Field-test validation of the Brazilian version of the Paediatric Asthma Quality of Life Questionnaire*,**

Versão brasileira do Paediatric Asthma Quality of Life Questionnaire: validação de campo

Edgar Enrique Sarria, Rosana Cardoso Manique Rosa, Gilberto Bueno Fischer, Vânia Naomi Hirakata, Neusa Sica da Rocha, Rita Mattiello

Abstract

Objective: To assess the psychometric properties of the official Brazilian Portuguese-language version of the Paediatric Asthma Quality of Life Questionnaire (PAQLQ) in a representative group of Brazilian children and adolescents with asthma. Methods: A total of 125 individuals with asthma, aged 8-17 years and being monitored at a pediatric pulmonology outpatient clinic in the city of Porto Alegre, Brazil, completed the PAQLQ. Validity was assessed by means of convergent validity (correlation between PAQLQ domains and those of the Pediatric Quality of Life Inventory (PedsQL) 4.0. Reliability was assessed by determining internal consistency (Cronbach’s alpha coefficient), reproducibility (intraclass correlation coefficient), sensitivity to change (effect size), and discriminatory power (floor/ceiling effects). Results: The mean age was 11 years, and 75 (60%) of the participants were male. The mean PAQLQ total score was 5.1, with floor/ceiling effects < 10%. Correlations between PAQLQ domains and the PedsQL 4.0 domains were acceptable (r = 0.37-0.40). The Cronbach’s alpha coefficient for the total score was 0.93, ranging from 0.72 to 0.88 for the domains. The overall effect size was 0.60 (range: 0.45-0.60), whereas the overall intraclass correlation coefficient was 0.80 (range: 0.66-0.79). Conclusions: The official Brazilian Portuguese-language version of the PAQLQ showed good psychometric performance, confirming its cultural adequacy for use in Brazil.

Keywords: Quality of life; Asthma; Validation studies.

Resumo

Objetivo: Determinar as propriedades psicométricas da versão oficial em português do Brasil de Paediatric Asthma Quality of Life Questionnaire (PAQLQ) em uma amostra representativa de crianças e adolescentes brasileiros com asma. Métodos: Um total de 125 participantes com asma, com idades de 8-17 e monitorados em um ambulatório pediátrico de pneumologia em Porto Alegre (RS), responderam o PAQLQ. A validade foi avaliada através de validade convergente (correlação entre os domínios do PAQLQ e os domínios do Pediatric Quality of Life Inventory 4.0 (PedsQL 4.0). A confiabilidade foi avaliada através da consistência interna (coeficiente alfa de Cronbach), reprodutibilidade (coeficiente de correlação intraclass), sensibilidade a mudança (tamanho do efeito) e discriminação (efeitos mínimo/máximo). Resultados: A idade média foi de 11 anos, e 75 (60%) eram meninos. A média do escore global do PAQLQ foi de 5.1, com efeitos mínimo/máximo < 10%. As correlações com os domínios do PedsQL 4.0 foram aceitáveis (r = 0.37-0.40). O coeficiente alfa de Cronbach do escore global foi 0,93, variando de 0,72 a 0,88 nos domínios. O tamanho do efeito global foi de 0,60 (variação: 0,45-0,60), e a correlação intraclass global foi de 0,80 (variação: 0,66-0,79). Conclusões: A versão oficial em português do Brasil do PAQLQ demonstrou boa performance psicométrica do instrumento, confirmando sua adequação para uso no contexto cultural brasileiro.

Descritores: Qualidade de vida; Asma; Estudos de validação.
Introduction

The progressive use of health-related quality of life (HRQoL) measures, combined with more traditional clinical endpoints in medicine, has shown great potential for improving the health care of patients, particularly that of those with chronic conditions.\textsuperscript{[1,2]} When such measures have been developed in a country other than that in which they will be applied, the appropriateness of the validation process (translation into the local language and adaptation for use in the target cultural context) is as important as is the selection of the instrument itself.\textsuperscript{[3]}

There are approximately eleven specific questionnaires designed to assess HRQoL in children with asthma.\textsuperscript{[4,5]} The most well-known and widely used of those is the Paediatric Asthma Quality of Life Questionnaire (PAQLQ).\textsuperscript{[6]} In 2001, the PAQLQ was supposedly validated for use in Brazil under the guidance of the MAPI Research Institute, a center specializing in the validation of HRQoL instruments. However, no study reported the results of this validation process. When queried, the MAPI staff stated that they had accredited only the linguistic component, having tested it in a small sample, consisting of 11 children (7–17 years of age).

