of maximum likelihood estimation (ML). The advantage of SEM, is that it enables the testing of theoretical models, including all the variables within the same regression equation. Likewise, this calculation of structural equations reveals a series of coefficients (goodness of fit indexes) which enable the possibility to verify the fit of a proposed theoretical model using empirical data. Among these, the significance of the chi squared test is analyzed ( $p$  of  $\chi^2$ ), which indicates the similarity among the covariances observed with those found in the hypothetical model; non-significant values in this index indicate an acceptable correspondence between the proposed model and the data. The chi squared divided by the degrees of freedom ( $\chi^2/df$ ) constitutes a less sensitive index to the size of the sample than the previous fit index, therefore, values below 3 are considered to be indicators of a very good adjustment of the model, whereas values below 5 are considered to be acceptable ([Hu & Bentler, 1999](#)). The CFI (Comparative Fit Index) and the GFI (Goodness of Fit Index), use values between 0 and 1; values above .90 are considered to be acceptable ([Bentler, 1995; Byrne, 2010](#)). In the IFI or Bollen's index, which uses values of between 0 and 1, it is understood that the model adjusts to the empirical data when it reaches values above .90. Another fit index is the RMSEA (Root Mean Square Error of Approximation), for which values lower than .10 are considered acceptable ([Byrne, 2010](#)). Lastly, the SRMR (Standardized RMR) fit indices are considered, with values below .08 considered as being acceptable ([Hu & Bentler, 1999](#)). Besides, as indicated by [Hu & Bentler \(1999\)](#), preferably, several of these indexes should be considered in order to accept or reject a model, as consideration of only one of these indexes is considered insufficient.

The indirect effects of SEM were estimated: the effect of the BPN of autonomy, competence and social relations on a balanced diet, the respecting meal times, rest habits and the intention of being physically active, via intrinsic motivation.

The  $p < .05$  and  $p < .01$  values are used for statistical significance. For the analysis of univariate normality (asymmetry and kurtosis), reliability (Cronbach's alpha) and descriptive data, the SPSS 21.0 statistical program was used. The multivariate normality analyses (Mardia Coefficient), the CFA, measurement model and the SEM, were performed using the E.Q.S. 6.1 program. Regarding the Omega index by McDonald, the calculations were performed with the "psych" 1.4.2.3 ([Revelle, 2014](#)) of R 3.0.3 ([R Core-Team, 2014](#)).

**Table 1**  
Asymmetry and kurtosis of the study variables

Instrument/Variable	Asymmetry	Kurtosis
Intrinsic motivation	-.76	.32
BPN Autonomy	-.34	-.24
BPN Competence	-.56	.12
BPN Social relations	-1.06	.81
Balanced diet	-.51	-.35
Respecting meal times	-.70	-.24
Rest habits	-.46	-.52
Intention of being physically active	-.70	-.42

## Results

### Analysis of normality

The measures of asymmetry and kurtosis verify the univariate normality (see Table 1). The Mardia coefficient reveals a value (147.01) lower than " $p(p+2)$ ", therefore, according to Bollen (1989), multivariate normality is assumed.

### Descriptive statistics and reliability analysis of the measurement tools

Table 2 displays the descriptive statistics of the tools used in the study reflecting the mean ( $M$ ) and the standard deviation ( $SD$ ) of all the study variables. The *BPN of social relations* obtained the highest mean, as opposed to the *NPB of autonomy* which obtained the lowest mean.

Also, the results of the reliability analysis reveal that all the factors present an appropriate reliability ( $\alpha > .70$ ) (Nunnally, 1978). However, as observed in Table 2, the *rest habits* factor shows a reliability below what is recommended (.66), however, considering the small number of items that comprise this (three), the observed internal consistency can be marginally accepted (Hair et al., 1998; Nunnally & Bernstein, 1994). Regarding the Omega Coefficient, the results reflect values above .70 (Campo-Arias & Oviedo, 2008).

Table 2 shows the composite reliability and the mean extracted variance, with values above .70 for composite reliability and over .50 for the mean extracted variance (Arias, 2008).

### Measurement model

A CFA was performed with the aim of evaluating the construct validity and selecting the variables included in the SEM analyses, thus performing the measurement model, as can be observed in Figure 1. It is important to highlight that the model displays appropriate adjustment indexes ( $p = .00$ ,  $\chi^2/df = 2.01$ , CFI = .95, IFI = .95, GFI = .92, SRMR = .05, RMSEA = .05) (Hu & Bentler, 1999; Kline, 2011).

