

# VALIDATION OF POSTURE HABIT ASSESSMENT QUESTIONNAIRE (PHAQ) FOR THE PORTUGUESE POPULATION IN CHILDREN OF THE 2ND AND 3RD CYCLES OF BASIC EDUCATION

VALIDAÇÃO DO QUESTIONÁRIO DE AVALIAÇÃO DE HÁBITOS POSTURAIS (PHAQ) PARA A POPULAÇÃO PORTUGUESA EM CRIANÇAS DO 2º E 3º CICLOS DO ENSINO BÁSICO

VALIDACIÓN DEL CUESTIONARIO PARA LA EVALUACIÓN DE HÁBITOS POSTURALES (PHAQ) PARA LA POBLACIÓN PORTUGUESA EN NIÑOS DEL 2º Y 3º CICLOS DE EDUCACIÓN BÁSICA

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## ABSTRACT

Postural changes that may occur in children and adolescents are a risk factor for spinal dysfunction in adulthood. The study aims to validate the Questionnaire for Assessment of Postural Habits (PHAQ) in 2nd and 3rd-grade students of Viseu and Leiria. The PHAQ validation procedure was carried out in 3 stages: linguistic adaptation for the Portuguese population through the analysis and validation of the content of the questionnaire by a panel of experts; Application of the PHAQ to the school population of Viseu and Leiria; comparison of PHAQ results with photographic still images analyzed by double-blind format experts. The correlation between the 11 questions of the PHAQ, using Cronbach's Alpha ( $\alpha = 0.536$ ) and KMO test (0.682) indicates that each question is specific and should be analyzed individually since the postural analysis is individual and not global. There were no differences between the postural analysis per image performed by the 2 experts ( $p > 0.05$ ) and between the answers of the participants with the answers given by the analysis of the experts ( $p > 0.05$ ). The PHAQ is a valid instrument for assessing postural habits in children and adolescents. It can be a good alternative to the image collection and is a method of detecting postural changes, with low cost, short application time and no risks.

*Keywords: postural habits, school age, questionnaire validation.*

## RESUMO

As alterações posturais que podem surgir em crianças e adolescentes assumem-se como um fator de risco para as disfunções da coluna vertebral na vida adulta. O objetivo do estudo é validar o Questionário de Avaliação dos Hábitos Posturais (PHAQ) em alunos do 2º e 3º ciclos do ensino básico. O procedimento de validação do PHAQ foi realizado em 3 etapas: adaptação linguística para

a população portuguesa através da análise e validação do conteúdo do questionário por um painel de peritos; aplicação do PHAQ à população escolar de Viseu e Leiria; e comparação dos resultados do PHAQ com imagens estáticas fotográficas, analisada por *peritos* em formato dupla cega. A correlação entre as 11 questões do PHAQ, através do Alpha de Cronbach ( $\alpha = 0,536$ ) e KMO (0,682) indica que cada questão é específica e deve ser analisada individualmente, visto a análise postural ser de carácter individual e não global. Não houve diferenças entre a análise postural por imagem realizada pelos dois *peritos* ( $p > 0,05$ ) e entre as respostas dos participantes com as respostas dadas pela análise dos *peritos* ( $p > 0,05$ ). O PHAQ é um instrumento válido para avaliar os hábitos posturais em crianças e adolescentes, pode ser uma boa alternativa à recolha de imagem e assume-se como um método de deteção de alterações posturais, com baixo custo, pouco tempo de aplicação e sem riscos.

*Palavras Chave: hábitos posturais, crianças, adolescentes, validação de questionário.*

## RESUMEN

Se supone que los cambios posturales que pueden ocurrir en niños y adolescentes son un factor de riesgo para disfunciones de la columna en la vida adulta. El objetivo del estudio es validar el cuestionario de Evaluación de Hábitos Posicionales (PHAQ) en estudiantes de 2º y 3º ciclos de la educación básica. El procedimiento de validación del PHAQ se llevó a cabo en 3 etapas: adaptación lingüística para la población portuguesa a través del análisis y la validación del contenido del cuestionario por un panel de *experts*; Aplicación del PHAQ a la población escolar de Viseu y Leiria y; Comparación de los resultados de PHAQ con imágenes fijas fotográficas analizadas por *experts* en formato doble ciego. La correlación entre las 11 preguntas del PHAQ, utilizando el Alfa de Cronbach ( $\alpha = 0.536$ ) y el KMO (0.682) indica que cada pregunta es específica y debe analizarse individualmente, ya que el análisis postural es individual y no global. No hubo diferencias entre el análisis postural realizado por los 2 *experts* ( $p > 0.05$ ) y entre las respuestas de los participantes y las respuestas proporcionadas por el análisis de los *experts* ( $p > 0.05$ ). El PHAQ es un instrumento válido para evaluar los hábitos posturales en niños y adolescentes, puede ser una buena alternativa a la recolección de imágenes y es un método para detectar cambios posturales, con bajo costo, tiempo de aplicación corto y sin riesgos.

