Carriedo, A.; Fernández-Río, J.; Méndez-Giménez, A. y Cecchini, J.A. (2022) Fitness Testing: Traditional Model Versus Sport Education Model. Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte vol. 22 (86) pp. 269-284 Http://cdeporte.rediris.es/revista/revista86/arttest1326.htm
DOI: https://doi.org/10.15366/rimcafd2022.86.005

ORIGINAL

FITNESS TESTING: TRADITIONAL MODEL VERSUS SPORT EDUCATION MODEL

TEST DE CONDICIÓN FÍSICA: MODELO TRADICIONAL VERSUS MODELO DE EDUCACIÓN DEPORTIVA

Carriedo, A.[1]; Fernández-Río, J.[3]; Méndez-Giménez, A.[2]; Cecchini, J.A.[3]

[1] Lecturer. Faculty of Teacher Training and Education. University of Oviedo (Spain) carriedoalejandro@uniovi.es
[2] Senior lecturer. Faculty of Teacher Training and Education. University of Oviedo (Spain) mendezantonio@uniovi.es
[3] Professor. Faculty of Teacher Training and Education. University of Oviedo (Spain) cecchini@uniovi.es, javier.rio@uniovi.es,

Spanish-English translator: Alejandro Carriedo, carriedoalejandro@uniovi.es, University of Oviedo

Código UNESCO / UNESCO code: 580107 Métodos Pedagógicos / 580107 Pedagogical Methods.
Clasificación Consejo de Europa / Council of Europe classification: 5. Didáctica y Metodología / Didactics and Methodology

Recibido 19 de diciembre de 2019 **Received** December 19, 2019
Aceptado 10 de mayo de 2020 **Accepted** May 10, 2020

ABSTRACT

The aim was to compare the use of two methodological approaches, the traditional model (TM) and the Sport Education Model (SEM) on the assessment of physical fitness with 118 students of 13 years old (*M* = 12.81, *SD* = 0.74). The results indicated that the use of the MED in physical fitness test administration produced higher scores on the variables autonomy, competence, relationship, and intrinsic motivation. Males became more bored and females felt less pressure-tension with the SEM. Fitness assessment from both methodological approaches were similar, indicating good reliability in data collection. Based on the self-determination theory, the results of this study suggest that the use of the SEM in fitness testing can produce benefits in the students without losing reliability in fitness testing.

KEYWORDS: Physical fitness, physical education, basic psychological needs, self-determination theory, pedagogical models

RESUMEN

El objetivo fue comparar el uso de dos planteamientos metodológicos, el modelo tradicional (MT) y el Modelo de Educación Deportiva (MED), en la valoración de las capacidades físicas básicas con 118 estudiantes de 13 años (*M* = 12,81, *DE* = 0,74). Los resultados indicaron que el uso del MED produjo mayores puntuaciones en las variables autonomía, competencia, relación, y motivación intrínseca. Los varones se aburrieron más y las mujeres sintieron menor presión-tensión con el MED. Los resultados registrados por el profesor en todos los test mediante el MT se correspondían con los resultados registrados por los alumnos con el MED con una fiabilidad que oscilaba entre buena y excelente. Con base en la teoría de la autodeterminación, se sugiere que el uso del MED en la enseñanza y aplicación de los test de condición física puede producir beneficios sin perder fiabilidad en la valoración de la condición física.

PALABRAS CLAVE: Condición física, educación física, necesidades psicológicas básicas, teoría de la autodeterminación, modelos pedagógicos

INTRODUCTION

Physical education is a relevant element of the educational system (Ntoumanis, 2001). Currently, there is much interest in improving the quality of the teaching-learning process (Fernández-Río, Calderón, Hortigüela, Pérez-Pueyo, & Aznar, 2016). Some studies have pointed out that pedagogical interventions should be both adapted to students and orientated to create an effective classroom climate that allow motivational learning experiences (e.g., Hattie, Biggs, & Purdie, 1996; Silverman, 2005). Motivation plays a significant role in this process. On the one hand, students can be committed and proactive in their learning or, conversely, they can be passive and distant. The perspective they adopt might be a consequence of their educational context.

The self-determinations theory (SDT; Deci & Ryan, 1985) is an outstanding macro-theory that tries to uncover how motivation works. This paradigm considers that motivation is a continuum with different levels of self-determination (i.e., intrinsic motivation, extrinsic motivation, and demotivation). Intrinsic motivation is very important for people' cognitive and social development (Orsini, Binnie, & Wilson, 2016), that is why it should be taken into account in any educational context. Within the SDT, there are other mini-theories that try to explain how these processes evolve. The Basic Psychological Needs Theory (Deci & Ryan, 2000) postulates that all individuals have the necessity to satisfy three basic psychological needs: autonomy, competence, and relatedness. Deci and Ryan (2000) pointed out that individuals' behavior is motivated by these three needs, which are essential for social development, optimal functioning and personal well-being. On the one hand, social factors that increase the perception of autonomy, competence, and