**Table 2**  
Descriptive statistics and reliability analysis

Variable	$M$	$SD$	$\alpha$	$\omega$	CR	MEV
Intrinsic motivation	3.86	.91	.85	.95	.80	.81
BPN Autonomy	3.31	.85	.73	.85	.80	.71
BPN Competence	3.92	.76	.77	.91	.81	.78
BPN Social Relations	4.36	.70	.81	.93	.81	.60
Balanced Diet	3.66	.90	.78	.84	.80	.61
Respecting Meal Times	3.78	.95	.76	.82	.83	.52
Rest Habits	3.59	.99	.66	.72	.74	.51
Intention of Being Physically Active	3.92	.91	.81	.90	.82	.61

Note. BPN: Basic Psychological Need,  $M$ : Mean,  $SD$ : Standard Deviation,  $\alpha$ : Cronbach's Alpha,  $\omega$ : Omega Coefficient, CR: Composite reliability, MEV: Mean Extracted Variance.

### Structural equations model

In line with the MJM (Vallerand, 1997, 2001), the background variables are included (BPN), together with the mediators (*intrinsic motivation*), and the consequences (*healthy lifestyle variables*) (see Figure 2).

This model aims to reveal the predictive variables of a healthy lifestyle, based on BPN and intrinsic motivation.

In the proposed model of structural equations, the *satisfaction of BPN* predicts the *intrinsic motivation* and this, in turn predicts the factors related with *eating habits (balanced diet and stable eating hours)*, the *rest habits* and the *intention of being physically active*. The *satisfaction of the BPN of autonomy, competence and social relations* positively and significantly predict *intrinsic motivation* ( $\beta = .17$ ;  $\beta = .80$ ;  $\beta = .20$ , respectively). However, the more self-determined motivation positively and significantly predicts *balanced diet* ( $\beta = .50$ ), with the factor *respecting meal times* ( $\beta = .49$ ), with *rest habits* ( $\beta = .50$ ) and the *intention of being physically active* ( $\beta = .95$ ).

Furthermore, the results show an appropriate goodness of fit of the model ( $p = .00$ ,  $\chi^2/df = 1.88$ , CFI = .92, IFI = .92, GFI = .92, SRMR = .07, RMSEA = .06) (Hu & Bentler, 1999; Kline, 2011).

### Indirect effects of latent variables

The indirect effects of the latent variables are shown in Table 3.

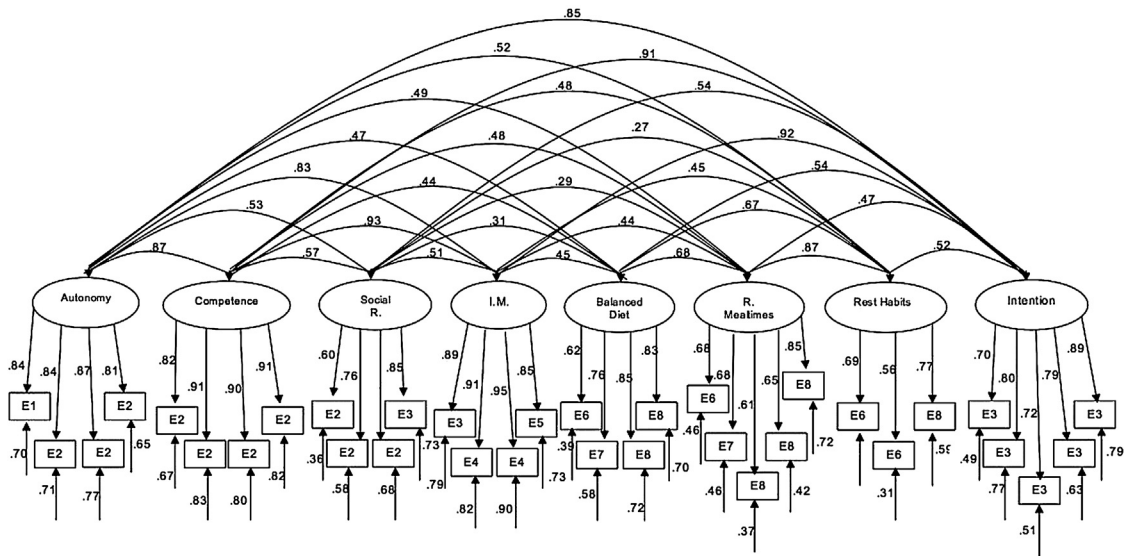
## Discussion

The principal aim of the present study was to analyze the predictive capacity of motivational processes on the adoption of lifestyle habits that enhance health in PE classes. The hypothesis was that the fulfillment of BPN would positively predict students' intrinsic motivation, and in turn, predict variables related with lifestyle habits that enhance health. The results obtained from the analysis of structural equations confirm the stated hypothesis.