*Palabras clave: hábitos posturales, edad escolar, validación de cuestionario.*

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## INTRODUCTION

Childhood and adolescence are two stages in which there are many discoveries concerning the world and itself. The child and adolescent undergo several changes, both at the psycho-socio-affective and physical level. In physical alterations it is important to point out the changes regarding posture that are directly related to the different phases of life, but it is mainly between 7 and 12 years of age that the posture of the child undergoes a great transformation and modification in the search for a balance harmonious relation to the new bodily proportions (Penha, João, Casarotto, Amino, & Penteado, 2005; Santos, Silva, Sanada, & Alves, 2009).

In recent years, there has been a significant prevalence of postural changes in children and adolescents, some of these problems being characteristic of postural development (Grimes & Legg, 2004; Rebolho, Casarotto, & João, 2009).

The occurrence of postural changes in children / adolescents makes possible the early detection of possible changes and the adoption of preventive strategies. In childhood and adolescence, acceleration of growth occurs and, since the variations in posture are also related to the stages of physical development, these periods are important for the implantation of interventions and for the minimization of the predisposing conditions to the appearance of postural problems (Lemos, Santos, & Gaya, 2012).

Posture is defined in various ways considering the biomechanical alignment and the spatial arrangement of body parts in relation to their segments (Desouzart, Matos, Melo, & Filgueiras, 2016; Silva, Punt, Sharples, Vilas-Boas, & Johnson, 2009; Vieira & Kumar, 2004).

Most of these postural problems are related to postural behavior during the school phase, a period in which children and adolescents remain seated for a long time, inappropriately use school portfolios, and carry school supplies. Most of the time, it is overloaded, resulting in hyperlordosis, hyperkinesis, scoliosis and low back pain (Desouzart et al., 2016; Rebolho et al., 2009).

The risk of back pain is due to a multi-factorial nature, being that poor posture is one of these factors. Poor posture is understood as postures deviating from neutral spinal curvature (Geldhof, De Clercq, De Bourdeaudhuij, & Cardon, 2007).

Several studies have shown that the poor postures adopted by children and adolescents at home and at school result in an imbalance in the body musculature, leading to postural changes, which requires vigilance both by the parents and by the teachers, so that there is an early correction of postural deviations, aiming to avoid permanent deformities (Desouzart et al., 2016; Dusing & Harbourne, 2010; Geldhof et al., 2007).

It is especially at school that children and adolescents acquire poor postures, resulting from many factors, such as heavy backpacking and school furniture, which can even result in pain in the various parts of the body, such as the vertebral column, more often in the lumbar region (Rebolho, Rocha, Teixeira, & Casarotto, 2011).

A number of factors have been studied that may influence the posture of children and adolescents, such as: transportation and backpack weight, gender, age, anthropometric measures, psychosocial and behavioral aspects, and postural habits in a daily life situation. Life habits may be associated with postural changes, which requires the development of school health programs, so that the prevalence of postural changes can be minimized, emphasizing the risk factors associated with incorrect postures by students, using assessment of students through validated instruments (Sedrez, Da Rosa, Noll, da Silva Medeiros, & Candotti, 2015).

In order to be able to validate a scale, one has to start from the initial version of the scale, the first step being its translation and transcultural adaptation. Afterwards, it should be submitted to the analysis of a panel of experts, for validation of content. "Expert panels" are generally composed of recognized independent experts in the areas covered by the evaluated scale and are usually seen as a mechanism for synthesizing information from a diverse set of sources, presenting a set of points of view to arrive at generalized conclusions (Herbert, Jamtvedt, Hagen, Mead, & Chalmers, 2011).

Considering this problem, the present study aims to validate for the Portuguese population the questionnaire Assessment of Postural Habits in students of the 2nd and 3rd cycles of basic education, enabling a better structuring of postural correction programs in these age groups.

The investigation of the occurrence of postural alterations, as well as the variables that may relate to these conditions allows the early detection of possible changes and the adoption of preventive strategies.

