Original Article

Validation of the Brazilian Portuguese version of the Pittsburgh Sleep Quality Index

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A B S T R A C T

Introduction: The Pittsburgh Sleep Quality Index (PSQI) is a questionnaire that assesses sleep quality and disturbances over a 1-month period. It is a valuable tool for research purposes. The aim of this study was to validate a Brazilian Portuguese version of the PSQI.

Methods: The Brazilian Portuguese version (PSQI-BR) was developed according to the following steps: (a) translation, (b) back-translation, (c) comparison between translation and back-translation performed by a group of experts, and (d) pretest in bilingual individuals. Between January 2006 and September 2007, the PSQI-BR was applied to a group of consecutive patients who were submitted to overnight polysomnography with clinical suspicion of obstructive sleep apnea syndrome (OSAS) or insomnia. As in the original article, a group of patients with depression and a control group were included. The depression group was composed of patients from the Mood Disorders Unit of the Psychiatry Department of Hospital de Clínicas de Porto Alegre (HCPA), Brazil. The control group was composed of subjects with a history of normal sleep habits, without noticed snoring.

Results: A total of 83 patients and 21 controls completed the questionnaire and were submitted to overnight polysomnography. The seven-component scores of the PSQI-BR had an overall reliability coefficient (Cronbach’s α) of 0.82, indicating a high degree of internal consistency. The groups included 43 patients with OSAS, 21 with insomnia, 19 with depression and 21 controls. The mean (±SD) PSQI-BR score was 8.1 ± 4.0 for patients with OSAS, 12.8 ± 3.7 for insomnia patients, 14.5 ± 3.7 for those with depression and 2.5 ± 2.0 for control subjects. The one-way ANOVA demonstrated significant differences in PSQI-BR scores across the four diagnostic groups (p < 0.001). Post hoc tests between paired groups showed that scores for OSAS, depression and insomnia were significantly higher than for controls (p < 0.05). PSQI-BR scores for insomnia did not differ from those obtained for depression (p > 0.05), but both were higher than for OSAS (p < 0.05).

Conclusions: The results of the present study demonstrate that the PSQI-BR is a valid and reliable instrument for the assessment of sleep quality and equivalent to its original version when applied to individuals who speak the Brazilian Portuguese language. Despite relevant influences of language and cultural background, no major cultural adaptations were necessary during the validation process. The PSQI-BR can be a tool either for clinical management or research.

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1. Introduction

Neurobiological processes associated with sleep are virtually necessary in all species for maintenance of physical and cognitive health. Sleep disorders may cause impairment in school performance, work, family and social relationships and are also associated with increased risk for accidents [1]. For individuals who suffer from these disorders, the effect of their symptoms on their quality of life often prompts them to seek medical attention for diagnosis and treatment [2,3]. This has encouraged researchers to develop tools for assessing and further investigating these disorders. But most of these tools have been validated in English and targeted for English-speaking populations. If one wishes to apply these tools in other populations, proper cross-cultural adaptation and validation are required [4–6].

Subjective measurement tools can be used in clinical practice for diagnostic purposes, for monitoring treatment responses, in epidemiological studies and in clinical research. Some of them are designed for the assessment of specific sleep disorders, such as sleepiness or presence of awakenings, while others evaluate...
sleep in a broad spectrum, especially with regard to sleep quality [7]. Assessing sleep quality is a complex task, since it involves quantitative parameters, such as sleep duration, sleep latency and number of awakenings, in addition to qualitative parameters, which are purely subjective.

The Pittsburgh Sleep Quality Index (PSQI) [8], developed by Buysse, appraises sleep quality through a standardized questionnaire, which can be easily understood and answered, differentiating between “good sleepers” and “poor sleepers.” It assesses sleep quality over a 1-month time interval. This is an intermediate period between those questionnaires that evaluate only the last night’s sleep and cannot detect dysfunctional patterns, and those that evaluate sleep quality over longer periods and cannot determine the severity of a disorder at the present time. In addition, since its development, the PSQI has been widely used to measure sleep quality in different patient groups, such as in patients with renal and intestinal diseases, with asthma and with cancer [9–13], and also in those with psychiatric or sleep disorders. This way, the combination of quantitative and qualitative information on sleep quality should be highlighted as an important feature of this questionnaire.

