Preliminary Validation in Spanish of a Scale Designed to Measure Motivation in Physical Education Classes: The Perceived Locus of Causality (PLOC) Scale

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The purpose of this paper was to validate the Spanish version of the Perceived Locus of Causality Scale (PLOC; Goudas, Biddle, & Fox, 1994). To achieve this, two studies with samples of 1535 and 400 physical education students, of ages 12 to 17 years, were carried out. The psychometric properties of the PLOC were examined through the following analyses: confirmatory factor analysis, factor invariance, correlation among factors, reliability (Cronbach's alpha), temporal stability (test-retest), and criterion validity. The results partially supported the five-factor structure. This structure was invariant across the two study samples. Correlations among the subscales indicated a simplex pattern, supporting construct validity of the scale. Alpha values over .70 (except for introjected regulation) and high temporal stability (intra-class correlation coefficient = .83 to .90) over a four-week period were obtained. The mastery-approach goal positively predicted self-determined motivation, whereas the performance-avoidance goal predicted it negatively. Future studies should continue to analyze the psychometric properties of the PLOC, as the validation of an instrument should be an ongoing process.
Keywords: motivation, self-determination, physical education, validation, achievement goals

El objetivo de este trabajo fue validar la versión española de la Escala del Locus Percibido de Causalidad (PLOC) de Goudas, Biddle y Fox (1994). Para ello, se llevaron a cabo dos estudios con muestras de 1535 y 400 alumnos en clases de educación física, edades entre 12 y 17 años. Se analizaron las propiedades psicométricas de la PLOC por medio de análisis factoriales confirmatorios, análisis de la invarianza factorial, análisis de correlaciones entre factores, fiabilidad a través del alfa de Cronbach, estabilidad temporal test-retest y validez de criterio. Los resultados ofrecieron un apoyo parcial a la estructura de cinco factores. Esta estructura se mostró invariante entre las dos muestras de estudio. Las correlaciones entre las subescalas indicaron un modelo simplex que apoya la validez de constructo de la escala. Se obtuvieron valores alfa de Cronbach superiores a .70, salvo para la regulación introyectada, y altos niveles de estabilidad temporal (coeficiente de correlación intra-clase = .83 a .90) en un periodo de cuatros semanas. La meta de aproximación-maestría predijo positivamente la motivación autodeterminada, mientras que la meta de evitación-rendimiento lo hizo de forma negativa. Futuros trabajos deberán continuar analizando las propiedades psicométricas de la PLOC, puesto que la validación de un instrumento debe ser un proceso continuado.
Palabras clave: motivación, autodeterminación, educación física, validación, metas de logro

One of the main goals of physical education classes is to provide the students with the necessary attitudes and motivations so they will practice sports outside of the academic timetable and for the rest of their whole lives. In the past few years, many works (Ntoumanis, 2001, 2005; Standage, Duda, & Ntoumanis, 2005, 2006) have analyzed motivation in physical education classes, using as reference the self-determination theory of Deci and Ryan (1985, 1991, 2000). This general motivation and personality theory was developed in the last three decades and contributes very interesting information to interpret adolescents' commitment to sport. It considers that there are different kinds of motivation and it places them along a continuum of self-determination, distinguishing whether the origin of such motivation is more internal or external to the subject (more or less self-determined). In this sense, the theory ranks them from higher to lower degree of self-determination: intrinsic motivation, extrinsic motivation, and amotivation.

Intrinsic motivation refers to participation in an activity for the very pleasure and satisfaction one feels from doing it. For example, a student who enjoys learning concepts about sports, performance techniques, and living stimulating experiences. Extrinsic motivation refers to commitment to the activity as a means to achieve something, but not an end in itself. There are different kinds of extrinsic motivation, some of them less self-determined than others. External regulation defines behavior regulated by external incentives, such as rewards or punishment. This would be the case of students who participate in the classes in order to prevent the teacher from taking reprisals against them, or flunking them. In introjected regulation, individuals begin to interiorize the reasons for their actions, but they act under self-imposed pressure, to avoid feelings of guilt or anxiety. This would be a situation in which students are interested in physical education classes because they would feel bad if they did not participate. Identified regulation involves carrying out an activity voluntarily because the individuals consider it important and beneficial, although they do not enjoy it. For example, students who want to learn methods to improve their physical condition to be able to train in their free time. Integrated regulation also involves performing the activity freely, but in this case, the choice harmonizes with the self. That is, the choice is coherent with other aspects of the self, such as in the case of students who participate actively in physical education classes because it is a part of their active and healthy life-style, in which they try to take good care of themselves, eat well, not smoke or consume alcohol, and practice sports outside of school hours.