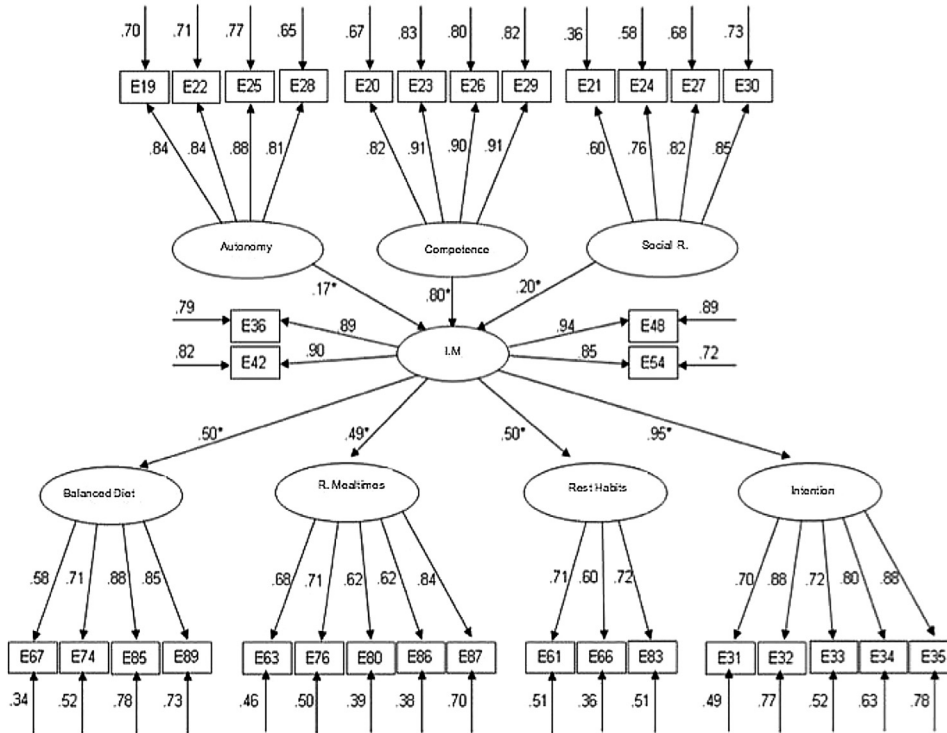
These results are in line with those found by Méndez and Fernández-Río (2017) and Núñez and León (2016), who note that the students who displayed a greater satisfaction of BPN developed a more self-determined motivation towards PA practice. Previous studies (Sánchez-Oliva et al., 2013), show that the students who present a more self-determined motivation are those with a more positive predisposition towards sports practice.

Greater feelings of autonomy have been shown to heighten intrinsic motivation (Amado et al., 2014; Sánchez-Oliva et al., 2017; Standage et al., 2005; Taylor & Ntoumanis, 2007), with BPN as the factor that predicts the greatest self-determined motivation. However, in the present study, the BPN of competence was found to be the strongest predictor of intrinsic motivation.

As demonstrated in previous studies (Deci et al., 2017; Ryan & Deci, 2017), together with the BPN of autonomy, competence explains increased variations in motivation, wellbeing and activity performance.



**Figure 1.** Measurement model. The ellipses represent the latent variables and the rectangles represent the measured variables. The explained variances are shown above the small arrows. All the regression weights are standardized and are statistically significant. *Note:* “Social R.”, Social relations; “I.M.”, Intrinsic Motivation; “R Mealtimes.”, Respecting mealtimes; “Intention”, Intention of being physically active.



**Figure 2.** Structural Equation Modeling, the relations between the fulfillment of basic psychological needs of autonomy, competence and social relations with intrinsic motivation and variables related with healthy lifestyles. All parameters are standardized and are statistically significant. *Note:* “Social R.”, Social Relations; “I.M.”, Intrinsic Motivation; “R Mealtimes.”, Respecting mealtimes; “Intention”, Intention of being physically active.