relatedness will satisfy these needs and increase intrinsic motivation. On the other hand, social factors that reduce these perceptions will promote unmotivated behaviors (Deci & Ryan, 1985). These predictions were confirmed in the context of physical education (Cecchini, Fernández-Losa, González, & Cecchini, 2013; Ntoumanis, 2001; Standage, Duda, & Ntoumanis, 2005). Ntoumanis (2001), based on the contributions of Vallerand and Losier (1999) and Ames (1992), proposed that collaborative learning, improvement of orientation and respect for personal initiative in decision-making could be some of the social factors that play an important role in motivation. Thus, an educational climate that encourages cooperation will encourage students to help each other learn and improve, which in turn will affect their relatedness (Cecchini et al., 2013). Likewise, contexts that are based on self-referenced results or that promote decision-making opportunities (e.g., how or when to perform tasks) will increase competence and autonomy respectively (Standage, Duda, & Ntoumanis, 2003), which can also affect self-determined motivation. This is of special relevance because it has been observed that the satisfaction of these needs can predict intrinsic motivation (Cecchini, Carriedo, & Méndez-Giménez, 2019), the perception of effort (Moreno-Murcia, Cervelló, Montero, Vera, & García), and fun and boredom (Baena-Extremera, Gómez-López, Granero-Gallegos, & Martínez-Molina, 2016) in physical education.

The Sport Education Model (SEM; Siedentop, 1994) is a methodological framework that could positively have an impact on these motivational processes. The main purpose of the SEM is to provide authentic sport experiences to students (Siedentop, Hastie, & Van der Mars, 2011). Likewise, the SEM aims to promote student learning and involvement through self-learning in cooperative teams and self-responsibility (Calderón, Martínez de Ojeda, Valverde, y Méndez-Giménez, 2016; Fernández-Río et al., 2016). It is also intended that everyone have the same practice opportunities in order to promote their perception of competence (Siedentop, 1994). Students can experience sports practice globally while developing their motor skills, sport culture, and enthusiasm for sport practice (Fernández-Río et al., 2016). Different studies have compared the effects of teaching sports and physical exercises between the SEM and traditional instructional methods (e.g., Burgueño, Medina-Casaubón, Morales-Ortiz, Cueto-Martín, & Sánchez-Gallardo, 2017; Calderón, Martínez de Ojeda, & Hastie, 2013; Méndez-Giménez, Fernández-Río, & Méndez-Alonso, 2015; Wallhead & Ntoumanis, 2004). It has been observed that students have better motivation indexes and a greater sense of relationship when they have been taught using the SEM (Perlman, 2011). However, despite the expansion of this pedagogical model, to our knowledge, the motivational impact of its implementation in the teaching and performance of physical fitness tests has not been explored.

The positive relationship between physical condition and health in children (Mayorga-Vega, Merino-Marban, & Rodríguez-Fernández, 2013) has led to the imposition of a paradigm that links both elements with physical education. Physical fitness tests may be a tool to know students' physical capacities (Martínez-López, 2003, 2004). Likewise, they have been used for grading, which have supporters and detractors (Hernández & Velázquez, 2004; López-Pastor et al., 2006). Plenty of scientific literature has focused on the

measurement of students' physical capacities in secondary education (e.g., Fernández-Río, Medina-Gómez, Garro-García, & Pérez-González, 2001; Martínez-López, 2003, 2004). Such measurement has been assigned to fitness tests, which are usually administered by the teacher or by a researcher, which increases the measurements' reliability. However, could the students themselves be responsible for using the physical fitness tests? What effects could this methodology have?

Based on this background, the purpose of this research was twofold. On the one hand, the aim was to compare the use of two methodological approaches, Traditional Model (TM) and SEM, in the students' basic psychological needs, motivation, effort, and pressure-tension. The second objective was to check if the use of the SEM in fitness testing could provide reliable results of the students' physical fitness.

MATERIAL AND METHODS

Participants

The sample consisted of 118 year secondary education students enrolled in a high school located in northern Spain. To obtain reliable results and to have greater experimental control, only those students who attended 8 of the 10 physical education sessions and that completed all the questionnaires were included in the analysis. Thus, the final sample was reduced to 108 participants (60 males and 48 females). The age of the participants ranged from 12 to 15 years (M_{age} = 12.81, *SD* = 0.74) (Year eight, *n* = 63, *M* = 12.43, *SD* = 0.64; Year nine, *n* = 45, *M* = 13.33, *SD* = 0.52). Good health was reported by 96.73% of participants. Some had scoliosis or knee pains, so they were excluded from executing the tests. The research was carried out in the physical education lessons during the last 5 weeks of the second term, requiring a total of 10 sessions. The same teacher taught all physical education lessons in all groups.

Procedure

A mixed factorial design, where each student participated in two conditions (TM and SEM) was used. It is considered a powerful control technique because each participant act as his/her own control, which increases the sensitivity of the effects of the independent variable with no need to have large samples (Christensen, Johnson, & Turner, 2011). To perform the study, permission was requested from the researchers' ethics university committee. Authorization was obtained from the principal of the participating secondary school. Finally, informed consent from the students' parents was obtained. Convenience sampling was used because the participating physical education teacher met all the inclusion criteria: a) to have at least 5 years of teaching experience and b) to be familiar with the TM and SEM frameworks. Before the study began, the teacher attender a training course related to the SEM that lasted 10 hours.

The intervention was carried out in 10 sessions of 55 minutes each, with a frequency of 2 sessions per week. In the first 5 sessions (phase 1: TM), the

students had to execute each of the six physical fitness test that were selected by the researchers: Standing Long Jump Test (lower body power), Medicine Ball Throw 4Kg (upper body power), 30-seconds Sit-up Test (muscular endurance), 20m Sprint (speed), Modified Sit and reach Test (flexibility), and 20-meters Course Navette test (aerobic cardiovascular endurance). These tests were performed individually under the close supervision of the teacher, who demonstrated the way they had to be performed and registered the better result obtained by each student. When all the results were recorded, students answered an individual and anonymous questionnaire that required between 5 and 7 minutes to complete. They were reminded that their answers would be anonymous and confidential, that they would have no effect on their grades and that they could leave the study at any time, so they were encouraged to answer with complete sincerity.