Lastly, amotivation refers to the lack of intentionality and relative absence of motivation. A clear example would be the students who are not intrinsically or extrinsically motivated and who do not perform the activities proposed by their teacher, but who instead attempt to avoid participating.

The self-determination theory establishes that satisfaction of the basic psychological needs of autonomy, competence, and relatedness plays a very important role in the achievement of more self-determined motivation. The need for autonomy refers to people's effort to feel themselves to be the origin of their actions and to be able to choose to determine their own behavior. The need for competence is based on attempts to control the result and to experience efficacy. The need for relatedness refers to positive feelings of connection with significant others and satisfaction with the social world (Deci & Ryan, 1991).

According to the hierarchical model of intrinsic and extrinsic motivation (Vallerand, 2001), social factors (e.g., the intervention of the physical education teacher) will affect satisfaction of the basic psychological needs in order to develop types of motivation that are more or less self-determined, leading to diverse cognitive, affective, and behavioral consequences. This sequence can have various levels of generality: (a) global (a person's general motivation), (b) contextual (general orientation towards a specific context such as physical education), and (c) situational (the motivation one has during the development of a particular activity).

The results of research in physical education concerning this model have shown that a mastery climate (focused on personal improvement of skills) and autonomy support help students to feel competent and autonomous, and to have satisfactory relationships with others (e.g., Standage, Duda, & Ntoumanis, 2003; Standage et al., 2006), thus achieving self-determined motivation. This self-determined motivation has been related to more interest, effort, positive emotions, satisfaction, and commitment to sports by students (Vallerand, 2007). Therefore, it is very useful to know how the physical education teacher should behave so as to develop motivation that leads to more positive consequences. In this sense, from the psychology of physical activity and sports, researchers are constantly working to elaborate instruments to measure the constructs defined by the self-determination theory.

Thus, to assess students' contextual motivation towards physical education classes, Goudas, Biddle, and Fox (1994), created the Perceived Locus of Causality (PLOC) Scale, adapting the Self-Regulation Questionnaire of Ryan and Conell (1989) to measure external, introjected, identified, and intrinsic motivation. In addition, they adapted the amotivation factor from the Academic Motivation Scale of Vallerand et al. (1992) to physical education. The scale was made up of 20 items (4 for each factor), headed by the phrase "I participate in this physical education class…." and was responded on a Likert-type rating scale, that ranged from 1 (*totally disagree*) to 7 (*totally agree*). It is noted that it does not measure integrated regulation because it was designed for adolescents and, according to Vallerand (1997), integrated regulation is more frequent in adults. Goudas et al. (1994) obtained Cronbach alpha values over .70 in all

the subscales except for introjected regulation (.68 and .69 with two different samples). Moreover, they found that the correlations among the subscales that were near each other on the self-determination continuum were high, and the magnitude of these correlations gradually decreased as they grew farther apart on the continuum. They also found a high and negative correlation between the two extremes of the continuum (intrinsic motivation-amotivation). These relations matched the postulates established by the self-determination theory. Although Goudas et al. (1994) did not test the factor structure of the PLOC by confirmatory factor analysis, subsequent studies have revealed adequate validity of the scale, obtaining acceptable fit indexes (e.g., Ntoumanis, 2005; Standage et al., 2005).

The PLOC has been extensively used and has shown adequate psychometric properties, although the factor introjected regulation has generally obtained alpha values lower than .70 (e.g., Ntoumanis, 2001, 2005; Standage et al., 2005, 2006). However, various studies have found an excessively high correlation between the factors of intrinsic motivation and identified regulation. Thus, Goudas et al. (1994) found a correlation of .87, Ntoumanis (2005) of .82, Standage et al. (2005) of .99, and Standage et al. (2006) of .85.

The PLOC is the only scale created specifically to measure contextual motivation in physical education classes. Some authors (e.g., Prusak, Treasure, Darst, & Pangrazi, 2004) have adapted the Sport Motivation Scale (SMS; Pelletier et al., 1995) for use in physical education, but without confirming whether its factor structure was valid for the physical education context. This scale was designed to measure motivation in the competitive sport setting.

