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Validation of the Physical Activity and Leisure Motivation Scale in Adolescent School Children in Spain (PALMS-e)

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Abstract: The aim of this study was to translate and adapt the physical activity and leisure motivation scale (PALMS) into Spanish, and to analyse its validity and reliability. The sample comprised 867 adolescents, with a mean age of 14.04 ± 1.19 years, 53.9% of whom were male. During the translation process, some of the items in the instrument were modified slightly, improving its comprehensibility. On the other hand, the exploratory factor analysis did not present an adequate factor structure, so a more in-depth analysis was carried out, using item response theory and confirmatory factor analysis; the conclusion was that it would be appropriate to eliminate several items from the scale. From this, a final shortened version, consisting of 25 items, was produced, with adequate fit indices—CFI = 0.933, TLI = 0.918, SRMR = 0.042, RMSEA = 0.052 (90% CI 0.048; 0.056)—and good reliability for each of the dimensions, ranging from 0.625 to 0.835. It can be concluded that the abbreviated version of the PALMS instrument, adapted for Spanish adolescents (PALMS-e), is a valid and reliable instrument for assessing their motives for doing physical activity.

Keywords: PALMS; translation; adaptation; motivation; physical activity

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1. Introduction

Physical activity (PA) has health benefits [1–3] that are both physical [4,5] and psychosocial [6–9]. Unfortunately, a high percentage of adolescents are physically inactive. [10–13], even though this life stage is a key time for creating active lifestyle habits that favour psychological well-being in individuals, as an improved self-concept [14] reduced overweight and obesity levels [15], and prevent the emergence of non-transmissible diseases [16].

This last aspect is particularly relevant in Spain, as the latest representative data on the body weight of the population aged between 8 and 16, obtained in the PASOS study [17], revealed that 20.7% of this age group is overweight and 14.2% is obese. These data, compared with the information in the Enkid study [18], carried out in Spain between 1998 and 2000, point to an upward trend in this problem.

Similarly, this recent study warns that only 36.7% of children and adolescents in this same age group (8–16 years) achieve the minimum recommendation of 60 min of moderate–vigorous PA per day, as proposed by the World Health Organisation (WHO) [19].

In this sense, it is important to consider that compliance with these recommendations by the adolescent population seems to be conditioned by how motivated these individuals are to do PA [20]. It is therefore necessary to understand why adolescents decide to engage in PA, in order to develop programmes that are aimed at increasing this motivation [21].

On the other hand, the specific motives that lead people to do PA have been analysed through various theories, including the achievement goal theory (AGT) [22] and the self-determination theory (SDT) [23,24], and have been evaluated using different measuring instruments, some of which have been validated in the Spanish context, such as the following for example: the exercise motivations inventory 2 (EMI-2) by Markland and Ingledew (1997) [25], adapted into Spanish (Autoinforme de Motivos para la Práctica de Ejercicio Físico, AMPEF) by Capdevilla, Niñerola and Pintanel (2004) [26]; motives for PA measure-revised (MPAM-R) by Ryan, Frederick, Lepes, Rubio, and Sheldon (1997) [27], validated in the Spanish context by Moreno, Cervelló and Martínez (2007) [28]; and the Cuestionario motivos de práctica físico-deportiva en la etapa adolescente (survey of motives for the practice of physical sporting activities in adolescents) created by Martínez et al. (2012) [29].

However, the assessment tools that have been cited above do have limitations. Some of them do not have a sufficiently solid theoretical framework to adequately understand this subject, relying only on empirical exploration, based on the individual motives of the subjects or on certain aspects of PA [30,31]. Others, although based on a specific motivation theory, are insufficient when it comes to identifying and covering the whole range of reasons that lead individuals to engage in PA [31].

In this study, we used the PA and leisure motivation scale (PALMS), by Morris and Rogers (2004) [32]. Although there is already a version that has been adapted to the adolescent population (PALMS-Y) [33], it was decided to validate the original scale for the Spanish adolescent population, given that there are a greater number of previous validation studies for this.

The PALMS scale comprises 40 items. These measure the reasons for doing PA, and are equally distributed across its eight factors (ego, appearance, expectations of others, affiliation, physical condition, psychological condition, mastery, and fun), with the first six being considered extrinsic motivational factors, based on the self-determination theory [23], and the latter two being considered intrinsic factors.

However, in terms of the factor structure of the instrument, we found that, in some languages, the content of the scale has been modified in order to achieve a good fit. In the Portuguese version of the scale, 30 items are omitted [31]; in the Farsi version, one dimension has been added, and the items are not grouped in the same way as in the original scale [34]; in the Malaysian version, two items have been removed [30]; and in the adolescent version (PALMS-Y), only 28 items are used [33].

The reasons for choosing this scale were the following:

(1) it has been developed from qualitative information, through semi-structured interviews, in which the individual reasons people do PA are analysed, and, in turn, it is supported by the self-determination theory, which overcomes the limitations that have been described above [31]; (2) it is a short test, as it reduces the number of items from 73 in the original scale (recreational exercise motivation measure; REMM), by Rogers (2000) [35], to just 40, which are grouped into eight factors. Indeed, this is one of the main reasons we selected it, as it reduces the likelihood of the adolescents becoming fatigued and bored while responding to the questions; (3) it possesses good psychometric properties, as shown in studies by Kueh, Kuan, and Morris (2017) (comparative fit index (CFI) = 0.911, Tucker–Lewis index (TLI) = 0.901, standardised root mean square (SRMR) = 0.052, residual root mean square error of approximation (RMSEA) = 0.041) [30], among others; (4) unlike other scales, it has been successfully applied to diverse age groups, ranging from 9 to 89 years old [36]; (5) it is suitable for use with practitioners of both competitive sports and non-competitive physical activities [37,38]; (6) it can be applied in different cultural contexts, as it has been used with Greek dancers [39] and Chinese yogis [40], as well as in various languages, including Farsi [34], Malay [31], Turkish [41], Portuguese [31], Thai [42], and Dutch [43]; and (7) the scarcity of previous studies.