Data analysis was performed using: descriptive statistics; correlation between the 11 questions of PHAQ through Cronbach's Alpha and KMO; comparison of the responses of the postural image analysis performed by the 2 experts using the nonparametric Mann-Whitney U test and; comparison of the participants' responses and the answers given by the expert's postural image analysis using the nonparametric Kruskal-Wallis test ( $p > 0.05$ ).

## 1. MATERIALS AND METHODS

The present work intends to cover the procedures of an adaptation and validation of a scale of postural habits in children of 2nd and 3rd cycles for the Portuguese population.

The lack of an instrument that evaluates in a practical way the attitudes acquired by children and adolescents in the school development phase, as well as the associated pathologies due to the postural alterations, acquired in school by the students, led to realize how important and useful the validation of PHAQ in 2nd and 3rd cycles students would be. Since the other existing methods are time-consuming, fairly extensive and of complex analysis such as analysis using Postural Assessment Software (eg. SAPO or Kinovea).

Therefore, the purpose of this study is to provide a validated instrument for the Portuguese population, capable of detecting postural changes in a faster way and with the same validity as other instruments used for the same purpose, such as postural analysis through the real image of the student in the various incidences.

### 1.1. Sample

The sample of this study was made up of students attending the schools of the district of Viseu and Leiria, belonging to the beginning and the end of the 2nd and 3rd cycles of basic education, namely the 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> and 9<sup>th</sup> years of schooling, between the ages of 9 and 15, of both gender. In the scope of this research, the sample plan is of the non-probabilistic type or for convenience.

Out of the 596.181 students in the 2nd and 3rd cycles in Portugal in 2017/2018, 29.782 students belong to the regions of Leiria and Viseu, 10.976 belong to the 2nd cycle and 18.506 belong to the 3rd cycle of basic education. For the definition of the sample, we used a statistical model

that, in order to define the fundamental parameters (with a sample error of 5%), informed us the representative number of people we should collect to achieve the predefined reliability of the results, according to the universe at a more heterogeneous distribution with a confidence level of 95%, a sample of at least 384 participants is required (Ortega & Cayuela, 2002; Sim & Wright, 2005).

Out of the 560 participants in this program, only 502 completed the questionnaire proposed. 47 participants were excluded due to answering the questionnaires incorrectly or not meeting the inclusion criteria. It was composed of 455 participants aged between 9 and 15 years old (mean  $12.66 \pm 1.845$ ).

The study had as inclusion criteria: age between 9-15 years; to be students of the 2nd and 3rd cycles of basic education in schools in Viseu and Leiria; participate voluntarily in the study after formal consent of the parents; autonomous gait and, as exclusion criteria: students with a surgical process; with intellectual developmental difficulties; in the process of physical rehabilitation.

## 1.2. Data collection instruments

All the parent's participants that consented to participate in the study and correctly performed the following procedures:

- Application of the questionnaire to evaluate postural habits;
- Assessment of weight and height;
- Capture of photographic images in the static position with and without backpack in lateral and later position;

The data collection instruments to be used in the present investigation were:

**Sociodemographic Questionnaire:** This questionnaire contained 8 sociodemographic characterization questions, with the following parameters: the school's name the year of schooling, the student's number, date of birth, age, gender, weight and height;

**Body discomfort questionnaire** (Corlett & Bishop, 1976);

**Postural habits assessment questionnaire** constituted by 11 questions, with lines, through which the postural habits of the students are evaluated. The original questionnaire was written by Rebolho (Rebolho et al., 2011), to whom the authorization was requested, and it was granted. This questionnaire was initially culturally adapted to the Portuguese reality by the director at the School of Education and Social Sciences of the Polytechnic Institute of Leiria and by the director of the D. Dinis - Leiria School Group;

**Photographic images:** Image collection in the static standing posture in posterior and lateral position and, sitting in lateral position, with posterior postural analysis through the images of the students performed by two experts, one in the area of Physiotherapy and another in the area of Human Kinetics (later called experts).

## 1.3. Procedures

### 1.3.1. Cultural and linguistic adaptation of the Postural Habits Assessment Questionnaire (PHAQ)

The process of linguistic and cultural adaptation of the questionnaire to assess postural habits for the Portuguese population was carried out through the establishment of the "panel of experts", whose objective was to evaluate conceptual and linguistic equivalence through

brainstorming meetings, followed by a retroversion and consequent analysis of the results by the panel of experts (experts 1 and 2) to obtain a final consensus version of the content of the PHAQ.