The purpose of this study was to validate the Spanish version of the Perceived Locus of Causality Scale (Goudas et al., 1994), as it is the only available tool in the international scenario that is valid and reliable to determine the level of contextual self-determined motivation in students of physical education. This instrument will allow us to examine self-determined motivation, relating it to social factors that affect the satisfaction of students' basic psychological needs and some positive results such as higher adherence to practicing sports and less sedentariness. Therefore, we carried out an analysis of its psychometric properties through two studies. In the first study, we examined factor structure, construct validity, internal consistency, and temporal stability. In the second study, we analyzed factor invariance and criterion validity. In order to analyze criterion validity, we attempted to relate self-determined motivation to the 2×2 achievement goals. The 2×2 achievement goals model (Elliot, 1999; Elliot & McGregor, 2001) proposes the existence of four achievement goals. The mastery-approach goal focuses on achieving personal improvement; the mastery-avoidance goal consists of avoiding the lack of learning and improvement; the performance-approach goal focuses on surpassing others; and the performance-avoidance goal consists of avoiding

doing worse than others. There is empirical evidence (Elliot, 1999; Elliot & Conroy, 2005; Moller & Elliot, 2006) that in the educational and sport area, the mastery-approach goal is related to more positive consequences. With regard to avoidance goals, Elliot (1999) suggested that mastery-avoidance could be negatively related to phenomenological variables such as self-determination, whereas performance-avoidance is harmful for experience and enjoyment, decreasing positive affect and short-term intrinsic motivation (Elliot & Conroy, 2005). On the basis of these previous works, we hypothesized that students' mastery-approach goal would positively predict self-determined motivation, whereas mastery-avoidance and performance-avoidance goals would predict it negatively.

Study 1

The purpose of this first study was to adapt the PLOC scale to Spanish. In this study, we wished to confirm its factor structure, analyze its construct validity, internal consistency, and temporal stability.

Method

Participants

In this study, participants were 1535 students from physical education classes (751 boys and 784 girls), ages between 12 and 17 years ($M = 14.15$, $SD = 1.28$), from various educational centers of the Region of Murcia (Spain). Following the recommendation of Bentler (1995), we used a sample size at least five times the number of total parameters present in the model of confirmatory factor analysis.

Instruments

Perceived Locus of Causality Scale (PLOC; Goudas et al., 1994). This instrument was described in the introduction.

Procedure

First, the scale was translated, using the backward translation strategy (Hambleton, 1996). In this process, the original scale was translated to Spanish by a group of translators and subsequently, another group of translators translated it back to the original language. The different translators judged the versions to be equivalent. The version thus obtained was analyzed by three experts (Lynn, 1986) in physical-sport motivation, to guarantee that the items were well designed to measure the constructs they were meant to measure and they had retained the original meaning. The sustained debate among the three experts only generated minor changes.

Once the scale was translated, we contacted various educational centers to request their collaboration in this investigation. The Director's office of the centers contacted the students' parents to obtain the pertinent authorization, as the participants were minors.

The main investigator administered the scale, stressing that responses were anonymous and there were no true or false responses; the students were requested to respond about their own perceptions. Likewise, he solved any doubts that came up during the process with regard to the wording or the meaning of the items. Participation was voluntary and all the ethical procedures for data gathering were respected. The students took about 10 minutes to complete the questionnaire.

Data Analysis

An initial analysis of the psychometric properties of the PLOC was conducted to determine its validity and reliability in the Spanish context. For this purpose, we performed descriptive analysis, as well as analysis of the correlations among the factors, confirmatory factor analysis of the five-factor structure, and analysis of internal consistency with Cronbach's alpha. In addition, to assess the temporal stability of the scale, we performed test-retest with a new sample of students. The statistical packages SPSS 14.0 and AMOS 6.0 were used for the diverse analyses.

Results

Descriptive Statistics and Analysis of Correlations among the Five Factors

As can be seen in Table 1, the students scored the highest in more self-determined forms of motivation, such as intrinsic motivation ($M = 5.29$) and identified regulation ($M = 5.43$). Their scores decreased progressively in the forms of motivation with a lower degree of self-determination, until reaching amotivation ($M = 2.74$). Correlation analysis revealed a positive correlation between the types of motivation that were nearer each other on the self-determination continuum and a negative correlation between the two extremes of the continuum (*simplex* model), which provides construct validity to the scale.

Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis (Figure 1) was conducted to test whether the five-factor structure of the original scale adequately matched the Spanish context. The skewness and kurtosis indexes of all the items were lower than 2.0, which indicates univariate normal distribution of the data (Bollen & Long, 1993). Likewise, Mardia's coefficient was 111.84. According to Bollen (1989), if Mardia's coefficient is lower than $p (p + 2)$, where p is the number of observed variables, then there is multivariate normality. As in this study, we used 20 observed variables, it can be stated that there was a multivariate normal distribution of the data. These results allowed us to use the maximum likelihood estimation method in the confirmatory factor analysis. The item covariance matrix was used to analyze the data.