The main objective of this study was to translate and adapt the PALMS scale to make it suitable for Spanish adolescents, and to analyse the validity and reliability of the adapted instrument.

2. Materials and Methods

2.1. Participants

The study sample comprised a total of 867 students in compulsory secondary education (Educación Secundaria Obligatoria; ESO), in the province of Salamanca (Spain), ranging from 12 to 16 years of age. These two aspects represent the inclusion criteria for the study, with all subjects who did not satisfy this age or residence limit being excluded from the analysis.

Their mean age was 14.04 ± 1.19 years. In terms of sex, 53.9% (n = 467) were male. The data were collected between 2015 and 2017.

The sample size of this study is very positive according to the recommendations of Kline [44].

Participants were randomly selected using two-stage proportional cluster sampling. We assumed an error of <0.04 at a confidence level (CI) of 95%. All the adolescents in the selected classes were invited to participate.

2.2. Instrument

We used the PALMS instrument, originally developed by Morris and Rogers (2004) [32].

(a) Description of the PALMS. It consists of 40 items, which measure the motives for doing PA and the questions are equally distributed among its 8 factors. The responses are 5-point Likert-type, where 1 corresponds to "strongly disagree" and 5 to "strongly agree";

(b) Factors according to the distribution of the PALMS items. Ego (items 6, 17, 27, 29, and 39), appearance (items 11, 23, 32, 36, and 40), other's expectations (items 1, 7, 18, 21, and 26), affiliation (items 4, 8, 20, 30, and 38), physical condition (items 10, 12, 15, 28, and 33), psychological condition (items 2, 9, 14, 22, and 35), mastery (items 5, 16, 19, 24, and 31), and fun (items 3, 13, 25, 34, and 37);

(c) Reliability of the PALMS. Validations of this scale in adult populations, such as that of Molanorouzi et al. (2014) [37], showed good internal consistency, with a Cronbach's alpha of 0.82. The same was seen with an earlier version by Zach et al. (2012) [36], which was applied, on this occasion, to a population between 9 and 69 years of age (values between 0.63 and 0.96 for the subscales).

2.3. Procedure

The process was divided into the following three parts: in the first, the PALMS scale was translated and adapted (n = 14); in the second, the adapted scale was applied to a larger population group (n = 198); and in the third, the validity and reliability of the PALMS scale adapted into Spanish was tested (n = 867), resulting in a proposal for a reduced version of this scale.

The translation–adaptation stage was conducted using 14 school students aged between 13 and 16 (8 males, 6 females). The instrument was adapted according to the process of Mungía-izquierdo, Legaz-Arrese and Mannerkorpi (2011) [45], through what is known as a translation back-translation [46,47]. Once the instrument had been translated and culturally adapted by an expert, to confirm the reliability of the test for the selected population, a test–retest was administered to 198 subjects, with a mean age of 14 ± 1.09 years, ranging from 12 to 16 years of age, 56.1% (n = 111) of whom were male.

The final questionnaires (n = 867) were administered by the same researcher, within a single 15-min session during the students' timetabled physical education classes. In all the studies, we had the authorisation of the school and teachers, as well as the written consent of the parents or guardians of the minors involved. Brief instructions were provided and the participants were assured of the confidentiality of their responses. Participation was

entirely voluntary. The respondents received no academic or monetary compensation for their contribution. No student refused to participate. The research was performed according to the ethical guidelines of the current Declaration of Helsinki (Brazil, 2013), complying at all times with the highest standards of safety and professional ethics for this type of work.

2.4. Data Analysis

An exploratory factor analysis (EFA) was run to study the construct validity of the research. Next, since the results did not replicate the factorial structure, the information function was studied using item response theory (IRT) and various reliability indices to assess the quality and relevance of the items in the different dimensions. Finally, once the problematic items had been eliminated, a confirmatory factor analysis (CFA) was performed to check the goodness of fit of the final data to the theoretical model proposed by the authors. Analyses were performed using Jamovi software, version 1.6.15.

3. Results

3.1. Translation and Adaptation

The level of difficulty of the translation and the conceptual consonance perceived by the translators during the translation process were studied. For the level of difficulty, values ranging from 1 to 3 points out of 10 were assigned, while the conceptual consonance scores, also out of 10, fluctuated between 7 and 10 points. The interviews were subsequently analysed for aspects that could generate the most controversy in relation to the comprehension of the questions. Table 1 shows all the questions that were considered in this part of the process, where some items were analysed and discussed in order to improve the respondents' comprehension, without compromising the authors' initial proposal.

Table 1. Items that were modified during the process of translation and back-translation, according to the level of comprehension derived from the cognitive test.

Items	Problem Detected	Agreed-Upon Term
Item 11 (appearance)	The concept of equivalence and comprehension presents difficulties when comparing "*lucir mejor*" (look better) and "*mejorar apariencia*" (improve appearance).	*Mejorar apariencia*, because it evidences good equivalence and presents less comprehension problems, according to the results of the cognitive test.
Item 26 (other's expectations)	The term "*prescrito*" (prescribed) is difficult to understand, so it is proposed that this is changed for an equivalent term with good levels of comprehension, such as "*mandado*" (ordered).	*Mandado*, as it shows acceptable equivalence and good levels of comprehension, according to the results of the cognitive test.
Item 27 (ego)	The concept of equivalence and comprehension presents difficulties when comparing "*duro*" (hard) and "*fuerte*" (strongly).	Fuerte, since it has an excellent equivalence and improves comprehension, according to the results of the cognitive test, being better understood as referring to the usual group of physical and sporting activities.
Item 35 (psychological condition)	The concept of equivalence and comprehension presents difficulties when comparing "*tomar*" (take) and "*pensar*" (think).	*Pensar*, as this maintains optimal equivalence and also improves comprehension, according to the results of the cognitive test.
Item 36 (appearance)	The concept of equivalence and comprehension presents difficulty between the real translation of "*lucir mejor*" (look better) and the option of "*mejorar apariencia*" (improve appearance).	*Mejorar apariencia*, because it evidences good equivalence and presents less comprehension problems, according to the results of the cognitive test.
Item 39 (ego)	The concept of equivalence and comprehension presents difficulties when comparing "*ajustado*" (fit) and "*en forma*" (in shape).	*En forma*, as this maintains a good equivalence and improves comprehension, according to the results of the cognitive test.

