


# Hip Disability and Osteoarthritis Outcome Score (HOOS): A Cross-Cultural Validation of the Brazilian Portuguese Version Study

## *Hip disability and osteoarthritis outcome score (HOOS): um estudo de validação intercultural da versão na língua portuguesa*

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### Abstract

**Objective** Translated and validated outcome instruments are of great importance, since they can be used for researchers studying different populations with the same problem. The objective of the present study was to translate, culturally adapt and validate the Hip Disability and Osteoarthritis Outcome Score (HOOS) into Brazilian Portuguese.

**Methods** The HOOS was translated from English into Brazilian Portuguese, translated back into English, and submitted to an experts committee. It was administered to 100 patients with hip osteoarthritis. The psychometric evaluation included factor analysis; internal reliability measures, test-retest reliability at 7 days, and construct validity comparison with the Brazilian version of the Graded Chronic Pain Scale (GCPS).

**Results** Factor analyses demonstrated a five-factor solution. The test-retest reliability showed a high degree of internal consistency for the five subscales (*pain and physical difficulties*, 0.97 at baseline and 0.93 at 7 days; *pain and difficulty sitting, lying down and getting up*, 0.93 at baseline and 0.89 at 7 days; *difficulty flexing the knee*, 0.92 at baseline and 0.83 at 7 days; *difficulty walking*, 0.88 at baseline and 0.87 at 7 days; *quality of life*, 0.80 at baseline and 0.35 at 7 days). The construct validity was established during the comparison of the Brazilian version of the GCPS.

**Conclusions** A Brazilian version of the HOOS was developed with adequate reliability and validity. It will facilitate evaluation of the hip within a large patient population and across cultures.

### Keywords

- ▶ hip osteoarthritis
- ▶ reproducibility of results
- ▶ validity of tests
- ▶ language
- ▶ Brazil

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## Resumo

**Objetivo** Escalas traduzidas e validadas são de grande importância, pois podem ser utilizadas por pesquisadores que estudam diferentes populações com o mesmo problema. O objetivo do presente estudo foi traduzir, adaptar culturalmente e validar a escala *Hip Disability and Osteoarthritis Outcome Score* (HOOS) para a Língua Portuguesa.

**Métodos** O HOOS foi traduzido do Inglês para a Língua Portuguesa, traduzido de volta para o inglês e submetido a um comitê de especialistas. Foi administrado a 100 pacientes com osteoartrite de quadril. A avaliação psicométrica incluiu a análise fatorial; medidas de confiabilidade interna, confiabilidade de teste-reteste em 7 dias e a comparação de validade de conteúdo com a versão brasileira da Escala de Dor Crônica Graduada (GCPS, na sigla em inglês).

**Resultados** A análise fatorial demonstrou uma solução de cinco fatores. A confiabilidade de teste-reteste mostrou um alto grau de consistência interna para as cinco subescalas (*dor e dificuldades físicas*, 0,97 no 1° dia e 0,93 aos 7 dias; *dor e dificuldade em sentar, deitar e levantar*, 0,93 no 1° dia e 0,89 aos 7 dias; *dificuldade em flexionar o joelho*, 0,92 no 1° dia e 0,83 aos 7 dias; *dificuldade de caminhada*, 0,88 no 1° dia e 0,87 aos 7 dias; *qualidade de vida*, 0,80 no 1° dia e 0,35 aos 7 dias). A validade de conteúdo foi estabelecida durante a comparação da versão brasileira da GCPS.

**Conclusões** Uma versão brasileira do HOOS foi desenvolvida com confiabilidade e validade adequadas. Isso facilitará a avaliação clínica do quadril em uma grande população de pacientes e entre diferentes culturas.

### Palavras-chave

- ▶ osteoartrite do quadril
- ▶ reproducibilidade de resultados
- ▶ validade dos testes
- ▶ linguagem
- ▶ Brasil

## Introduction

Musculoskeletal disorders are the major concern in public health, as well as the major causes of disability, absence from work, and increased health costs.<sup>1</sup> Osteoarthritis is known as a social disease which is characterized by pain, inflammation, and stiffness owing to an involvement of articular cartilage, soft tissues, and bone. Furthermore, osteoarthritis represents a major therapeutic challenge to the health team since several causes are attributed to it.<sup>2</sup> One of the major problems for healthcare providers is which instrument to use for outcome measurement.

