



Translation, transcultural adaptation and validation of the Nordic questionnaire for the evaluation of low back pain in Brazilian adolescents

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ABSTRACT

Background: Low back pain has been configured as a public health problem capable of compromising functional capacity, even in adolescents, however, there are no validated instruments for Brazilian adolescents. **Objective:** Validate the psychometric properties of the Nordic questionnaire for the evaluation of low back pain in Brazilian adolescents. **Methods:** The sample consisted of 150 adolescents (84 female), aged between 15 and 19 years. The Nordic questionnaire for the evaluation of low back pain in adolescents, was translated and culturally adapted into Portuguese (Brazil). A committee of experts followed the entire validation process. The questionnaire was administered in two moments, with a 14-day interval. Statistical analysis involved Kappa index. **Results:** After the slight modifications in the translation process, the expert committee considered that the Brazilian Portuguese version of the questionnaire presented semantic, idiomatic, cultural and conceptual equivalence. The results showed that, among the 15 items considered in the eight questions of the questionnaire, 66.6% presented substantial agreement (kappa between 0.61-0.80). The other items presented almost perfect agreement (kappa > 0.80). **Conclusion:** The Nordic questionnaire for the evaluation of low back pain in adolescents, after being translated and culturally adapted into the Portuguese (Brazil) language, showed adequate psychometric properties, with high reproducibility in all items, demonstrating that it can be used safely to evaluate the low back pain in Brazilian adolescents.

Keywords: Validation Studies; Surveys and Questionnaires; Low Back Pain; Pain Measurement; Adolescent.

INTRODUCTION

Lumbar pain is typically associated as an adult-only occurrence, however, approximately 18% of adolescents between the ages of 14 and 16 suffer from this condition, which is a significant risk factor for having low back pain as an adult⁽¹⁾. With 18 years, the prevalence of low back pain is similar to that reported in adults, with an estimated annual prevalence of 20%⁽²⁾. Most cases of low back pain in adolescents have non-specific causes and are mainly associated with participation in competitive sports, female sex, peak growth phase, adverse psychosocial factors, age, previous history of back injury, and family history of low back pain⁽³⁾.

When the occurrence of low back pain lasts for at least three months, it is characterized as chronic low back pain, representing the second leading cause of disability in the world, becoming an important economic and welfare problem⁽⁴⁾.

In this way, to identify the occurrence of low back pain as soon as possible becomes fundamental, so that intervention strategies can be traced in order to minimize the occurrence of functional disability⁽⁵⁾.

For the identification of low back pain, the most widely used means are the self-reported measures and the Nordic questionnaire are one of the most used for this purpose⁽⁶⁾. However, to preserve the psychometric properties of this tool, cross-cultural adaptation is necessary^(7,8). Nevertheless, different studies with Brazilian adolescents have been carried out with this questionnaire⁽⁹⁻¹¹⁾ without adequate validation for this population. With this, the objective of the present study was to validate the psychometric properties of the Nordic lumbar pain questionnaire in Brazilian adolescents.

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METHODS

Place of study and Subjects

The research was carried out in the municipality of Bandeirantes, in the state of Paraná, Brazil, between April and May 2017. The students excluded were the ones who: a) were under medical treatment; b) were using continuous medication; c) underwent a surgical procedure in less than six months; d) presented musculoskeletal lesions; e) were pregnant. The participants were 150 students of both genders (84 females), aged between 15 and 19 years (mean 15.8 ± 1.2 years) enrolled in public and private high schools. All signed a Free and Informed Consent Form. The study was approved by the Ethics Committee of the Universidade Norte do Paraná (Protocol Number 1.302.963).

To obtain the sample we used probabilistic sampling by clusters, taking into account the sex, year of study and shift in which the adolescents were enrolled in each stratum of the school structure (public and private). In total, six schools were part of the sample. The classrooms chosen were visited by the researchers and the students were clarified about the research objectives, principles of confidentiality, non-identification in the study and no influence on the social treatment that they already receive in the school if they did not agree to participate in the research.

