DOI: 10.1590/1809-2950/e24003124en

ORIGINAL RESEARCH

Development and validation of the body posture self-perception questionnaire

Desenvolvimento e validação do questionário de autopercepção da postura corporal

Desarrollo y validación del cuestionario de autopercepción de la postura corporal

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ABSTRACT | The assessment of self-perceived body posture still lacks valid instruments that measure the "perception" construct. This study aims to develop and validate the content of a questionnaire that assesses self-perceived static body posture alignment in school-aged children and adolescents. In total, six experts in postural assessment and education — three dedicated to clinical practice and three, to the scientific area — evaluated the Self-Bodpos proposed instrument by a validation questionnaire with general and specific questions about each item and the options for closed answers and contained spaces for suggestions. The content validity index (CVI) served to calculate the experts' responses. In total, two rounds of evaluations with the experts were necessary. In the first round, CVI ranged from 90 to 40%, requiring further adjustments in the drawings and response options. In the second round, the CVI reached values above 90%, ending the content validation stage. The Self-Bodpos proposed questionnaire offers a valid tool to assess children's and adolescents' self-perceived static body posture, which can serve scientific research, clinical practice, and the educational environment.

Keywords | Validation Study; Posture; Self-Perception.

RESUMO | A avaliação da autopercepção da postura corporal ainda carece de instrumentos válidos que meçam o constructo "percepção". O objetivo deste estudo é desenvolver e validar o conteúdo de um questionário que avalie a autopercepção do alinhamento da postura corporal estática de crianças e adolescentes em idade escolar. Seis experts em avaliação e educação postural, sendo três dedicados à prática clínica e os outros três à área científica, avaliaram o *Self-Bodpos* por meio de um questionário de validação com perguntas gerais e específicas sobre cada item, tendo opções de respostas fechadas e com espaços para sugestões. Foi utilizado o Índice de Validade de Conteúdo (IVC) para calcular as respostas dos experts, sendo necessárias duas rodadas de avaliações. Na primeira, os IVC variaram de 90% a 40%, necessitando de maiores ajustes nas ilustrações dos desenhos e nas opções de respostas. Na segunda rodada, os IVC atingiram valores acima de 90%, finalizando a etapa de validação de conteúdo. O questionário *Self-Bodpos* é uma ferramenta válida para avaliar a autopercepção da postura corporal estática de crianças e adolescentes, podendo ser utilizada em pesquisas científicas, nas clínicas e no ambiente escolar.

Descritores | Estudo de Validação; Postura; Autopercepção.

RESUMEN | La evaluación de la autopercepción de la postura corporal todavía carece de instrumentos válidos que midan el ítem "percepción". El objetivo de este estudio fue desarrollar y validar el contenido de un cuestionario que evalúa la autopercepción de la alineación de la postura corporal estática de niños y de adolescentes en edad escolar. El Self-Bodpos fue validado por seis expertos en evaluación y educación postural, de los cuales tres se dedican a la práctica clínica;

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y los otros tres al área científica, mediante un cuestionario de validación con preguntas generales y específicas sobre cada ítem, con opciones de respuesta cerrada y espacios para sugerencias. Se utilizó el Índice de Validez de Contenido (IVC) para calcular las respuestas de los expertos, lo que requirió dos rondas de evaluaciones. En la primera, el IVC osciló entre el 90% y el 40%, requiriendo mayores ajustes en las ilustraciones de los dibujos y en las opciones de respuesta. En la segunda ronda, el IVC alcanzó valores superiores al 90%, finalizando la etapa de validación de contenido. El cuestionario Self-Bodpos es una herramienta válida para evaluar la autopercepción de la postura corporal estática en niños y en adolescentes, y se puede utilizarlo en investigación científica, en clínicas y en el entorno escolar.

Palabras clave | Estudio de validación; Postura; Autopercepción.

INTRODUCTION

Posture refers to adopting an automatic and unconscious position in static and dynamic conditions to maintain balance, maximum stability, and less energy consumption, minimally stressing anatomical structures[1,2].