Table 2 shows the complete translation–adaptation process for the instrument in items 11, 26, 27, 35, 36, and 39. Some of the modified aspects were the following: in items 11 and 36, the expression "*lucir mejor*" (look better) was replaced by "*mejorar la apariencia*" (improve appearance); in item 26, the statement "*prescrito por el doctor*" (prescribed by the doctor) was replaced by "*mandado por el médico*" (ordered by the doctor); in item 27, "*duro*" (hard) was replaced by "*fuerte*" (strongly); in item 35, the verb "*tomar*" (take) was replaced by "*pensar*" (think); in item 39, the indicator "*ajustado*" (fit) was replaced by "*en forma*" (in shape). In relation to the level of conformity with the questionnaire, all the respondents considered that the format was adequate and no proposals for change were received, since the modified items were already sufficient and permitted the instrument to be interpreted correctly. There was also no loss of data or questionnaires.

Table 2. Complete process of cross-cultural adaptation. Explanation of the different items adapted and the sequence of steps followed.

	Items 11	**Items 26**	**Items 27**
Original version	To define muscle, look better.	Because it was prescribed by doctor, physio.	To work harder than others.
Direct translation A	*Para definir músculos, lucir mejor.*	*Porque fue prescrito por el doctor, fisio.*	*Para trabajar más duro que otros.*
Equivalence	2	2	4
Difficulty	9	9	7
Direct translation B	*Para definir músculos, mejorar la apariencia.*	*Porque fue mandado por el doctor, fisio.*	*Para trabajar más fuerte que otros.*
Equivalence	4	2	3
Difficulty	7	7	6
First agreed-upon version	*Para definir los músculos, verse mejor.*	*Porque fue mandado por el médico, fisio.*	*Para trabajar más fuerte que otros.*
Back translation	To define muscles, improve appearance.	Because it was ordered by the doctor, physio.	To work harder than others.
Second agreed-upon version	The following two options suggested to patients in the cognitive test: • Para definir los músculos, mejorar la apariencia. • Para definir los músculos, verse mejor.	The following two options suggested to patients in the cognitive test: • Porque fue mandado por el médico, fisio. • Porque fue recetado por el médico, fisio.	The following two options suggested to patients in the cognitive test: • Para trabajar más fuerte que otros. • Para trabajar más fuerte que los otros.
Cognitive test	All respondents prefer the option *mejorar la apariencia* (improve appearance), as follows: • *Mejorar la apariencia* has a high equivalence and lower difficulty. • *Lucir mejor* has a high difficulty and good equivalence with *mejorar la apariencia*.	All respondents prefer the option *mandado* (ordered), as follows: • *Mandado* and *médico* (doctor) have a high equivalence and lower difficulty. • *Prescrito* has a high difficulty and acceptable equivalence with *mandado*; *médico* has high equivalence and lower difficulty than *doctor*.	All respondents prefer the option *fuerte* (strong) option and *los* (the), as follows: • *Fuerte* has a high equivalence and lower difficulty. • *Duro* has a high difficulty and good equivalence with *fuerte*. • *Los* has good item equivalence and decreases the comprehension difficulty with respect to the original version.
Final version	Option B: *Para definir los músculos, mejorar la apariencia.*	Option B: *Porque fue mandado por el doctor, fisio.*	Option B: *Para trabajar más fuerte que los otros.*

Table 2. *Cont.*

	Items 11	**Items 26**	**Items 27**
	Items 35	**Items 36**	**Items 39**
Original version	To take mind off other things.	To lose weight, look better.	To be fitter than others.
Direct translation A	*Para tomar mente en otras cosas.*	*Para perder peso, lucir mejor.*	*Para estar más ajustado que otros.*
Equivalence	3	2	3
Difficulty	8	9	8
Direct translation B	*Para pensar en otras cosas.*	*Para perder peso, mejorar la apariencia.*	*Para estar más en forma que otros.*
Equivalence	2	4	3
Difficulty	7	7	7
First agreed-upon version	*Para pensar en otras cosas.*	*Para perder peso, mejorar la apariencia.*	*Para estar más en forma que otros.*
Back translation	To think of other things.	To lose weight, improve appearance.	To be more fit than others.
Second agreed-upon version	The following two options suggested to patients in the cognitive test: • Para pensar en otras cosas. • Para ocupar la mente en otras cosas.	The following two options suggested to patients in the cognitive test: • Para perder peso, mejorar la apariencia. • Para perder peso, verse mejor.	The following two options suggested to patients in the cognitive test: • Para estar más en forma que otros. • Para estar más apropiado que otros.
Cognitive test	All the respondents prefer the option *pensar*, as follows: • *Pensar* has a high equivalence and lower difficulty. • *Tomar miente* has a high difficulty and good equivalence with *pensar*.	All respondents prefer the option *mejorar la apariencia* (improve appearance), as follows: • *Mejorar la apariencia* has a high equivalence and lower difficulty. • *Lucir major* has a high difficulty and good equivalence with *mejorar la apariencia*.	All respondents prefer the option *en forma*, as follows: • *En forma* has a high equivalence and lower difficulty. • *Ajustado* has a high difficulty and good equivalence to *en forma*.
Final version	Option B: *Para pensar en otras cosas*.	Option B: *Para perder peso, mejorar la apariencia*.	Option B: *Para estar más en forma que otros*.

