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Development of an instrument in Portuguese to identify barriers for physical activity in children

Desenvolvimento de um instrumento em Português para identificar as barreiras para a atividade física em crianças

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Abstract – The aim of this study was to develop an instrument to identify barriers to PA in children. This is a validation study with observational and cross-sectional design. The population consisted of students aged 06-09 years from the city of Uruguaiana/RS. The instrument content was obtained by theoretical matrix, constructed from the literature review and the assessment of barriers through open questions applied by proxy-report (n=100) and focus groups conducted with parents/guardians and children. It is a questionnaire consisting of 29 closed questions. After testing the instrument clarity, its implementation was carried out (n = 293) to verify the construct validity and internal consistency. After one week, parents/guardians were asked to answer the questionnaire retest reliability (n = 168) to verify the agreement. Exploratory factor analysis distributed the 29 questions in six factors, with total variance of 55.6%. All items that have defined the factors obtained load greater than 0.4 and eingenvalues above 1.0. In the internal consistency analysis, item-total correlations ranged from 0.23 to 0.64 and the total alpha value was 0.90. Reproducibility values ranged from 0.43 to 0.78. Twenty-four questions met all the criteria adopted for the study. It was concluded that the instrument developed has adequate validity and reliability for the identification of barriers to PA in schoolchildren aged 06-09 years.

Key words: Child; Motor activity; Reproducibility of results; Surveys and questionnaires; Validity of tests.

Resumo – *O objetivo do presente estudo foi desenvolver um instrumento para identificar as barreiras para a prática de AF em crianças. Trata-se de um estudo de validação com caráter observacional e delineamento transversal. A população foi composta por escolares de 06 a 09 anos da cidade de Uruguaiana/RS. O conteúdo do instrumento foi obtido através da matriz teórica, construída a partir de revisão da literatura e do levantamento das barreiras através de questões abertas aplicadas por Proxy-report (n=100) e grupos focais conduzidos com pais/responsáveis e com crianças. Constitui-se um questionário composto por 29 questões fechadas. Após realizar o teste de clareza do instrumento, foi realizada a aplicação do mesmo (n=293) para verificar a validade e a consistência interna. Depois de uma semana, os mesmos pais ou responsáveis foram convidados a responder o questionário em reteste (n=168) verificando-se a concordância. A análise fatorial exploratória distribuiu as 29 questões em seis fatores, com variância total de 55,6%. Todos os itens que definiram os fatores obtiveram carga maior que 0,4 e eingenvalues acima de 1,0. Na análise de consistência interna, as correlações item-total variaram de 0,23 a 0,64 e o valor total de alfa foi de 0,90. A reprodutibilidade variou entre 0,43 e 0,78. Vinte e quatro questões atenderam todos os critérios adotados para o estudo. Concluí-se que o instrumento desenvolvido apresenta validade e fidedignidade adequadas para identificação das barreiras para prática de AF em escolares de seis a nove anos.*

Palavras-chave: *Atividade motora; Criança; Inquéritos e questionários; Validade dos testes; Reprodutibilidade dos testes.*

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INTRODUCTION

The practice of Physical Activity (PA) is associated with numerous health benefits at all ages[1]. Physically active children are less likely to develop chronic non-communicable diseases such as obesity, diabetes, hypertension and metabolic syndrome[2]. In addition, the practice of physical activities in this period is positively associated with bone and muscle growth[2].

Although evidence shows behaviors related to PA acquired and consolidated in childhood and adolescence influence the active lifestyle in adulthood[3,4], it has been verified that the levels of PA decrease as age increases, especially from adolescence[5]. A study conducted with preschool children aged 4-6 years has shown that 65.3% are exposed to low level of PA[6]. Among adolescents, evidence points to a prevalence of physical inactivity ranging from 39.0% to 93.5%[7].

Biological, social and environmental aspects can influence the involvement in physical activities[8]. The so-called barriers to the practice of PA are among these aspects. The term "barrier" is conceptually defined as a set of personal and environmental obstacles that, based on individual perceptions, prevent or hamper adherence to the practice of PA[9].

In recent years, several studies have addressed this item in scientific literature[10-14]. However, in a search conducted in the main health databases (PubMed, SciElo and Lilacs), no studies investigating the perceived barriers to the practice of PA in Brazilian children were found. Knowledge about the theme in this age group is affected by the inexistence of instruments validated for this purpose. Literature only reports instruments exclusively developed to assess barriers among adolescents[15,16], adults[17,18] and the elderly[19].