In the proposed model, self-determined motivation was found to positively predict the lifestyle variables that enhance health, such as a balanced diet, respecting meal times, adequate rest habits and the intention of being physically active. Ng et al. (2012), performed a meta-analysis with mostly non-experimental studies determining the existence of a strong relationship between SDT and positive health behaviors. These authors insist on the importance of applying interventions based on SDT. In the study by Carbó-Carreté, Guàrdia-Olmos, Giné, and Schallock (2016), it is determined that

individualized support in the field of physical activity acts as a predictor of an improved quality of life.

Recent studies, such as research by Chacón-Cuberos, Zurita-Ortega, Puertas et al. (2018), and Leyton, García, Fuentes, and Jiménez (2018), support the results of the present study, finding a relation between motivation towards physical activity and eating habits. However, Ferriz, González-Cutre, Sicilia, and Hagger (2016) contradict the present findings, as they were unable to find a relationship between motivation towards PE and healthy eating, after

**Table 3**  
Indirect effects of the model of structural equations

	Variables	Standardized Beta	Value <i>t</i>
BPN Autonomy	Balanced diet	.17 <sup>a</sup>	2.26
	Respecting meal times	-.02	-.26
	Rest habits	-.00	-.09
	Intention of being physically active	.32 <sup>b</sup>	4.39
BPN Competence	Balanced diet	.09	1.14
	Respecting meal times	-.00	-.09
	Rest habits	-.06	.70
	Intention of being physically active	.49 <sup>b</sup>	7.44
BPN Social relations	Balanced diet	.15	1.90
	Respecting meal times	.17 <sup>a</sup>	2.08
	Rest habits	.09	.94
	Intention of being physically active	.75 <sup>b</sup>	17.48

Note. BPN: Basic Psychological Needs.

<sup>a</sup>  $t \geq 1.96$  is significant.

<sup>b</sup>  $t \geq 2.56$  is very significant.

the application of a program based on SDT in PE classes. Similarly, neither did [Chacón-Cuberos, Zurita-Ortega, Olmedo-Moreno, Padial-Ruz, and Castro-Sánchez \(2018\)](#), find any such relationship, among a sample of university PE students.

Very few studies have related motivation towards PA with rest habits. [Jiménez et al. \(2007\)](#), found a relationship, albeit non-significant, between the intrinsic motivation of PE students with rest habits. However, in the present study, a significant predictive value was found for both variables. This is in agreement with the experimental study among adults and older people by [Leyton, Batista, Lobato, Aspano, and Jiménez \(2017\)](#), where intrinsic motivation was reported as being crucial for the development of healthy habits, such as appropriate eating and rest habits.

Regarding the finding that intrinsic motivation predicts the intention of being physically active, [Sanchez, Byra, and Wallhead \(2012\)](#), affirm that motivation is an ensemble of emotional, cognitive and social phenomena in which, if a style of teaching is used that enables the student to participate in a process of learning and teaching, their cognitive and physical implication will be greater. Studies such as that by [Moreno-Murcia, Huéscar, and Cervelló \(2012\)](#) confirm the results of the present study. These findings show that intrinsic motivation positively predicts the importance that students grant to physical education and this, in turn, positively predicts the student's intention of continuing to practice sports. Along these lines, [Fernández-Ozcorta et al. \(2015\)](#), affirm that self-determined motivation positively predicts the intention of being physically active in adolescents.

It seems evident that PA in the long term appears to be ideal for generating a greater intrinsic motivation and, therefore, changes towards healthy lifestyles which remain stable over time ([Saavedra et al., 2014](#)).

Although the present study is a step forward in our understanding of the role that PE plays in adopting health related habits, the performance of a longitudinal intervention study is recommended, together the establishment of appropriate strategies to improve the fulfillment of BPN and, therefore, of intrinsic motivation. It is also important to perform triangulation with the data obtained, not only regarding students, but also including close figures, such as teachers and/or guardians. In addition, the sample should be increased to other geographical zones and different types of centers.

The results of this study are highly applicable for PE teachers to be able to propose tasks, and support the BPN of autonomy, competence and students' social relationships. Furthermore, PE teachers can employ specific strategies, such as granting students the possibility of choosing activities, proposing activities with different levels of difficulty, performing cooperative games and collaborating to promote teamwork, among others.

These findings are considered very important, as they have major implications on the teaching of PE. Teachers must seek strategies for improving the BPN during the activities performed in class, by specifically considering these in the teaching project and in each didactic unit, as competencies that must be achieved on behalf of the students. This would allow students to increase self-determined types of motivation which, in turn would lead to an increased practice of PE and more healthy lifestyles.