Field testing is fundamental in the process of validating a questionnaire. It allows researchers to determine the psychometric properties and acceptability of the instrument, as well as its general applicability to cultural groups or subgroups.\textsuperscript{[7]} In order to meet the need for a full validation of this important questionnaire in the Brazilian cultural context, the aim of this study was to assess the psychometric properties of the PAQLQ in a representative group of Brazilian children and adolescents with asthma.

Methods

Between January and September of 2007, we enrolled a convenience sample of 125 children and adolescents with asthma, ranging from 8 to 17 years of age. Subjects were being monitored, via the Porto Alegre Asthma Program, at the pediatric pulmonology outpatient clinic of the Hospital da Criança Santo Antônio, in the city of Porto Alegre, Brazil. The participants had been diagnosed with asthma based on signs, symptoms, clinical course, and response to treatment. The classification of severity used was that published in 2002 by the National Asthma Council Australia, which includes the following categories of asthma: infrequent episodic asthma, frequent episodic asthma, and chronic asthma.\textsuperscript{[8]} For the purpose of our study, we included only individuals classified as having frequent episodic asthma, who, accordingly, used inhaled corticosteroids on a regular basis. Those experiencing an exacerbation at the time of enrollment were not selected for inclusion.

We collected data related to the following variables: socioeconomic status; Fischer asthma control scale score\textsuperscript{[9]}; FEV\textsubscript{1}, expressed as the percentage of predicted, according to the reference values established by Knudson et al.\textsuperscript{[10]}; and family functioning, as per the Family Adaptability and Cohesion Evaluation Scale III (FACES III).\textsuperscript{[11]}

In order to assess socioeconomic status, we used the Brazilian criteria, based on the 1997 Brazilian Association of Survey Firms scale.\textsuperscript{[12]} Using the scores obtained by combining educational and economic information, this scale identifies five socioeconomic categories, ordered from highest to lowest. The Fischer asthma control scale assesses disease control between follow-up visits.\textsuperscript{[9]} We used a modified version of that scale, applied during the retest visit. Scores range from 1 (in use of regular inhaled corticosteroids, with no exacerbations) to 4 (hospitalization due to exacerbation). Spirometric tests were conducted using a SpiroDoc\textsuperscript{®} spirometer (Medical International Research, Rome, Italy), in accordance with the American Thoracic Society/European Respiratory Society recommendations.\textsuperscript{[13]} Pulmonary function was classified according to FEV\textsubscript{1} (% of predicted) as follows: normal (80–100%); mild obstruction (60–79%); or moderate obstruction (41–59%). The FACES III scale is a twenty-item scale that evaluates family functioning by combining two domains, cohesion and adaptability, which allow families to be classified as being at low, medium or high risk for psychological disorders. We used the Brazilian Portuguese-language version of FACES III, which has been validated for use in Brazil.\textsuperscript{[14]}

The psychometric properties we studied were validity and reliability. Validity was assessed on the basis of convergent validity, evaluating whether the domains measured in the PAQLQ correlated well with equivalent domains in a
generic instrument, the Pediatric Quality of Life
Inventory (PedsQL) 4.0.\(^{15}\) Both instruments
were applied twice (test-retest) by means of
standardized interviews, with 4-5 weeks between
the two tests, in order to avoid recall bias.

The reliability of the PAQLQ was assessed by
determining the following: internal consistency
(specific correlations between items, total and
by domain); sensitivity to change (whether the
instrument is capable of identifying differences in
HRQoL between interviews); and reproducibility
(whether the instrument produces similar results
at different time points, assuming that the
conditions are the same).\(^{16}\) We also estimated
the proportion of participants with the lowest
and highest scores (floor/ceiling effect), in
order to assess the discriminatory power of the
instrument.\(^{17}\) This last parameter, which should
be < 15\%, contributes to assessing aspects of
validity and reliability.