The development of reliable instruments to identify barriers to the practice of PA that consider, in addition to the psychometric characteristics particularities of the study population, is of extreme importance for the understanding of this phenomenon and, therefore, for the elaboration of effective interventions to promote the practice of PA in the age group under study. Based on this premise, the present study aimed to develop an instrument to identify barriers to the practice of PA in children aged 6-9 years. This age group was selected considering that children are of school age, which makes it possible to perform data collection.

METHODOLOGICAL PROCEDURES

An observational validation study with cross-sectional design was carried out. For the elaboration and analysis of the instrument validity and reliability, several steps were carried out, including: construction of the theoretical matrix, content validation, identification of barriers (application of open questions and focus groups), questionnaire elaboration, clarity test, validity, internal consistency and reproducibility testing (test-retest agreement analysis).

Construction of the Theoretical Matrix

The construction of the theoretical matrix to support the elaboration of the instrument was performed through a literature review carried out in health databases (PubMed, SciElo and Lilacs). Collections were carried out between August 2014 and August 2015. The year of publication of articles was not delimited, since publications on the subject in the age group of study are scarce. Combinations of the following Health Sciences Descriptors (HSDe) were used: "barriers", "motor activity", "physical activity", "exercise" and "children" and their correspondents in the Portuguese language. Studies that met the following inclusion criteria were selected: a) those with outcomes of barriers to practice of PA, b) samples composed of children, without physical or mental disabilities c) published in Portuguese, English or Spanish. At the end of the search, only three studies met all criteria[12-14], then composing the matrix. In these studies, 29 barriers were identified, which were grouped according to determinant and dimension, which could be social, individual (psychological, cognitive and emotional) or environmental (physical and natural environment), according to classification presented in the ecological model of determinants proposed by Sallis and Owen[20].

Content validity

The content validity of the theoretical matrix was verified through the judgment of Physical Education experts who had published at least one article on barriers to the practice of PA. In a nationwide survey, 23 names that met the criteria were found, with the exception of authors of this study who did not participate in this process to avoid any bias in the validation results. Experts were contacted via email and after three attempts to contact in different electronic addresses, 17 (73.9%) issued a response to the request sent. In the form sent to researchers, there was an item that represented or not a barrier to children and the classification of barriers according to the ecological model. Of the 17 experts, all gave their opinion on whether or not to agree that the item represented a barrier to children, some agreed and others did not. However, some did not feel safe to give their opinion. For validation, the minimum agreement value of 70% among experts was adopted, according to recommendations of Serpa[21].

In addition, some adaptations were made to the matrix, taking into account the suggestions of experts. The items are: presence of animals on the street, heavy traffic of cars, crimes / kidnappings and gang activities were included in the item "lack of safety of places for the practice of PA". The item "lack of places to exercise" was considered equal to "lack of recreational facilities", forming one single item. Item lack of encouragement from friends, parents and family members to exercise was divided into two: "lack of encouragement and stimuli from friends" and "lack of encouragement and stimuli from parents and relatives". Item "exclusion from group activities" was grouped with "fights and conflicts". At the end, the theoretical matrix was composed of 24 items that prevent or hamper the practice of PA by children, validated for the continuation of the study (Table 1).

Table 1. Theoretical matrix of factors that prevent or hinder the practice of Physical Activity (PA) by children after content validity.