In a second phase, the "panel of experts" was constituted, so that the content of the questionnaire could be analyzed and validated. In order to set up the "panel of experts", a Portuguese licensed teacher, Cláudia Daniela Oliveira Lopes, graduated from the 2nd cycle of Basic Education in Portuguese / English by Jean Piaget Higher Education School / Viseu, a teacher at the Lisbon school and as second expert for the constitution of the "panel of experts", invited Dr. Rui Manuel Neto e Matos, PhD in Human Kinetics, professor and director of the School of Education and Social Sciences of the Polytechnic Institute of Leiria. He has already carried out several studies and publications on postural analysis and behavior, which was requested to carry out the linguistic and cultural adaptation of the questionnaire of evaluation of the postural habits of Master Marília Christina Rebolho for the Portuguese population with corrections to the grammatical level, the adequacy of the vocabulary and the clarity of the text. Dr. Rui Matos has a dual role, first as an expert in the linguistic adaptation of the PHAQ and secondly as a expert in the area of postural analysis and behavior.

As the last expert for our constitution of the "panel of experts", specializing in the field of physiotherapy, we invited Professor Nuno Adriano de Sousa Carvalho, a physiotherapist with a focus on occupational health and ergonomic assessment of jobs, a doctorate in physiotherapy from the University of Porto, and currently a professor at the Piaget Institute of Viseu.

After the creation of the "expert panel" and based on this sequential methodology, which aimed to evaluate conceptual and linguistic equivalence, linguistic and cultural adaptation was carried out through brainstorming meetings, followed by a retroversion and consequent analysis of the results by the "panel of experts" (experts 1 and 2), to obtain a final consensus version of the content of the PHAQ. In this way it is verified that the content was analyzed by a panel of experts from clinical reviewers in the field of physiotherapy and human kinetics (experts 2 and 3).

The aim of this study was to evaluate the clarity, comprehension and fit of words for the Portuguese language of Portugal and Portuguese culture, which implied a change in the terms of Portuguese from Brazil to Portuguese in Portugal, since these are sociocultural realities and with different linguistic variations.

As recommended by several existing articles for cultural validation and adaptation, the use of a clinical review by a panel of professionals in the area of physiotherapy and human mobility and a small population for the application of the same for the accomplishment of a pre-test, is an integral part of the process of cultural adaptation. This panel was meant to represent, in the best possible way, the general population.

The process of linguistic and cultural adaptation of the questionnaire to assess postural habits ran from February to March 2018 and the pre-test in March. Later, in April, the images and questionnaires.

In the analysis of the questionnaire factors, the qualitative data were transformed into scalar data to analyze the statistical validity. The results of each question, concerning: sitting position, with the subscales of the position of the back, position of the buttocks and position of the feet; standing posture, with the subscales of the position of the back, position of the feet and position of the head; position carrying the backpack; position that lifting objects; position carrying objects; sleeping position and; position the pillows when sleeping (Figure 1).

Participante nº: \_\_\_\_\_  
 Nº Aluno: \_\_\_\_\_  
 Data: \_\_\_\_/\_\_\_\_/20\_\_

**Questionário de avaliação de hábito postural (PHAQ)**

Por favor, responda as perguntas a seguir. Indique uma única resposta que corresponde a postura que habitualmente utiliza no seu dia-a-dia. Este questionário não possui resposta certa ou errada, somente a indicação da postura utilizada pelo requerido.

Escola: \_\_\_\_\_ Ano de escolaridade: \_\_\_\_\_ Turma: \_\_\_\_\_  
 Data Nascimento: \_\_\_\_/\_\_\_\_/\_\_\_\_ Idade: \_\_\_\_\_ Menino ( ) Menina ( )  
 Altura: \_\_\_\_\_ Peso: \_\_\_\_\_

**1.) Qual a posição que habitualmente costumas ter, quando estás sentado(a)?**

**1.1.) Qual a posição das tuas costas:**

a) Retas, com costas encostadas ao encosto da cadeira ( )  
 b) Curvada, com costas encostadas ao encosto da cadeira ( )  
 c) Retas, com costas afastadas do encosto da cadeira ( )  
 d) Curvada, com costas afastadas do encosto da cadeira ( )  
 e) Não sei ( )

**1.2.) Qual a posição das tuas nádegas:**

a) Afastadas do encosto da cadeira, encostando para a frente ( )  
 b) Perto do encosto da cadeira, sem encostar para a frente ( )  
 c) Não sei ( )

**1.3.) Qual a posição dos teus pés:**

a) Alcançam o chão, ficando retos, apoiados no chão ( )  
 b) Alcançam o chão com as pontas ( )  
 c) Alcançam o chão, mas ficam sentados na ponta da cadeira e não encostam as costas ( )  
 d) Ficam pendurados ( )  
 e) Não sei ( )

