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Research article

Scale development for measuring and predicting adolescents' leisure time physical activity behavior

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Abstract
The aim of this study was to develop a scale for assessing and predicting adolescents' physical activity behavior in Spain and Luxembourg using the Theory of Planned Behavior as a framework. The sample was comprised of 613 Spanish (boys = 309, girls = 304; M age =15.28, SD =1.127) and 752 Luxembourgish adolescents (boys = 343, girls = 409; M age = 14.92, SD = 1.198), selected from students of two secondary schools in both countries, with a similar socio-economic status. The initial 43-items were all scored on a 4-point response format using the structured alternative format and translated into Spanish, French and German. In order to ensure the accuracy of the translation, standardized parallel back-translation techniques were employed. Following two pilot tests and subsequent revisions, a second order exploratory factor analysis with oblimin direct rotation was used for factor extraction. Internal consistency and test-retest reliabilities were also tested. The 4-week test-retest correlations confirmed the items' time stability. The same five factors were obtained, explaining 63.76% and 63.64% of the total variance in both samples. Internal consistency for the five factors ranged from $\alpha = 0.759$ to $\alpha = 0.949$ in the Spanish sample and from $\alpha = 0.735$ to $\alpha = 0.952$ in the Luxembourgish sample. For both samples, inter-factor correlations were all reported significant and positive, except for Factor 5 where they were significant but negative. The high internal consistency of the subscales, the reported item test-retest reliabilities and the identical factor structure confirm the adequacy of the elaborated questionnaire for assessing the TPB-based constructs when used with a population of adolescents in Spain and Luxembourg. The results give some indication that they may have value in measuring the hypothesized TPB constructs for PA behavior in a cross-cultural context.

Key words: Psychology, public health, behavior, assessment, physical activity.

Introduction

Physical activity (PA) is a vital part of a healthy lifestyle and has been extensively documented and associated with health benefits (Department of Health, 2004; Welk, 2002). It is recommended that youth should undertake at least 60 minutes of moderate-to-vigorous PA on most (National Association for Sport and Physical Education, 2004), if not all (Department of Health and Ageing, 2004), days of the week. However, there is evidence that adolescents do not engage in sufficient PA to achieve health benefits (Van Mechelen et al., 2000; Varo et al., 2003). This situation underlines the need to dedicate more attention to the factors explaining the adoption of PA, which may include past PA behavior, intention to be physically active, perceived health benefits, motivation, self-efficacy, support by significant others, family influences, peer influences, accessibility of sport facilities and attitude toward PA. This concern is particularly important during adolescence due to the rapid decline of PA participation between the ages of 12 – 15 years (Bös et al., 2006; Kjønniksen et al., 2008; Pierón et al., 1999). Even different cultures, like Luxembourg and Spain do not deviate from this tendency. As adolescents grow older, PA decreases to the extent that in Luxembourg at the age of 17 years, only 58% are physically active in their leisure time, whereas almost 71% professed to practice regular PA at the age of 14 years (Bös et al., 2006). In Spain the situation is even more alarming (Ministerio de Sanidad y Consumo, 2007) and should be considered a challenge for our society since today's sedentary adolescents may become the inactive adults of the future.

A theory that has been frequently used for predicting and explaining PA behavior is the Theory of Planned Behavior (TPB; Ajzen, 1985; 1991). The TPB has proven to be useful in exploring the antecedents of PA in young people and adults in different populations and nations (Hagger et al., 2001; 2002). In Spain several studies (e.g., Espí, 2004; Gil et al., 2004; Montil, 2004) employed the TPB in a PA domain, whereas, to date, no such study has been conducted in Luxembourg. This theory appeared to be appropriate for our requirements as it addressed our major areas of concern: attitude toward PA, social influences, perception of control over PA behavior and intention to practise PA. The TPB suggests that intention to engage in a behavior is the primary determinant of behavior. Intention is conceived as the summary motivation to perform a behavior and mediates the influence of the three main TPB constructs on behavior (Ajzen, 1991). The first determinant is attitude, which will have an impact on intention, such that an individual who has a positive attitude toward PA will be much more likely to plan to exercise than a person who believes that exercise has no value. Subjective norms, the second determinant, stem from normative beliefs of the behavior and may have various sources: whether the individual's culture values and promotes PA; whether his significant others practise PA and how they react to his PA behavior. The third construct influencing behavior, the perceived behavioral control, is thought to be an appraisal of volitional control over the behavior. Perceived behavioral control is con-

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ceived as a categorization of the skills, opportunities, and resources to perform the behavior while holding motivation constant (Rhodes and Courneya, 2003). Ajzen (1991) hypothesized that behavioral control primarily influences behavior through intention, but, to the extent that behavioral control reflects actual control, it can also influence behavior directly. The main purpose of this study was to construct an instrument for measuring each variable of a theoretical model, using the TPB as a framework, in adolescents in two culturally different samples, namely Spain and Luxembourg.