Factors	Agree that they represent a barrier for children	Environmental			Individual	Did not give their opinion
		Physical	Natural	Social	Demographic-biological Psychological, cognitive and emotional	
Lack of safety at practice sites	17 (100%)	15 (88.2%)		2 (11.8%)		0
Lack of places to exercise (such as parks, squares, fenced or grass areas)	16 (94.1%)	15 (88.2%)				2
Absence or bad condition of sidewalks	14 (82.4%)	14 (82.4%)				3
Garbage / pollution	15 (88.2%)	13 (76.5%)		1 (5.9%)		3
Lack of street lighting	17 (100%)	17 (100%)				0
Lack of maintenance at practice sites	17 (100%)	16 (94.1%)		1 (5.9%)		0
Unfavorable climatic conditions (rain, very hot)	15 (88.2%)		16 (94.1%)			1
Lack of access to organized activities	16 (94.1%)	1 (5.9%)		15 (88.2%)		1
Financial cost of PA	14 (82.4%)			14 (82.4%)		3
Lack of transportation	15 (88.2%)	1 (5.9%)		15 (88.2%)		1
Lack of company	15 (88.2%)			15 (88.2%)		2
No one to take them to PA sites (not to leave the house alone or for having small children)	17 (100%)			17 (100%)		0
Lack of encouragement and stimuli from friends	16 (94.1%)			15 (88.2%)		2
Lack of encouragement and stimuli from parents or relatives	16 (94.1%)			15 (88.2%)		2
Conflicts, fights, exclusion from PA group	14 (82.4%)			14 (82.4%)		3
Lack of access to places of PA practice	15 (88.2%)	8 (47%)		7 (41.2%)		2
Health problems such as asthma and respiratory problems in general	15 (88.2%)				15 (88.2%)	2
Lack of body energy	13 (76.5%)				13 (76.5%)	4
Lack of motivation	15 (88.2%)				15 (88.2%)	2
Lack of time to practice PA	16 (94.1%)				16 (94.1%)	1
Fear of getting hurt in activity	15 (88.2%)				15 (88.2%)	2
Lack of fun from practice	15 (88.2%)				15 (88.2%)	2
Use of electronic devices	13 (76.5%)				11 (64.7%)	6
Lack of adequate clothing	14 (82.4%)				14 (82.4%)	3

Identification of barriers

The identification of factors that prevent or hamper the practice of PA in the study population, children aged 6-9 years, was performed through the application of a questionnaire with open questions, answered by parents and the formation of two focal groups, one with parents and the other with children.

For the application of the open questions, two schools from the urban area of Uruguaiana-RS were drawn, one from the public network and one from the private network. The sample was composed of students from one class of each school grade (1st to 4th year) of each of the schools (public and private). A total of 109 children participated in the study, nine of which were not eligible, as they were children above the study age, totaling 100

participants (48 boys and 52 girls). For this stage, the free and informed consent form was sent to their parents / guardians, together with a questionnaire composed of the following open questions: 1- Does your child practice PA? 2- If not, what are the main reasons for him/her not to practice PA? 3- If so, are there reasons that make it difficult to practice PA? Which are they? This questionnaire was answered by parents or guardians.

The Focus Group (FG) was developed in order to complement the instrument construction, which was especially based on studies and qualitative researches of Dias[22] and Placco[23]. For the formation of the focus groups, a drawn was made between the two schools participating of the previous stage. The public school was drawn. For the FG performed with parents/guardians, three parents from each class, from the 1st to 4th school grade, who had not previously participated, were invited. Of these, seven attended the day and time previously scheduled, agreeing to participate in the group. A 65-minute session was held, which encouraged discussions guided by five indirectly structured questions (1- Do you consider that the place where you live stimulates your child to practice PA (what is missing or could be different) 2- Do the everyday tasks of your child make it difficult or impossible for him/her to practice PA? 3 - Do you think that the government carries out any program to stimulate the practice of PA for child? 4 – Do you think that the weather interferes with your child's PA practice. In what way? 5- Do you think that there is any personal factor of your child that prevents him/her from practicing PA?).

The FG developed with children consisted of eight participants, two from each age group (six to nine years). For this, two children from each school grade (1st to 4th grades) were drawn, whose parents did not participate in the previous stages. FG was conducted in two sessions, the first with duration of 30 minutes and the second with duration of 45 minutes. Discussions among participants were stimulated through the exposure of images of situations that represent obstacles to the practice of PA.

The sessions of both focus groups were conducted by the researcher in the school library. This place was chosen because it has little movement of people and because it is silent, thus allowing greater privacy and concentration throughout the accomplishment of the work. Sessions were recorded and later transcribed in order to identify the main points that could help in the elaboration of questions.

From the content of parents' answers to open questions and focus group discussions, barriers were identified and grouped according to determinant and dimension and to the classification presented in the ecological model of determinants proposed by Sallis and Owen[20] (Figure 1). Five barriers to the practice of PA were identified that were not included in the theoretical matrix.

"My son is lazy about playing and moving"	"Laziness practicing PA"	Laziness	Psychological, Cognitive and emotional
Response to open question	Barrier	Determinant	Dimension

Figure 1. Example of classification of barriers

Questionnaire elaboration

From the content of the theoretical matrix, of answers to open questions and from data obtained in focus groups, the closed questions that composed the final questionnaire were formulated. The questionnaire consisted of 29 questions with response options that followed the summative or additive scale format with three levels: (0) never; (1) sometimes and (2) always. This three-point scale was adopted considering the evidence that individuals, when faced with many answer options, tend to mark extreme points and show difficulty in differentiating intermediate evaluations [24].