Then, phase 2 started using the SEM: collaborative work groups were formed and the different roles explained (doctor, coach, secretary, photograph, and psychologist). Students freely decided the role they would play during the sessions. In this phase, students made all decisions. Therefore, in the following sessions (7-9) the coach (student) had to lead the warm-up. Students performed all tests and recorded the results by themselves. They were performed autonomously and under the supervision of each groups' members. It should be noted that the students were able to repeat the test freely and they were informed that the results would not be graded. When they recorded all the data, they continued to work in groups to analyze the information and to write a health report. In the last session, the final event was held and a new questionnaire was administered.

Measures

Basic psychological need satisfaction. It was assessed using the Spanish adapted version for the physical education lessons (i.e., Moreno, González-Cutre, Chillón, & Parra, 2008) of the *Basic Psychological Needs in Exercise Scale* (Vlachopoulos & Michailidou, 2006). This includes 12 items that measure the satisfaction of the three basic psychological needs in sport and exercise: autonomy (e.g., "the exercises I do are in line with my interests"), competence (e.g., "I do the exercises effectively"), and relatedness (e.g., "I feel very comfortable when I exercise with other classmates"). This scale has been used in different studies with secondary school students in the context of physical education (e.g., Méndez-Giménez, Fernández-Río, & Cecchini, 2013). The questionnaire administrated after the TM included the heading: "indicate whether you disagree or agree…". The instructions of the questionnaire administrated after the SEM included the heading: "indicate whether you agree or disagree, referring to the last lessons related to the physical fitness test, when you worked with your team…"

Intrinsic satisfaction. It was assessed using *the adaptation to physical education of the Intrinsic Satisfaction in Sport Questionnaire* (SSI-EF; Baena-Extremera, Granero-Gallegos, Bracho-Amador, & Pérez-Quero, 2012). It is an adaptation for the physical education classes of the Spanish version (Balaguer, Atienza, Castillo, Moreno, & Duda, 1997) of the *Sport Satisfaction Instrument*

(SSI: Duda y Nicholls, 1992) which was developed to assess intrinsic satisfaction during sports practice. The SSI-EF includes eight items grouped in two subscales: satisfaction/fun (5 items; e.g., "I normally have fun in physical education classes"), and boredom (3 items; eg., "I usually get bored in physical education classes"). The same headings of the previous instrument were used in the Post-TM and post-SEM measurement instructions. This instrument has been used with secondary school students and has provided adequate reliability indices in both subscales: fun α = .92, boredom α = .77 (Muñoz, Gómez-López, & Granero-Gallegos, 2019).

Instrinsic motivation. The subscale intrinsic motivation from the Perceived Locus of Causality Scale (PLOC; Goudas, Biddle, & Fox, 1994) was used. This scale was validated by Moreno, González-Cutre, and Chillón (2009) for the Spanish context and it includes four items (e.g., "because they were fun"). The students responded to the stems: "I participated in the physical education classes of fitness testing…" (i.e., Post-TM) and "I participated in the last physical education lessons of fitness testing… (i.e., Post-SEM). This subscale has been used with physical education students with adequate reliability scores (Moreno, González-Cutre, & Chillón, 2009).

Effort and Pressure-tension. They were assessed using the specific subscales of the Spanish version (Escartí & Gutierez, 2001) of the Intrinsic Motivation Inventory (IMI) that was adapted for sport contexts by McAuley, Duncan, and Tammen (1989). These subscales assess effort and perceived pressure-tension during an activity. The IMI has shown adequate validity and reliability indexes in adolescent populations in the context of physical education (Goudas and Biddle, 1994). Both subscales include four items (e.g., effort: "I put a lot of effort into this"; pressure-tension: "I felt very tense while doing this activity"). Participants responded to the stems: "when we performed the fitness tests…" (i.e., Post-TM) and "when I performed the fitness test with my team…" (i.e., Post-SEM).

All instruments were rated on a 5 point Likert scale anchored by 1 (strongly disagree) to 5 (strongly agree). All the measures offered adequate internal reliability indexes (Table 1).

Data analysis

All data were analyzed using IBM SPSS version 22.0. Descriptive statistics were conducted, scales' reliability was verified using Cronbach's alpha. Variables followed a normal distribution since asymmetry and kurtosis were less than 2 (Gravetter & Wallnau, 2014). Moreover, a significance level of .005 was used to evaluate the results of the Multivariate Analysis of Variance (MANOVA) 2 x (2) (gender [male, female] * methodology [TM, SEM]). Finally, the interclass correlation coefficient (ICC[3,1]), using a single evaluator, bidirectional combined model of absolute agreement with 95% confidence intervals and single measure, was used to analyze the degree of concordance between the physical fitness tests' results. From the initial 118 participants, 10 missed more than two lessons and they were removed from the study. The final sample (*N* = 108) included less than 5% of missing data, which met the assumption of

missing completely at random (MCAR). Therefore, missing data were imputed using the Expectation-maximization algorithm (EM).