Methods

Participants

Participants were recruited from coeducational high schools in Spain and Luxembourg. Spanish participants (N = 613; boys = 309, girls = 304; M age = 15.28 years; SD = 1.127 years) were recruited from a private (N = 305) and a government-run secondary school (N = 308) in southern Spain (Seville). School statistics indicated that the majority of the pupils were Spanish nationals, with less than 5% from other ethnic minority groups. Details on the socio-economic status of the participants were given by the school directors. Both schools draw their students from an area characterized as middle class. The Luxembourgish sample (N = 752; boys = 343, girls = 409; M age = 14.92 years; SD = 1.198 years) was collected from both a private (N = 358) and a government-run high school (N = 394) in Luxembourg City. The majority of the participants were Luxembourgish (65%) and the remaining students were children of immigrants mainly from Portugal, Italy, Belgium, France and Germany. The students are predominantly from an area characterized as middle class. Prior to data collection, the school principals gave their permission and were asked to act in loco parentis following the APA ethical guidelines. All participants were informed that their involvement was being requested for scale development as part of a doctoral dissertation.

Instrument development

The items assessing attitude toward PA, perceived parental socialization, physical competence and resources support were all scored on a 4-point response format using Harter's (1985a) "structured alternative approach". An example item is shown in Table 1.

The idea of this format is to avoid the tendency to supply socially desirable answers, or to provide answers participants believe to be "correct" in the eyes of adults. It provides two different ways in which they can express feelings without the suggestion that one or the other response is how they are "supposed to feel". Upon making this choice, they must decide whether the statement is "sort of true" or "really true" for them. By using this unique item wording, Harter was able to avoid the issues frequently linked with positively versus negatively worded items, such as agreement bias for positively-worded items, or confusion with negatively-worded items (DeVellis, 2003).

In order to assess attitude toward PA, we employed the 15-item version of Brustad's (1993) instrument, Children's Attraction to Physical Activity scale (CAPA) that was introduced in 1999 (Brustad, personal communication, August 19th, 2008). The original 26-item CAPA scale was developed to measure young peoples' interest in, and attraction to, PA, and specifically, to assess their emotional response to anticipated PA. Positive affect, in the form of liking of PA, is a fundamental contributor to youth's motivation to become involved in PA. Brustad (1993) identified five different dimensions of PA that children find either attractive or unattractive, for example: "liking of exercise", "liking of games and sports", "liking of physical exertion", "peer acceptance in PA contexts", and "perceived health benefits". Minimal cross-loadings across these factors indicated relative independence. The 15-item version of the CAPA contains the three best items from each of the five subscales of the longer version and has shown good reliability (α ranged from .85 to .95) and validity indices in previous use. Data from Paxton's et al. (2004) study confirmed the CAPA scale's excellent internal consistency (α = 0.88). It also demonstrated good concurrent validity through high correlations with other measures of PA motivation, and good predictive validity in that it is a good predictor of adolescents' current PA levels. The 15-item CAPA scale is available in Latin American Spanish (Brustad, personal communication, March 22nd, 2008) and has been frequently used without difficulty and has proven good psychometric properties. As this version reflects Spanish usage in Mexico and Latin America, a new translation adapted to the Spanish usage in Spain was made and its adequacy was tested in a pilot study with 168 Spanish adolescents (see translation and pilot testing).

The initial items for assessing perceived parental socialization processes referred to the social and psychological influences on adolescents' PA behavior, such as parental role-modeling (four items), parental encouragement of their children's PA participation (six items) and parental enjoyment of PA (four items). Brustad (1996) revealed a significant relationship between children's perceptions of their parental socialization processes and children's perceived physical competence and attraction to PA. More recently, parental encouragement has been frequently hypothesized to predict adolescents PA (Bauer et al., 2008; Duncan et al., 2005; McGuire et al., 2002; Ornelas et al., 2007; Pugliese and Tinsley, 2007; Sallis et al., 2000). Parental role-modeling has also been examined in PA contexts with blended empirical results. Brustad (1996) found that parental role-modeling and parental enjoyment of PA were less important parental variables than perceived parental encouragement. Indeed, the

Table 1. Structured alternative format.