Clarity test

To verify the clarity of the developed instrument, a new public school class participating in the previous stages was drawn. This group had not participated in the application of open questions or focus groups. Parents / guardians of students were invited to attend the school at previously scheduled date and time. On this occasion, the questions were applied, so that each one of them was read by the researcher, without generating any influence on answers or explanation about it. Twelve mothers participated in this stage. After this test, only question "is the financial cost of the activity a barrier?" needed to be rewritten, being reformulated to "Is the financial cost involved in the PA practice a barrier?"

Validity and reliability test

To verify the instrument validity and reliability, the sample size was defined by the "Thumb Rules", applied to factorial analysis techniques[25]. The sample number was defined by the number of items in the closed questionnaire, establishing at least ten cases per variable (290 cases). We included 10% for possible losses and refusals, requiring a sample size of 319 children / parents.

The selection of schools and students was random. Initially, a mapping of all schools in the urban area of the municipality was carried out, and public schools were grouped according to their location into two groups: downtown and periphery. Later, a public school of downtown region and another of a peripheral region were drawn. All private schools of the municipality were also mapped, one drawn for this stage of the collection. Schools participating in the definition of barriers were excluded from the draw. As the study sample covered four school grades, the classes belonging to each of them were proportionally drawn. All draws were made in the Microsoft Excel software, for which, from the list of schools, random numbers were generated.

The questionnaire was sent to parents or guardians of students in these three schools, being tested to verify their validity and internal consistency. After one week, parents or guardians were again invited to participate in the retest in order to verify the reproducibility of the questionnaire. The applications (test and retest) had at least three collection attempts.

Data analysis

The database was built in EpiData 3.1 software and data was double-typed for consistency checking. Statistical analysis was conducted in SPSS for Windows software version 20.0.

The questionnaire validity was tested through exploratory factorial analysis and applied to the direct Oblimin rotation, accepting eingenvalues above 1.0 and items with load greater than 0.4 to define the factors[26]. This procedure allowed verifying to what extent the sample response patterns adhere or distanced. The Kaiser-Meyer-Olkin (KMO) statistics was used to identify the sample adequacy.

Internal consistency analysis was performed using the Cronbach alpha coefficient of each factor, and alpha values ≥0.70[27] were considered adequate. The general analysis (all items) of Cronbach's alpha and the identification of the alpha value excluding each item was also tested. Corrected values of item-total correlations were also analyzed, considering values above 0.3 as appropriate.

Reproducibility was verified by agreement analysis using the weighted Kappa index obtained after two applications in the same group with one week of interval. Minimum values of 0.4 (relative aggregation) were considered for concordance[28]. In all analyses, significance level of 5% was adopted.

Ethical aspects

The study was approved by the Ethics Research Committee of the School of Physical Education, Federal University of Pelotas (protocol No. 1,109,092). Data collection began after formal authorization from the municipal and state Department of Education (10th CRE) and also from schools selected for the study. Participants voluntarily signed the Free and Informed Consent Form.

RESULTS

In the validity and reliability testing phase, participants of the first instrument application (test) was composed of the parents / guardians of 293 students, considering 31 losses. Of these, 164 (56%) were female, 35 aged six years, 63 aged seven years, 70 aged eight years and 125 aged nine years. In the second application (retest), 168 parents / guardians responded to the instrument. Regarding students, 111 were girls (66%), 17 aged six years, 36 aged 7 years, 37 aged 8 years and 78 aged 9 years.

The exploratory factorial analysis distributed the 29 questions in six factors, which were named according to the similarities of the content of

items that compose them. Factor one was named as "physical and social environment", consisting of nine items. Factor two, consisting of four items, was defined as "personal motivation." Factor three, with two items, was given the name "financial contribution". Factor four was named as "social support and encouragement", composed of five items. Factor five, with seven items, was named as "individual factors" and factor six as "natural environment and transportation" (this one with only two items). All items that defined the factors obtained load higher than 0.4.

The total variance found was 55.6% and all factors obtained eingenvalues above 1.0. Factors that presented the highest eingenvalues were factor one (5.47 and variance 26,30) and factor five (4.56 and variance 4.53). Factor six was the one with the lowest value (1.76 and variance 3.93) (Table 2).