Therefore, to conclude, the satisfaction of BPN of autonomy, competence and social relations, especially, the BPN of competence, positively and significantly predicts intrinsic motivation. In turn, intrinsic motivation positively and significantly predicts the maintenance of a balanced diet, respecting meal times, appropriate rest habits, and, with a higher prediction weight, the intention of being physically active in the future.

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## References

- Amado, D., Del Villar, F., Leo, F. M., Sánchez-Oliva, D., Sánchez-Miguel, P. A., & García-Calvo, T. (2014). Effect of a multi-dimensional intervention programme on the motivation of physical education students. *PLoS One*, 9(1), e85275 <http://dx.doi.org/10.1371/journal.pone.0085275>
- Arias, B. (2008). Desarrollo de un ejemplo de análisis factorial confirmatorio con LISREL, AMOS y SAS. In M. A. Verdugo, M. Crespo, M. Badía, & B. Arias (Eds.), *Metodología en la investigación sobre discapacidad. Introducción al uso de las ecuaciones estructurales* (pp. 1–42). Salamanca: INICO.
- Aron, A., & Aron, E. (2001). *Estadística para psicología*. Buenos Aires: Pearson Educación.
- Aspano, M. I., Lobato, S., Leyton, M., Batista, M., & Jiménez, R. (2016). Predicción de la motivación en los estadios de cambio de ejercicio más activos. *Retos: Nuevas Tendencias en Educación Física, Deporte y Recreación*, 30, 87–91.
- Azorín, F., & Sánchez-Crespo, J. L. (1986). *Métodos y aplicaciones del muestreo*. Madrid: Alianza Editorial.
- Batista, M., Jiménez, R., Leyton, M., Lobato, S., & Aspano, M. I. (2016). Adaptation and validation of the portuguese version of the healthy life styles questionnaire. *Internacional Scientific Researches Journal, PONTE*, 72(9), 145–158. <http://dx.doi.org/10.21506/j.ponte.2016.9.11>
- Bentler, P. M. (1995). *EQS structural equations program manual*. Encino, CA: Multi-variate Software.
- Bollen, K. A. (1989). *Structural equations with latent variables*. New York: John Wiley y Sons, Inc. <http://dx.doi.org/10.1002/9781118619179>
- Byrne, B. M. (2010). *Structural equation modeling with AMOS: Basic concepts, applications, and programming* (2nd ed.). Routledge Taylor & Francis Group.
- Campo-Arias, A., & Oviedo, H. C. (2008). Propiedades psicométricas de una escala: la consistencia interna. *Revista de Salud Pública*, 10(5), 831–839. <http://dx.doi.org/10.1590/S0124-00642008000500015>
- Carbó-Carreté, M., Guàrdia-Olmos, J., Giné, C., & Schallock, R. L. (2016). A structural equation model of the relationship between physical activity and quality