Really true for me	Sort of true for me				Sort of true for me	Really true for me
□	□	Some teens try hard to stay in good shape	**BUT**	Other teens don't try to stay in good shape	□	□

Table 2. English version of items.

Item	
1	I have more fun playing games and sports than anything else.
2	I like to exercise a lot.
3	I am told that I am good at games and sports.
4	I get teased by other teens when I play games and sports.
5	I think that the more exercise you get, the better.
6	I enjoy exercise a lot.
7	I really like to run a lot.
8	I don't mind getting out of breath after I play hard.
9	I think it is very important to always be in good shape.
10	Playing games and sports is my favorite thing.
11	I am popular when I play games and sports.
12	I look forward to playing games and sports.
13	I really like to exercise
14	I feel good when I run hard.
15	I try to stay in good shape.
16	My parents practice games and sport skills with me a lot.
17	My parents tell me that I am good at games and sports
18	My parents encourage me to play games and sports.
19	My parents play games and sports with me.
20	My parents give me equipment to play games and sports.
21	My parents really help me to be good at sports.
22	My parents get a lot of exercise.
23	My parents enjoy physical activity and exercise.
24	My parents are in a really good shape.
25	My parents have fun doing physical activity.
26	My parents try to stay in a good shape.
27	My parents are pretty sure that they are a good athlete.
28	My parents really like to exercise.
29	My parents like physical activity and exercise.
30	I do very well at all kinds of sports.
31	I am better than others my age at sports.
32	I am pretty sure that I am a good athlete.
33	I am better than others at most sports.
34	My parents feel that I do very well at all kinds of sports.
35	My parents think that I am better than others my age at sports.
36	My parents are pretty sure that I am a good athlete.
37	My parents think that I am better than others at most sports.
38	I have access to sporting facilities nearby my home.
39	I can take sporting courses in my district.
40	My school provides sporting activities for me outside the physical education classes.
41	The private sport clubs in my area offer sporting activities.
42	My parents give me financial support for my physical activity participation.
43	My parents take me to the venues of my sporting courses or physical activities.

significance of parental role-modeling is attenuated when other mechanisms of influence are observed (Trost et al., 2003) and there is even some evidence of no association to adolescent PA behavior (Anderssen et al., 2006). Likewise, Sallis et al. (2000) could not establish consistent and positive associations between parental role-modeling and adolescents' PA behavior, whereas Pugliese and Tinsley (2007) demonstrated a weak relationship between both variables moderated by age, being significantly lower in early adolescence than with older adolescents. Parental encouragement was significantly related to both children and adolescents' PA and consistent through sample age. Data from Brustad's (1996) study found acceptable internal consistency for parental socialization subscales, perceived parental encouragement ($\alpha = 0.74$), perceived parental enjoyment of PA ($\alpha = 0.71$) and parental role-modeling ($\alpha = 0.64$).

Perceived physical competence has also been shown to be a deciding factor for adolescents' participation in PA (Bois et al., 2005; Castelli et al., 2007; Moreno and Cervelló, 2005; Paxton et al., 2004; Sollerhed et al., 2008; Weiss and Amorose, 2005) and those who perceive themselves as competent will persist longer in current and future PA (Harter, 1985b). In the present study, adolescents' perceived physical competence was assessed using part of the Athletic Subscale of the Self-Perception Profile for Children (SPPC; Harter, 1985a), changing the item wording (i.e., using the word "teens" in the items instead of "kids"). This subscale originally consisted of 6 items and its validity and reliability has been confirmed for children aged 8-14 (Weiss and Amorose, 2005). Atienza et al. (2002) found acceptable reliability for 16 years old Spanish adolescents ($\alpha = 0.76$). Previous research from Brustad (1993) confirmed that three items of Harter's original 6-item subscale had moderate cross-loadings with CAPA dimensions and were deleted. Thus, two of Harter's original six items were retained ("Some teens do very well at all kinds of sports but others don't feel that they are very good when it comes to sports" and "Some teens feel that they are better than others their age at

sports but other teens don't feel they can play as well") and two items related to youth's perceived physical competence were added. These items were "Some teens are pretty sure that they are good athletes but other teens don't think they are good athletes" and "Some teens are better than others at most sports but other teens aren't so good at most sports". Additionally, the four self-perceived items were reworded to assess the participants' perception of how their parents perceive their own children's physical competence (e.g., "Some teens have parents who feel that their children do very well at all kinds of sports, but other teens have parents who don't feel that their children are so good when it comes to sports").