3.2. Psychometric Analysis of the Scale

First, an attempt was made to replicate the factor structure through an EFA, but the results were inconclusive. The number of dimensions retained through parallel analysis (or any other more arbitrary factor selection criteria) was not as expected at the theoretical level, and the items classified in each dimension were also not supported by the construct definition.

A comprehensive analysis of both the PALMS dimensions and its component items, as proposed by Morris and Rogers (2004) [32], was therefore carried out, using IRT and CFA (Table 3).

3.3. Item Response Theory

To analyse the information provided by the items for each of the proposed dimensions, we used IRT. Once the hypothesis of unidimensionality and the independence of the scales had been tested, the results described in Table 4 were obtained.

Table 3. Exploratory factor analysis.

		Dimensions				
		1	**2**	**3**	**4**	**5**
PALMS_32	Appearance	0.774				
PALMS_23	Appearance	0.772				
PALMS_40	Appearance	0.756				
PALMS_11	Appearance	0.744				
PALMS_36	Appearance	0.586				0.419
PALMS_10	Physical condition	0.582				
PALMS_15	Physical condition	0.572				
PALMS_28	Physical condition	0.548				
PALMS_12	Physical condition	0.532				
PALMS_33	Physical condition	0.475				
PALMS_18	Other's expectations	0.466				
PALMS_16	Mastery	0.456				
PALMS_24	Mastery	0.437				
PALMS_31	Mastery					
PALMS_22	Psychological condition		0.800			
PALMS_2	Psychological condition		0.750			
PALMS_14	Psychological condition		0.741			
PALMS_13	Fun		0.695			
PALMS_9	Psychological condition		0.643			
PALMS_25	Fun		0.622			
PALMS_34	Fun		0.605			
PALMS_3	Fun		0.561			
PALMS_35	Psychological condition		0.533			
PALMS_37	Fun		0.494			
PALMS_17	Ego			0.786		
PALMS_27	Ego			0.751		
PALMS_29	Ego			0.748		
PALMS_6	Ego			0.732		
PALMS_39	Ego			0.709		
PALMS_19	Mastery			0.578		
PALMS_7	Other's expectations			0.535		
PALMS_30	Affiliation			0.503	0.480	
PALMS_1	Other's expectations			0.423		
PALMS_20	Affiliation				0.739	
PALMS_38	Affiliation				0.722	
PALMS_8	Affiliation				0.711	
PALMS_4	Affiliation				0.648	
PALMS_5	Mastery					
PALMS_21	Other's expectations					0.673
PALMS_26	Other's expectations					0.670

Note: varimax rotation. No. of factors through parallel analysis.

Table 4. Item response theory.

ITEMS	MIP
EGO: MIP = 30.43/EI = 6.08	
6. Because I perform better than others.	4.98
17. To be the best in the group/class.	8.07
27. To work harder (higher intensity) than others.	6.45
29. To compete with other around me (colleagues, friends, etc.).	5.27
39. To be fitter than other people (colleagues, friends, etc.).	5.66
APPEARANCE: MIP = 37.81/EI = 7.56	
11. To define muscle, look better.	8.17
23. To improve/define body shape.	8.68
32. To improve (physical) appearance.	9.49
36. To lose weight, look better (more attractive).	4.07
40. To maintain trim, toned body.	7.4
OTHER'S EXPECTATIONS: MIP = 13.63/EI = 2.73	
1. To earn a living.	1.46
7. Because I get paid to do it.	3.19
18. To manage medical condition.	0.24
21. Because people tell me I need to do exercise/sport.	3.1
26. Because it was prescribed by doctor, physio.	5.64
AFFILIATION: MIP = 25.71/EI = 5.14	
4. Because I enjoy spending time with others.	5.39
8. To do activity with others.	6.23
20. To do something in common with friends.	5.64
30. To talk with friends exercising.	2.43
38. To be with friends.	6.02
PHYSICAL CONDITION: MIP = 29.63/EI = 5.93	
10. Because it helps me maintain a healthy body.	7.05
12. Be physically fit (have more strength, speed, endurance, flexibility, etc.)	4.24
15. To maintain physical health.	8.99
28. Because it keeps me healthy.	6.18
33. To improve cardiovascular fitness (heart, circulatory system, etc.).	3.16
PSYCHOLOGICAL CONDITION: MIP = 31.27/EI = 6.25	
2. Because it helps me relax.	6.57
9. To cope better with stress.	4.56
14. To get away from pressure, to relax and unwind.	6.21
22. Because doing sport acts as a stress release.	10.89
35. To take mind off other things.	3.04
MASTERY: MIP = 25.47/EI = 5.09	
5. To get better at an activity or task.	2.96
16. To improve existing skills.	7.32
19. To do my personal best.	3.59

Table 4. *Cont.*

ITEMS	MIP
24. To obtain new skills or abilities.	6.79
31. To keep current skill level.	4.81
FUN: MIP = 32.35/EI = 6.47	
3. Because it is interesting.	5.78
13. Because it makes me happy.	6.87
25. Because it is fun.	8.34
34. Because I enjoy exercising.	7.73
37. Because I have a good time (I feel encouraged, motivated, etc.).	3.62

Abbreviations: MIP: maximum information point; EI: expected information.

To interpret the above table, it is necessary to look at the maximum level of information that has been provided by each of the dimensions, and the average amount of information that is expected for each item. If an item provides less information than expected, it becomes a candidate for elimination, because it does not provide sufficient information for that dimension.