- of life. *International Journal of Clinical and Health Psychology*, 16(2), 147–156. <http://dx.doi.org/10.1016/j.ijchp.2015.11.001>
- Casado-Pérez, C., Hernández-Barrera, V., Jiménez-García, R., Fernández-de-Las-Peñas, C., Carrasco-Garrido, P., & Palacios-Cena, D. (2015). Physical activity in adult working population: Results from the European National Health Survey for Spain (2009). *Atención Primaria*, 47(9), 563–572. <http://dx.doi.org/10.1016/j.aprim.2015.01.005>
- Chacón-Cuberos, R., Zurita-Ortega, F., Olmedo-Moreno, E., Padial-Ruz, R., & Castro-Sánchez, M. (2018). An exploratory model of psychosocial factors and healthy habits in university students of physical education depending on gender. *International Journal of Environmental Research and Public Health*, 15(11), 2430. <http://dx.doi.org/10.3390/ijerph15112430>
- Chacón-Cuberos, R., Zurita-Ortega, F., Puertas, P., Knox, E., Cofré, C., Viciana, V., & Muros, J. (2018). Relationship between healthy habits and perceived motivational climate in sport among university students: A structural equation model. *Sustainability*, 10(4), 938. <http://dx.doi.org/10.3390/su10040938>
- Charchaoui, I., Cachón, J., Chacón, F., & Castro, R. (2017). Tipos de motivación para participar en las clases de Educación Física en la etapa de Enseñanza Secundaria Obligatoria (ESO). *Acción Motriz: Tu Revista Científica Digital*, 18(1), 37–46.
- Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to non normality and specification error in confirmatory factor analysis. *Psychological Methods*, 1, 16–29.
- Deci, E. L., Olafsen, A. H., & Ryan, R. M. (2017). Self-determination theory in work organizations: The state of a science. *Annual Review of Organizational Psychology and Organizational Behavior*, 4, 19–43. <https://doi.org/10.1146/annurev-orgpsych-032516-113108>
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum.
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227–268. <http://dx.doi.org/10.1207/S15327965PLI1104.01>
- Deci, E. L., & Ryan, R. M. (2002). *Handbook of self-determination research*. Rochester, New York: University of Rochester Press.
- Egan, C. A., & Webster, C. A. (2018). Using theory to support classroom teachers as physical activity promoters. *Journal of Physical Education Recreation & Dance*, 89(1), 23–29. <http://dx.doi.org/10.1080/07303084.2017.1390510>
- Fernandes, H. M., & Vasconcelos-Raposo, J. (2005). Continuum de auto-determinação: validade para a sua aplicação no contexto desportivo. *Estudos de Psicologia*, 10(3), 385–395. <http://dx.doi.org/10.1590/S1413-294X2005000300007>
- Fernández-Ozcorta, E. J., Almagro, B. J., & Sáenz-López, P. (2015). Predicción de la intención de seguir siendo físicamente activos en estudiantes universitarios. *Cuadernos de Psicología del Deporte*, 15(1), 275–284. <http://dx.doi.org/10.4321/S1578-84232015000100026>
- Ferriz, R., González-Cutre, D., Sicilia, Á., & Hagger, M. S. (2016). Predicting healthy and unhealthy behaviors through physical education: a self-determination theory-based longitudinal approach. *Scandinavian Journal of Medicine & Science in Sports*, 26(5), 579–592. <http://dx.doi.org/10.1111/sms.12470>
- Franco, E., Coterón, J., Gómez, V., Brito, J., & Martínez, H. A. (2017). Influencia de la motivación y del flow disposicional sobre la intención de realizar actividad físico-deportiva en adolescentes de cuatro países. *Retos: Nuevas tendencias en Educación Física, Deporte y Recreación*, 31(1), 46–51.
- Franco, E., Coterón, J., Gómez, V., & Laura, A. (2017). Relación entre motivación, actividad física realizada en el tiempo libre y la Intención futura de práctica de actividad física. Estudio comparativo entre adolescentes argentinos y españoles. *SPORT TK-Revista EuroAmericana de Ciencias del Deporte*, 6(1), 25–34. <http://dx.doi.org/10.6018/280371>
- Giménez, M. R. L., López, M. P. M., Urdá, A. I. M., & Collazos, J. F. R. (2015). Eating habits, health and gender in the elderly. *European Journal of Investigation in Health Psychology and Education*, 4(1), 31–40. <http://dx.doi.org/10.30552/ejihpe.v4i1.62>
- González-Cutre, D., Ferriz, R., Beltrán-Carrillo, V. J., Andrés-Fabra, J. A., Montero-Carretero, C., Cervelló, E., & Moreno-Murcia, J. A. (2014). Promotion of autonomy for participation in physical activity: A study based on the trans-contextual model of motivation. *Educational Psychology*, 34, 367–384. <http://dx.doi.org/10.1080/01443410.2013.817325>
- González-Cutre, D., Sicilia, A., & Moreno, J. A. (2011). Un estudio cuasi-experimental de los efectos del clima motivador tarea en las clases de educación física. *Revista de Educación*, 356(1), 677–700. <https://doi.org/10.4438/1988-592X-RE-2010-356-056>
- Goudas, M., Biddle, S., & Fox, K. (1994). Perceived locus of causality, goal orientations, and perceived competence in school physical education classes. *The British Journal of Educational Psychology*, 64, 453–463. <http://dx.doi.org/10.1111/j.2044-8279.1994.tb01116.x>
- Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis* (5th ed.). Upper Saddle River, NJ: Prentice Hall.
- Hein, V., Müür, M., & Koka, A. (2004). Intention to be physically active after school graduation and its relationship to three types of intrinsic motivation. *European Physical Education Review*, 10(1), 5–19. <http://dx.doi.org/10.1177/1356336X04040618>
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1–55. <http://dx.doi.org/10.1080/10705519909540118>
- Jiménez, R., Cervelló, E., García, T., Santos-Rosa, F. J., & Iglesias, D. (2007). Estudio de las relaciones entre motivación, práctica deportiva extraescolar y hábitos alimenticios y de descanso en estudiantes de Educación Física. *International Journal of Clinical and Health Psychology*, 7, 385–401.
- Jiménez, R., Leyton, M., & Batista, M. (2019). Validation of the intentionality scale of being physically active in a Portuguese population. Comunicación Oral aceptada. In *2019 XV Seminário Internacional de Educação Física, Lazer e Saúde (SIEFLAS) e IV Budo Congress*.