The term "perceived physical competence" used in this study reflects the appraisal of one's own competence to perform PA behavior and represents the subjective (internal) side of perceived behavior control as a TPB construct. The participants' perceived availability of resources for PA participation (PA programs, sport facilities and financial support) reflects the objective (external) side (i.e. favorable conditions and limitations) of perceived behavioral control (Skinner, 1996). This external control variable was measured through six items ranging from sporting facilities, organized sporting courses, extracurricular sports activities and private sports clubs, to financial and transportation support. All perceived resources support items were ranged on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree).

Translation and pilot testing

It is well known that the use of a questionnaire in a different culture than the one in which it was developed needs evidence of reliability and validity. Among several methods, the parallel back-translation technique, widely described in the literature (Brislin et al., 1973; Sperber, 2004; Van der Vijver and Leung, 1997) is preferred by many researchers even though it is very time-consuming and may be expensive. Prior to translation, all 43 items were analyzed for readability, bias and comprehension. For pilot testing the items were translated from English to Spanish separately by four native Spanish speakers all of them specialists in sports sciences, including the first author of this study. Translation discrepancies between the translated forms were discussed to develop an initial Spanish version of the questionnaire. Four different translators, all native English speakers, translated this Spanish version back to the source language. In order to reach consensus among the back-translated versions, the English translators again undertook the fine tuning. The comparability of language and similarity of interpretability (Sperber, 2004) of the original and back-translated versions were then discussed and compared. Minor translation discrepancies were found and corrected. In the Luxembourgish sample, the source language scale was translated into French and German by a panel of four trilingual (German-French-English) physical education (PE) teachers. The translated versions were then given to four different trilingual PE teachers who had not seen the original English version to translate the French and German items back into English. The French and German, back-translated English and original English versions of the instrument were then again compared to determine any major differences. Finally, a first pilot study was undertaken to test the adequacy of the scale to be used with the Spanish and Luxembourgish adolescents. The Spanish version was administered to a group of 168 Spanish students (boys = 97, girls = 71; M age = 14.85 years; SD = 0.966). The French and German versions were completed by 152 Luxembourgish students (boys = 83, girls = 67; M age = 14.43 years; SD = 0.859). The results from the pilot study showed that some students had problems understanding the 4-point "structured alternative format". Specifically, the problem consisted in how the adolescents' choice had to be represented in the response format. Many of them did not perceive the response format as a continuum (many subjects scored both one box on the left and one on the right side of the statement) and others had difficulties relating the statement to themselves. Authors like Marsh and Holmes (1990), as cited in Shevlin et al. (2003), found that 31% of the respondents in their study completed the "structured alternative format" incorrectly. Due to low internal consistency, the items were rephrased into first person statements, negative phrasing was avoided as far as possible and scored on a 5-point Likert-type scale that ranged from 1 (strongly disagree) to 5 (strongly agree) (Brustad, personal communication, January 24th, 2008). An English version of all 43 items is presented in Table 2.

A subsequent pilot study was undertaken to test the adequacy of the new Likert-type scale in the Spanish and Luxembourgish samples. The participants of the second pilot study were 61 Spanish (boys = 29, girls = 32; M age = 14.25 years; SD = 0.894) and 102 Luxembourgish students (boys = 42, girls = 60; M age = 14.18 years; SD = 0.989). In the latter sample, 53 adolescents completed the French version and 49 adolescents completed the German version of the instrument. Results from the second pilot study showed that internal consistency was greatly enhanced for all initial subscales (Table 3).

Procedures

Final data collection occurred in two waves. In the first wave, participants completed a questionnaire including the measures of attitude toward PA, perceived parental

Table 3. Internal consistency coefficients in pilot studies 1, 2 and final study.