To corroborate the proposed candidate items for elimination, after applying IRT, reliability indicators were calculated, verifying that the items that decreased reliability coincided with the previous results.

In addition, a group of experts was consulted with regard to the appropriateness, or lack therof, of eliminating these items from each dimension, thus contributing to the content validity of the resulting instrument.

The items 1, 3, 5, 6, 9, 12, 18, 19, 29, 30, 33, 35, 36, 37, and 40 were therefore eliminated from the subsequent analyses, resulting in a final abbreviated version of 25 items (PALMS-e) (Table 5). In this version, the items associated with the different dimensions were distributed in the following way: ego (items 11, 19, and 25), appearance (items 6, 15, and 22), other's expectations (items 3, 13, and 18), affiliation (items 2, 4, 12, and 24), physical condition (items 5, 9, and 20), psychological condition (items 1, 8, and 14), mastery (items 10, 16, and 21), and fun (items 7, 17, and 23).

Table 5. Abbreviated version of the physical activity and leisure motivation scale instrument adapted for Spanish adolescents (PALMS-e).

PALMS-e					
Los Motivos por los que Hago Actividad Física son . . .	**Muy en Desacuerdo**	**En Desacuerdo**	**Ni de Acuerdo ni en Desacuerdo**	**De Acuerdo**	**Muy de Acuerdo**
1. Porque me ayuda a relajarme					
2. Porque me gusta pasar el tiempo con los demás					
3. Porque me pagan por hacerlo					
4. Por hacer actividad con las demás personas					
5. Porque me ayuda a mantener un cuerpo sano					
6. Para definir mis músculos, mejorar la apariencia					
7. Porque me hace feliz					
8. Para alejarme de la presión, para relajarme y desconectar					
9. Para mantener la salud física					
10. Para mejorar mis habilidades					

Table 5. *Cont.*

PALMS-e					
Los Motivos por los que Hago Actividad Física son . . .	**Muy en Desacuerdo**	**En Desacuerdo**	**Ni de Acuerdo ni en Desacuerdo**	**De Acuerdo**	**Muy de Acuerdo**
11. Para ser el mejor del grupo/clase					
12. Para hacer algo en común con los amigos					
13. Porque la gente me dice que necesito hacer actividad física/deporte					
14. Porque hacer deporte me relaja					
15. Para mejorar/definir la forma de mi cuerpo					
16. Para obtener nuevas habilidades o destrezas					
17. Porque es divertido					
18. Porque me lo ha recetado/mandado el médico o fisioterapeuta					
19. Para trabajar más fuerte (mayor intensidad) que los demás					
20. Porque me mantiene con buena salud					
21. Para mantener el nivel actual de habilidad o destreza					
22. Para mejorar la apariencia (física)					
23. Porque me gusta hacer ejercicio físico					
24. Para estar con los amigos					
25. Para estar más en forma que los demás (amigos, compañeros . . .)					

3.4. Confirmatory Factor Analysis

A CFA was then performed on only the items selected via the IRT. The following indices of fit were obtained: CFI = 0.933, TLI = 0.918, SRMR = 0.042, and RMSEA = 0.052 (90% CI 0.048; 0.056).

3.5. Reliability Analysis. Internal Consistency

Finally, Cronbach's alpha (α) was calculated for each of the subscales, which ranged from 0.625 to 0.835.

For the ego dimension it was 0.787, for appearance 0.835, for other's expectations 0.625, for affiliation 0.780, for physical condition 0.760, for psychological condition 0.792, for mastery 0.721, and for fun 0.811.

4. Discussion

The main objective of this study was to translate and adapt the PALMS scale to make it suitable for Spanish adolescents, and to analyse the validity and reliability of the adapted instrument.

The reason we decided to use a sample of the adolescent population in this study, unlike other studies that use populations with a distinct or wider age range, with the exception of the PALMS-Y study, is that adolescence is a fundamental stage in the acquisition of healthy habits.

The WHO [19] recommends at least 60 min of moderate- or vigorous-intensity PA per day at this stage, something that young Spaniards do not achieve, and in order to generate commitment to PA, adolescents need to be motivated [47].

In this sense, motivation is influenced by a number of internal and external factors [48,49], which favour the appearance or maintenance of certain behaviours [50], including PA [51]. It is therefore important to understand the reasons why adolescents decide to engage in PA, as this will help to improve healthy habits in the future [21].

In this study, once an EFA had been carried out, we decided to analyse the dimensions of the scale using an IRT and a CFA, resulting in a final version of the scale, consisting of 25 items and 8 dimensions. A good fit and internal consistency were found for this final version of the PALMS (PALMS-e).

According to the recommendations of various authors [52–54], it can be affirmed that, in this study, the scale complies with the quality indicators, both globally and in each of its different dimensions—CFI: 0.933, TLI = 0.918, SRMR = 0.042, and RMSEA: 0.052 (90% CI 0.048; 0.056)—which is in line with other studies, such as those of Roychowdhury (2012)—CFI: 0.969 and RMSEA: 0.078—in Australia [55]; Molanorouzi et al. (2014)—CFI: 0.91 and RMSEA: 0.06—in Malaysia [37]; Lameiras et al. (2020)—CFI: 0.950, TLI: 0.939 and RMSEA: 0.021—in Portugal [31]; and Kueh et al. (2020)—CFI = 0.921, TLI = 0.907 and RMSEA: 0.061—in Thailand [42].