- Kline, R. B. <https://doi.org/10.1038/156278a0>, 2011
- Leyton, M., Batista, M., Lobato, S., Aspano, M. I., & Jiménez, R. (2017). Application of two intervention programs in order to optimize motivation and to improve eating habits in adult and elderly women. *Journal of Human Kinetics*, 59(1), 131–142. <http://dx.doi.org/10.1515/hukin-2017-0153>
- Leyton, M., García, M., Fuentes, G., & Jiménez, C. (2018). Analysis of motivational variables and healthy lifestyles in sports center practitioners by gender. *Retos: Nuevas Tendencias en Educación Física, Deporte y Recreación*, 34(1), 166–171.
- Mardia, K. V. (1970). Measures of multivariate skewness and kurtosis with applications. *Biometrika*, 57, 519–530.
- McDonald, R. P. (1999). *Test theory. A unified treatment*. Mahwah, NJ: Lawrence Erlbaum Associates.
- McDonough, M. H., & Crocker, P. R. (2007). Testing self-determined motivation as a mediator of the relationship between psychological needs and affective and behavioral outcomes. *Journal of Sport & Exercise Psychology*, 29(5), 645–663. <http://dx.doi.org/10.1123/jsep.29.5.645>
- Méndez, J. I., & Fernández-Río, J. (2017). Social responsibility, basic psychological needs, intrinsic motivation, and friendship goals in physical education. *Retos: Nuevas Tendencias en Educación Física, Deporte y Recreación*, 32(1), 134–139.
- Montero, I., & León, O. G. (2007). A guide for naming research studies in Psychology. *International Journal of Clinical and Health Psychology*, 7(3), 847–862.
- Moreno-Murcia, J. A., Huéscar, E., & Cervelló, E. (2012). Prediction of adolescents doing physical activity after completing secondary education. *The Spanish Journal of Psychology*, 15(1), 90–100. [http://dx.doi.org/10.5209/rev\\_SJOP.2012.v15.n1.37288](http://dx.doi.org/10.5209/rev_SJOP.2012.v15.n1.37288)
- Ng, J. Y., Ntoumanis, N., Thøgersen-Ntoumani, C., Deci, E. L., Ryan, R. M., Duda, J. L., & Williams, G. C. (2012). Self-determination theory applied to health contexts: A meta-analysis. *Perspectives on Psychological Science*, 7(4), 325–340. <http://dx.doi.org/10.1177/1745691612447309>
- Ntoumanis, N., Quested, E., Reeve, J., & Cheon, S. H. (2017). Need supportive communication: Implications for motivation in sport, exercise, and physical activity. In *Persuasion and communication in sport, exercise, and physical activity*. Abingdon, UK: Routledge.
- Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill.
- Núñez, J. L., & León, J. (2016). The mediating effect of intrinsic motivation to learn on the relationship between student's autonomy support and vitality and deep learning. *The Spanish Journal of Psychology*, 19(42), 1–6. <http://dx.doi.org/10.1017/sjp.2016.43>
- Pires, A., Cid, L., Borrego, C., Alves, J., & Silva, C. (2010). Validação preliminar de um questionário para avaliar as necessidades psicológicas básicas em Educação Física. *Motricidade*, 6(1), 33–51. [http://dx.doi.org/10.6063/motricidade.6\(1\).157](http://dx.doi.org/10.6063/motricidade.6(1).157)
- R Core-Team. <http://www.R-project.org>, 2014., Accessed 20.09.18
- Revelle, W. (2014). *Psych: Procedures for psychological, psychometric, and personality research*. Illinois: Evanston.
- Revelle, W., & Zinbarg, R. E. (2009). Coefficients Alpha, Omega, and the Gbl: Comments on sijtsma. *Psychometrika*, 74(1), 145–154. <http://dx.doi.org/10.1007/s11336-008-9102-z>
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *The American Psychologist*, 55, 68–78. <http://dx.doi.org/10.1037/0003-066X.55.1.68>
- Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation development and wellness*. New York: Guilford Publishing.
- Saavedra, J. M., García-Hermoso, A., Escalante, Y., & Domínguez, A. M. (2014). Self-determined motivation, physical exercise and diet in obese children: A three-year follow-up study. *International Journal of Clinical and Health Psychology*, 14(3), 195–201. <http://dx.doi.org/10.1016/j.ijchp.2013.12.001>
- Sanchez, B., Byra, M., & Wallhead, T. L. (2012). Students' perceptions of the command, practice, and inclusion styles of teaching. *Physical Education and Sport Pedagogy*, 17(3), 317–330. <http://dx.doi.org/10.1080/17408989.2012.690864>
- Sánchez-Oliva, D., Leo, F. M., Sánchez-Miguel, P. A., Amado, D., & García-Calvo, T. (2013). Desarrollo de un modelo causal para explicar los comportamientos positivos en las clases de educación física. *Acción Motriz*, 10, 48–58.
- Sánchez-Oliva, D., Pulido-González, J. J., Leo, F. M., González-Ponce, I., & García-Calvo, T. (2017). Effects of an intervention with teachers in the physical education context: A self-determination theory approach. *PLoS One*, 12(12), e0189986. <http://dx.doi.org/10.1371/journal.pone.0189986>
- Standage, M., Duda, J. L., & Ntoumanis, N. (2005). A test of self-determination theory in school physical education. *The British Journal of Educational Psychology*, 75(3), 411–433. <http://dx.doi.org/10.1348/000709904X22359>
- Standage, M., Duda, J. L., & Ntoumanis, N. (2006). Students' motivational processes and their relationship to teacher ratings in school physical education: A self-determination theory approach. *Research Quarterly for Exercise and Sport*, 77(1), 100–110. <http://dx.doi.org/10.1080/02701367.2006.10599336>
- Taylor, I. M., & Ntoumanis, N. (2007). Teacher motivational strategies and student self-determination in physical education. *Journal of Education Psychology*, 99(2), 747–760. <http://dx.doi.org/10.1037/0022-0663.99.4.747>
- Taylor, I. M., Ntoumanis, N., Standage, M., & Spray, C. M. (2010). Motivational predictors of physical education students' effort, exercise intentions, and leisure-time physical activity: A multilevel linear growth analysis. *Journal of Sport & Exercise Psychology*, 32(1), 99–120. <http://dx.doi.org/10.1123/jsep.32.1.99>