Subscale	Number of items	Cronbach's alpha		
		Spanish version *N* = 168, 61*, 613†	French version *N* = 80, 53*, 377†	German version *N* = 72, 49*, 375†
Attitude toward PA	15	.571, .927*, .907†	.596, .901*, .908†	.525, .911* .903†
Perceived parental socialization	14	.763, .912*, .925†	.702, .899*, .933†	.711, .903*, .918†
Perceived physical competence	8	.747, .956*, .944†	.696, .939*, .948†	.682, .942*, .953†
Perceived resources support	6	.596, .778*, .752†	.472, .723*, .726†	.493, .696*, .691†
OVERALL	43	.765, .948*, .940†	.716 .936*, .953†	.702, .927*, .937†

Note. * Participants and Cronbach's alpha for pilot study 2. † Participants and Cronbach's alpha for final study.

Table 4. Means and standard deviations of subscales in the Spanish and Luxembourgish samples.

Subscale	Spanish sample (N = 613)	Luxembourgish sample (N = 752)
Attitude toward PA	3.56 (.70)	3.63 (.74)
Perceived parental socialization	2.76 (.86)	2.96 (.89)
Perceived physical competence	2.91 (.99)	2.88 (1.05)
Perceived resources support	3.51 (.90)	3.81 (.84)

socialization, perceived physical competence and perceived resources support. Additionally, their intention to participate in PA outside PE classes was assessed on a 5-point scale in terms of frequency ("How many times per week do you intend to practise PA over the next three months?"), duration ("How many hours per week do you plan to engage in PA over the next three months?") and determination ("How hard will you try to practise PA in the next three months?"). Mean scores of these three items represented the measures of participants' intentions for PA during leisure-time.

After three months, adolescents were asked to indicate in a follow-up questionnaire which form of PA they had practised during leisure-time over the past three months. They were given a list of 35 common activities to choose from and additional PA supplied by the adolescents was also considered as long as it involved energy expenditure. They were then requested to indicate the frequency (4-point scale ranging from once to more than six times per week) and duration (3-point scale ranging from less than 20 minutes to more than one hour) of each chosen PA. A PA index was calculated (in hours) by summing up the product(s) of frequency x duration of each PA they participated in over the last three months. Research assistants in Seville and Luxembourg provided verbal and visual information on how to respond to items in each questionnaire. Respondents were told that there were no right or wrong answers in the questionnaire instructions. Both questionnaires were administrated under quiet classroom conditions and matched using dates of birth, gender and class identification as matching indices.

Analysis

Initial descriptive and preliminary analyses were first employed to assess the internal reliability of the subscales. This included the calculation of Cronbach's alpha for each subscale and the complete 43-item scale. The reliability estimates are reported in Table 3. An exploratory factor analysis (EFA) was conducted in order to identify the factorial structure of the scale. Items were retained on the basis of clustering of their factorial loadings and were considered to be salient with a factor if loadings exceeded .40 (Lewis-Beck, 1994). Additionally, Pearson correlations were calculated for examining the item stability over time.

Results

Descriptive statistics

The mean scale scores and standard deviations for both samples (Spain, N = 613; Luxembourg, N = 752) are presented in Table 4. The means were all above the midpoint of the scale. Means ranged from 2.76 to 3.56 and standard deviations varied from 0.70 to 0.99 in the Spanish sample. In the Luxembourgish sample means varied from 2.88 to 3.81 with standard deviations ranging from 0.74 to 1.05.

Reliability

The test-retest sample consisted of the same individuals as the second pilot study, providing responses twice within a 4-week interval. The test-retest correlations ranged from 0.502 for Item 4 to 0.862 for Item 42, indicating that the items were stable over time. The internal consistency reliabilities (Cronbach's alpha) in the final study (N = 1365) for all four subscales have been shown previously in Table 3 (†). The reliabilities ranged from 0.691 to 0.953, most of them exceeding 0.900 and showing excellent internal consistency. The lowest reliability score was found for the perceived resources support subscale in the German version of the instrument. Table 5 shows reliabilities for gender.

Exploratory factor analysis

As a prerequisite to the application of factor analysis, the index of goodness of fit (Kaiser-Meyer-Olkin's-test) was calculated for both samples. Coefficients of 0.934 and 0.942 were elicited for the Spanish and Luxembourgish samples respectively, establishing that the data matrix is suitable for factor analysis (Tabachnik et al., 2006). Additionally, the Bartlett Test of Sphericity (BTS) was conducted on data prior to factor analysis for measuring sampling adequacy (anti-image correlation matrix) for the 43 items and was yielded highly significant for both the Spanish sample (χ^2 = 19329.83, df = 903, $p < 0.001$) and the Luxembourgish sample (χ^2 = 24080.99, df = 903, $p < 0.001$). A principal components analysis with oblique rotation was then performed on all 43 items which composed the instrument in order to examine the factor structure. The number of factors was estimated using the following criteria: eigenvalues of approximately 1.0 or

Table 5. Internal consistency for gender.