Translation and Application of the Lumbar Pain Questionnaire

A cross-cultural adaptation and translation in the present study was an adjusted version of a questionnaire widely used to verify the low back pain of adolescents⁽¹²⁻¹⁴⁾, proposed by Salminen (personal communication, 1996), derived from a Nordic questionnaire⁽⁶⁾. The questionnaire includes a drawing of the lumbar region and defines as back pain any pain or discomfort that occurred during the previous year, not related to trauma or menstrual pain. All adopted protocol respected the procedures suggested by Guillemin et al. ⁽⁸⁾. The initial translation of the English to Brazilian Portuguese (BP) language was carried out independently by two specialists in lumbar pain. Both teachers had Portuguese as a native language and English as a foreign language, with experience in translations of academic texts. Besides the translation, they were asked to register expressions that could offer dubious interpretation.

A bilingual group of three health researchers compared the translated texts, standardizing the use of divergent expressions, to produce a single version of the questionnaire, which synthesized the previous two. Then, the back translation of the questionnaire by two other translators occurred independently. The translators chosen for this stage had English as their native language, a domain of the BP language and experience in translating scientific texts. Translators were asked to register expressions that might generate doubts in the translation process. In the sequence, the bilingual group compared both back-translated texts, producing an unique version.

Then, a committee reviewed the translation process and the results achieved in previous steps. The committee was formed by seven members: translators who participated in the translation/back-translation process and the bilingual group, composed of three university professors from the health area. The committee reviewed all versions of the questionnaire available: initial version in English, two versions translated into BP, a summary version of both translations into Portuguese of Brazil, two versions of back translation and a summary version of both back-translations.

The committee assessed the types of equivalences between the original questionnaire and the version of BP. The members received written guidance on the purpose of the study and the definitions adopted for the equivalences. Each one of them responded individually to an analysis form that compared each question of the final Portuguese (Brazil) version with the respective English questionnaire question in relation to the semantic, idiomatic, cultural and conceptual equivalences. The analysis form was structured by differential scaling with discrete alternatives: "unchanged", "slightly altered", "greatly altered" and "completely altered". The final version of the BP questionnaire is found in Appendix 1.

The final version of the questionnaire translated into Portuguese of Brazil was tested in order to investigate difficulties and suggestions of the adolescents regarding the understanding of the questions. The questionnaire was initially applied as a pilot by the authors in 80 adolescents, high school students from a school not drawn to participate in the study, in the city of Bandeirantes, state of Paraná, Brazil. No difficulties were reported by students during the application of the pilot questionnaire.

Afterwards, the schools participating in the study were visited so that participants could be informed of the objectives of the study and the delivery of the Free and Informed Consent Form. The classrooms were revisited and those students who submitted the signed Form received a copy of the final version of the lumbar pain questionnaire translated into BP. They were then given instructions for self-completion of the questionnaire and information on the availability of researchers for possible clarifications. After completing and returning the questionnaire, it was stored and a code was created for each student. After 14 days, the replica of questionnaire application occurred. The classrooms were revisited and the students who were participating in the study received a new questionnaire. The following guidelines were identical to those of the first application. After completing and returning the questionnaire, it was stored next to the first one, receiving the same code initially generated for each student.