RESULTS

Multivariate analysis of variance

All the variables showed skewness and kurtosis values smaller than two. Therefore, a mixed factorial MANOVA 2 x (2) (gender[male, female] * methodology[TM, SEM]) was conducted to examine the differences between the two methods and the effects of gender. Before executing the analysis, the assumption of homogeneity of covariances was examined using the Box test, but results were not satisafctory (Box M = 250.883, F = 1.546, p < .001). Therefore, suggestions by Olson (1979) and Tabachnick and Fidell (1996) were considered to evaluate the multivariate significance of the main effects and interactions. The MANOVA showed a significant multivariate effect between the two methodologies: V = .182, F(8, 99) = 2.749, p = .009, η_p^2 = .182, β = .92, and for gender: V = .165, F(8, 99) = 2.441, p = .019, η_p^2 = .165, β = .88. However, although a multivariate interaction did not emerge: V = .095, F(8, 99) = 1.305, p > .05, η_p^2 = .095, β = .57, subsequent univariate analyses revealed the existence of a significant interaction with boredom: V = 1.692, F(1, 106) = 4.716, p = .032, η_p^2 = .043, β = .58, and pressure-tension: (V) = 1.722, F(1, 106) = 4.169, p = .044, η_p^2 = .038, β = .52. The effect on these two variables was analyzed using the SIDAK adjustment. Thus, it was observed that gender moderated the effect of boredom and pressure-tension, indicating that men were more bored (p = .021) when they performed the tests using the SEM (M = 2.18, SD = 1.07) than the TM (M = 1.92, SD = 1.03) and that women perceived lower pressure-tension (p < .001) when they participated through the SEM (M = 2.09, SD = 0.77) than the TM (M = 2.53, SD = 0.98). Regarding the univariate inter-subject analysis, it was observed that there were no significant differences between men and women in any of the variables.

The main effect of the remaining variables revealed that students scored significantly higher when they performed the test using the SEM than the TM in autonomy: F(1, 106) = 8.351, p = .005, η_p^2 = .073, β = .82, competence: F(1, 106) = 4.579, p = .035, η_p^2 = .041, β = .57, relatedness: F(1, 106) = 5.760, p = .018, η_p^2 = .052, β = .66, and intrinsic motivation: F(1, 106) = 4.204, p = .043, η_p^2 = .038, β = .53. On the other hand, no significant differences were observed in satisfaction/fun: F(1, 106) = 2.201, p > .05, η_p^2 = .020, β = .31, and effort: F(1, 106) = 0.408, p > .05, η_p^2 = .004, β = .10. Table 1 shows each variable's means and the percentage of change (Hopkins, 2006) in those variables that showed significant differences between the two methodologies.

Table 1. Means, Standard Deviations, Cronbach' alphas, and MANOVA 2 x (2) results

	Tradicional Model			Sport Education Model			
	M	*SD*	α	*M*	*SD*	α	Percentage change
Autonomy	3.41	0.78	.72	3.59**	0.75	.76	5.28%
Competence	3.95	0.76	.78	4.05*	0.65	.78	2.53%
Relatedness	4.08	0.67	.70	4.23*	0.62	.77	3.68%
Satisfaction/fun	4.15	0.72	.81	4.25	0.69	.84	
Boredom	1.94[a]	0.98	.74	2.03[a]	1.01	.71	
Intrinsic Mot.	3.87	0.92	.86	4.01*	0.85	.86	3.62%
Effort	4.10	0.83	.72	4.14	0.72	.71	
Pressure-tension	2.30[a]	0.95	.76	2.07[a]	0.83	.72	

Note. ** $p < .01$. * $p < .05$. [a]Interaction $p < .05$ (gender*methodology).

Inter-rater reliability analysis

To analyze the degree of agreement among the different measurement methods, that is, between the ones made by the physical education teacher and the ones made by the students themselves in an autonomous and collaborative way, the ICC(3,1) was used using a single evaluator, bidirectional combined model of absolute agreement with 95% confidence intervals. Table 2 shows that the results obtained by the teacher correspond to the results obtained by the students with a reliability that ranges from good to excellent. It can be observed that the upper body power (i.e., 4kg Medicine Ball Throw) showed the highest reliability score, while the 30-second Sit–up Test showed the lowest, but within the range of acceptable or good (Landis & Koch, 1977).

Table 2. Interclass correlation coefficient using a single evaluator, bidirectional combined model of absolute agreement (single measure) results

	TM	SEM	Intraclass Correlation	95% IC	Test *F* true value 0			
	M(*SD*)	*M*(*SD*)			Value	df1	df2	*p*
Medicine Ball Throw (cm)	356.77 (87.69)	358.16 (82.94)	.840	.77 - .88	11.41	103	103	.000
Standing Long Jump (cm)	156.28 (27.54)	155.54 (27.68)	.813	.74 - .87	9.63	105	105	.000
20m Sprint (seg.)	4.59 (0.54)	4.50 (0.54)	.672	.55 - .76	5.24	105	105	.000
M. Sit and Reach (cm)	27.38 (8.28)	32.82 (8.81)	.646	.12 - .83	7.908	104	104	.000
30-second Sit-up Test	21.25 (4.77)	22.45 (4.49)	.640	.49 - .74	4.879	104	104	.000
Course navette	4.40 (210)	4.18 (2.21)	.811	.72 - .87	9.57	85	85	.000

Note. Due to the school schedule, one group did not repeat the Course Navette Test.