**2.) Qual a posição que costumas ter quando estás de pé?**

**2.1.) Qual a posição das tuas costas:**

a) Retas ( )  
 b) Curvadas para a frente com a barriga para a frente ( )  
 c) Com as nádegas "arrebitadas" ( )  
 d) Não sei ( )

**2.2.) Qual a posição dos teus pés:**

a) Afastados ( )  
 b) Juntos ( )  
 c) Não sei ( )

**2.3.) Qual a posição da tua cabeça:**

a) Inclinada para cima ( )  
 b) Inclinada para baixo ( )  
 c) A olhar para a frente ( )  
 d) Não sei ( )

**3.) Qual é a posição que, habitualmente, usas para carregar a tua mochila escolar?**

a) Nas costas, com uma ou duas alças num ombro ( )  
 b) Nas costas, com uma alça em cada ombro ( )  
 c) Na mão ( )  
 d) À frente, com uma alça em cada ombro ( )  
 e) Não sei ( )  
 f) Outro ( ) Qual? \_\_\_\_\_

**4.) Qual é a posição que, habitualmente, usas para levantar um objeto do chão?**

a) As costas curvadas ( )  
 b) As costas retas ( )  
 c) Não sei ( )

**5.) Qual é a posição que usas para mudar um objeto de lugar?**

a) De frente para o objeto, segues-o com as duas mãos e gira com o objeto próximo do corpo ( )  
 b) De lado, segues-o com uma mão e gira com o objeto afastado do corpo ( )  
 c) Não sei ( )

**6.) Quando dormes:**

**6.1) Em que posição costumas dormir?**

a) De barriga para baixo ( )  
 b) De barriga para cima ( )  
 c) De lado ( )  
 d) Não sei ( )

**6.2) Em que posição colocas as almofadas quando dormes:**

a) Não uso ( )  
 b) Na cabeça ( )  
 c) Nos braços ( )  
 d) Nas pernas ( )  
 e) Misto ( )  
 f) Não sei ( )

Figure 1 – Postural habits assessment questionnaire (PHAQ)

### 1.3.2. Data Analysis

For the analysis of the answers of the questionnaires, after the collection of the same, the nominal and qualitative data of each question regarding posture was transformed into ordinal and quantitative data for later analysis of means and standard deviations, as well as the relationship between variables and, a correlation of the answers given by the experts and the participants, resulting in the following structure of the positions:

- Sitting, position of the back: 1 - Straight lines; 2 - Curved against each other; 3 - Straight away from the backrest; 4 - Curved away from the backrest and; 5 - I do not know.
- Sitting, buttock position: 1- Away from the backrest / chair; 2- Near backrest / chair and; 3- I do not know.
- Sitting, your feet: 1- Reach the ground are supported on the ground; 2 - They reach the ground with the posts; 3 - Reach the ground, but I sit on the edge of the chair and do not lean my back; 4- They hang and; 5- I do not know.
- Standing; position of your back: 1- Straight; 2 - Curved for front with belly forward; 3- With the "raised" buttocks and; 4- I do not know.
- Standing; position of your feet: 1- Away; 2- Together and; 3- I do not know.
- Standing; position of your head: 1- Tilted up; 2- Tilted down; 3- Look forward and; 4- I do not know.
- Position that you carry the backpack: 1- Back with one or two handles on one shoulder; 2- Back with a handler on each shoulder; 3- At hand; 4- Front with a strap on each shoulder; 5- I do not know and; 6- Other.
- Position you use to lift an object from the ground: 1- Curved back; 2- Straight back and; 3- I do not know.
- Position that you use to change an object of place: 1- Front to the object, holding it with both hands and turning with the object near the body; 2 - On the side, hold it with one hand and twist the object away from the body and; 3- I do not know.
- Sleep position: position that you usually sleep: 1- Prone position; 2 - Supine position; 3- Lateral position; 4- I do not know.
- Position of the pillows when you sleep: 1- I do not use; 2- Under the head; 3- Between the arms; 4- Between the legs; 5- Mixed position, 6- I do not know.

For data analysis, and characterization of the sample, descriptive statistics and analytical or inferential statistics were used.

Data were analysed using a statistical analysis program - *Statistical Package for the Social Sciences* (SPSS), version 24.0.

The normality of the distribution of the studied variables (age) through the Kolmogorov-Smirnov test, in order to be able to define on the use of parametric or non-parametric tests, verifying that the variables in study did not follow the normality, resorting for this reason the use of non-parametric tests.