Statistical analysis

In order to identify the psychometric properties of the instrument, reliability related to reproducibility was investigated, through replicates of the questionnaire application (translated version into Portuguese of Brazil). Two procedures were used for the reproducibility analysis: the calculation of the traditional Kappa agreement measure and the prevalence rates of the first and second application



of the questionnaire. The calculation of the Kappa agreement measure was determined for each of the 15 items of the questionnaire. For interpretation of Kappa test was used in the proposal of Landis and Koch⁽¹⁵⁾ who proposed: 0= no agreement; 0.10 – 0.20 = slight agreement; 0.21 – 0.40 = fair agreement; 0.41 – 0.60 = moderate agreement; 0.61 – 0.80 = substantial agreement; 0.81 – 1.0 = almost perfect agreement. The prevalence rates of the first and second applications were determined from one of the answer alternatives of each item of the questionnaire, following the methodological guidelines of the instrument itself in a dichotomous form: “yes” and “no”, with the exception of one item (question 4) that offered four possibilities of answers, for which the prevalence rate was grouped between the last two (“yes”) and the first two (“no”) alternatives. Further, to determine if the adolescent had low or high risk for low back pain, the affirmative responses were scored as “1” (one) and the negative responses were scored as “0” (zero). Adolescents were considered at high risk for low back pain, whose sum of the 15 items of the questionnaire was > 7, otherwise adolescents were classified as low risk for low back pain. This form of classification was similar to that adopted by previous studies^(12,16). Data were processed

in the SPSS 20.0 program (SPSS Corp., Chicago, IL, EUA). The confidence interval allowed for all tests was 95% ($p < 0.05$).

RESULTS

After discussion by the committee responsible for the analysis of the validation process of the BP version of the lumbar pain questionnaire in adolescents, some expressions were modified in order to facilitate understanding. Of the eight questions that compose the questionnaire, in 62.5% (five questions) of the cases the committee considered as “unaltered” the semantic, idiomatic, cultural and conceptual equivalences. In the remaining 37.5% (three) questions, the committee members pointed out as “little changed”. Table 1 summarizes the changes made to each of these issues.

The psychometric properties of the lumbar pain questionnaire in adolescents, identified through the Kappa agreement, among application replicas are presented in Table 2. Among the 15 items considered in the eight questions, the majority (66.6%) presented substantial agreement (kappa between 0.61-0.80). The remaining five items (33.3%) presented almost perfect agreement (kappa > 0.80).

Table 1. Questions adjusted during the Brazilian Portuguese version of the lumbar pain questionnaire in adolescents.

Question	Original version	Adjusted translation
2	(...) pain or discomfort in your lower back	(...) pain or discomfort in your lower back
3-4	(...) during the last year	(...) in the last 12 months
7	(...) X-ray examination (picture taken at a doctor's office)	(...) X-ray examination (performed in clinics or hospital emergency department)

Table 2. Prevalence of affirmative responses of the lumbar pain questionnaire in adolescents and Kappa agreement between the applications.

Question	Prevalence Rates (%) ^a		Concordance	
	1 st application	2 nd application	%	Kappa*
1. Have you ever had any injury to your lower back caused by an accident?	6.0	6.7	98.0	0.83
2. Have you ever had pain or discomfort in your lower back?	78.0	79.3	90.7	0.72
3. Have you had lower back pain in the last 12 months?	54.7	55.3	92.0	0.85
4. For how many days have you suffered from low back pain in the last 12 months? ^b	8.0	8.0	87.3	0.76
5. Have you ever had to change your activities because of low back pain?	14.7	13.3	93.3	0.72
6. Have you ever been treated by a doctor for low back pain?	7.3	6.7	98.0	0.84
7. Have you ever had an X-ray (examination performed at specialist clinics or hospital emergency department) in your lower back?	13.3	12.7	96.7	0.85
8. Doing the following activities leaves you with lower back pain or increases your low back pain:				
a. Sitting at school on normal school days?	46.7	50.7	88.0	0.76
b. Sitting at home to do school activities?	36.0	40.7	86.7	0.73
c. Watching TV or playing video games?	29.3	26.7	92.0	0.80
d. Sitting in front of the computer?	38.7	46.0	91.3	0.82
e. Sitting in the car or on the bus?	25.3	22.7	90.6	0.74
f. In other sitting positions?	42.0	39.3	84.0	0.67
g. In Physical Education classes at school?	22.7	20.7	88.7	0.66
h. Physical activities outside school (pedaling, running, etc.)	30.0	33.3	87.3	0.71

Note: ^aPrevalence rates for affirmative answers – “yes”; ^bAs the fourth question offered four possible answers, the first two alternatives (never or almost never [from 1 to 7 days]; and sometimes [from 8 to 30 days]) and the last two alternatives (many days [more than 30 days], but not every day; and every day) were grouped in “no” and “yes” respectively.