In the recent years, outcomes instruments used for orthopedic observational studies have increased.<sup>3</sup> There are some specific scales and questionnaires, which are very useful instruments for the health team to elucidate the functional status, the difficulties and the abilities to perform daily activities of the patient with osteoarthritis.<sup>4</sup> Many of these instruments are available only in English, which can lead to difficulties in information exchange.

When these questionnaires are translated and validated, they automatically become a tool for use in multicentre studies, allowing researchers to evaluate functional status across a wide range of different linguistic populations.<sup>5</sup> One of the mostly used instruments for both research and clinical use is the Hip Dysfunction and Osteoarthritis Outcome Score (HOOS). The HOOS was developed as a tool to evaluate the opinion of the patients about their hip and associated problems. It was created to be used for hip disability with or without osteoarthritis.<sup>6</sup> This scale has

been frequently used in previous studies that investigated the functional status of the hip.<sup>7,8</sup> To our knowledge, the original Swedish version of the HOOS<sup>6</sup> was translated into French,<sup>9</sup> Danish, Dutch,<sup>10</sup> Lithuanian, and Korean.<sup>11</sup> These translations facilitate cross-cultural comparisons of functional disability between populations, which speak different languages. Besides a good linguistic translation, scales intended for use across different cultures must be culturally adapted in order to maintain the validity of the instrument across different cultural contexts.<sup>12</sup> Nowadays, patients that have indication for total hip replacement (THR) expect more demanding needs than just usual daily living activities.<sup>13</sup> The number of patients with osteoarthritis in Brazil is large. Brazil is a country with a population of > 180 million people, which justifies the need for validated outcomes scales in Brazilian Portuguese. Moreover, Brazil is gradually increasing its worldwide participation in clinical trials, which reinforces the need for translated and validated instruments in Brazilian Portuguese.

In the present study, we describe the translation, the cultural adaptation, and the validation of a Brazilian Portuguese version of the HOOS.

## Methods

### Ethics

Approval from the Research Ethics Committee of our institution was obtained prior to the initiation of the present project. All of the study participants provided informed consent prior to the enrollment in the present study.

### Hip Dysfunction and Osteoarthritis Outcome Score

The original Swedish version of the HOOS consists of five subscales: pain, other symptoms, function in daily living (ADL), function in sport and recreation (sport/rec) and hip-related quality of life (QoL). The total number of questions is 40: 3 items are related to hip symptoms and difficulties; 2 items concern the amount of joint stiffness the patient has experienced; 10 items are related to hip pain; 17 items concern the physical function (ability to move around and to look after oneself); 4 items concern the physical function when the patient is active on a higher level; and the last 4 items are related to QoL related to the hip. How the patient felt during the previous week is also evaluated in the questions. Standardized answer options are given (five Likert alternatives) and each question is scored from zero to four. A normalized score (100 indicating no symptoms and 0 indicating extreme symptoms) is calculated for each subscale. The translation of the HOOS into Brazilian Portuguese, as discussed in the following sections, was performed according to the recommendations of the American Academy of Orthopedic Surgeons for the cross-cultural adaptation of health status measures.<sup>14</sup>

### Initial Translation into the Brazilian Portuguese Language

The HOOS was initially translated from English into Brazilian Portuguese. Three translations were performed by bilingual translators whose mother tongue was Portuguese.<sup>15</sup> Two of the translators were aware of the particular concepts of the questionnaire, while the third was not aware of and neither was informed about the concepts.

### Translation Synthesis

A synthesis of the three translated versions was produced resulting in one common translation. The three translators and a recording observer documented the synthesis process and resolved all of the conflicts by consensus.

### Translation Back Into English

Two different bilingual translators whose native language was English and who were not aware of the HOOS concepts translated the synthesized version of the questionnaire back to English. The back-translation was used to certify that the original content of the scale had been reliably translated.

### Expert Committee

The synthesized translation and the back-translated versions of the scale were submitted to a committee including clinical, psychometric, and language experts. The committee comprised: three bilingual, native Brazilian Portuguese speakers; two bilingual, native English-speaking Americans; two Brazilian Portuguese language specialists; and two bilingual physicians. The committee members developed a prefinal version of the Brazilian Portuguese questionnaire for field-testing.