In order to accept or reject a model, the most appropriate method is to use a combination of various fit indexes, as there is no consensus among researchers about which is the best index for this kind of analysis (Hoyle & Panter, 1995). Taking into account the contributions of some authors (Bentler, 1990; Bollen & Long, 1993), in this study, we used the following fit indexes: χ^2, χ^2/df, the comparative fit index (CFI), the incremental fit index (IFI), the Tucker Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). As χ^2 is very sensitive to sample size (Jöreskog & Sörbom, 1989), we also used the ratio between χ^2 and the degrees of freedom (χ^2/df), which is considered acceptable when it is lower than 5 (Bentler, 1989). According to Shumacker and Lomax (1996), the incremental indexes (CFI, IFI, and TLI) have acceptable fit when they obtain values of .90 or higher. Hu and Bentler (1999) raised the cut-off point to .95 to deem incremental indexes acceptable, but this rule has been criticized, as it is considered too restrictive (Marsh, Hau, & Wen, 2004). Regarding the error indexes (RMSEA and SRMR), .06 and .08, respectively, have been established as cut-off points to accept them (Hu & Bentler, 1999).

The results of the CFA revealed the following values: χ^2 (160, $N = 1535$) = 1062.71, $p = .00$; $\chi^2/df = 6.64$; CFI = .90; IFI = .90; TLI = .88; RMSEA = .06; and SRMR = .05. The value of χ^2/df was above the established reference values, which could be justified because of the large sample

Table 1

Descriptive Statistics and Correlations of all the PLOC Factors

Factors	M	SD	Skewness	Kurtosis	1	2	3	4	5
1. Intrinsic motivation	5.29	1.14	–.74	.63	—	.98**	.49**	–.11**	–.52**
2. Identified regulation	5.43	1.13	-1.01	1.33	—	—	.64**	.06	–.51**
3. Introjected regulation	4.20	1.28	–.30	–.24	—	—	—	.64**	.04
4. External regulation	3.97	1.29	–.17	–.38	—	—	—	—	.55**
5. Amotivation	2.74	1.44	.67	–.23	—	—	—	—	—

** $p < .01$.

size, because despite the fit due to degrees of freedom, the sample size continued to have a negative effect on the fit index (Cea, 2002). Regarding the remaining indexes, acceptable values were obtained, although, according to Hu and Bentler (1999), the model could be substantially improved. All the items had relatively high standardized regression weights (ranging between .41 and .76) which were statistically significant ($p < .05$), and satisfactory error variance. Thus, it seems that the data provide partial support to the factor validity of the scale.
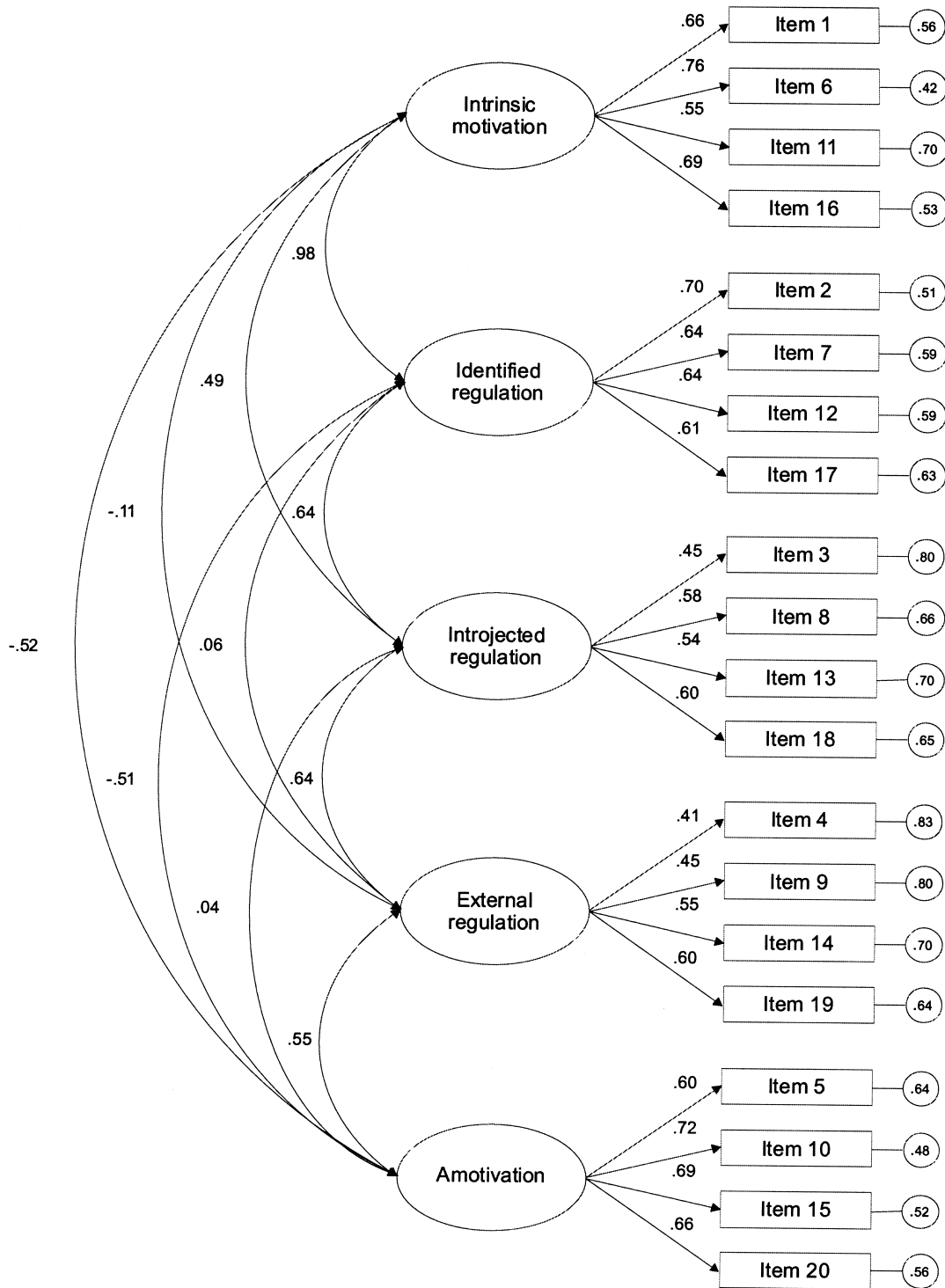