Likewise, the scale showed a reliability between 0.625 and 0.835 for each of the dimensions. Considering a reference value of 0.7 [56,57], this reflects a very good level of reliability in almost all the dimensions, with the exception of "other's expectations" (0.625). This coincides with the results obtained by Zach et al. (2012) [36], and Sarol and Çimen (2017) [41], who obtained similar, although slightly higher values, ranging between 0.63–0.93 and 0.62–0.92, respectively. However, there are differences with the results reported by Filippos et al. [39], which ranged from 0.89 for the dimension "fun", and 0.95 for "physical condition". These differences may be due to the following two aspects: (1) the sample in that study was substantially smaller than in this work; and (2) the sample comprised practitioners of a specific PA, such as dance.

On the other hand, the differences between the factor structure of the original scale (PALMS) and the final version of the scale adapted to Spanish adolescents (PALMS-e) coincide with the validation of this scale in other languages. The final version of the PALMS-e included 25 items, in order to obtain a good fit. In the validation of the scale in Portuguese [31], it was reduced to 30 items; in the Malaysian adaptation, two items were removed [30]; and in the adolescent version (PALMS-Y), a scale with only 28 items was proposed [33].

Similarly, it could be argued that the factor structure obtained, despite being modified, consolidates the self-determination theory approach [23], as it maintains the eight dimensions of the PALMS scale, which encompass intrinsic motivation (mastery and fun), as well as extrinsic factors (ego, appearance, external expectations, affiliation, physical condition, psychological condition) related to PA.

Furthermore, given that a shorter scale is usually associated with greater reliability [34], it could be argued that reducing the number of items contained in the PALMS-e enhances its reliability.

It should also be noted that the data obtained after the test–retest suggest that the PALMS-e is a time-stable instrument for assessing participants' motives for engaging in PA, just as seen in previous research with the test–retest for the original PALMS scale [34,37].

This study does have a potential limitation, in that it is not possible to ensure that any of the questions in the scale are not misinterpreted, intentionally or unintentionally, by the participants. We did, however, endeavour to minimise this possibility by ensuring anonymity throughout the process. Nevertheless, this aspect could be disregarded as a limitation, given the good reliability and validity of the scale.

In conclusion, we can affirm that the PALMS-e scale is a valid and reliable instrument for ascertaining the reasons adolescents engage in PA. The results obtained may contribute

to improving the comparison between adolescents from different contexts, ages, and gender, through ranking and, particularly, the implementation of intervention strategies that encourage greater adherence to the practice of PA.

Finally, with regard to future lines of research, the present scale could be adapted to younger children (6–12 years old), to encourage and promote the practice of PA from an even earlier age, taking into account preferences related to variables such as age and gender.

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References

1. Capdevila, A.; Bellmunt, H.; Hernando, C. Estilo de vida y rendimiento académico en adolescentes: Comparación entre deportistas y no-deportistas. *Retos* **2015**, *27*, 28–33. [CrossRef]
2. López-López, E.; Navarro-Valdivielso, M.; Ojeda-García, R.; Brito-Ojeda, E.; Ruiz-Caballero, J.A.; Navarro-Hernández, C.M. Práctica de actividad física y actitudes en los adolescentes de Canarias. *Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte* **2015**, *15*, 211–222. [CrossRef]
3. Motl, R.W.; McAuley, E. Pathways between physical activity and quality of life in adults with multiple sclerosis. *Health Psychol.* **2009**, *28*, 682–689. [CrossRef]
4. Márquez, S.; Garatachea, N. *Actividad Física y Salud*; Ediciones Díaz de Santos: Madrid, Spain, 2009.
5. Torres-Luque, G.; Carpio, E.; Lara, A.; Zagalaz, M.L. Niveles de condición física de escolares de educación primaria en relación a su nivel de actividad física y al género. *Retos* **2014**, *25*, 17–22.
6. Castillo, I.; Molina-García, J. Adiposity and psychological well-being: Effects of physical activity on university students in Valencia, Spain. *Revista Panamericana de Salud Pública* **2009**, *26*, 334–340. [CrossRef] [PubMed]
7. Hong, X.; Li, J.; Xu, F.; Tse, L.A.; Liang, Y.; Wang, Z.; Yu, I.T.S.; Griffiths, S. Physical activity inversely associated with the presence of depression among urban adolescents in regional China. *BMC Public Health* **2009**, *9*, 148. [CrossRef]
8. Taylor, M.J.; Wamser, R.; Welch, D.; Nanney, J. Multidimensional self-esteem as a mediator of the relationship between sports participation and victimization: A study of African American girls. *Violence Vict.* **2012**, *27*, 434–452. [CrossRef] [PubMed]
9. Toseeb, U.; Brage, S.; Corder, K.; Dunn, V.J.; Jones, P.B.; Owens, M.; St Clair, M.C.; van Sluijs, E.M.; Goodyer, I.M. Exercise and depressive symptoms in adolescents: A longitudinal cohort study. *JAMA Pediatrics* **2014**, *168*, 1093–1100. [CrossRef] [PubMed]
10. Abarca-Sos, A.; Bois, J.E.; Aibar, A.; Antonio Julian, J.; Generelo, E.; Zaragoza, J. Sedentary Behaviors by Type of Day and Physical Activity in Spanish Adolescents: A Socio-Ecological Approach. *Percept. Mot. Skills* **2016**, *122*, 286–298. [CrossRef]
11. Ruiz-Juan, F.; Piéron, M.; Baena-Extremera, A. Socialización de la actividad físico-deportiva en adultos: Relación con familia, pareja y amigos. *Revista Iberoamericana de Diagnóstico y Evaluación Psicológica* **2012**, *1*, 35–59.
12. Soos, I.; Biddle, S.J.; Ling, J.; Hamar, P.; Sandor, I.; Boros-Balint, I.; Szabo, P.; Simonek, J. Physical activity, sedentary behaviour, use of electronic media, and snacking among youth: An international study. *Kinesiology* **2014**, *46*, 155–163.
13. Guthold, R.; Stevens, G.A.; Riley, L.M.; Bull, F.C. Worldwide trends in insufficient physical activity from 2001 to 2016: A pooled analysis of 358 population-based surveys with 1·9 million participants. *Lancet Glob Health* **2018**, *6*, e1077–e1086. [CrossRef]
14. Reigal, R.F.; Videra, A.; Parra, J.L.; Juárez, R. Actividad físico deportiva, autoconcepto físico y bienestar psicológico en la adolescencia. *Retos* **2012**, *22*, 19–23.
15. Aguilar, M.J.; Ortegón, A.; Mur, N.; Sánchez, J.C.; García, J.J.; García, I.; Sánchez, A.M. Programas de actividad física para reducir sobrepeso y obesidad en niños y adolescentes; revisión sistemática. *Nutrición Hospitalaria* **2014**, *30*, 727–740.
16. Lee, I.; Shiroma, E.J.; Lobelo, F.; Puska, P.; Blair, E.; Katzmarzyk, P.T. The Lancet Physical Activity Series Working Group. Effect of physical inactivity on major non-communicable diseases worldwide: An analysis of burden of disease and life expectancy. *Lancet* **2012**, *380*, 219–229. [CrossRef]