The PAQLQ is a specific instrument to assess
HRQoL in individuals with asthma who are
between 7 and 17 years of age.\(^{16}\) It can be self-
administered or completed during an interview.
For the purposes of the present study, we chose
the latter option. Originally developed in Canadian
English, the PAQLQ has been translated into over
twenty languages and has been either partially
or fully validated for use in the corresponding
cultures.\(^{17}\) It has 23 items distributed in three
domains: activity limitations (5 items), symptoms
(10 items) and emotional function (8 items).
Three items in the activity limitations domain
are individualized for each patient, who chooses
from a list of common activities/sports. All
PAQLQ items are similarly answered by means of
a 7-point Likert scale, ranging from 1 (severely
affected) to 7 (unaffected). Items are then
added, and their average represents the scores
(total and by domain). The minimal important
difference (MID) established for this instrument
is 0.5 points.\(^{18}\)

The PedsQL 4.0 is a generic questionnaire that
was originally developed in American English.\(^{15}\)
The version for the age group we studied has
23 items, divided into four domains: physical
functioning (8 items), emotional functioning
(5 items), social functioning (5 items), and
school functioning (5 items). A fifth domain,
psychosocial functioning, encompasses the
scores for last three of the four primary domains.
Each item has five possible answers on a Likert
scale, ranging from 0 (never) to 4 (always), values
that are later transformed into an inverse linear
scale from 0-100, a higher value indicating a
better state. We used the Brazilian Portuguese-
language version adapted and supplied by MAPI
upon our request.

After the participants had completed the
HRQoL questionnaires during the retest visit,
we also applied a modified version of the Global
Index of Change (GIC) questionnaire in order to
assess overall change between the two interviews.\(^{6}\)
The GIC questionnaire consisted of a single
question regarding the state of the asthma in
comparison with that at the time of the test
visit, and there were seven possible answers on
a Likert scale, ranging from 1 (“a lot better”)
to 4 (“about the same”) to 7 (“a lot worse”).
For the analysis, subjects were divided into two
subgroups: “change”, those who indicated either
improvement or worsening between interviews;
and “no change”, those who did not perceive a
change. This allowed us to test the sensitivity to
change and reproducibility of the PAQLQ.

Data processing was carried out with the
Statistical Package for the Social Sciences, version
13 (SPSS Inc., Chicago, IL, USA). To find an MID
of 0.5 points in the PAQLQ total scores between
the two interviews, the estimated sample size

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>75</td>
<td>60.0</td>
</tr>
<tr>
<td>Female</td>
<td>50</td>
<td>40.0</td>
</tr>
<tr>
<td>Pulmonary function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>102</td>
<td>81.8</td>
</tr>
<tr>
<td>Mild obstruction</td>
<td>23</td>
<td>19.1</td>
</tr>
<tr>
<td>Change between interviews(^a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change</td>
<td>106</td>
<td>84.8</td>
</tr>
<tr>
<td>No change</td>
<td>19</td>
<td>15.0</td>
</tr>
<tr>
<td>Family psychological risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>36</td>
<td>32.1</td>
</tr>
<tr>
<td>Medium</td>
<td>61</td>
<td>54.5</td>
</tr>
<tr>
<td>High</td>
<td>15</td>
<td>13.4</td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very low</td>
<td>8</td>
<td>7.2</td>
</tr>
<tr>
<td>Low</td>
<td>37</td>
<td>33.0</td>
</tr>
<tr>
<td>Medium</td>
<td>56</td>
<td>50.0</td>
</tr>
<tr>
<td>Medium high</td>
<td>11</td>
<td>9.8</td>
</tr>
<tr>
<td>High</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

\(^a\)Global Index of Change.
scores and the various demographic variables were also assessed.

Internal consistency was estimated by calculating the Cronbach’s alpha coefficient for the PAQLQ during the test. The sensitivity to change was estimated by calculating the effect size of the differences between the two interviews in the GIC “change” subgroup. Reproducibility was estimated by determining the intraclass correlation coefficient (ICC) between interviews.

Table 2 - Correlations of the Paediatric Asthma Quality of Life Questionnaire scores (Brazilian Portuguese-language version) with the Pediatric Quality of Life Inventory 4.0 scores (Brazilian Portuguese-language version) and demographic variables in the 125 participants.