Table 2. Factorial analysis and validity indexes of barriers found for the practice of physical activity (PA) in children.

Questionnaire items (barriers)	Factor loading					
	F1	F2	F3	F4	F5	F6
Lack of places to practice PA (such as parks, squares, fenced or grassy areas) close to my home makes it difficult for my child to practice PA	0.75					
The lack of safety at PA practice places makes it difficult for my child to practice PA	0.74					
The lack of maintenance of PA practice places makes it difficult for my child to practice PA	0.72					
The absence or bad conditions of sidewalks makes it difficult for my child to practice PA	0.70					
The presence of garbage and pollution at practice sites makes it difficult for my child to practice PA	0.72					
The lack of lighting in streets, parks and squares makes it difficult for my child to practice PA	0.70					
Lack of access to practice sites makes it difficult for my child to practice PA	0.63			0.45		
Lack of access to organized activities makes it difficult for my child to practice PA	0.54					
There are few physical activity options that are appropriate for my child's age	0.45					
My son is lazy to practice PA		0.76				
My son does not find it fun to practice PA		0.76				
My child prefers to use free time with electronic devices (computer / internet, video game, television) than practicing PA		0.71				
My child prefers to do activities that do not involve physical effort, such as playing with toys, theater, drawing, among others		0.68				
It is difficult for my child to practice PA because he / she does not have adequate equipment or clothing for practice			0.57	0.43	0.44	
The financial cost involved in practicing PA is a barrier for my child	0.41		0.52	0.40		
Lack of encouragement from friends makes it difficult for my child to practice PA		0.46		0.48	0.45	
Not having someone to take him / her to practice PA due to commitments of parents and family (such as work, studies, not leaving home alone or having to care for younger siblings) makes it difficult for my child to practice PA				0.78		

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Questionnaire items (barriers)	Factor loading					
	F1	F2	F3	F4	F5	F6
I do not have time to be with my child in the practice of PA				0.67		
Not having company makes it difficult for my child to practice PA				0.57		
Lack of encouragement and stimuli from parents or family members makes it difficult for my child to practice PA		0.47		0.55	0.46	
Lack of energy and fatigue makes it difficult for my child to practice PA					0.78	
Health problems like asthma and respiratory problems in general, allergies and body aches make it difficult for my child to practice PA					0.75	
It is difficult for my child to practice PA due to fights, conflicts, exclusion from group activities or fear of bullying (being overweight, body shame, doing something wrong)	0.42				0.69	
Lack of motivation makes it difficult for my child to practice PA		0.51			0.66	
Fear of getting hurt makes it difficult for my child to practice PA					0.56	
Lack of time makes it difficult for my child to practice PA				0.46	0.50	
My child does not practice some activities correctly due to lack of motor coordination, physical fitness and agility, which makes it difficult to practice PA			0.42		0.43	
Unfavorable weather conditions (rain, too much heat, intense cold) make it difficult for my child to practice PA						0.75
Lack of adequate transportation makes it difficult for my child to practice PA			0.40	0.43		0.45
Eingenvalue	5.47	4.00	1.87	3.97	4.56	1.76
% variance	26.30	10.72	5.43	4.68	4.53	3.93
Alpha	0.85	0.74	0.61	0.70	0.79	0.36

Table 2 shows the alpha values for each extracted factor. Variations from 0.36 to 0.85 were found, and factors three and six did not obtain adequate values (alpha ≥0.70). Regarding the sample suitability, KMO value was 0.88.

The results of reliability analyses are presented in Table 3. In the internal consistency analysis, item-total correlations ranged from 0.23 to 0.64, showing that not all items contributed equally to the set of barriers and that items "Unfavorable weather conditions (rain, too much heat, intense cold) make it difficult to practice PA" and "My child prefers to do activities that do not involve physical effort, such as playing with toys, theater, drawing, among others", did not present adequate values (≥0.3) (values of 0.23 and 0.29, respectively). The total alpha value was 0.90. The alpha values, if items were deleted, ranged from 0.89 to 0.90, showing that no item, if removed, would increase the total alpha value.