*All Kappa values were statistically significant ($p < 0.001$).

**Table 3.** Cross-tabulation between the first and second application of the questionnaire to identify adolescents with low and high risk for low back pain.

	1 st application			Concordance		
	Classification	Low Risk	High Risk	Total	(%)	Kappa
2 nd application	Low Risk	113	5	118 (78.7%)	92.7	0.78*
	High Risk	6	26	32 (21.3%)		
	Total	119 (79.3%)	31 (20.7%)	150		

Note: * $p < 0.001$.

Concordance ranged from 84.0% to 98.0%. All Kappa values presented significance ($p < 0.05$).

Table 3 presents the Kappa statistic for adolescents classified with high and low risk for low back pain. In the first application of the questionnaire, 20.7% of the adolescents were classified as having a high risk for low back pain, while in the second application they were 21.3%. The concordance between the first and second applications was 92.7%, with a Kappa statistic presenting substantial agreement ($kappa = 0.78$) and significant ($p < 0.05$).

DISCUSSION

The objective of the present study was to validate the psychometric properties of the BP language version of the Nordic lumbar pain questionnaire in adolescents. Considering the methodology adopted in the present study and the simple and objective structure of the questionnaire, the translation process occurred without difficulties. Thus, the initial version for the BP language performed by the first two translators was little modified in subsequent stages. As a consequence, the analysis of semantic, idiomatic, cultural and conceptual equivalence, with respect to cross-cultural adaptation, showed that the questionnaire was relatively easy to translate.

In relation to the Brazilian adolescent population, to the knowledge of the authors of the present study, to date, there has been no attempt to validate instruments to measure low back pain. The present study demonstrated that the Nordic questionnaire for lumbar pain, translated and culturally adapted for Brazilian adolescents, when administered twice in a 14-day interval, presented substantial or near perfect agreement, with values between 84% and 98% (Kappa between 0.72 and 0.85).

This type of questionnaire has demonstrated good test-retest reliability, in which disagreements (non-identical responses) do not exceed 23%⁽⁶⁾. There was a validation of the psychometric properties of the Nordic lumbar pain questionnaire for the Brazilian adult population⁽¹⁷⁾. In the occasion, the authors identified an excellent agreement by the Kappa index in the different questions, which ranged from 0.88 to 1, however, the interval between the applications was only one day, which may have compromised the validity of the study, in view of the short time between the first and second application of the instrument.

The outcome of low back pain is typically classified as the absence or presence of low back pain, based on a single issue (such as “have you had low back pain in the last three months?”)⁽¹⁸⁻²⁰⁾. The questionnaire used as validation object in the present study offered a more robust classification of low back pain, since it questions about low back pain in different domains. There are no standardized approaches to classify adolescents with low back pain using surveys, however, the arbitrary limit adopted by the present study reflects a conservative classification approach, since adolescents scored at least at high risk for low back pain in eight items out of the fifteen available in the questionnaire. Other studies with adolescent population have adopted a similar form of classification^(12, 16).

Also, regarding the classification of adolescents with low or high risk for low back pain, the current study demonstrated a substantial agreement (92.7%, Kappa= 0.78) in the replicas of application of the instrument, which demonstrates the reliability of the administration using the classification adopted. In the current study, the prevalence of adolescents at high risk for low back pain was 20.7% and 21.3%, respectively, in the first and second applications of the questionnaire, respectively. Values close to that expected for the prevalence of low back pain, which is between 18% for adolescents between 14 and 16 years old⁽¹⁾ and 20% for adolescents with 18 years of age⁽²⁾.