Figure 1. Confirmatory factor analysis of the PLOC. Ellipses represent the factors and rectangles represent the diverse items. All the regression weights are standardized and statistically significant at p < .05. The residual variances are represented in the small circles.

Analysis of Internal Consistency

The results of the analysis of internal consistency revealed alpha values of .76 for amotivation, .70 for external regulation, .61 for introjected regulation, .74 for identified regulation, and .75 for intrinsic motivation.

Analysis of Temporal Stability

We used a second sample of 272 students from physical education classes, ages between 12 and 17 years ($M = 14.88$, $SD = 0.71$), from various educational centers of the Region of Murcia (Spain). We administered the PLOC twice, with a 4-week interval. To assess temporal stability, we calculated the intra-class correlation coefficient (ICC) for each of the five factors of the PLOC. The two means for intrinsic motivation were 5.59 ($SD = 1.00$) and 5.59 ($SD = 1.07$) with an ICC of .90. For identified regulation, the mean dropped from 5.64 ($SD = 1.00$) to 5.60 ($SD = 1.04$) with an ICC of .90. For introjected regulation, the mean changed from 4.08, ($SD = 1.25$) to 4.06 ($SD = 1.26$), with an ICC of .88. For external regulation, the mean varied from 3.97 ($SD = 1.24$) to 3.94 ($SD = 1.34$) with an ICC of .84. For amotivation, the mean rose from 2.23 ($SD = 1.16$) to 2.34 ($SD = 1.22$) with an ICC of .83. Cicchetti (1994) considers that when interpreting the reliability of an instrument in psychology, an ICC value between 0.75 and 1.00 is excellent. Therefore, the results revealed high levels of temporal stability for the five subscales of the PLOC.

Discussion

The results of this first study provide partial support to the factor validity of the Spanish version of the PLOC. We obtained minimally acceptable fit indexes in the confirmatory factor analysis, although they could be substantially improved. These results lead us to classify this study as preliminary. The results of the correlation analysis are in the same vein as the postulates of the self-determination theory, which supports the construct validity of the scale. However, there was a high correlation between intrinsic motivation and identified regulation, indicating problems with discriminant validity. Prior studies already yielded similar correlation values between these same variables (Goudas et al., 1994; Ntoumanis, 2005; Standage et al., 2005, 2006). Future research should continue to analyze the validity of the Spanish version of the PLOC with different samples, attempting to solve these problems.