### Qualitative Evaluation

To evaluate if further adjustments were necessary, the preliminary version of the HOOS questionnaire was applied in a 1<sup>st</sup> evaluation to a group of 20 patients who had an

appointment because of hip pathologies. The patients were asked to read each item aloud and then were asked questions about their understanding of the meaning of the item. A final version of the Brazilian Portuguese questionnaire was finally obtained and approved by the expert committee.

### Test of the Final Version

The final version of the instrument was administered to 100 patients<sup>16,17</sup> with hip disability and osteoarthritis evaluated at a large hospital in southern Brazil. Patients < 42 years old or > 89 years old were excluded from the study, because the HOOS is not applicable for this age group. Test-retest patients were randomly chosen with the use of a table containing random numbers generated using the R language.<sup>18</sup>

### Evaluation of Psychometric Properties

The internal consistency of the HOOS-BR was examined with the Cronbach alpha. Alpha values > 0.70 were deemed acceptable.<sup>19</sup> Test-retest reliabilities were analyzed at 7 days ( $n = 20$ ). Validity (defined as the ability of the instrument to measure what it is intended to measure) was also evaluated. The scale was correlated with the Brazilian Portuguese version of the Graded Chronic Pain Scale (GCPS-BR) expecting positive correlations between each of the GCPS-BR subscales and the HOOS-BR subscales. The GCPS is an eight-item questionnaire that has been used in several studies<sup>20-22</sup> to evaluate persistence, intensity and disability associated with pain.<sup>23</sup> Its validity was evaluated in American and British populations<sup>24,25</sup> and its construct has items capable of measuring each of the main components of the international classification of functioning, disability, and health of the World Health Organization (WHO).<sup>26</sup> It was chosen since the patients included in the present study do have chronic pain and we have considered that any other scale currently cross-culturally translated to Brazilian-Portuguese would not capture the whole extent of the construct measured by the HOOS. Finally, the factor structure of the HOOS was analyzed.

### Statistical Methods

All of the statistical analyses were performed with the use of Stata/SE software, Version 9.0 for Windows (StataCorp LLC, College Station, TX, USA). Initially, descriptive analyses employing means and percentages with 95% confidence intervals (CIs) were used to establish the demographic and clinical characteristics of the sample. Intraclass correlation coefficients (ICCs) were used to examine the test-retest reliability of the scale, and the Cronbach alpha reliability coefficients were calculated for each subscale. The validity of the instrument was determined with the use of correlational and t-test analyses, and the factor structure was analyzed with the use of factor analysis with varimax rotation.

## Results

### Baseline Characteristics

Most of the participants were female ( $n = 53$ ; 53.0%), Caucasian ( $n = 98$ , 98.0%) and had a low level of education (65% had basic but incomplete education) (► **Table 1**).

**Table 1** Baseline participant demographics

Demographics	n = 100 (%)
Age (years old) (mean ± SD)	59.38 ± 8.77
Gender	
Male	47 (47%)
Female	53 (53%)
Race	
White	98 (98%)
Black	2 (2%)
Education	
Incomplete Basic School	65 (65%)
Basic School	15 (15%)
Incomplete High School	3 (3%)
High School	14 (14%)
Incomplete Graduate School	3 (3%)

### Psychometric Characteristics of the Hip Dysfunction and Osteoarthritis Outcome Score

#### Factor Analysis of the Hip Dysfunction and Osteoarthritis Outcome Score

The factor analysis (with varimax rotation) of the 40 items of the HOOS was performed (► **Table 2**). The HOOS yielded a five-factor solution. The most interpretable factor solution performed for the HOOS was a five-factor solution. The five subscales were identified as *pain and physical difficulties* (15 items), *pain and difficulty sitting, lying down and getting up* (9 items), *movements of the hip* (8 items) *difficulty walking* (5 items) and *quality of life* (3 items). After the factors were identified, further reliability and validation procedures were conducted, including a comparison of the newly identified subscales with those of the GCPS-BR.