Static body posture includes inherent individual characteristics, which depend on daily experienced attitudes/body positions[3]. Once the habit of holding a certain position becomes constant during daily activities, the body tends to adapt to this pattern, setting inadequate postures due to body asymmetries[4].

Postural therapies use active methods to correct spinal deformities, realign body segments, and prevent poor postures[4]. These treatments instruct patients to perform active movements to correct their posture. This process requires refined body awareness so individuals can perceive their own physical changes. Thus, understanding self-perceived body posture is essential for patients and physical therapists conducting treatment.

The perception of body posture is essential for the success of postural therapies. The ability to actively perceive and correct postures constitutes the principle for self-perceived static body posture, in which individuals can move between positions of comfort and alignment, avoiding the fixation of inappropriate standards[5].

The need to evaluate the effectiveness of educational and/or therapeutic practices necessitates the constant development of evaluation tools. The educational environment has greatly advanced scientific research, validating instruments such as photogrammetry, checklists, battery of tests and questionnaires that aim to assess static or dynamic body posture, lifestyle habits, postures in activities of daily living, and musculoskeletal pain[6-9]. However, as far as we know, no such instrument take in consideration the perception of children and adolescent regarding their body posture[5].

This study aimed to develop and validate a questionnaire that assesses school-age children's and adolescents' self-perceived static body posture alignment. Due to its ease of application and low cost, this questionnaire can also serve scientific research or clinical practice.

METHODOLOGY

This study is characterized by the development and content validation of an instrument to assess children's and adolescents' self-perceived static body posture called Self-Perceived Body Posture Questionnaire (Self-Bodpos). The guidelines of the Consensus-Based Standards for the Selection of Health Measurement Instruments (Cosmin) were followed in this study.

In total, two stages were involved in developing the proposed questionnaire: (1) a review study[5] that aimed to find what instruments assess self-perceived body posture, describing the type of instrument, its measurement properties (validity and reliability), and postural outcomes and (2) researchers' experience with postural assessment and education. Based on these theoretical and practical assumptions, static positions were initially chosen in the frontal and sagittal planes, representing the aligned body posture and the most common postural changes in children and adolescents.

Then, based on photographs of one of the researchers reproducing all initially defined static positions, the images were edited and graphically transformed into drawings. This procedure was carried out so the images would become appropriate for children in order to facilitate individuals to relate to them since drawings facilitate communication and better achieve the proposed objective of the instrument.

Thus, in the first version of the questionnaire, which was named Self-Perceived Body Posture Questionnaire,

static positions are shown in the frontal back, forward-facing frontal, and sagittal planes. The questions were distributed in body segment assessments, and only one was aimed at the body as a whole. In addition to the images, each question had two descriptive answer options for students who are unable to perceive their posture in the drawings or who perceive themselves unlike the offered alternatives.

Expert evaluation

Using snowball sampling, the convenience sample was composed of six experts in postural assessment and education, three of whom dedicated themselves to clinical practice, whereas the other three, to the academia, having experience in developing and validating instruments such as questionnaires and checklists (as recommended by Cosmin). All six experts had a minimum of 10 and a maximum of 30 years of professional experience in posture, working in clinical practice or scientific research with re-education, education, and postural assessment. The experts were professionals in physical therapy, physical education, and/or psychomotricity.

The invitation to participate in this research, the informed consent form, the Self-Bodpos questionnaire, and a specific questionnaire for content validation were sent to experts via email.

The content validation questionnaire was composed of three generic questions related to ease of question comprehension, language adequacy, and fit of the illustrations representing the static positions of the body. The questionnaire also included questions regarding each question in the Self-Bodpos. Overall, the experts evaluated the relevance of the Self-Bodpos in showing static positions representing body posture.

All questions in the content validation questionnaire had closed answer options that consisted of inadequate (1), not very adequate (2), adequate (3), or very adequate (4). At the end of each question, a blank space was provided so that the experts could to write their suggestions and/or observations.