Regarding reliability, the factor introjected regulation obtained an alpha value lower than the recommended .70 (Nunnally, 1978). As the factor is made up of only 4 items, the internal validity observed could be marginally accepted (Hair, Anderson, Tatham, & Black, 1998; Nunnally & Bernstein, 1994). This factor has shown relatively low alpha values in previous studies (Ntoumanis, 2001, 2005; Standage et al., 2005, 2006), which indicates that perhaps the items that comprise it

should be restructured in the future. Nevertheless, the scale showed an adequate temporal stability in its measurement, indicating that contextual motivation does not change substantially in the interval of one month, in accordance with the results obtained by previous works with the SMS (Núñez, Martín-Albo, Navarro, & González, 2006; Pelletier et al., 1995).

Study 2

In this study, we analyzed the psychometric properties of the PLOC with a new sample of students, including an analysis of factor invariance, and we confirmed criterion validity by relating self-determined motivation to 2×2 achievement goals.

Method

Participants

In this study, participants were 400 students from physical education classes (197 boys and 203 girls), ages between 14 and 16 years ($M = 14.76$, $SD = 0.79$), from various educational centers of the Region of Murcia (Spain). Following the recommendation of Bentler (1995), we used a sample size at least five times the number of total parameters present in the model of confirmatory factor analysis.

Instruments

2×2 Achievement Goal Scale in Physical Education. We used the Spanish translation (Moreno, González-Cutre, & Sicilia, 2008) of the 2×2 Achievement Goal Questionnaire (Elliot & McGregor, 2001), which had been adapted to physical education (Guan, Xiang, McBride, & Bruene, 2006). This scale is made up of a total of 12 items, grouped in four factors (3 items per factor) that measure the following achievement goals: (a) performance-approach goal (e.g., "it's important for me to do better than other students"); (b) mastery-approach goal (e.g., "I want to learn as much as possible"); (c) performance-avoidance goal (e.g., "I just want to avoid doing poorly"); and (d) mastery-avoidance goal (e.g., " sometimes I'm afraid that I may not understand the content as thoroughly as I'd like"). The scale was headed with the sentence, "In my physical education classes…", and was rated on a 7-point Likert-type rating scale, ranging from 1 (*totally disagree*) to 7 (*totally agree*). In this study, the scale obtained alpha values of .78 for the factor performance-approach, .75 for mastery-approach, .60 for performance-avoidance, and .71 for mastery-avoidance. In a recent work on the validation of this instrument through two studies, Wang, Biddle, and Elliot (2007) obtained similar alpha values to those obtained in this investigation.

Perceived Locus of Causality Scale (PLOC). We used the Spanish version of the PLOC (Goudas et al., 1994), derived from Study 1 (see Appendix). To measure self-determined motivation, we used the self-determination index (SDI), which

is calculated from the scores obtained in each of the PLOC subscales, as follows: (2 × intrinsic motivation + identified regulation) – ((introjected regulation + external regulation) / 2 + 2 × amotivation) (Vallerand & Rousseau, 2001). This index has already been extensively used in research in psychology of physical activity and sports, demonstrating its great usefulness (e.g., Chantal, Robin, Vernat, & Bernache-Asollant, 2005; Kowal & Fortier, 2000; Ntoumanis, 2005).

Data Analysis

Firstly, we analyzed the psychometric properties of the PLOC through confirmatory factor analysis, analysis of factor invariance, and analysis of internal consistency with Cronbach's alpha. Secondly, we performed linear regression analysis to examine the relations between self-determined motivation and the 2 × 2 achievement goals. Self-determined motivation was entered as dependent variable and the 2 × 2 achievement goals as independent variables. We wished to determine how students' achievement goals affect their self-determined motivation. The statistical packages SPSS 14.0 and AMOS 6.0 were used for the diverse analyses.

Results

Confirmatory Factor Analysis

The CFA was performed with the maximum likelihood estimation method (Mardia's coefficient = 89.65), entering the item covariance matrix for the data analysis. The results yielded similar fit indexes to those of Study 1, although χ^2/df had a lower value: χ^2 (160, $N = 400$) = 462.56, $p = .00$, $\chi^2/df = 2.89$, CFI = .90, IFI = .90, TLI = .87, RMSEA = .06, and SRMR = .07. The standardized regression weights ranged between .39 and .79 and were statistically significant ($p < .05$), with satisfactory error variance. The relations between factors were in accordance with those of Study 1.