#### Scale Reliability Indexes

The test-retest reliability indexes as measured by ICCs were 0,972 at day 1 (n = 14) and 0,937 at 7 days (n = 14) for the pain and physical difficulties subscale, 0,939 at day 1 (n = 9) and 0,897 at 7 days (n = 9) for pain and difficulty sitting, lying down and getting up, 0,924 at day 1 (n = 8) and 0,839 at 7 days (n = 8) for movements of the hip, 0,884 at day 1 (n = 5) and 0,875 at 7 days (n = 5) for difficulty walking, and 0,800 at day 1 (n = 3) and 0,354 at 7 days (n = 3) for the QoL subscale (► **Table 3**).

#### Correlation of the Hip Dysfunction and Osteoarthritis Outcome Score

##### to the Graded Chronic Pain Scale

The HOOS scores presented statistically significant correlations, in the expected directions, with all of the Graded Chronic Pain subscales (► **Table 4**). The most convincing pattern emerged for the disability score ( $r = -0,700$ ;  $p < 0.0001$ ). The pain and physical difficulties demonstrated

**Table 2** Factor loadings for five-factor solution of the Hip Dysfunction and Osteoarthritis Outcome Score

Factor 1: Pain and physical difficulties					
Factor 2: Pain and difficulty in sitting, lying down and getting up					
Factor 3: Movements of the hip					
Factor 4: Difficulty in walking					
Factor 5: Quality of life					
Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
1		0.605			
2				0.489	
3	0.498				
4		0.537			
5		0.525			
6			0.630		
7	0.585				
8	0.541				
9	0.512				
10			0.521		
11		0.613			
12		0.690			
13	0.669				
14				0.539	
15	0.505				
16	0.582				
17			0.594		
18	0.711				
19	0.677				
20			0.693		
21	0.598				
22	0.680				
23	0.825				
24	0.695				
25	0.690				
26	0.693				
27		0.659			
28			0.786		
29		0.664			
30		0.699			
31			0.543		
32		0.577			
33			0.791		
34			0.707		
35				0.672	
36				0.613	
37					0.708
38					0.660
39					0.571
40				0.499	

**Table 3** Scale Reliability indexes for the Hip Dysfunction and Osteoarthritis Outcome Score

Instrument Subscale	Test (day 1)	Test (day 7)
Pain and physical difficulties	0.972	0.937
Pain and difficulty sitting, lying down and getting up	0.939	0.897
Movements of the hip	0.924	0.839
Difficulty walking	0.884	0.875
Quality of life	0.800	0.354

strong correlations with characteristic pain intensity ( $r = -0.631$ ;  $p < 0.0001$ ), disability score ( $r = -0.64$ ;  $p < 0.0001$ ) and disability days ( $r = -0.35$ ;  $p < 0.0001$ ). The pain and difficulty in sitting, lying and getting up subscale correlation was significant with all of the Graded Chronic Pain subscales. Movements of the hip, difficulty walking and QoL relationships were also noted with all of the Graded Chronic Pain subscales.

## Discussion

The Brazilian Portuguese version of the HOOS demonstrated adequate scale reliability and validity, with factor analysis resulting in a five-factor solution. Both the conventional and the newly identified subscales of the Brazilian Portuguese version of the HOOS-BR demonstrated sufficient internal reliability, and both groups of subscales revealed significant correlations with virtually all of the relevant subscales of the validated Brazilian Graded Chronic Pain Scale (GCPS-BR).

The internal consistency coefficients for the HOOS-BR in the present study were notable. Ornetti et al<sup>9</sup> also reported acceptable reliability coefficients for the five subscales of the French version of the HOOS (0.83 for the pain subscale, 0.84 for the symptoms subscale, 0.86 for the function in daily living subscale, 0.89 for the function sports/recreation subscale, and 0.89 for the hip-related QoL subscale). Similarly, De Groot et al<sup>10</sup> reported reliability coefficients of the German version of the HOOS of 0.74 for the pain subscale, 0.95 for the symptoms subscale, 0.98 for the function in daily living (ADL) subscale, 0.91 for the function sports/recreation (sport/rec) subscale, and 0.75 for the hip-related QoL subscale for patients with hip osteoarthritis. Moreover, Ornetti et al<sup>12</sup> reported in a study of

comparative validity and responsiveness of the HOOS-PS, which is a reduced version of the HOOS, an internal consistency of 0.79 as assessed by the Cronbach alpha.