17. Gasol Foundation. Estudio PASOS. Physical Activity, Sedentarism and Obesity of Spanish Youth. 2019. Available online: https://www.gasolfoundation.org/wp-content/uploads/2019/09/diptico-resultados-preliminares-PASOS.pdf (accessed on 20 October 2020).
18. Serra-Majem, L.; Ribas, L.; Aranceta, J.; Pérez, C.; Saavedra, P.; Peña, L. Obesidad infantil y juvenil en España. Resultados del Estudio enKid (1998–2000). *Med. Clin* **2003**, *121*, 725–732. [CrossRef]
19. World Health Organisation. *Recomendaciones Mundiales Sobre Actividad Física para la Salud*; OMS: Ginebra, Switzerland, 2010.
20. Gómez-López, M.; Granero-Gallegos, A.; Baena-Extremera, A.; Bracho, C.; Pérez, F.J. Efectos de Interacción de Sexo y Práctica de Ejercicio Físico sobre las Estrategias para la Disciplina, Motivación y Satisfacción con la Educación Física. *Revista Iberoamericana de Diagnóstico y Evaluación Psicológica* **2015**, *2*, 6–16.
21. Kalman, M.; Hamrik, Z.; Sigmund, E.; Sigmundová, D.; Salonna, F. Czech National HBSC team Physical activity of Czech adolescents: Findings from the HBSC 2010 study. *Acta Gymnica* **2015**, *45*, 3–11. [CrossRef]
22. Nicholls, J.G. *The Competitive Ethos and Democratic Education*; Harvard University Press: Cambridge, UK, 1989.
23. Deci, E.L.; Ryan, R.M. *Intrinsic Motivation and Self-Determination in Human Behaviour*; Plenum: New York, NY, USA, 1985.
24. Deci, E.L.; Ryan, R.M. A Motivational Approach to Self: Integration in Personality. In *Nebraska Symposium on Motivation 1990: Perspectives on Motivation*; Dienstbier, R., Ed.; University of Nebraska Press: Lincoln, NE, USA, 1991; pp. 237–288.
25. Markland, D.; Ingledew, D.K. The measurement of exercise motives: Factorial validity and invariance across gender of a revised Exercise Motivations Inventory. *Br. J. Health Psychol.* **1997**, *2*, 361–376. [CrossRef]
26. Capdevilla, L.; Niñerola, J.; Pintanel, M. Motivación y actividad física: El Autoinforme de Motivos para la Práctica de Ejercicio Físico (AMPEF). *Revista de Psicología del Deporte* **2004**, *13*, 55–74.
27. Ryan, R.M.; Frederick, C.M.; Lepes, D.; Rubio, N.; Sheldon, K.M. Intrinsic motivation and exercise adherence. *Int. J. Sport Psychol.* **1997**, *28*, 335–354.
28. Moreno, J.A.; Cervelló, E.; Martínez, A. Validación de la escala de Medida de los Motivos para la Actividad Física-Revisada en españoles: Diferencias por motivos de participación. *Anales de Psicología* **2007**, *23*, 167–176.
29. Martínez, A.C.; Chillón, P.; Martín-Matillas, M.; Pérez, I.; Castillo, R.; Delgado-Fernández, M. Motivos de práctica de actividad físico-deportiva en adolescentes españoles: Estudio AVENA. *Profesorado Revista de Currículum y Formación del Profesorado* **2012**, *16*, 391–398. [CrossRef]
30. Kueh, Y.C.; Kuan, G.; Morris, T. The Physical Activity and Leisure Motivation Scale: A confirmatory study of the Malay language versión. *Int. J. Sport Exerc. Psychol.* **2017**, *17*, 250–265. [CrossRef]
31. Lameiras, J.; Almeida, P.L.; Oliveira, J.; Da Silva, W.R.; Martins, B.; Hernández-Mendo, A.; Rosado, A.F. Validation of the Portuguese Adaptation of the Physical Activity and Leisure Motivation Scale (PALMS-p). *Sustainability* **2020**, *12*, 5614. [CrossRef]
32. Morris, T.; Rogers, H. Measuring motives for physical activity. In *Sport and Chance of Life, Proceedings of the 2004 International Sport Science Congress*; The Kansas Association for Health: Seoul, Korea, 2004.
33. Hu, L.; Morris, T.; Lu, J.; Zhu, L.; Zhang, T.; Chen, L. Development and validation of a youth version of physical activity and lesuire motivation scale (PALMS-Y). In Proceedings of the 14th European Congress of Sport Psychology, Bern, Switzerland, 15 July 2015.
34. Zarei, S.; Memari, A.H.; Moshayedi, P.; Mosayebi, F.; Mansournia, M.A.; Khoo, S.; Morris, T. Psychometric Properties of Physical Activity and Leisure Motivation Scale in Farsi: An International Collaborative Project on Motivation for Physical Activity and Leisure. *Arch. Iran. Med.* **2016**, *19*, 704–711. [PubMed]
35. Rogers, H.E. Development of a recreational exercise motivation questionnaire. Ph.D. Thesis, Victoria University of Technology, Melbourne, Australia, 2000.
36. Zach, S.; Bar-Eli, M.; Morris, T.; Moore, M. Measuring motivation for physical activity: An exploratory study of PALMS-the physical activity and leisure motivation scale. *Athl. Insight* **2012**, *4*, 141–152.
37. Molanorouzi, K.; Khoo, S.; Morris, T. Validating the Physical Activity and Leisure Motivation Scale (PALMS). *BMC Public Health* **2014**, *14*. [CrossRef] [PubMed]
38. Roychowdhury, D. A comprehensive measure of participation motivation: Examining and validating the Physical Activity and Leisure Motivation Scale (PALMS). *J. Hum. Sport Exerc.* **2018**, *13*, 231–247. [CrossRef]
39. Filippos, F.; Stella, R.; Mavridis, G. Examining the motives for participating in dance activities, using the "Physical Activity and Leisure Motivation Scale" (PALMS). *Sport Sci.* **2016**, *9*, 42–49.
40. Jia, S. Leisure Motivation and Satisfaction: A Text Mining of Yoga Centres, Yoga Consumers, and Their Interactions. *Sustainability* **2018**, *10*, 4458. [CrossRef]
41. Sarol, H.; Cimen, Z. Why people participate leisure time physical activity: A Turkish perspective. *Pamukkale J. Sport Sci.* **2017**, *8*, 63–72.
42. Kueh, Y.C.; Bhasavanija, T.; Abdullah, N.; Morris, T.; Kuan, G. The validation of the Thai version of the physical activity and leisure motivation scale using confirmatory factor analysis. Gazzetta Medica Italiana. *Archivio per le Scienze Mediche* **2020**, *179*, 404–411. [CrossRef]
43. Lankveld, W.; Linskens, F.; Stolwijk, N. Motivation for Physical Activity: Validation of the Dutch Version of the Physical Activity and Leisure Motivation Scale (PALMS). *Int. J. Environ. Res. Public Health* **2021**, *18*, 5328. [CrossRef] [PubMed]
44. Kline, R.B. *Methodology in the Social Sciences. Principles and Practice of Structural Equation Modeling*, 3rd ed.; Guilford Press: New York, NY, USA, 2011.