	Cronbach's Alpha			
	Spanish sample (N = 613)		Luxembourgish sample (N = 752)	
Subscale	Boys (N = 309)	Girls (N = 304)	Boys (N = 343)	Girls (N = 409)
Attitude toward PA	.910	.901	.913	.914
Perceived parental socialization	.931	.932	.925	.926
Perceived physical competence	.942	.939	.952	.950
Perceived resources support	.726	.738	.713	.722

Table 6. Reliability analysis of Factor 5 in the Spanish sample.

Item	Scale mean if item deleted	Scale variance if item deleted	Corrected item total correlation	Alpha if item deleted
5	17.85	25.778	.095	.818
18	18.56	19.946	.546	.743
20	18.58	18.633	.592	.730
21	19.23	17.683	.682	.705
42	18.83	18.040	.584	.733
43	18.90	17.520	.615	.724

greater (Kaiser, 1961), a Scree test (Cattell, 1966) and the interpretability of resulting factors (Gorsuch, 1983). In the Spanish sample seven factors were obtained accounting-for 66.027% of the total variance. Four items were grouped into two residual factors with two items each. Items 4 (.497) and 11 (.452) loaded on Factor 6 accounting for 2.506% of variance and Items 5 (-0.449) and 9 (-0.417) on Factor 7 explaining only 2.014% of the total variance. Based on information provided by the Scree test and the small amount of variance, both factors were dropped.

In the sample of Luxembourg nine factors were obtained after analysis with eigenvalues greater than 1.0 and explaining 71.351% of the total variance. Factors 6, 7, 8 and 9 were limited to two items each after deleting some problematic items in the corresponding data matrix. Factor 6 remained with two items associated with the peer acceptance and Factor 7 originally had three items (7, 8 and 14). However, Item 8, with low loading (< 0.40) on this factor was removed and Factor 7 was considered as residual, explaining low variance (2.913%). Factor 8 associated with parents' PA with their children, covered only two items (16 and 19) and accounted for a low percentage of total variance (2.533%). When analyzing Factor 9 which was comprised of four items and explained only 2.428% of the total variance, Item 15 was deleted due to low factorial loading (< 0.40). Item 40 was dropped for lack of congruence with the content of Factor 9, leaving only two items in the same factor.

Based on the previous results, the models with seven and nine factors were discarded and different solutions were analyzed. Subsequently, the analysis was restricted to a 5-component solution and was followed by direct oblimin rotation. In the Spanish sample these factors accounted for 60.195% of the total variance, whereas Factor 1 and 2 explained most of the variance, 31.530% and 14.808%, respectively. Items 4 and 11 were deleted for further analysis due to low factor loading. The deletion of Item 5 due to lack of association with the factor's content, improved its internal consistency from 0.780 to 0.818 (Table 6).

In the Luxembourgish sample the first-order factors explained 60.391% of the total variance, accounting Factors 1 and 2 for most of the variance, 33.848% and 12.117%, respectively. As occurred in the Spanish sample, Items 4 and 11 were deleted for further analysis. Item 40 was deleted due to low communality and low corrected item total correlation (Table 7).

The results of the second-order factorial analysis in the Spanish and Luxembourgish samples without the deleted items are shown in Table 8. In both samples, the first factor was identified as perceived physical competence and was comprised of ten items (eight initial perceived physical items; Item 3 from the short version of the CAPA scale and Item 17 from the initial parental socialization scale). The second factor was associated with parents' PA and comprised ten items derived from the initial parental socialization subscale in both samples. The third extracted factor referred to perceived external support for PA and grouped four items in the Spanish sample and three items in the Luxembourgish sample. The fourth factor makes reference to the adolescents' attitude toward PA. In the Spanish sample eleven items produced this factor, whereas in the Luxembourgish sample the factor was comprised of twelve items. The fifth factor is related to perceived parental support and was established by five items in both samples. As shown in Table 8, all five dimensions reached acceptable (Factor 3) to good (Factor 5) and even excellent internal consistency coefficients (Factors 1, 2, and 4). In the Spanish sample item factor loadings were all superior to 0.617, except for Items 1, 8, 9, 15, 20, 21 and 43 where loadings ranged from 0.465 to 0.617. In the Luxembourgish sample, thirty items reached factor loadings exceeding 0.620 and only ten items ranged from 0.480 to 620.