The reliability indexes, as measured by ICC, showed good reliability, and the same has occurred with the HOOS-D<sup>9</sup> which demonstrated good reliability of the pain subscale (ICC = 0.88), excellent reliability of the symptoms subscale (ICC = 0.97), ADL (ICC = 0.94), sport/rec (ICC = 0.96) and QoL (ICC = 0.97) in a mean period of 7.6-days in a group of 49 patients with hip osteoarthritis. Ornetti et al<sup>9</sup> have also demonstrated satisfactory reliability of the pain subscale (ICC = 0.83), symptoms subscale (ICC = 0.84), ADL (ICC = 0.86), sport/rec (ICC = 0.89) and QoL (ICC = 0.86) 2 weeks later, a time span considered short enough to prevent clinical change in hip osteoarthritis pain and disability.

Thus, our results, which suggest that the HOOS-BR is an internally stable instrument, are consistent with the results of the validations of the French and German translation of the scale.

The original HOOS has been hypothesized to include five subscales (pain, other symptoms, ADL, sport/rec, and hip-related QoL) in its factor structure. In the factor analysis of the HOOS-BR reported here, we have examined five competing models, and a five-factor solution resulted in the cleanest separation between factors. Five subscales emerged, which we termed pain and physical difficulties, pain and difficulty sitting, lying down and getting up, movements of the hip, difficulty walking, and QoL.

One of the methods that we used to establish the construct validity of the HOOS-BR was to compare it with the subscales of the GCPS-BR. All of the subscales of the HOOS-BR correlated, in the expected directions, with all of the subscales of the GCPS-BR, in agreement with the original HOOS, which also demonstrated construct validity when correlated with the 36-item short-form health survey (SF-36). The construct validity of the Dutch version of the HOOS<sup>9</sup> was determined by comparing it with the SF-36, with the Oxford Hip Score (OHP) and with the visual analogue scale (VAS) for pain. It was determined that the highest correlations between the HOOS-D and the validity scales were found for the subscales intended to measure similar constructs in a sample of 39 patients with hip osteoarthritis. Similarly, Ornetti et al<sup>9</sup> evaluated the relationships between the French version of the HOOS subscales, the VAS for pain, and the Lequesne index in a sample of 32 patients with hip osteoarthritis. A strong

**Table 4** Comparison of the Hip Dysfunction and Osteoarthritis Outcome Score with graded chronic pain subscales;

Instrument Subscale	GCPS: Characteristic Pain Intensity	GCPS: Disability Score	GCPS: Disability Days
HOOS: Pain and physical difficulties	-0.631; < 0.001	-0.644; < 0.001	-0.358; < 0.001
HOOS: Pain and difficulty sitting, lying and getting up	-0.559; < 0.001	-0.644; < 0.001	-0.354; < 0.001
HOOS: Movements of the hip	-0.602; < 0.001	-0.639; < 0.001	-0.514; < 0.001
HOOS: Difficulty walking	-0.613; < 0.001	-0.700; < 0.001	-0.391; < 0.001
HOOS: Quality of life	-0.569; < 0.001	-0.569; < 0.001	-0.295; < 0.003

Abbreviation: GCPS, Graded Chronic Pain Scale; HOOS, Hip Dysfunction and Osteoarthritis Outcome Score.



correlation was observed between all of the HOOS subscales and the Lequesne index or the VAS for pain that measured similar constructs.

The HOOS-BR thoroughly evaluates disabilities caused by osteoarthritis, and this explains the strong correlation between all of the HOOS subscales and the GCPS-BR disability subscale.

Albeit the careful study design, some limitations can be pointed out in the present study, such as the recruitment of patients from a single university hospital that might not represent the entire population with hip osteoarthritis. The short interval between the applications of the reliability tests could also imply a recall bias. Another limitation to be considered is the small number of patients that returned for the test-retest evaluation.

## Conclusion

In summary, we have translated, culturally adapted and validated the HOOS-BR. The factor analysis yielded a five-factor solution. Adequate scale reliability and validity were demonstrated. A Brazilian Portuguese version of the HOOS will facilitate evaluation of the hip within a large patient population in multinational studies.

### Conflicts of Interests

The authors have no conflicts of interests to declare.

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