Chart 1. Description of the 10 questions in the content validation questionnaire regarding Self-Bodpos

Questions
1. Overall, regarding ease of understanding, you consider the Self-Bodpos questionnaire:
2. Regarding the objective of assessing the self-perceived body posture alignment by drawings, you consider the Self-Bodpos questionnaire:
3. Regarding the language in the questions, do you consider the Self-Bodpos questionnaire:
4. Regarding question 1 of the Self-Bodpos questionnaire, you consider:
5. Regarding question 2 of the Self-Bodpos questionnaire, you consider:
6. Regarding question 3 of the Self-Bodpos questionnaire, you consider:
7. Regarding question 4 of the Self-Bodpos questionnaire, you consider:
8. Regarding question 5 of the Self-Bodpos questionnaire, you consider:
9. Regarding question 6 of the Self-Bodpos questionnaire, you consider:
10. Regarding question 7 of the Self-Bodpos questionnaire, you consider:

After the experts' feedback, suggestions for modifications were incorporated into the Self-Bodpos, thus obtaining its second version. This evaluation by the experts was carried out until they reached a consensus.

Data analysis

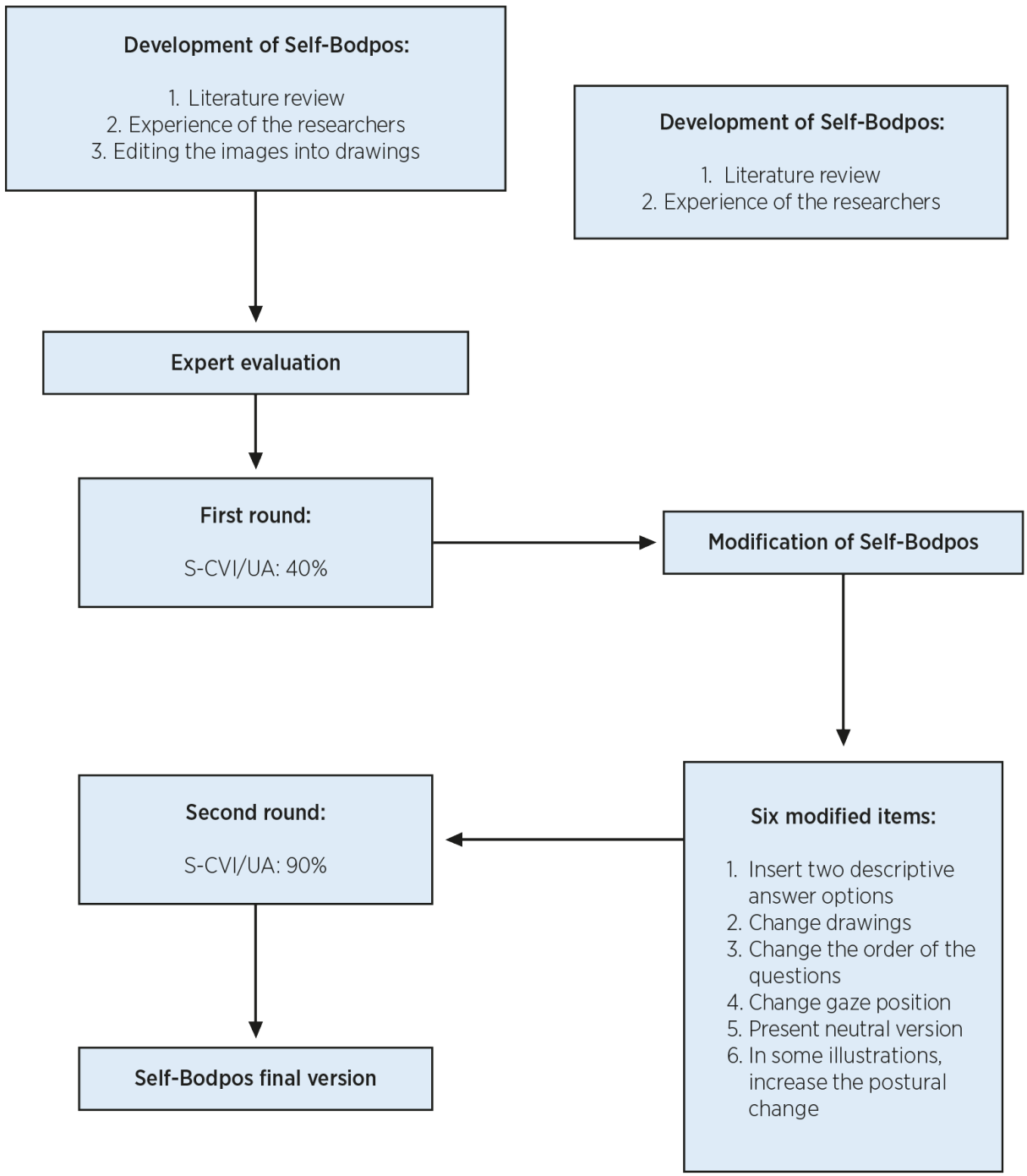
Content validation of the Self-Bodpos questionnaire was determined based on experts' agreement. For this, the content validity index (CVI) was used as it measured the content validity of each Self-Bodpos item and that of the questionnaire as a whole. The following indices were used: (1) item-level content validity index (I-CVI): calculated by the proportion of each question that was rated as three or four by the experts in the content validation questionnaire; (2) scale-level content validity index/universal agreement calculation method (S-CVI/UA): defined by the proportion of items in the content validation questionnaire all experts rated as three or four; (3) scale-level content validity index/averaging calculation method (S-CVI/Ave): the average proportion of