- Thompson, D., Cantu, D., Bhatt, R., Baranowski, T., Rodgers, W., Jago, R., ... & Buday, R. (2014). Texting to increase physical activity among teenagers (TXT me!): Rationale, design, and methods proposal. *JMIR Research Protocols*, 3(1), 14. <http://dx.doi.org/10.2196/resprot.3074>
- Usán, P., Salavera, C., Mejías, J. J., & Murillo, V. (2018). Orientación motivacional y percepción de promoción del bienestar en profesorado de educación física hacia sus alumnos. *Retos: Nuevas Tendencias en Educación Física, Deporte y Recreación*, 33, 46–49.
- Vallerand, R. J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (29) (pp. 271–360). New York, San Diego: Academic Press.
- Vallerand, R. J. (2001). A hierarchical model of intrinsic and extrinsic motivation in sport and exercise. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 263–319). Champaign, IL: Human Kinetic.
- Vansteenkiste, M., Lens, W., & Deci, E. L. (2006). Intrinsic versus extrinsic goal contents in self-determination theory: Another look at the quality of academic motivation. *Educational Psychology*, 41(1), 19–31. <http://dx.doi.org/10.1207/s15326985Sep4101.4>
- Vansteenkiste, M., Niemiec, C., & Soenens, B. (2010). The development of the five mini-theories of self-determination theory: An historical overview, emerging trends, and future directions. In T. Urdan, & S. Karabenick (Eds.), *Advances in motivation and achievement* (vol. 16) (pp. 105–166). Bingley, UK: Emerald. [http://dx.doi.org/10.1108/S0749-7423\(2010\)000016A007](http://dx.doi.org/10.1108/S0749-7423(2010)000016A007). The decade ahead
- Vlachopoulos, S. P., & Michailidou, S. (2006). Development and initial validation of a measure of autonomy, competence, and relatedness: The basic psychological needs in exercise scale. *Measurement in Physical Education and Exercise Science*, 10, 179–201. <http://dx.doi.org/10.1207/s15327841mpee1003.4>
- Wold, B. (1995). Health behavior in schoolchildren: A WHO cross-national survey. In *Resource package questions 1993–1994*. Norway: University of Bergen.
- Yilmaz, A., Esenturk, O. K., Demir, G. T., & Ilhan, E. L. (2017). Metaphoric perception of gifted students about physical education course and physical education teachers. *Journal of Education and Learning*, 6(2), 220–234. <https://doi.org/0.5539/jel.v6n2p220>