DISCUSSION AND CONCLUSIONS

The purpose of this study was twofold. On the one hand, the aim was to compare the use of two methodological approaches, Traditional Model (TM) and SEM, in the students' basic psychological needs, motivation, effort, and pressure-tension. The second objective was to check if the use of the SEM in fitness testing could provide reliable results of the students' physical fitness. Results showed that the use of the SEM improved students' autonomy, competence, relatedness, and intrinsic motivation. Likewise, it was observed that the SEM produced less pressure-tension in women and greater boredom

among men. Physical fitness data collected by students through the SEM was as reliable as the collected by the teacher using the TM.

Regarding the first objective, the results showed statistically significant differences between the two methodologies. Specifically, students manifested higher levels of intrinsic motivation and greater satisfaction of the basic psychological needs when they assessed their physical skills through the SEM. In this regard, the application of this model with these type of contents can be very interesting because an increase in the intrinsic motivation could have an impact in their cognitive and social development (Orsini, Binnie, & Wilson, 2016). These results are consistent with the theoretical framework of the self-determination theory (Deci & Ryan, 1985, 2000). On the one hand, the TM mainly involved the teacher, who initially explained the execution of every test. Subsequently, the students performed each test under his supervision and also registered the results. The other approach was based on the SEM. This methodology provides more autonomy to the students, who worked in collaborative groups.

Previous studies that used the SEM in physical education contents have also shown improvements in students' intrinsic motivation (Burgueño, Medina-Casaubón, Morales-Ortiz, Cueto-Martín, & Sánchez-Gallardo, 2017), in their basic psychological needs (Perlman, 2011) and in their motivation towards physical education (Wallhead & Ntoumanis, 2004). This is the first study that has found these positive effects of the SEM while using physical fitness test, expanding the benefits that systematic reviews of the model have shown in different contents such as sports (i.e., badminton, volleyball, ultimate, athletics…), dance, indiaca, mime, or cross-fit (Evangelio, Sierra-Díaz, González-Villora, & Fernández-Río, 2018). It has been documented that teachers tend to offer few alternatives in physical education (Cothran, Kulinna, Banville, Choi, Amade-Escot, MacPail et al., 2005), especially when using physical fitness tests. Results obtained using the SEM showed that teachers should offer students a collaborative work methodology when dealing with fitness testing. In this context, students will try hard in the tests, while feeling less emotional pressure/tension. Finally, they will obtain valid and reliable measures of their physical fitness and, moreover, it would also help the creation of a teaching-learning environment where the students get involved in the whole process, including the evaluation of their physical skills. In this regard, effort and commitment would be more associated with the grades than the physical performance itself (Carriedo & González, 2019). There will multiple situations that may facilitate students' competence, autonomy and relatedness. For instance, those where students have the opportunity to work in groups to help each other (e.g., when each student plays a role in the group), where they are allowed to organize and plan their activities (Cecchini, Fernández-Losa, González, & Cecchini, 2013; Cecchini, González, Méndez, & Fernández-Río, 2011). It has been observed that the involvement in a work context such as the proposed in the SEM positively affected students' autonomy, competence, relatedness, and intrinsic motivation. Thus, the results of the present study are consistent with the SDT (Deci & Ryan, 1985). It seems important that teachers provide contexts that positively affect students' basic psychological needs and intrinsic motivation (Standage, Duda, & Ntoumanis, 2003).

It should be noted that a significant interaction effect emerged in boredom and pressure-tension, indicating that gender moderated such effect. It was observed that men became more bored and women perceived less pressure-tension when they worked in collaborative groups. These differences could be due to the effect produced by the repetition of the same content (Subramanian & Silverman, 2007), an issue that would be a possible threat to the study's internal validity. However, this would not explain why it only affected males. It has been pointed out that regardless of age, males have a better attitude than females to perform batteries of physical fitness tests in physical education and that the way teachers conduct those tests could be the cause of these differences (Mercier and Silverman, 2014). For this reason, this novel approach could have negatively affected boredom in males and neutrally in females who did not experience changes in satisfaction/fun and boredom, but showed significant differences in perceived pressure-tension. A large percentage of students declared that they feel great tension and anxiety when they were being tested (Álvarez, 2009). Specifically, females had higher levels of anxiety when they were being tested (Sari, Bilek, & Celik, 2018; Rosario, Núñez-Pérez, Salgado, González-Pineda, Valle, Joly et al., 2008). So, it seems reasonable to think that girls in this study felt greater pressure-tension when they had to perform the fitness tests under teacher supervision. Likewise, it should take into consideration that students had to perform these tests while being observed by their classmates. On the other hand, performing the same physical fitness test, but in a small collaborative group where the feeling of being tested is probably not perceived (students collected information for their own knowledge), could explain the reduction observed in the pressure-tension levels of females when they perform the same task through the SEM. This is very important because it shows that the contents of physical education are "neutral"; it is the methodology used by teachers that causes these effects on the students. Thus, the results of the present study showed that the SEM produces better outcomes than the TM when physical fitness tests are implemented. In addition, both supporters and critics of the use of physical fitness tests in physical education (López-Pastor et al., 2006) could see that the SEM is a more successful methodological approach than the TM, so it can help bring opposing positions closer.