Mann-Whitney U test of two independent samples was used to comparative analysis of the answers given by the expert (2 and 3) in completing the questionnaire and to comparative analysis of real image with students' PHAQ response, setting the level of significance at  $p \leq .05$ .

Kruskal-Wallis test, carried out among the specialists through the images of the postures and the self-perception responses of the posture answered by the participants through the PHAQ, setting the level of significance at  $p \leq .05$ .

The Factor Analysis was used to study the relational structure between the different children's positions studied in the questionnaires. Bartlett's test of sphericity was also used to test whether the correlation matrix is an identity matrix, the Kaiser-Meyer-Olkin (KMO) test, to

verify the proportion of data variance that can be considered common to all variables ( $KMO > 0.5$ ), and the psychometric study of the scale, seeking to assess its reliability, which is a measure of its ability to be consistent, taking into account Cronbach's Alpha values (Coutinho, Martins, & Pereira, 2014; Maroco, 2007).

## 2. RESULTS

### 2.1. Cultural and linguistic adaptation of the posture habits questionnaire

It is the PHAQ of a postural evaluation instrument that intends to evaluate the posture of 2nd and 3rd cycles students, all participants in this panel are included in the inclusion criteria. Experts of this panel considered that the measure did not have any problems regarding its clarity and form filling, referring to the expert two other expressions also make sense as, for example, "buttocks are away from the chair" could be replaced by "buttocks are away from the backrest / back of the chair", the same "buttocks near the chair" by "buttocks near the backrest".

However, it was considered that the same could be said in relation to other tasks, in this case other postures of each segment that could evaluate new variables (e.g. inclined or rounded head position) and since it was not considered to add new items, but to analyze those which were part of the original measure (which were not questioned), only those comments were recorded.

### 2.2. Results in the pre-test

The pre-test sample consisted of 10 students attending the Schools of Viseu and Leiria, 2nd and 3rd cycles, namely 5th, 6th, 7th and 9th years of schooling, in the age bracket of the 9 to 15 years, of both genders.

This small sample was selected according to the inclusion and exclusion criteria defined in the study. In this sample of 10 students of the 2nd and 3rd cycles of the Schools of Leiria and Viseu, the average age was  $11.80 \pm 1.317$  years old.

This questionnaire turned out to be a very short measure, presenting an average filling time of 10 minutes.

When we verify the answers given by the experts (2 and 3), through the blind double-blind analysis of the static image in the sitting and standing positions, and answering in the PHAQ, what represents the real image and comparing the answers given by the expert 2 and expert 3, there are no significant differences between scores in all variables analyzed and compared between the posture image of each participant, using the Mann-Whitney U test of two independent samples ( $p > 0.05$ ) (Table 1).

Table 1 - Mann-Whitney U-test comparative analysis of the answers given by the expert (2 and 3) in completing the questionnaire

| Scale validation (pre-test)  | Expert 2 | Expert 3 | <i>p</i> -value |
|------------------------------|----------|----------|-----------------|
| Seated Image of the Back     | 11,70    | 9,30     | <b>0,333</b>    |
| Image Buttocks               | 10,00    | 11,00    | <b>0,648</b>    |
| Sitting On Foot Image        | 9,85     | 11,15    | <b>0,584</b>    |
| Standing Image Back Position | 12,05    | 8,95     | <b>0,212</b>    |
| Image Foot Position          | 10,50    | 10,50    | <b>1,000</b>    |
| Picture Head Position        | 10,40    | 10,60    | <b>0,914</b>    |

Comparing the answers given by the expert 2 or 3 and the answers given by the students in the questionnaires, it was similarly verified in both cases where there were no statistically significant differences, since the majority obtained a value of  $p > 0.05$ , except in the posture (image) position of the feet ( $p = 0.012$ ).

Regarding the answers given by the expert 2 and the expert 3 and comparing with the self-perception responses of the posture given in the questionnaires, it is observed that there are no significant differences, since in most of the answers there was no statistically significant differences being ( $p > 0.05$ ). Expectations regarding the image of the position of the feet had a value of ( $p = 0.003$ ).

With these data we can verify that there are no differences of the answers given by the students in the questionnaires and the analysis of the experts when observing the images of the students in lateral and posterior view, using the Kruskal-Wallis test (Table 2).