Analysis of Factor Invariance

We wished to verify whether the structure of the confirmatory factor analysis was invariant across the samples from Study 1 and 2, using multigroup analysis. In Table 2 are displayed the diverse fit indexes. The differences found between the unconstrained model (Model 1) and the model with invariant factor loadings (Model 2) were not statistically significant ($\Delta\chi^2 = 21.93$, $\Delta df = 15$, $p = .11$), which is a minimum criterion to accept the existence of invariance between the two samples of the study (Byrne, Shavelson, & Muthén, 1989; Marsh, 1993).

Analysis of Internal Consistency

Alpha values of .74 were obtained for amotivation, .70 for external regulation, .67 for introjected regulation, .80 for identified regulation, and .80 for intrinsic motivation.

Regression Analysis

The results of the linear regression analysis with the direct introduction method (Table 3) showed that the

Table 2
Multigroup Invariance Analysis of the PLOC across Samples of Studies 1 and 2

Model	χ^2	df	χ^2/df	$\Delta\chi^2$	Δdf	CFI	IFI	TLI	RMSEA	SRMR
Model 1	1525.55	320	4.76	—	—	.90	.90	.88	.04	.05
Model 2	1547.49	335	4.61	21.93	15	.90	.90	.88	.04	.05
Model 3	1587.17	350	4.53	61.61*	30	.89	.89	.89	.04	.05
Model 4	1620.34	370	4.37	94.78*	50	.89	.89	.89	.04	.05

Notes. Model 1 = unconstrained; Model 2 = invariant factor loadings; Model 3 = invariant factor loadings and covariances among factors; Model 4 = invariant factor loadings and covariances and variances among factors. CFI = comparative fit index, IFI = incremental fit index, TLI = Tucker Lewis index, RMSEA = root mean square error of approximation, SRMR = standardized root mean square residual.
*$p < .05$.

Table 3
Linear Regression Analysis of Self-Determined Motivation as a Function of the 2 × 2 Achievement Goals

Variables	B	$SE\ B$	β	Adjusted R^2
	−5.99	.81		.44**
Performance-approach	−.28	.15	−.08	.043
Mastery-approach	3.06	.19	.79**	.383
Performance-avoidance	−.46	.19	−.11*	.012
Mastery-avoidance	−.31	.18	−.08	.002

* $p < .05$. **$p < .001$.

mastery-approach goal positively predicted self-determined motivation ($\beta = .79$), whereas the performance-avoidance goal did so negatively ($\beta = -.11$). The prediction of self-determined motivation by performance-approach and mastery-avoidance goals was not statistically significant. The analysis accounted for 44% of the variance of self-determined motivation.

Discussion

The results of the confirmatory factor and reliability analyses of the PLOC in this study were similar to those obtained in Study 1. Moreover, the scale showed factor invariance across the two samples of the study. These results indicate that the instrument is valid and reliable to measure motivation in classes of physical education within the Spanish context. The linear regression analysis reflected that students' mastery-approach goals positively predict self-determined motivation. In this sense, previous works carried out in the educational and sport setting (Elliot, 1999; Elliot & Conroy, 2005; Moller & Elliot, 2006) also revealed empirical evidence that mastery-approach goals are related to positive consequences. Moreover, this work showed that the performance-avoidance goal predicted self-determined motivation negatively. Therefore, the scale showed adequate criterion validity. In this regard, Elliot and Conroy (2005) considered this kind of goal to be harmful for experience and satisfaction, decreasing short-term intrinsic motivation. However, the mastery-avoidance goal did not predict self-determined motivation negatively, although Elliot (1999) had suggested that mastery-avoidance goals could be negatively related to phenomenological variables such as self-determined motivation. Future studies should continue to study in depth the relation between the 2×2 achievement goals and self-determined motivation in physical education classes, because, as it is a fairly novel topic, there are few studies about it. The consequences derived from each one of the 2×2 achievement goals and the social factors that affect the development of these goals should be clarified.

General Discussion

The self-determination theory is one of the most relevant theories for the study of human motivation. Its application in the setting of physical education has allowed us to better understand students' behaviors, attitudes, and involvement in sports. It should not be forgotten that motivation is the key to action, establishing its initiation, maintenance, or completion and it is therefore necessary to determine the factors that affect the development of positive motivation in students in order to promote habits of physical activity that last throughout their whole lifetime. Along these lines, the goal of this work was to validate the Spanish version of the only scale designed to measure in physical education

classes diverse forms of motivation established by the self-determination theory, the Perceived Locus of Causality Scale (Goudas et al., 1994). The results have revealed it to be a scale with acceptable psychometric properties that could be used to continue to examine in depth the motivation of students of physical education in the Spanish context.