The second objective of the study was to check if the use of the SEM in fitness testing could provide reliable results of the students' physical fitness. The intraclass correlation analyses showed a good or excellent correlation for all the tests. This result suggests that less directive approaches, such as the SEM, does not mean "loss of reliability" in the assessment. This can help the "critics" of the use of physical fitness tests due to their limited scientific validity (López-Pastor et al., 2006), because there might be positive effects like the observed in this study (discussed in the first objective of the study), in addition to practical validity of the results. Previous experiences have showed how physical fitness testing can be used by the students to know their own physical skills (Martínez-López, 2003) and under autonomous approaches (Fernández-Río et al., 2001). The results of the present study are consistent with these ideas and suggest that data collected by the students themselves are similar to those registered by their teachers. The tests that obtained the highest reliability score were the

Medicine Ball Throw, the Standing Long Jump, and the Course Navette. On the other hand, the 30-seconds Sit-up Test, the 20m Sprint Test, and the Modified Sit and Reach Test obtained the lowest, although within acceptable or good ranges (Landis & Koch, 1997). The guidelines and execution of the Sit-up and the Sit and Reach Tests require a greater degree of precision (for example, the starting point in the Modified Sit and Reach Test may vary between observers). Moreover, a recent study concluded that this test did not offer as much absolute reliability as other tests that assess flexibility (Ayala & Sainz, 2011). Thus, it might be interesting to analyze this component of fitness through other test in future research. The same can happen with the Sit-up Test. If the rater is not very strict (or it is) with the movement of the arms or the criterion to consider a repetition acceptable, the results could vary slightly.

The present study acknowledges some limitations that should be taken into account in subsequent works. For instance, although it is true that each participant acted as his/her own control, which maximizes the sensitivity of the effects of the independent variables, the fact that the students participated in the two experimental conditions in a short period of time could have produced some exhaustion. Therefore, similar studies using a control group or using a counterbalanced design should be considered. Furthermore, it would be necessary to analyze these relationships deeper due to the mediating role that other motivational variables could play on satisfaction/fun and effort (e.g., goal orientation; Goudas, Biddle, & Fox, 1994). Similarly, it would be interesting to repeat this intervention at different times during the school year, or throughout the entire stage of secondary education. Finally, this study should be replicated with students of other ages and educational contexts.

REFERENCES

Álvarez, J.M. (2009). La evaluación en la práctica de aula. Estudio de campo. *Revista de Educación, 350*, 351-374.

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology*, *84*(3), 261-271. https://doi.org/10.1037/0022-0663.84.3.261

Ayala, F., y Sainz, P. (2011). Fiabilidad absoluta de las pruebas sit and reach modificado y back saber sit and reach para estimar la flexibilidad isquiosural en jugadores de fútbol sala. *Apunts. Medicina de l'Esport*, *46*(170), 81-88. https://doi.org/10.1016/j.apunts.2011.01.001

Baena-Extremera, A., Gómez-López, M., Granero-Gallegos, A., y Martínez-Molina, M. (2016). Modelo de predicción de la satisfacción y diversión en Educación Física a partir de la autonomía y el clima motivacional. *Universitas Psychologica*, *15*(2), 39-50. https://doi.org/10.11144/javeriana.upsy15-2.mpsd

Baena-Extremera, A., Granero-Gallegos, A., Bracho-Amador, C., y Pérez-Quero, F. J. (2012). Spanish version of the sport satisfaction instrument (SSI) adapted to physical education. *Revista de Psicodidáctica*, *17*(2), 377-396. https://doi.org/10.1387/revpsicodidact.4037

Balaguer, I., Atienza, F.L., Castillo, I., Moreno, Y., y Duda, J.L. (1997). Factorial structure of measures of satisfaction/interest in sport and classroom in the case of Spanish adolescents. *Abstracts of the 4thEuropean Conference of Psychological Assessment* (p. 76). Lisbon: Portugal.

Burgueño, R., Medina-Casaubón, J., Morales-Ortiz, E., Cueto-Martín, B., y Sánchez-Gallardo, I. (2017). Educación Deportiva versus Enseñanza Tradicional: Influencia sobre la regulación motivacional en alumnado de Bachillerato. *Cuadernos de Psicología del Deporte*, *17*(2), 87-98. https://doi.org/10.47197/retos.v37i37.70880

Calderón, A., Martínez de Ojeda, D.M., Valverde, J.J., y Méndez-Giménez, A. (2016). "Ahora nos ayudamos más": Docencia compartida y clima social de aula. Experiencia con el modelo de Educación Deportiva. *RICYDE. Revista Internacional de Ciencias del Deporte*, *12*(44), 121-136. https://doi.org/10.5232/ricyde2016.04403

Calderón, L., Martínez, D. O., y Hastie, P. A. (2013). Students and teachers' perception after practice with two pedagogical models in physical education. *RICYDE: Revista Internacional de Ciencias del Deporte*, *9*(32), 137-153. https://doi.org/10.5232/ricyde2013.03204

Carriedo, A. y González, C. (2019). Rendimiento académico en Educación Física: Aspectos académicos versus físico-deportivos. *Cultura, Ciencia y Deporte, 14*(42), 225-232. doi.10.12800/ccd.v14i42.1335

Cecchini, J.A., Carriedo, A., y Méndez-Giménez, A. (2019). Testing a circular, feedback model in physical education from self-determination theory. *The Journal of Educational Research*, *112*(4), 473-482. https://doi.org/10.1080/00220671.2018.1555788

Cecchini, J.A., González, C., Méndez, A., y Fernández-Río, J. (2011). Achievement goals, social goals, and motivational regulations in

physical education settings. *Psicothema, 23*(1), 51-57. https://doi.org/10.17811/rifie.43.2015.18-25

Cecchini, J.A, Fernández-Losa, J.L., González, C., y Cecchini, C. (2013). Aplicaciones del modelo de autodeterminación en la educación física de primaria. *Revista Latinoamericana de psicología, 45*(1), 97-109. https://doi.org/10.1174/021093912803758110

Christensen, L.B., Johnson, R.B., y Turner, L.A. (2011). *Research Methods, Design, and Analysis*. Boston: Pearson.