Table 2 - Kruskal-Wallis test, carried out among the specialists through the images of the postures and the self-perception responses of the posture answered by the participants through the PHAQ

|                              | Expert 2 | Experts 3 | Questionnaire | <i>p</i> -value |
|------------------------------|----------|-----------|---------------|-----------------|
| Seated Image of the Back     | 17,55    | 14,00     | 14,95         | <b>0,610</b>    |
| Image Buttocks               | 14,70    | 16,15     | 15,65         | <b>0,909</b>    |
| Sitting On Foot Image        | 14,00    | 15,90     | 16,60         | <b>0,753</b>    |
| Standing Image Back Position | 18,60    | 14,25     | 13,65         | <b>0,338</b>    |
| Image Foot Position          | 13,00    | 13,00     | 20,50         | 0,003           |
| Picture Head Position        | 14,95    | 15,20     | 16,35         | <b>0,843</b>    |

### 2.3. Results of the descriptive and inferential statistics of the Postural Habits Assessment Questionnaire (PHAQ)

In a universe of 455 students at the beginning and end of the 2nd and 3rd cycles of the Leiria and Viseu Basic Schools, the percentages of students were 32.1% from the 5th grade, 32.5% from the 6th grade, 16.3% from the 7th grade and 19.1% from the 9th grade.

The male participants were 50.3% and 49.7% were female, with an average age of  $11.43 \pm 1.156$  years old.

Through the evaluation of the images of the students, the results of the observation of the real image were compared in the lateral and posterior view of the sitting and standing positions and was compared with the responses of the postural self-perception performed through the PHAQ

performed by the students and, thus, it is demonstrated that there were no statistically significant differences, with a value of  $p > 0.05$  (Table 3).

Table 3 - Mann-Whitney U-test, comparative analysis of real image with students' PHAQ response

| Validation of the questionnaire                                                                               | Observation of student's image | Questionnaire |              |
|---------------------------------------------------------------------------------------------------------------|--------------------------------|---------------|--------------|
| Comparison of the observed real positions (images) of the students and the postural self-perception performed |                                |               | p-value      |
| Seated Image of the Back                                                                                      | 74,82                          | 85,12         | <b>0,121</b> |
| Image Buttocks                                                                                                | 79,13                          | 80,86         | <b>0,756</b> |
| Sitting On Foot Image                                                                                         | 76,49                          | 83,46         | <b>0,155</b> |
| Standing Image Back Position                                                                                  | 81,37                          | 78,65         | <b>0,594</b> |
| Image Foot Position                                                                                           | 77,41                          | 81,59         | <b>0,410</b> |
| Picture Head Position                                                                                         | 76,59                          | 83,37         | <b>0,223</b> |

## 2.4. Questionnaire validation

Through Cronbach's alpha coefficient, the results demonstrate a global value of the eleven questions from the postural habits questionnaire of  $\alpha = 0.536$ , which means a low relation between the questions and what actually represents the questionnaire provides, that the questions are analysed individually, since the self-perception of each posture (sitting, standing, sleeping, etc.) is analysed. These data are confirmed by the analysis of each item, when it is withdrawn/eliminated, reinforces the individual analysis. These data can be verified in Table 4.

Table 4 - Mean values, standard deviation and Alpha Cronbach of the respective variables

|                           | Mean | Standard deviation | Cronbach Alpha if the item is deleted |
|---------------------------|------|--------------------|---------------------------------------|
| Sitting back              | 2,29 | 1,233              | 0,501                                 |
| Sitting buttocks          | 1,90 | 0,637              | 0,508                                 |
| Sitting with feet         | 1,89 | 1,285              | 0,481                                 |
| Standing on back position | 1,57 | 1,056              | 0,477                                 |
| Standing foot position    | 1,72 | 0,761              | 0,483                                 |
| Standing head position    | 2,92 | 0,549              | 0,490                                 |
| Backpack transport        | 1,91 | 0,856              | 0,505                                 |
| Lifting objects           | 1,55 | 0,661              | 0,495                                 |
| Change objects            | 1,60 | 0,780              | 0,474                                 |
| Sleeping position         | 1,66 | 1,037              | 0,510                                 |
| Cushion location          | 1,47 | 1,253              | 0,465                                 |

These results are confirmed by the Kaiser-Meyer-Olkin (KMO) factorial test, with a low relation between each question (0.682) and the Bartlett's test of sphericity showing statistical differences between the questions ( $p = 0.000$ ). The Intraclass Correlation Coefficient (ICC) or reproducibility coefficient (R) obtained a satisfactory reproducibility of the study with an average measures  $p = 0.514$ .

These final indications were used to start the following discussion, according to the main objectives of this study.

### 3. DISCUSSION

The sample of the pre-test consisted of a sample of 10 students aged 9 to 15 years, of both sexes, who showed that there are no differences between the answers given by the students in the questionnaires and the analysis of the experts when observing the students' images in the side and back view.