45. Munguía-Izquierdo, D.; Legaz-Arrese, A.; Mannerkorpi, K. Transcultural Adaptation and Psychometric Properties of a Spanish-Language Version of Physical Activity Instruments for Patients with Fibromyalgia. *Arch. Phys. Med. Rehabil.* **2011**, *92*, 284–294. [CrossRef] [PubMed]
46. Vilaró, J.; Gimeno, E.; Férez, N.S.; Hernando, C.; Díaz, I.; Ferrer, M.; Roca, J.; Alonso, J. Actividades de la vida diaria en pacientes con enfermedad pulmonar obstructiva crónica: Validación de la traducción española y análisis comparativo de 2 cuestionarios. *Medicina Clínica* **2007**, *129*, 326–332. [CrossRef] [PubMed]
47. Wild, D.; Grove, A.; Martin, M.; Eremenco, S.; McElroy, S.; Verjee-Lorenz, A.; Erikson, P. Principles of good practice for the translation and cultural adaptation process for patient-reported outcomes (PRO) measures: Report of the ISPOR Task Force for Translation and Cultural Adaptation. *Value Health* **2005**, *8*, 94–104. [CrossRef] [PubMed]
48. De la Vega, R.; Ruiz, R.; Tejero, C.; Rivera, M. Relación entre estados de ánimo y rendimiento en voleibol masculino de alto nivel. *Revista de Psicología del Deporte* **2014**, *23*, 49–56.
49. Ruiz, F.; García, M.E.; Díaz, A. Análisis de las motivaciones de práctica de actividad física y de abandono deportivo en la Ciudad de La Habana (Cuba). *Anales de psicología* **2007**, *23*, 152–166.
50. Candela, F.; Zucchetti, G.; Villosio, C. Preliminary validation of the Italian version of the original Sport Motivation Scale. *J. Hum. Sport Exerc.* **2014**, *9*, 136–147. [CrossRef]
51. Meyer, N.; Bevan-Dye, A.L. Gender differences in South African Generation Y students' motives for engaging in physical activity. *Mediterr. J. Soc. Sci.* **2014**, *5*, 195–202. [CrossRef]
52. Bentler, P.M. Comparative fit indexes in structural models. *Psychol. Bull.* **1990**, *107*, 238–246. [CrossRef] [PubMed]
53. Brown, T.A. *Confirmatory Factor Analysis for Applied Research*; Guildford Press: New York, NY, USA, 2006.
54. Jöreskog, K.G.; Sörbom, D. *LISREL 7: A Guide to the Program and Applications*; SPSS: Chicago, IL, USA, 1989.
55. Roychowdhury, D. Examining Reasons for Participation in Sport and Exercise Using the Physical Activity and Leisure Motivation Scale (PALMS). Ph.D. Thesis, Victoria University of Technology, Melbourne, Australia, 2012.
56. Nunnally, J.C. *Psychometric Theory*, 2nd ed.; McGraw-Hill: New York, NY, USA, 1978.
57. Nunnally, J.C.; Bernstein, I.H. *Psychometric Theory*, 3rd ed.; McGraw-Hill: New York, NY, USA, 1994.