This study presents some strengths and limitations that need to be considered. As strengths, the fact that it is possibly the first questionnaire validated for the assessment of low back pain in Brazilian adolescents. In addition, consideration should be given to the fact that a questionnaire widely used in the international literature has been applied, which facilitates comparison with different studies. As a limitation, the small size of the sample stands out, however, this did not influence the statistical results for the kappa agreement, which presented substantial or almost perfect agreement on all occasions, always with statistical significance.

CONCLUSION

The results presented showed that the questions of the Nordic questionnaire of low back pain translated and culturally adapted for Brazilian adolescents presented high agreement, which demonstrated good reproducibility of the instrument.



The cross-cultural adaptation of the items of the questionnaire was satisfactory, with few adjustments in the questions of the BP version, compared to the English version. In this way, the questionnaire can be safely used for assessment of low back pain in Brazilian adolescents.

AUTHOR'S CONTRIBUTION

RGO and LCO elaborated the study design. AKR and SCG performed the data collection. RGO, LCO, DAAPO, CCA, FJJ, WLR and RFO participated in the validation process of the questionnaire. RGO performed the statistical analysis. LCO, AKR, SCG, CCA, FJJ and WLR were involved in the preparation of the manuscript. RGO, DAAPO, PEMV, JTJ and RFO performed the critical intellectual review of the manuscript. All authors read and approved the final manuscript.

CONFLICTS OF INTEREST

The authors declare that there was no conflicts of interest.

AUTHOR DETAILS

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REFERENCES

- Moreno MA. Low back pain in children and adolescents. *JAMA Pediatr.* 2017;171: 312.
- Jeffries LJ, Milanese SF, Grimmer-Somers KA. Epidemiology of adolescent spinal pain: a systematic overview of the research literature. *Spine.* 2007;32:2630-37.
- MacDonald J, Stuart E, Rodenberg R. Musculoskeletal Low Back Pain in School-aged Children: A Review. *JAMA Pediatr.* 2017; 171:280-87.
- Allegrì M, Montella S, Salici F, Valente A, Marchesini M, Compagnone C, et al. Mechanisms of low back pain: a guide for diagnosis and therapy. Version 2. F1000Res. 2016 [revised 2016 Oct 11]; 5. pii: F1000 Faculty Rev-1530.
- Landry BW, Fischer PR, Driscoll SW, Koch KM, Harbeck-Weber C, Mack KJ, et al. Managing Chronic Pain in Children and Adolescents: A Clinical Review. *PM R.* 2015;7:295-315.
- Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sorensen F, Andersson G, et al. Standardised Nordic questionnaire for the analysis of musculoskeletal symptoms. *Appl Ergon.* 1997;18:233-37.
- Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine.* 2000;25:3186-91.
- Guillemin F, Bombardier C, Beaton D. Cross-cultural adaptation of health-related quality of life measures: literature review and proposed guidelines. *J Clin Epidemiol.* 1993;46:1417-32.
- Scarabottolo CC, Pinto RZ, Oliveira CB, Zanuto EF, Cardoso JR, Christofaro DGD. Back and neck pain prevalence and their association with physical inactivity domains in adolescents. *Eur Spine J.* 2017 (in press).
- De Vitta A, Martinez MG, Piza NT, Simeão SFAP, Ferreira NP. Prevalência e fatores associados à dor lombar em escolares. *Cad Saúde Pública.* 2011;27:1520-28.
- Dorneles RCG, Oliveira HLR, Bergmann MLA, Bergmann GG. Flexibility and muscle strength/resistance indicators and screening of low back pain in adolescents. *Rev Bras Cineantropom Desempenho Hum.* 2016;18:93-102.
- Saint-Maurice PF, Welk GJ, Burns R, Plowman SA, Corbin CB, Hannon JC. The criterion-referenced validity of the FITNESSGRAM Trunk-Extension test. *J Sports Med Phys Fitness.* 2015;55:1252-63.
- Sjolie AN. Low-back pain in adolescents is associated with poor hip mobility and high body mass index. *Scand J Med Sci Sports.* 2004;14:168-75.
- Sjölie AN. Psychosocial correlates of low-back pain in adolescents. *Eur Spine J.* 2002;11:582-88.
- Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics.* 1977;33:159-74.
- Salminen JJ, Maki P, Oksanen A, Pentti J. Spinal mobility and trunk muscle strength in 15-year-old schoolchildren with and without low-back pain. *Spine.* 1992;17:405-11.
- de Barros EN, Alexandre NM. Cross-cultural adaptation of the Nordic musculoskeletal questionnaire. *Int Nurs Rev.* 2003;50:101-08.
- Théroux J, Stomski N, Hodgetts CJ, Ballard A, Khadra C, Le May S, et al. Prevalence of low back pain in adolescents with idiopathic scoliosis: a systematic review. *Chiropr Man Therap.* 2017;25:10.
- Manogharan S, Kongsted A, Ferreira ML, Hancock MJ. Do older adults with chronic low back pain differ from younger adults in regards to baseline characteristics and prognosis? *Eur J Pain.* 2017;21:866-73.
- Bauer CM, Rast FM, Ernst MJ, Meichtry A, Kool J, Rissanen SM, et al. The effect of muscle fatigue and low back pain on lumbar movement variability and complexity. *J Electromyogr Kinesiol.* 2017;33:94-102.