The data obtained in relation to the answers given by the expert 2 and the expert 3 in comparison to the answers given in the questionnaires by the students showed that there were no significant differences ( $p > 0.05$ ) between the answers given by the students in the questionnaires, that is, the self-perception of the students and the analysis of the experts when observing the images of the students in lateral and posterior view.

These results lead to the rejection of the hypothesis that there were differences between the experts 2 and 3 in the analysis of the postural image, even though the double-blind evaluation was performed.

In general, there were no statistically significant differences in the analysis of images by the experts with the completion of the questionnaire of posture habits, nor differences between the real image of the one who analysed with the completion of the questionnaire carried out by the students.

With regard to the sample of students in which it was intended to validate the PHAQ, it consisted of 455 students from the 2nd and 3rd cycles of the Basic Schools of the district of Leiria and Viseu, which results from a representative sample of all students in the 2nd and 3rd cycles of Portugal ( $N = 596181$ , requiring a sample of 400 students), as well as of the region Leiria and Viseu ( $N = 29782$ , requiring a sample of 384 students).

The results obtained, through the evaluation of the students' images with the self-perception responses through the questionnaire, reveal that there is no statistically significant differences between answers given by the students in the questionnaires and the analysis of the experts when observing the images of the students in lateral view and posterior.

As to the comparison of the results of observation of the students' actual image in the lateral and posterior view and in the sitting and standing positions with the comparison of the responses of the postural self-perception, performed through the PHAQ, it was verified that there were no statistically significant differences ( $p > 0.05$ ).

The results of the psychometric analysis of the study, using Cronbach's alpha coefficient ( $\alpha = 0.536$ ), suggesting a low relation between the questions and that represents what the questionnaire actually provides, that the questions are analysed individually, since the self-perception of each postural segment (sitting, standing, sleeping, etc.) is analysed. Thus, the results point to quite satisfactory values, which guarantee to the instrument good psychometric qualities, namely of validity and reliability.

The results indicate an adequate psychometric quality of the questionnaire, allowing its use in samples of Portuguese young people with the same characteristics as those who participated in the present study.

Its use will be an added value so that, from its application, an analysis of the postural habit of children and adolescents can be carried out and, in this way, one can act in accordance with the quality of this information, the success of early prevention of behavioural risk factors, more specifically postural habits in children and adolescents.

According to Sedrez, Rosa, Noll, Medeiros and Candotti (Sedrez et al., 2015), based on their study, the presence of structural postural alteration in the spine of children and adolescents is considerable. The results of his study reveal a prevalence of postural changes of 79.7%.

Age, gender, backpack weight, anthropometric parameters, computer positioning, sitting time, decreased flexibility, and less active lifestyle are some of the variables that cause musculoskeletal discomfort and have an influence on posture. Children and adolescents may present with scoliosis, body asymmetry, spinal misalignment and pain, which may have long-term consequences, compromising health and influencing adult quality of life (Coelho et al., 2014; G. Desouzart et al., 2016; Gustavo Desouzart & Gagulic, 2018).

The importance of the validation of the posture habits questionnaire is also corroborated by the fact that several factors contribute to the development of postural changes in children and adolescents, being associated with future health problems of the neuro-musculoskeletal system if these are not detected early (Minghelli et al., 2009; Santos et al., 2009; J. G. Silva et al., 2014).

The present study was not free of limitations. It should be noted that there were some limitations that arose during the study, such as the fact that the sample had a large number of participants, which made it difficult to collect data, since it was a school population that we had to meet with the educational institution in the collection of data, since we could not "interrupt in a certain way the school operation".

Finally, it is worth mentioning that the time factor was a constraint for the whole study, which did not allow us to extend our data collection in other districts.

In future studies, we would like to study the application of the questionnaire to evaluate the posture habits in a sample that covers more schools of the different districts of the country.

## CONCLUSION

Therefore, after the results presented, it will be worthwhile to use the questionnaire in the present study, assuming it as an instrument to evaluate the posture habits of children and adolescents through the macro analysis of posture, whose results may be used for the analysis epidemiology and characterization of postural habits in this type of population and generate information about students' health problems.

The evaluation of postural habits, based on the validated questionnaire, is a method of detecting postural changes, through a macroanalysis, with low cost, short application time and no risk. This method does not consist of a diagnostic medium but is useful in the analysis of postural asymmetries from various postures.

From the data obtained, it is considered important to implement programs to track postural habits in children and adolescents, in order to prevent changes and / or treat them early.

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