Regarding reproducibility, all items had agreement above 0.4 between questionnaire applications (test and retest). Item "My child does not correctly

practice some activities due to lack of motor coordination, physical fitness and agility, which makes it difficult to practice PA", presented the highest reproducibility value (0.78). Item "Unfavorable climatic conditions (rain, too much heat, intense cold) prevent the practice of PA" showed the lowest value found (0.43). In general, 16 items presented reproducibility values with moderate classification (0.40-0.59) and 13 optimal classification (≥0.60).

Table 3. Results of the internal consistency and reproducibility (test-retest) of barriers.

	Internal consistency		Test-retest
Questionnaire Items	Total correlation	Alpha if deleted	Kappa
Lack of places to practice PA (such as parks, squares, fenced or grassy areas) close to my home makes it difficult for my child to practice PA	0.48	0.89	0.70
The lack of safety at PA practice places makes it difficult for my child to practice PA	0.47	0.89	0.67
The absence or bad conditions of sidewalks makes it difficult for my child to practice PA	0.44	0.89	0.50
The presence of garbage and pollution at practice sites makes it difficult for my child to practice PA	0.50	0.89	0.64
The lack of lighting in streets, parks and squares makes it difficult for my child to practice PA	0.45	0.89	0.58
The lack of maintenance of PA practice places makes it difficult for my child to practice PA	0.48	0.89	0.63
Unfavorable weather conditions (rain, too much heat, intense cold) make it difficult for my child to practice PA	0.23	0.90	0.43
Lack of access to organized activities makes it difficult for my child to practice PA	0.47	0.89	0.45
The financial cost involved in practicing PA is a barrier for my child	0.48	0.89	0.55
Lack of adequate transportation makes it difficult for my child to practice PA	0.48	0.89	0.53
Not having company makes it difficult for my child to practice PA	0.45	0.89	0.56
Not having someone to take him / her to practice PA due to commitments of parents and family (such as work, studies, not leaving home alone or having to care for younger siblings) makes it difficult for my child to practice PA	0.44	0.89	0.58
Lack of encouragement and stimuli from friends makes it difficult for my child to practice PA	0.52	0.89	0.51
Lack of encouragement and stimuli from parents or family members makes it difficult for my child to practice PA	0.50	0.89	0.59
It is difficult for my child to practice PA due to fights, conflicts, exclusion from group activities or fear of bullying (being overweight, body shame, doing something wrong)	0.58	0.89	0.62
Lack of access to practice sites makes it difficult for my child to practice PA	0.64	0.89	0.61
Health problems like asthma and respiratory problems in general, allergies and body aches make it difficult for my child to practice PA	0.48	0.89	0.64
Lack of energy and fatigue makes it difficult for my child to practice PA	0.55	0.89	0.63
Lack of motivation makes it difficult for my child to practice PA	0.58	0.89	0.56
Lack of time makes it difficult for my child to practice PA	0.47	0.89	0.44
Fear of getting hurt makes it difficult for my child to practice PA	0.46	0.89	0.64

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	Internal consistency		Test-retest
Questionnaire Items	Total correlation	Alpha if deleted	Kappa
My son does not find it fun to practice PA	0.42	0.89	0.59
My child prefers to use free time with electronic devices (computer / internet, video game, television) than practicing PA	0.33	0.90	0.70
It is difficult for my child to practice PA because he / she does not have adequate equipment or clothing for practice	0.53	0.89	0.64
There are few physical activity options that are appropriate for my child's age	0.45	0.89	0.49
My child prefers to do activities that do not involve physical effort, such as playing with toys, theater, drawing, among others	0.29	0.90	0.51
My child does not practice some activities correctly due to lack of motor coordination, physical fitness and agility, which makes it difficult to practice PA	0.33	0.90	0.78
Lack of time makes it difficult for my child to practice PA	0.31	0.90	0.53
My son is lazy to practice PA	0.30	0.90	0.69

Considering the validity analyses, internal consistency and reproducibility, four factors (one, two, four and five) met all the criteria adopted for the study. Among items belonging to these four factors, only one ("My child prefers to do activities that do not involve physical effort, such as playing with toys, theater, drawing, among others") did not present value considered adequate for Item-total correlation (≥0.3). Thus, the final questionnaire consisted of 24 questions (Annex I).

DISCUSSION

The present study is the first to develop a specific instrument for the identification of barriers to the practice of PA in children, a population group that has not yet been evaluated in scientific literature. The elaboration of the instrument considered the specific peculiarities of the age group when investigating the barriers that are relevant to the study population. For this, the participation of parents and children themselves and the inclusion of barriers identified in the review of studies conducted in different countries were fundamental factors to achieve the study purposes[12-14].