Appendix 1: Nordic questionnaire for the evaluation of low back pain in adolescents, translated and culturally adapted to the Portuguese (Brazil) language.

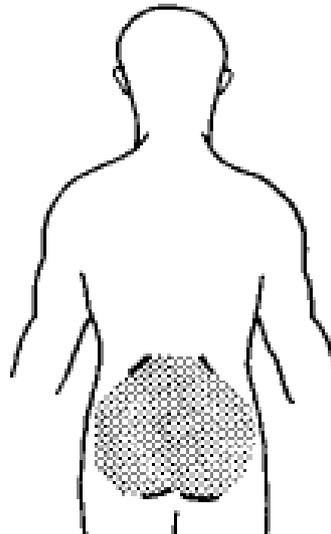


Figura 1. Localização da região lombar.

1. Você já teve alguma lesão na região lombar causada por um acidente? Sim Não
2. Você já teve dor ou desconforto na região lombar? Sim Não
3. Você teve dor na região lombar nos últimos 12 meses? Sim Não
4. Por quantos dias você sofreu de dor lombar nos últimos 12 meses:
- Nunca ou quase nunca (de 1 até 7 dias)
- Às vezes (de 8 até 30 dias)
- Muitos dias (mais de 30 dias), mas não todos os dias
- Todos os dias
5. Você já teve que mudar suas atividades por causa da dor lombar? Sim Não
6. Você já foi tratado por um médico para dor lombar? Sim Não
7. Você já fez um exame de raio-X (exame realizado em clínicas especializadas ou pronto socorro de hospitais) da sua região lombar? Sim Não
8. Fazer as seguintes atividades te deixa com dores na região lombar ou aumenta sua dor lombar:
- a) Sentado na escola nos dias normais de aula Sim Não
- b) Sentado em sua casa para fazer atividades da escola Sim Não
- c) Assistindo televisão ou jogando videogames Sim Não
- d) Sentado em frente ao computador Sim Não
- e) Sentado no carro ou no ônibus Sim Não
- f) Em outras posições sentadas Sim Não
- g) Nas aulas de Educação Física na escola Sim Não
- h) Atividades físicas fora da escola (pedalando, correndo, etc.) Sim Não