<table>
<thead>
<tr>
<th>Variable</th>
<th>PAQLQ scores, r (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>Activity limitations</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>PedsQL 4.0 domains</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0.37 (&lt; 0.001)</td>
</tr>
<tr>
<td>Physical functioning</td>
<td>0.34 (&lt; 0.001)</td>
</tr>
<tr>
<td>Emotional functioning</td>
<td>0.40 (&lt; 0.001)</td>
</tr>
<tr>
<td>Pulmonary function</td>
<td></td>
</tr>
<tr>
<td>FEV₁</td>
<td>0.37 (&lt; 0.001)</td>
</tr>
<tr>
<td></td>
<td>0.34 (&lt; 0.001)</td>
</tr>
<tr>
<td>Age</td>
<td>0.47 (&lt; 0.001)</td>
</tr>
<tr>
<td></td>
<td>0.45 (&lt; 0.001)</td>
</tr>
<tr>
<td>Fischer asthma control scale</td>
<td>−0.22 (0.080)</td>
</tr>
<tr>
<td></td>
<td>−0.14 (0.245)</td>
</tr>
<tr>
<td>Global Index of Change</td>
<td>0.95 (0.323)</td>
</tr>
<tr>
<td></td>
<td>0.98 (0.308)</td>
</tr>
<tr>
<td>Adherence index</td>
<td>0.11 (0.240)</td>
</tr>
<tr>
<td></td>
<td>0.13 (0.179)</td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td>0.18 (0.590)</td>
</tr>
<tr>
<td></td>
<td>0.18 (0.068)</td>
</tr>
<tr>
<td>Fischer asthma control scale</td>
<td>0.95 (0.323)</td>
</tr>
<tr>
<td></td>
<td>0.98 (0.308)</td>
</tr>
<tr>
<td>Adherence index</td>
<td>0.11 (0.240)</td>
</tr>
<tr>
<td></td>
<td>0.13 (0.179)</td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td>0.18 (0.590)</td>
</tr>
<tr>
<td></td>
<td>0.18 (0.068)</td>
</tr>
<tr>
<td>Family cohesion</td>
<td>0.10 (0.277)</td>
</tr>
<tr>
<td></td>
<td>−0.10 (0.308)</td>
</tr>
<tr>
<td>Family adaptability</td>
<td>−0.07 (0.459)</td>
</tr>
<tr>
<td></td>
<td>−0.06 (0.562)</td>
</tr>
</tbody>
</table>

PAQLQ: Paediatric Asthma Quality of Life Questionnaire; and PedsQL: Pediatric Quality of Life Inventory. *According to the Family Adaptability and Cohesion Evaluation Scale III.

was 36 subjects, with alpha and beta errors set at 5% and 20%, respectively.

For each questionnaire, the two interviews were compared by means of paired t-tests. We used Pearson’s correlation coefficient (r) to determine the strength of the association between the instruments (total scores and similar domains). Values of r > 0.3 were considered acceptable. Correlations between the PAQLQ scores and the various demographic variables were also assessed.

Table 3 - Overall scores in the Paediatric Asthma Quality of Life Questionnaire (Brazilian Portuguese-language version): floor/ceiling effects and reliability results.

<table>
<thead>
<tr>
<th>Variable</th>
<th>PAQLQ scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>Activity limitations</td>
</tr>
<tr>
<td></td>
<td>Symptoms</td>
</tr>
<tr>
<td>Items, n</td>
<td>23</td>
</tr>
<tr>
<td>Theoretical score, range</td>
<td>1-7</td>
</tr>
<tr>
<td>Measured score, range</td>
<td>2.2-7</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>5.1 ± 1.1</td>
</tr>
<tr>
<td>Floor effect, n (%)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Ceiling effect, n (%)</td>
<td>2 (1.6)</td>
</tr>
<tr>
<td>α-C, total</td>
<td>0.93</td>
</tr>
<tr>
<td>α-C, range*</td>
<td>0.93-0.93</td>
</tr>
<tr>
<td>Reproducibility*</td>
<td>0.80</td>
</tr>
<tr>
<td>Sensitivity to change*</td>
<td>0.60</td>
</tr>
</tbody>
</table>

PAQLQ: Paediatric Asthma Quality of Life Questionnaire; and α-C: Cronbach’s alpha coefficient. *Range of values by domain. *Effect size in the “Change” subgroup. *Intraclass correlation coefficient in the “No Change” subgroup.
in the “no-change” subgroup. Cronbach’s alpha coefficient and the ICC values were considered adequate if ≥ 0.7. To calculate the effect size, we used the method that includes the test and retest standard deviations. Conventional interpretation of effect size values is as follows: 0.2 = small; 0.5 = medium; and 0.8 = large.\(^{(16)}\)

The study was approved by the review board of the institution, parents gave written informed consent, and the participants verbally agreed to be included in the study. Permission to use each of the questionnaires was granted by the corresponding copyright holders or their agents.

**Results**

A total of 125 children and adolescents participated in the study, and the mean age was 11 years. Males accounted for more than half of all subjects, and 82% of the participants had normal lung function. Most of the families (67.9%) were at medium or high risk for psychological disorders, and the socioeconomic status was low or very low in 40% of cases. Table 1 summarizes the characteristics of our study sample.