Intercorrelations

The correlations between the extracted dimensions or factors are presented in Table 9 and showed significant positive association between all of them, except for Factor 5, where significant negative correlations were yielded. The highest correlations were found for both samples between the dimensions 'perceived physical competence' and 'attitude toward PA'. These findings indicate that adolescents who reported greater perceptions of physical competence also had a positive attitude toward sports and exercise. In the Spanish sample, the lowest correlations obtained were between 'parents' PA' and 'attitude toward PA', whereas in the Luxembourgish sample this was the case between 'parents' PA' and 'perceived resources support'.

Table 7. Reliability analysis of Factor 4 in the Luxembourgish sample.

Item	Scale mean if item deleted	Scale variance if item deleted	Corrected item total correlation	Alpha if item deleted
38	11.76	6.996	.533	.584
39	11.44	7.070	.598	.530
40	10.34	11.765	.238	.735
41	11.34	7.763	.545	.572

Table 8. Second-order factorial loadings in the Spanish and Luxembourgish samples.

Item	Factors				
	1	2	3	4	5
37	.880 (.893)				
35	.867 (.879)				
33	.851 (.831)				
31	.827 (.804)				
34	.808 (.813)				
32	.773 (.751)				
36	.768 (.824)				
30	.691 (.684)				
3	.649 (.591)				
17	.591 (.545)				
28		.896 (.834)			
27		.887 (.862)			
22		.876 (.886)			
25		.859 (.833)			
29		.845 (.757)			
23		.843 (.840)			
24		.792 (.745)			
26		.760 (.766)			
16		.699 (.730)			
19		.667 (.738)			
39			.813 (.876)		
41			.771 (.733)		
40			.727 (----)		
38			.680 (.742)		
6				.794 (.684)	
14				.789 (.620)	
13				.784 (.710)	
7				.764 (.585)	
2				.691 (.665)	
12				.672 (.651)	
10				.644 (.579)	
1				.544 (.554)	
9				.543 (.638)	
15				.517 (.540)	
8				.465 (.547)	
5				---- (.480)	
43					-.690 (-.635)
42					-.635 (-.685)
18					-.617 (-.575)
20					-.581 (-.697)
21					-.534 (-.583)
Variance explained (%)	33.44 (35.61)	15.74 (12.92)	6.29 (6.09)	4.58 (5.45)	3.74 (3.75)
Reliability	.949 (.952)	.944 (.944)	.759 (.735)	.918 (.904)	.818 (.826)
Total variance explained	63.76 (63.64)				

Note. Factor loadings less than .40 are not included. In parentheses factor loadings, variance explained, reliability and total variance explained in the Luxembourgish sample.

Discussion

The main purpose of this study was to develop an instrument for the measurement of each variable of a theoretical model, using the TPB as a framework, in order to facilitate a second study for prediction of intention and PA behavior in adolescents in Spain and Luxembourg.

The short version of the CAPA scale was considered suitable for the current study due to the fact that its subscales relate closely to the attitude areas to be examined in the TPB model. Eleven items of the original 15-item CAPA scale were retained in the Spanish sample for Factor 4 (attitude toward PA) and twelve items were grouped into the same factor in the Luxembourgish sample. However, based on the results from this study, it could be argued that the originally employed "structured alternative format" (Harter, 1985a, p.7) requires prior experience of the respondents in order to obtain stable and unbiased responses.

The extracted factors 'parents' PA' and 'perceived parental support' were hypothesized as subjective norm constructs in the TPB. In fact, the role of this construct in explaining PA behavior has been questioned in the literature in many meta-analyses and studies (e.g., Downs and Hausenblas, 2005; Hagger et al., 2001; 2002; Hausenblas et al., 1997), which found that the relationship between

Table 9. Intercorrelation matrix in the Spanish and Luxembourgish samples.