responses to the items of the content validation questionnaire, obtained by adding the I-IVC and dividing it by the number of questions in the content validity questionnaire[10]. To consider the validity of the questionnaire, a minimum of 80% agreement between the experts was adopted as a criterion[11] for each of the three indices.

RESULTADOS

Figure 1 shows a flowchart of all the steps to develop and validate the Self-Bodpos questionnaire. Building the final version of the questionnaire required two rounds of expert evaluation.

Figure 1. Flowchart of the stages of development and validation of the Self-Bodpos questionnaire



SELF-PERCEIVED BODY POSTURE QUESTIONNAIRE (*SELF-BODPOS*)

Name: _____ Date of birth: __/__/__

Weight: _____kg Height:____cm Sex: Male [ ] Female [ ]

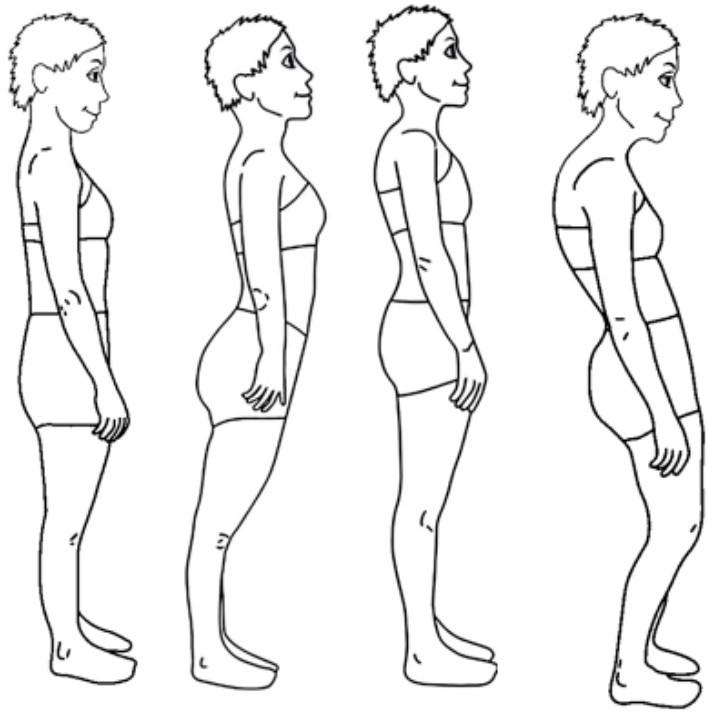
Year: _____ Name of school: _____ Municipality: _____