Cothran D.J., Kulinna P., Banville D., Choi E., Amade-Escot C., MacPail A., … Kirk D. (2005) A cross-cultural investigation of the use of teaching styles. *Research Quarterly for Exercise and Sport, 76*(2), 193-201. https://doi.org/10.1080/02701367.2005.10599280

Deci, E.L., y Ryan, R.M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum.

Deci, E.L., y Ryan, R.M. (2000). The 'what' and 'why' of goal pursuits: Human needs and the self-determination of behaviour. *Psychological Inquiry, 11*, 227-268. https://doi.org/10.1207/s15327965pli1104_01

Duda, J.L. y Nicholls, J.G. (1992). Dimensions of achievement motivation in schoolwork and sport. *Journal of Educational Psychology, 84*, 1-10. https://doi.org/10.1037/0022-0663.84.3.290

Escartí, A., y Gutiérrez, M. (2001). Influence of the motivational climate in physical education on the intention to practice physical activity or sport. *European Journal of Sport Sciences, 1*(4), 1-12. https://doi.org/10.1080/17461390100071406

Evangelio, C., Sierra-Díaz, J., Gonzalez-Villora, S., y Fernandez-Rio, J. (2018). The Sport Education Model in elementary and secondary education: A systematic review. *Movimento, 24*(3), 931-946. https://doi.org/10.22456/1982-8918.81689

Fernández-Río, J., Calderón, A., Hortigüela, D., Pérez-Pueyo, Á., y Aznar, M. (2016). Modelos pedagógicos en educación física: consideraciones teórico-prácticas para docentes. *Revista Española de Educación Física y Deportes*, *413*, 55-75. https://doi.org/10.5672/apunts.2014-0983.es.(2016/1).123.05

Fernández-Río, J., Medina, J.F., Garro, J., y Pérez, M. (2001). Un ejemplo de investigación-acción aplicado al bloque de contenidos de condición física en enseñanza secundaria. *Revista Internacional de Medicina y Ciencias de la Actividad Física y del Deporte, 1*(2), 84-99. https://doi.org/10.15366/rimcafd2019.76.008

Gravetter, F.J., y Wallnau, L.B. (2014). *Statistics for the behavioural sciences.* Belmont, CA: Wadsworth.

Goudas, M., y Biddle, S. (1994). Perceived motivational climate and intrinsic motivation in school physical education classes. *European Journal of Psychology of Education*, *9*(3), 241-250. https://doi.org/10.1007/bf03172783

Goudas, M., Biddle, S.J., y Fox, K. (1994). Perceived locus of causality, goal orientatios and perceived competente in school physical education classes. *British Journal of Educational Psychology, 64*, 453-463. https://doi.org/10.1111/j.2044-8279.1994.tb01116.x

Hattie, J., Biggs, J., & Purdie, N. (1996). Effects of learning skill interventions on student learning: A meta-analysis. *Review of Educational Research, 66*(2), 99-136. doi:10.3102/00346543066002099

Hernández, J.L., y Velázquez, R. (Coords.). (2004). *La evaluación en educación física. Investigación y práctica en el ámbito escolar*. Barcelona: GRAÓ.

Hopkins, W. G. (2006). *A new view of statistics: Effect magnitudes*. Recuperado de http://www.sportsci.org/resource/stats/effect.html#effectsize

Landis, J.R., y Koch, G.G. (1977). The measurement of observer agreement for categorical data. *Biometrics, 33*, 159-74. https://doi.org/10.2307/2529310

López-Pastor, V., Monjas, R., Gómez, J., López, E., Martín, J.F., González, J., … Marugán, L. (2006). La evaluación en educación física. Revisión de modelos tradicionales y planteamiento de una alternativa. La evaluación formativa y compartida. *Retos, Nuevas tendencias en Educación Física, Deporte y Recreación, 10*, 31-41. https://doi.org/10.47197/retos.v0i10.35061

Martínez-López, E.J. (2003). Aplicación de la prueba de lanzamiento de balón medicinal, abdominales superiores y salto horizontal a pies juntos. Resultados y análisis estadístico en Educación Secundaria. *Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte, 3*(12), 223-241. https://doi.org/10.15366/rimcafd2018.72.007

Martínez-López, E.J. (2004). Aplicación de la prueba de Cooper, Course Navette y test de Ruffier. Resultados y análisis estadístico en Educación Secundaria. *Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte, 4*(15), 163-182. https://doi.org/10.15366/rimcafd2018.72.007

Mayorga-Vega, D., Merino-Marban, R., y Rodríguez-Fernández, E. (2013). Relación entre la capacidad cardiorrespiratoria y el rendimiento en los tests de condición física relacionada con la salud incluidos en la batería ALPHA en niños de 10-12 años. *Cultura, Ciencia y Deporte, 8*, 41-47. https://doi.org/10.12800/ccd.v8i22.222

McAuley, E., Duncan, T.E., y Tammen, V.V. (1989). Causal attributions and affective reactions to disconfirming outcomes in motor performance. *Journal of Sport and Exercise Psychology, 11*, 187-200. https://doi.org/10.1123/jsep.11.2.187