N = 613 (*N* = 752)	1.	2.	3.	4.	5.
1. Perceived physical competence	-				
2. Parents' PA	.214** (.260**)	-			
3. Perceived resources support	.146** (.223**)	.123** (.140**)	-		
4. Attitude toward PA	.586** (.425**)	.120** (.250**)	.132** (.150**)	-	
5. Perceived parental support	-.254** (-.244**)	-.317** (-.295**)	-.186** (-.231**)	-.209** (-.297**)	-

Note. **, significant at p < .01. In parentheses correlations and number of participants in the Luxembourgish sample.

subjective norm, as conceptualized in the original TPB, and intention was significantly smaller than the relationships between the other TPB constructs (attitude and perceived behavioral control) and intention to be physically active. White et al. (1994) argued that the original conceptualization of the subjective norm construct is insufficient when focusing only on perceived social pressure and suggested that there may be other types of social influences, such as the effects of social support that may provide a better explanation of the social influences determining behavioral intentions. Perceived parental support was also reported for explaining adolescents' PA behavior indicating inclusively a stronger influence than subjective norms for prediction of PA intentions (Rhodes and Courneya, 2003). Rhodes et al. (2002) even suggested that social support might replace subjective norms in the TPB. Recently parental support has emerged as one of the most important mechanisms influencing youth PA behavior (Ornelas et al., 2007) indicating that parental influences should continue to be explored as sources of adolescent PA behavior (Sabiston and Crocker, 2008). Additionally, researchers like Tappe (2008) explained the TPB social influence construct through other concepts, like the promotion of PA in the individual's culture and the PA behavior of significant others.

The adolescents' perceived control variable in TPB was assessed by referencing their self-perceived physical competence. Additionally, the participants' perceived parental perception of their children's physical competence was measured in order to examine the parental effect on the overall physical competences as perceived by the adolescents. In both samples, all initial physical competence items were grouped into Factor 1 (perceived physical competence) plus Items 3 and 17. This factor is hypothesized as the subjective (internal) side of perceived behavior control as a TPB construct. Factor 3 (perceived resources support) was conceptualized as the objective (external) side (i.e. favorable conditions and limitations) of perceived behavioral control. Ajzen's (1985) conceptualization of perceived behavioral control seems analogous to the two former constructs. In order to explain the lack of consensus in the measures of both objective and subjective views of control in the PBC construct in the TPB, many authors (Armitage et al., 1999; Armitage and Conner, 1999; Hagger et al., 2001; Terry and O'Leary, 1995) provided empirical and conceptual support for separate measurement of perceived control (referred to external constraints for PA) and self-efficacy (analogous to perceived competence, as referring to one's judgment of the ability to successfully perform a behavior) demonstrating that internal and external aspects of control achieved discriminant and predictive validity in the TPB.

Limitations and perspectives

Despite the potentially good results concerning the content validity and reliability of our subscales and instrument, the study had some limitations. First, distortion of statistical analysis due to the method of collecting samples may have occurred. In a future study we should attempt to conduct the selection of adolescents randomly to increase the representativeness of both samples. Second, although self-reporting methods among young people are considered to be reliable and valid forms of assessing PA with participants older than 10 years (Kohl et al., 2000), they are nevertheless inferior to objective exercise assessment and any future research should take this into consideration.

Ajzen (1985) expected that the pattern of predictions among TPB constructs should be universal and generalizable for a certain behavior and proposed that there might be sample-specific variations in the TPB variables in prediction of intention and behavior. As a consequence, future research should test cross-cultural generalizability of the predictions of the developed instrument, using the TPB as a framework, among adolescents from cultural groups with differing cultural orientations in a physical activity context. We might expect that the measurement aspects of the proposed TPB model will exhibit minimal differences across samples, but that there will be some variation in hypothesized effects of the attitude and subjective norm constructs on intentions to engage in PA across contexts according to the cultural orientation of the samples, individualist (i.e. Luxembourg) or more collectivist (i.e. Spain).

Conclusion

After second-order factorial analysis, a very similar factorial structure was found for the 43 items in both samples. The factors were comprised of exactly the same items, except Items 5 and 40 that were discarded respectively from the analysis in the Luxembourgish and Spanish sample. The high internal consistency of the subscales and test-retest reliabilities confirm the adequacy of the elaborated questionnaire for assessing the TPB-based constructs when used with adolescents of two cities in Spain and Luxembourg. The results give some indication that they may have value in measuring the hypothesized TPB constructs for PA behavior and in a cross-cultural context.

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Key points

- When using the structured alternative format, weak internal consistency was obtained. Rephrasing the items and scoring items on a Likert-type scale enhanced greatly the subscales reliability.
- Identical factorial structure was extracted for both culturally different samples.
- The obtained factors, namely perceived physical competence, parents' physical activity, perceived resources support, attitude toward physical activity and perceived parental support were hypothesized as for the original TPB constructs.

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