Name of the guardian: _____

SELF-PERCEIVED BODY POSTURE IS HOW YOU PERCEIVE YOUR BODY POSTURE. THERE ARE NO RIGHT OR WRONG ALTERNATIVES. IT IS IMPORTANT THAT YOU ANSWER BY YOURSELF, CHOOSING ONLY ONE OPTION IN EACH QUESTION THAT BEST REPRESENTS THE WAY YOU PERCEIVE YOURSELF IN THE STANDING POSITION.

CLICK ON THE CHOSEN OPTION.

(1) I PERCEIVE THE POSITION OF MY BODY AS THAT OF THE FIGURE:



( ) ( ) ( ) ( )

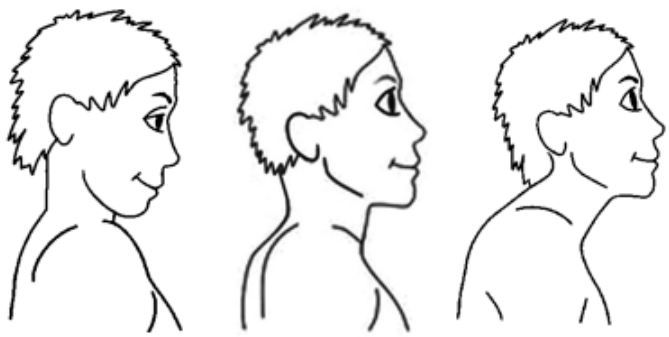
I can't describe how I perceive my body

( )

I perceive my body unlike that of the drawings

( )

(2) I PERCEIVE THE POSITION OF MY HEAD AS THAT OF THE FIGURE:



( ) ( ) ( )

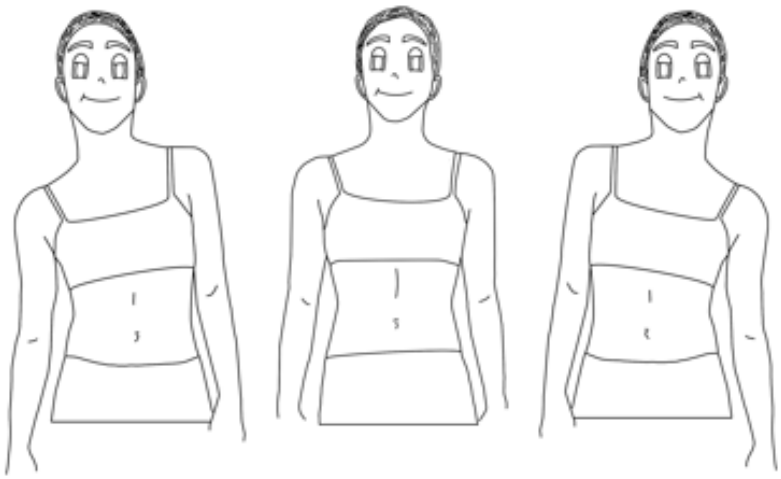
I can't describe how I perceive my head

( )

I perceive my head unlike that of the drawings

( )

(3) I PERCEIVE THE POSITION OF MY BODY AS THAT OF THE FIGURE:

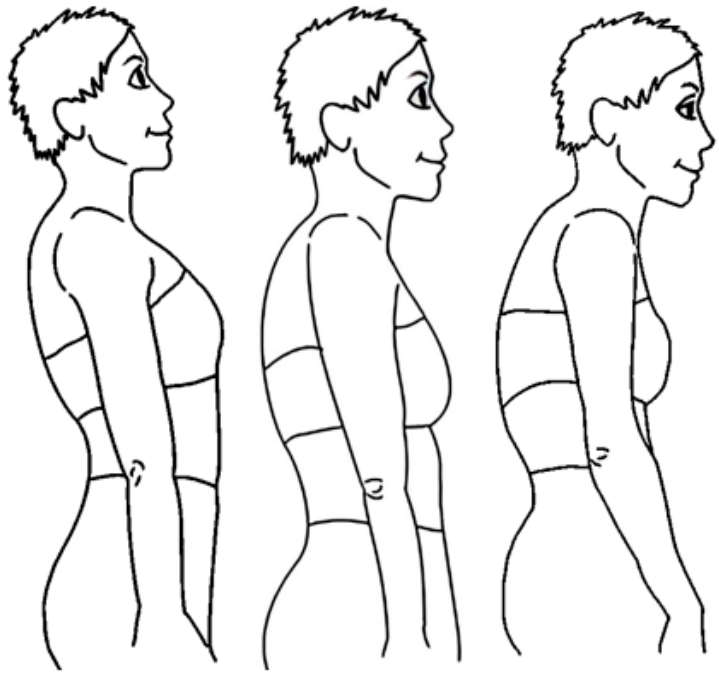


I can't describe how I perceive my body

I perceive my body unlike that of the drawings

( ) ( ) ( ) ( ) ( )

(4) I PERCEIVE THE POSITION OF MY BACK AS THAT OF THE FIGURE:



I can't describe how I perceive my back

I perceive my back unlike that of the drawings

( ) ( ) ( ) ( ) ( )

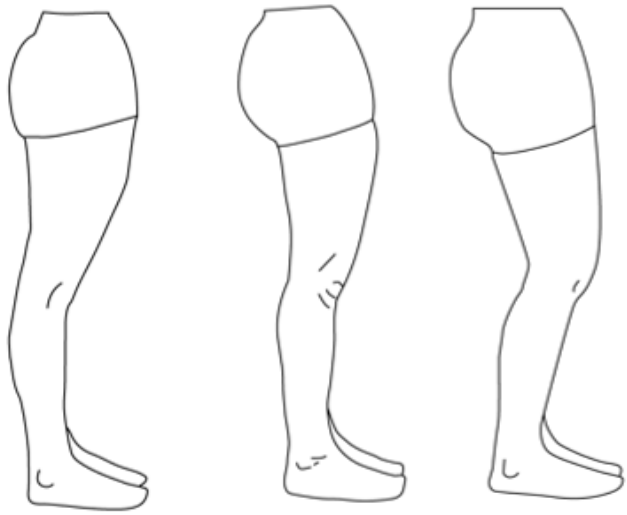
(5) I PERCEIVE THE POSITION OF MY SHOULDERS AS THAT OF THE FIGURE:

I can't describe how I perceive my shoulders

I perceive my shoulders unlike that of the drawings

( ) ( ) ( ) ( ) ( )

(6) I PERCEIVE THE POSITION OF MY KNEES AS THAT OF THE FIGURE:

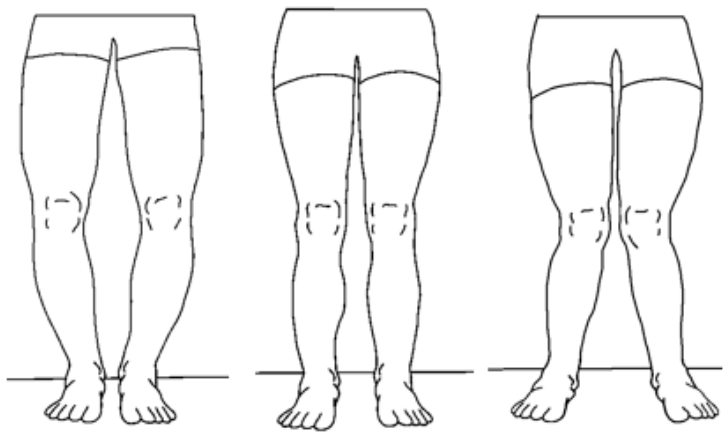


I can't describe how I perceive my knees

I perceive my body unlike that of the drawings

( ) ( ) ( ) ( ) ( )