Table 2 shows how the PAQLQ scores correlated with the PedsQL scores and with the various demographic variables. The instruments correlated reasonably well with each other in terms of the total scores and the scores for equivalent domains, suggesting an acceptable convergent validity.\(^{(16)}\) Variables related to socioeconomic status or family risk correlated weakly with the PAQLQ scores.

The overall reliability and floor/ceiling effects of the PAQLQ are shown in Table 3. The mean PAQLQ total score was 5.18, the mean domain scores being lowest (4.99) for the activity limitations domain and highest (5.20) for the asthma symptoms domain. Although none of the participants made the lowest possible score for the emotional function domain, some (8.8%) attained the highest possible score for that domain. The Cronbach’s alpha coefficient was 0.65 for the activity limitations domain, whereas it was ≥ 0.7 for all of the other domains, as well as for the homogeneity within each domain. For the two subgroups (“change” and “no change”), the changes over time were at acceptable levels (Table 4). In the “change” subgroup, the effect size was 0.6, and the ICC was 0.8 in the “no change” subgroup. The lowest values were for reproducibility in the activity limitations domain (0.66) and for sensitivity to change in the asthma symptoms domain (0.45). Differences between test and retest scores were greater than the MID in the “change” subgroup.

**Discussion**

The psychometric results of our field testing demonstrate the cultural adequacy of the official Brazilian Portuguese-language version of the PAQLQ, which can therefore now be considered validated for use in Brazil.

A different and independent Brazilian version of the PAQLQ was validated in 2005.\(^{(19)}\) Although there were some methodological objections,\(^{(20)}\) the authors certainly made a great investment of time and resources to develop a thorough validation process starting from zero. However, the resulting version is not available and would not be applicable, since the original author of the PAQLQ allows the use only of MAPI versions.\(^{(17)}\) This added to the prevailing confusion.
of 0.3–0.4 between total scores on HRQoL instruments and FEV₁ are now considered adequate. However, unlike what would be expected, socioeconomic status correlated weakly with the PAQLQ scores. Although 40% of participants were in the two lowest socioeconomic strata, the mean score for our sample as a whole was 5.1, out of a maximum possible score of 7, which suggests the group had an acceptable HRQoL. Proper functioning of health care microsystems could account for these particular results since they can have a positive impact on patient quality of life, as suggested in different studies, including that carried out in the city of Porto Alegre, Brazil.

Our study has some limitations. We had a smaller number of subjects in the subgroup of patients who reported no changes in their asthma-related health status. That might have limited our assessment of reproducibility. However, the reproducibility of their PAQLQ results was in accordance with their reportedly unchanged state. Our sample size, however, was larger than the estimated sample size needed in order to perform our core analysis, as well as being larger than those evaluated in other PAQLQ validation studies. The decision not to include cases of asthma that were more severe could be considered another limitation. Severe asthma is certainly a great challenge for clinicians and asthma control programs, but we preferred to include only the most important category in terms of epidemiology, frequent episodic asthma, which is equivalent to the sum of the mild persistent asthma and moderate persistent asthma categories outlined in the Brazilian Guidelines for Asthma Management.

In conclusion, based on our field testing, the Brazilian Portuguese-language version of the PAQLQ, developed by the MAPI in 2001, shows good convergent validity, internal consistency, sensitivity to change, reproducibility, and discriminatory power. Consequently, we can state that the psychometric performance of this version of the PAQLQ is acceptable.

Acknowledgments

We thank Prof. José Moreira and Mr. Marco A. da Silva (Pulmonology Post-Graduate Program of the Federal University of Rio Grande do Sul) for their support throughout the study.
References


About the authors

Edgar Enrique Sarria
Research Fellow in Pediatric Pulmonology. Indiana University, Indianapolis (IN) USA.

Rosana Cardoso Manique Rosa
Resident in Pediatrics. Hospital Nossa Senhora da Conceição, Porto Alegre, Brazil.

Gilberto Bueno Fischer
Professor of Pediatrics. Universidade Federal de Ciências da Saúde de Porto Alegre – UFCSPA, Federal University of Health Sciences of Porto Alegre.

Vânia Naomi Hirakata

Neusa Sica da Rocha
Post-Doctoral Fellow in Psychiatry. Universidade Federal do Rio Grande do Sul – UFRGS, Federal University of Rio Grande do Sul – School of Medicine, Porto Alegre, Brazil.

Rita Mattiello
Doctoral Fellow in Pediatrics. Universidade Federal do Rio Grande do Sul – UFRGS, Federal University of Rio Grande do Sul – School of Medicine, Porto Alegre, Brazil.