Some points of the research should be emphasized. The elaboration of the study followed all the steps for the process of development and testing regarding the instrument validity and reliability, following a psychometric model similar to that used in other studies[15,16,29]. This accomplishment sought to guarantee the psychometric quality of the instrument developed to identify barriers for PA in children. The inclusion of items related to individual, social and environmental factors identified in the literature review and assessed in the study population such as to include in the instrument the maximum number of items that contemplated the diversity of factors that may represent barriers to children's engagement in PA practice is another point that should be emphasized. Last but not least, it concerns

the content validation process, which relied on the opinion of experts with recognized knowledge in the field.

The validity analysis of the study found values similar to studies that developed similar procedures and used the factorial analysis for its verification[15,16]. The internal consistency analysis showed that all items significantly contributed to the construction of the questionnaire with alpha values ranging from 0.89 to 0.90. A study by Santos et al.[15] aimed at developing an instrument to analyze barriers to the practice of PA in adolescents, and by Kienteka et al.[30], which analyzed the validity and reliability of an instrument to evaluate the perception of barriers to bicycle use in adults, verified similar internal consistency values (> 0.85 and> 0.72, respectively).

In the agreement analysis, the Kappa index was classified from moderate (0.40-0.59) to optimal (≥0.60)[28], similar to results found by Kienteka et al.[30] (k = 0.41 to k = 0.82) and Martins & Petroski[17], who tested an instrument to verify barriers to the practice of PA in adults (k = 0.55 to k = 0.88). In contrast, the present study presented higher concordance values compared to a study performed with a very similar population, but with another age group[16]. This difference may be related to the fact that in the study by Engers et al.[16], the questionnaire was answered by adolescents. On the other hand, the application of the questionnaire was performed by Proxy-report with parents or guardians, that is, it was answered by adults. Proxy-report collections have been used in research with children because they are, in most cases, unable to answer complex questionnaires. Thus, information about the child's life is provided by someone of his or her life, such as parents, guardians, teachers or neighbors[29,12,14].

Among studies investigating barriers to the practice of PA performed so far, no national studies investigating subjects under the age of ten were found. At international level, a study conducted in Mexico[12] identified as the main barriers among children the presence of dogs on the street, intense heat, bad weather, heavy traffic, inadequate public lighting and lack of places such as parks to exercise. A study conducted in the United States[14] found that the most cited barriers are poor neighborhood safety, followed by lack of sports and organized activities and the financial cost of participating in PA. In Denmark, the most frequently identified barriers were weather, conflicts, lack of space, lack of leisure facilities and preference for the use of electronic devices[13]. Most of these barriers remained in the instrument proposed by the present study after validity and reliability analyses. Although the influence of climatic conditions is reported as one of the main barriers in different parts of the world[10,11,13], it was not considered as a barrier in the present study. This fact may be related to the sociocultural aspects of the sample and the region where the study was conducted.

Although the present study contributes to knowledge about the barriers to the practice of PA in children, some limitations should be discussed. One of them is the fact that the barriers perceived by children have been reported by parents or guardians. Even though this procedure is frequently adopted for data collection with this age group, such limitation was attenu-

ated with the development of a FG with children who reported perceiving practically the same barriers as those reported by parents. Another characteristic that must be considered is that even though methodological procedures recognized as adequate to develop instruments with psychometric quality have been applied, the fact that the theoretical matrix was not returned to experts after the changes suggested by them should be pointed out as a limitation. In addition, the fact that the research did not investigate the construct validity is another limitation. The procedure used to verify the construct validity was only exploratory and does not reflect the construct validity, serving as a subsidy for future studies.

CONCLUSION

It was concluded that the proposed instrument has adequate validity and reliability to identify barriers to practice of PA in children aged 6-9 years. It should be noted that the socio-cultural characteristics of children should be considered in order to identify barriers in different locations. The use of this instrument in research to identify barriers to the practice of PA is important to increase the evidence on the subject. This information will provide support for better-planned and implemented PA programs for the health promotion of this population.

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Annex I. Questionnaire about barriers of physical activity – Portuguese version.