(7) I PERCEIVE THE POSITION OF MY KNEES AS THAT OF THE FIGURE:



I can't describe how I perceive my knees

I perceive my body unlike that of the drawings

( ) ( ) ( ) ( ) ( )

The first round of evaluation by the experts obtained unsatisfactory CVI (Table 1). The sub-item S-CVI-UA, which indicates how many questions the experts classified as three or four, obtained a percentage of 40%. S-CVI/AVE, which points out the average percentage of experts who rated each question as a three or a four, totaled 88%. I-CVI, which shows the percentage of experts who rated each question as a three or a four, equaled 67% in one question and 83% in five questions. The other questions obtained 100%.

Table 1. Results of content validity index from the first round of assessment of the Self-Perceived Body Posture Questionnaire

Number of questions in the validation questionnaire	Exp. 1	Exp. 2	Exp. 3	Exp. 4	Exp. 5	Exp. 6	Rating: 3 or 4 per item	I-CVI
1	✓	✓	✓	✓	✓	✓	6	100%
2	✓	✓	✓	✓	✓	✓	6	100%
3	✓	✓	✓	✓	✓	✓	6	100%
4	X	✓	✓	✓	✓	✓	5	83%
5	X	X	✓	✓	✓	✓	4	67%

(continua)

Tabela 1. Continuação

Number of questions in the validation questionnaire	Exp. 1	Exp. 2	Exp. 3	Exp. 4	Exp. 5	Exp. 6	Rating: 3 or 4 per item	I-CVI
6	X	✓	✓	✓	✓	✓	5	83%
7	X	✓	✓	✓	✓	✓	5	83%
8	✓	✓	✓	✓	✓	✓	6	100%
9	X	✓	✓	✓	✓	✓	5	83%
10	X	✓	✓	✓	✓	✓	5	83%
PR =	50%	90%	100%	100%	100%	100%	S-CVI/Ave: 88%	
			EAP: 90%				S-CVI/UA: 40%	

Exp.: expert; N: number, I-CVI: Item-level content validity index
✓: Item evaluated as three or four in the validation questionnaire of the manual evaluated by the experts
X: item evaluated as one or two in the validation questionnaire of the manual evaluated by the experts
RP: Relevant proportion
S-CVI/Ave: Scale-level content validity index / average estimation
S-CVI/UA: Scale-level content validity index / universal agreement calculation method
EAP: Experts' average proportion

A partir desses resultados da primeira rodada, o questionário *Self-Bodpos* foi submetido às modificações, seguindo os comentários dos experts, e enviado para a segunda rodada de avaliação. Os resultados dessa segunda rodada foram satisfatórios, pois todos os índices de validade atingiram valores acima de 80%, finalizando assim o processo de validação de conteúdo (Tabela 2).

Table 2. CVI results from the second round of assessment of the Self-Perceived Body Posture Questionnaire (Self-Bodpos)

Number of questions in the validation questionnaire	Exp. 1	Exp. 2	Exp. 3	Exp. 4	Exp. 5	Exp. 6	Rating: 3 or 4 per item	I-CVI
1	✓	✓	✓	✓	✓	✓	6	100%
2	✓	✓	✓	✓	✓	✓	6	100%
3	✓	✓	✓	✓	✓	✓	6	100%
4	✓	✓	✓	✓	✓	✓	6	100%
5	✓	✓	✓	✓	✓	✓	6	100%
6	✓	✓	✓	✓	✓	✓	6	100%
7	✓	✓	X	✓	✓	✓	5	83%
8	✓	✓	✓	✓	✓	✓	6	100%
9	✓	✓	✓	✓	✓	✓	6	100%
10	✓	✓	✓	✓	✓	✓	6	100%
PR =	100%	100%	90%	100%	100%	100%	S-CVI/Ave: 98%	
			EAP: 98%				S-CVI/UA: 90%	