Specifically, the two studies carried out revealed that the data collected from Spanish students partially fit the five-factor structure of the original scale, because the fit indexes, although minimally acceptable, could improve substantially. The factor structure was invariant in both the samples of the study, which provides more support to the factor validity of the scale.

The correlational analysis supported the construct validity of the instrument, showing positive relations among the variables that were near each other on the self-determination continuum and negative relations between the two extremes. However, there was a high correlation between the factors of intrinsic motivation and identified regulation. These results are in accordance with those found by previous works (Goudas et al., 1994; Ntoumanis, 2005; Standage et al., 2005, 2006) and they indicate the need for future research to continue to analyze the validity of this scale, attempting to solve the problem of the discriminant validity.

Moreover, the scale showed temporal stability in its measurements and had acceptable Cronbach alpha reliability indexes. Only the factor introjected regulation obtained values lower than the recommended value of .70 (Nunnally, 1978); values that could be accepted taking into account that the factor comprises only a few items (Ntoumanis, 2001) and that most of the previous studies have found similar alpha values (e.g., Goudas et al., 1994; Ntoumanis, 2005; Wang & Biddle, 2001; Wang et al., 2007). Nevertheless, future research should continue to analyze the reliability of this factor and whether or not its items should be modified to improve the measurement of the scale.

Lastly, we analyzed the criterion validity of the scale, by relating the self-determination index to the 2×2 achievement goals. In accordance with the data established by other works (Elliot, 1999; Elliot & Conroy, 2005; Moller & Elliot, 2006), the results showed that the mastery-approach goal was positively related to self-determined motivation, whereas the performance-avoidance goal had a negative relation. These results reveal the importance of orienting students towards personal improvement in tasks, engagement, and effort (mastery-approach). Likewise, they indicate that students should not constantly compare their performance to that of other students in an attempt to avoid being worse than them (performance-avoidance). This way, it is more likely for the students to achieve a more self-determined motivation, and they will enjoy practicing and will identify with the practice of sport.

This work is a first step in the analysis of motivation, from the perspective of the self-determination theory, in classes of physical education in the Spanish context. Up till

now, in Spain, there were only scales to measure self-determined motivation in competitive sports (the Sport Motivation Scale; Núñez et al., 2006) and in healthy physical activity (The Behavioral Regulation in Exercise Questionnaire-2; Moreno, Cervelló, & Martínez Camacho, 2007). With the validation of the PLOC, it is now possible to analyze self-determined motivation in all the physical-sport contexts. Nevertheless, the validation of an instrument should be an ongoing process, and new analyses of the psychometric properties of the PLOC are required to solve the problems detected. Invariance across gender and other variables should also be analyzed.

From now on, research along these lines in our country should be aimed at examining the effect of various significant agents (family, teacher, peers, etc.) on adolescents' motivation towards classes of physical education, to determine how to intervene so as to develop more self-determined motivation that would enhance active and healthy lifestyles. Physical education classes should be one of the places where we start to generate favorable attitudes towards the practice of sports, attempting to overcome one of the biggest problems of advanced societies: sedentariness.

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APPENDIX

Escala del Locus Percibido de Causalidad (PLOC) [Perceived Locus of Causality Scale]

Participo en esta clase de educación física…

1. Porque la educación física es divertida.
2. Porque quiero aprender habilidades deportivas.
3. Porque quiero que el profesor/a piense que soy un/a buen/a estudiante.
4. Porque tendré problemas si no lo hago.
5. Pero no se realmente por qué.
6. Porque disfruto aprendiendo nuevas habilidades.
7. Porque es importante para mí hacerlo bien en educación física.
8. Porque me sentiría mal conmigo mismo si no lo hiciera.
9. Porque eso es lo que se supone que debo hacer.
10. Pero no comprendo por qué debemos tener educación física.
11. Porque la educación física es estimulante.
12. Porque quiero mejorar en el deporte.
13. Porque quiero que los/as otros/as estudiantes piensen que soy hábil.
14. Para que el/la profesor/a no me grite.
15. Pero realmente siento que estoy perdiendo mi tiempo en educación física.
16. Por la satisfacción que siento mientras aprendo nuevas habilidades/técnicas.
17. Porque puedo aprender habilidades que podría usar en otras áreas de mi vida.
18. Porque me preocupa cuando no lo hago.
19. Porque esa es la norma.
20. Pero no puedo comprender lo que estoy sacando de la educación física.

*Translator's note: The items have not been translated because this is the *Spanish* version of a scale originally written in English.