Gostaríamos de saber se as condições ou situações abaixo dificultam a prática de atividade física de seu filho(a). Marque o quanto (nunca, às vezes ou sempre) cada situação representa uma barreira para seu filho(a) praticar atividade física. Marque apenas uma opção de resposta em cada questão!
1- A falta de locais para praticar atividades físicas (como por exemplo, parques, praças, áreas cercadas ou de grama) perto de casa dificulta a prática do meu filho(a).
(0) Nunca (1) Às vezes (2) Sempre
2- A falta de segurança dos locais de prática dificulta para meu filho(a) fazer atividade física.
(0) Nunca (1) Às vezes (2) Sempre
3- A ausência ou as más condições das calçadas dificultam a prática de atividade física do meu filho(a).
(0) Nunca (1) Às vezes (2) Sempre
4- A presença de lixo e poluição nos locais de prática dificulta para meu filho(a) fazer atividade física.
(0) Nunca (1) Às vezes (2) Sempre
5- A falta de iluminação pública das ruas, parques e praças dificulta a prática de atividade física do meu filho(a).
(0) Nunca (1) Às vezes (2) Sempre
6- A falta de manutenção dos locais de prática dificulta para meu filho(a) fazer atividade física.
(0) Nunca (1) Às vezes (2) Sempre
7- A falta de acesso a atividades organizadas dificulta a prática de atividade física do meu filho(a).
(0) Nunca (1) Às vezes (2) Sempre
8- Não ter companhia dificulta a prática de AF do meu filho(a).
(0) Nunca (1) Às vezes (2) Sempre
9- Não ter alguém para levar para praticar AF, devido aos compromissos dos pais e familiares (como trabalho, estudos, não deixar a casa sozinha ou por ter que cuidar de irmãos menores) dificulta a prática do meu filho(a).
(0) Nunca (1) Às vezes (2) Sempre
10- A falta de incentivo e estímulo dos amigos dificulta a prática de atividade física do meu filho(a).
(0) Nunca (1) Às vezes (2) Sempre
11- A falta de incentivo e estímulo dos pais ou familiares dificulta a prática de atividade física do meu filho(a).
(0) Nunca (1) Às vezes (2) Sempre
12- É difícil para meu filho(a) praticar atividade física devido as brigas, conflitos, exclusão de atividades em grupo ou medo de sofrer bullying (por estar acima do peso, vergonha do corpo, fazer alguma coisa errada).
(0) Nunca (1) Às vezes (2) Sempre
13- A falta de acesso a locais de prática dificulta para meu filho(a) fazer atividade física.
(0) Nunca (1) Às vezes (2) Sempre
14- Os problemas de saúde como asma e problemas respiratórios em geral, alergias e dores no corpo dificultam a prática de atividade física do meu filho(a).
(0) Nunca (1) Às vezes (2) Sempre
15- A falta de energia e o cansaço dificultam a prática de atividade física do meu filho(a).
(0) Nunca (1) Às vezes (2) Sempre
16- A falta de motivação dificulta a prática de atividade física do meu filho(a).
(0) Nunca (1) Às vezes (2) Sempre
17- A falta de tempo do meu filho (a) dificulta a prática de atividade física.
(0) Nunca (1) Às vezes (2) Sempre
18- O medo de se machucar dificulta a prática de AF do meu filho(a).
(0) Nunca (1) Às vezes (2) Sempre
19- Meu filho(a) não acha divertido praticar atividade física.
(0) Nunca (1) Às vezes (2) Sempre
20- Meu filho(a) prefere utilizar o tempo livre com aparelhos eletrônicos (computador/internet, vídeo game, televisão) do que praticar atividade física.
(0) Nunca (1) Às vezes (2) Sempre

Continue…

… continue

Gostaríamos de saber se as condições ou situações abaixo dificultam a prática de atividade física de seu filho(a). Marque o quanto (nunca, às vezes ou sempre) cada situação representa uma barreira para seu filho(a) praticar atividade física. Marque apenas uma opção de resposta em cada questão!
21- Existem poucas opções de atividades físicas adequadas para a idade do meu filho(a).
(0) Nunca (1) Às vezes (2) Sempre
22- Meu filho(a) não pratica corretamente algumas atividades por falta de coordenação motora, aptidão física e agilidade, isso dificulta a prática de AF.
(0) Nunca (1) Às vezes (2) Sempre
23- Não tenho tempo para acompanhar os filhos na prática de AF.
(0) Nunca (1) Às vezes (2) Sempre
24- Meu filho(a) tem preguiça de praticar atividade física.
(0) Nunca (1) Às vezes (2) Sempre