Méndez-Giménez, A., Fernández-Río, J., y Cecchini, J.A. (2013). Papel importante del alumnado, necesidades psicológicas básicas, regulaciones motivacionales y autoconcepto físico en educación física. *Cuadernos de psicología del deporte*, *13*(1), 71-82. https://doi.org/10.4321/s1578-84232013000100008

Méndez-Giménez, A., Fernández-Río, J., y Méndez-Alonso, D. (2015). Modelo de educación deportiva versus modelo tradicional: efectos en la motivación y deportividad. *Revista Internacional de Medicina y Ciencias de la Actividad Física y del Deporte*, *15*(59), 449-466. https://doi.org/10.15366/rimcafd2015.59.004

Mercier, K., y Silverman, S. (2014). High school students' attitudes toward fitness testing. *Journal of Teaching in Physical Education, 33*, 269-281. https://doi.org/10.1123/jtpe.2013-0153

Moreno, J.A., González-Cutre, D., y Chillón, M. (2009). Preliminary validation in Spanish of a scale designed to measure motivation in physical education

classes: The Perceived Locus of Causality (PLOC) Scale. *The Spanish Journal of Psychology, 12*, 327-337. https://doi.org/10.1017/s1138741600001724

Moreno, J.A., González-Cutre, D., Chillón, M., y Parra, N. (2008). Adaptación a la educación física de la escala de las necesidades psicológicas básicas en el ejercicio. *Revista Mexicana de Psicología, 25*(2), 295-303. https://doi.org/10.17060/ijodaep.2020.n1.v1.1790

Moreno-Murcia, J.A., Cervelló, E., Montero, C., Vera, J.A., y García, T. (2012). Metas sociales, necesidades psicológicas básicas y motivación intrínseca como predictores de la percepción del esfuerzo en las clases de educación física. *Revista de psicología del deporte*, *21*(2), 215-221. https://doi.org/10.6018/analesps.29.1.161881

Muñoz, V., Gómez-López, M., y Granero-Gallegos, A. (2019). Relación entre la satisfacción con las clases de educación física, su importancia y utilidad y la intención de práctica del alumnado de educación secundaria obligatoria. *Revista Complutense de Educación, 30*(2), 479-491. https://doi.org/10.5209/rced.57678

Ntoumanis, N. (2001). A self-determination approach to the understanding of motivation in physical education. *British journal of educational psychology*, *71*(2), 225-242. https://doi.org/10.1348/000709901158497

Olson, C. L. (1979). Practical considerations in choosing a MANOVA Test Statistic: A rejoinder to Stevens. *Psychological Bulletin, 86*, 1350-1352. https://doi.org/10.1037/0033-2909.86.6.1350

Orsini, C., Binnie, V.I., y Wilson, S.L. (2016). Determinants and outcomes of motivation in health professions education: a systematic review based on self-determination theory. *Journal of educational evaluation for health professions*, *13*. https://doi.org/10.3352/jeehp.2016.13.19

Perlman, D.J. (2011). Examination of self-determination within the sport education model. *Asia-Pacific Journal of Health, Sport and Physical Education*, *2*(1), 79-92. https://doi.org/10.1080/18377122.2011.9730345

Rosario, P., Núñez-Pérez, J.C., Salgado, A., González-Pineda, J.A., Valle, A., Joly, C., y Bernardo, A. (2008). Ansiedad ante los exámenes: relación con variables personales y familiares. *Psicothema, 20*(4), 563-570.

Sari, S. A., Bilek, G., y Celik, E. (2018). Test anxiety and self-esteem in senior high school students: A cross-sectional study. *Nordic Journal of Psychiatry*, *72*(2), 84-88. https://doi.org/10.1080/08039488.2017.1389986

Siedentop, D. (1994). *Sport education: Quality PE through positive sport experiences*. Champaign, IL: Human Kinetics.

Siedentop, D., Hastie, P.A., y Van der Mars, H. (2011). *Complete guide to Sport Education* (2nd ed.). Champaign, IL: Human Kinetics.

Silverman, S. (2005). Thinking long term: Physical education's role in movement and mobility. *Quest, 57*, 138-147. https://doi.org/10.1080/00336297.2005.10491847

Standage, M., Duda, J, & Ntoumanis, N. (2003). Predicting motivational regulations in physical education: the interplay between dispositional goal orientations, motivational climate and perceived competence. *Journal of Sports Sciences, 21*(8), 631-647. https://doi.org/10.1080/0264041031000101962

Subramaniam, P., y Silverman, S. (2007). Middle school students' attitudes toward physical education. *Teaching and Teacher Education 23*, 602–11. https://doi.org/10.1016/j.tate.2007.02.003

Tabachnick, B. G., & Fidell, L. S. (1996). *Using multivariate statistics* (3ª ed.). New York: Harper Collins.

Vallerand, R.J., y Losier, G.F. (1999). An integrative analysis of intrinsic and extrinsic motivation in sport. *Journal of applied sport psychology*, *11*(1), 142-169. https://doi.org/10.1080/10413209908402956

Vlachopoulos, S.P., y 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. https://doi.org/10.1207/s15327841mpee1003_4

Wallhead, T.L., y Ntoumanis, N. (2004). Effects of a sport education intervention on students' motivational responses in physical education. *Journal of teaching in physical education*, *23*(1), 4-18. https://doi.org/10.1123/jtpe.23.1.4

Número de citas totales / Total references: 56 (100%)

Número de citas propias de la revista / Journal's own references: 4 (7,14%)