Exp.: expert; N: number, I-CVI: Item-level content validity index
✓: Item evaluated as three or four in the validation questionnaire of the manual evaluated by the experts
X: item evaluated as one or two in the validation questionnaire of the manual evaluated by the experts
RP: Relevant proportion
S-CVI/Ave: Scale-level content validity index / average estimation
S-CVI/UA: Scale-level content validity index / universal agreement calculation method
EAP: Experts' average proportion

The authors incorporated the experts' main suggestions (Figure 1) in the second round of evaluation: (1) in all questions, insert two descriptive answer options, namely: "I perceive the position of my knees unlike that of the drawings" and "I can't describe how I perceive my knees"; (2) replace the drawings referring to the inclination of the trunk in the back frontal plane with frontal drawings; (3) change the order of the questions, starting the questionnaire with global body posture; (4) modify the position of the gaze to better characterize the postural arrangement; (5) show a neutral version of the questionnaire that avoids differentiating girls from boy and that has illustrations only in outline without any skin tone; and (6) in some illustrations, increase postural change to facilitate visualization and differentiation.

DISCUSSION

This study aimed to develop and validate a questionnaire that assesses school-age children's and adolescents' self-perceived static body posture alignment. Building the

Self-Bodpos questionnaire used a taxonomy of the relevant measurement properties in assessing the quality of health self-report instrument results[12]. The taxonomy this study used belongs to the Cosmin initiative.

As it belongs to the development of evaluation instruments, content validation uses content validity as a measure property[4,13]. It ensures that the content of the instrument adequately reflects the construct it proposes to measure[12]. Thus, this study included six posture experts who evaluated, in general, the objective, comprehensibility, and language of the instrument, and specifically each question in the questionnaire, establishing a percentage of approval and agreement between these experts with I-CVIs[10] exceeding 80%[11].

A recent scoping review concluded that up to date no instrument that assesses posture self-perception considers all body segments in their evaluation[5]. The studies this review included specifically assessed restricted postural outcomes in relation the general public, such as trunk deformities or leg and foot dysfunctions due to certain pathologies. This scoping review also showed that instruments that used images to represent the construct to be evaluated showed higher reliability values than those who only used descriptive language[5]. This finding corroborates the use of artistic drawings in the Self-Bodpos as a representation of postural changes in the body.

The scientific environment often develops questionnaires to assess what people think about their own posture[8,14,15]. A good example refers to the popularization of communication technologies[4]. The excessive use of mobile devices causes the general population to adopt inappropriate postural behaviors, becoming the object of research toward instruments that analyze and document the body habits of contemporary society[15]. Most such instruments aim to assess self-perceived dynamic body posture, that is, during activities of daily living[4,8,15].

Clinical practice deems a good diagnosis as that consisting of the maximum amount of information extracted from evaluations[16]. Thus, the clinical environment should use several types of instruments as it assesses posture. Among them, professionals usually choose to evaluate static posture due to the possible correlation between physical examinations and radiography[17,18].

Nevertheless, current evaluation routines must combine patients' own perception of their body alignment with the judgment of the professional conducting the evaluation.

The lack of instruments that assess the self-perceived static posture may explain why this aspect is yet to become routine in clinical practice, constituting the basis for the development of this study, which can even be included in school practice.

An important limitation of this study lies in the difficulty assessing posture knowledge as individuals' perceptions can overestimate or underestimate it. Another limitation refers to the closed questions in the Self-Bodpos questionnaire as they represent only one possible postural misalignment for each body segment. However, self-report lies among the most used measurement tools in the scientific and clinical environment as it is a more pragmatic measure.

CONCLUSION

The Self-Bodpos questionnaire configures a valid tool for scientific research, clinical practice, and education, as it offers of a new way to assess children's and adolescents' self-perceived static body posture.

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