The present study was carried out to translate the PSQI and validate its use in Brazil.

2. Patients and methods

2.1. Research tool

The PSQI assesses sleep quality over a 1-month period. The questionnaire consists of 19 self-rated questions and 5 questions that should be answered by bedmates or roommates. The latter questions are used only for clinical information. The 19 questions are categorized into 7 components, graded on a score that ranges from 0 to 3. The PSQI components are as follows: subjective sleep quality (C1), sleep latency (C2), sleep duration (C3), habitual sleep efficiency (C4), sleep disturbances (C5), use of sleeping medication (C6) and daytime dysfunction (C7). The sum of scores for these 7 components yields one global score, which ranges from 0 to 21, where the highest score indicates worst sleep quality. A global PSQI score greater than 5 indicates major difficulties in at least 2 components or moderate difficulties in more than 3 components [8].

2.2. Translation

The PSQI was translated into Brazilian Portuguese by 2 independent translators, who were aware of the study objectives. The translations were compared by researchers until a final version could be obtained. Back-translations into English were carried out by another 2 translators, who did not participate in any of the previous steps. The author of the scale, Daniel J. Buysse, assessed the back-translations and a final version was then obtained.

The comparison of the PSQI with the final back-translation was made by individuals who were fluent in English and who were not involved in the research study. Each of the items in both versions was analyzed following the method described in the literature [6]. After this procedure, the final version of the PSQI, in Brazilian Portuguese, known as PSQI-BR, was obtained (see Appendix).

In order to assess the linguistic interchangeability between the translation and the original questionnaire, a separate group of 14 bilingual individuals answered firstly the PSQI and then PSQI-BR at 4 week intervals. Their scores on each version were correlated.

2.3. Patients

The PSQI-BR was applied to a group of consecutive patients aged 18–65 years who underwent polysomnography (PSG) at the Sleep Laboratory of Hospital de Clínicas de Porto Alegre (HCPA), Brazil, between January 2006 and September 2007. Those patients were clinically diagnosed with depression, psychophysiological or idiopathic insomnia or OSAS. The questionnaire was applied by a previously trained researcher during sleep outpatient clinic visits, which could precede PSG in at most 2 weeks. The depression group was selected from patients under treatment at the outpatient clinic of Psychiatry of HCPA who had scored 17 or more points on the Hamilton [14] depression rating scale. For each patient data regarding age, sex, body mass index (BMI), neck circumference (cm), comorbidities, and use of medications were recorded.

Patients who could not understand the questions; those with overlapping diagnoses, such as OSAS and depression; shift workers; those with polysomnographic findings suggesting disorders other than OSAS, insomnia or depression were excluded from the study.

The control group consisted of patients from the Outpatient Clinic of Ophthalmology of HCPA as well as of hospital staff members who did not have any sleep complaints and whose PSG findings were normal.

The diagnoses of OSAS and insomnia followed the standards established by the American Academy of Sleep Medicine (AASM) [15].

2.4. Statistical analysis

Quantitative variables were expressed as mean ± SD, and qualitative variables were expressed as percentage values. Two-tailed P values of 0.05 or less were regarded as statistically significant, and 95% confidence intervals were calculated for results.

Group data are described by means and standard deviations (SD). For comparisons between groups, an analysis of variance (ANOVA) was performed. The effects of age, sex, body mass index (BMI) and apnea–hypopnea index (AHI) on the PSQI-BR scores were evaluated by analysis of covariance (ANCOVA). Internal consistency of the PSQI-BR was assessed by Cronbach’s α statistics. A probability of p < 0.05 was considered statistically significant. Data were analyzed by the Statistical Package for the Social Sciences for Windows (SPSS), version 12.0.

2.5. Ethical aspects

The study protocol was approved by the Research Ethics Committee of the Graduate Research Program (GPPG) of Hospital de Clínicas de Porto Alegre (HCPA), in accordance with International and National Guidelines.

All patients and controls signed an informed consent form before inclusion in the study.

3. Results

3.1. Cross-cultural adaptation

No structural modifications to the questionnaire were necessary during the cross-cultural adaptation process. After the analysis of the translations, the authors decided to keep the translation of the term “bad dreams” in the item “Had bad dreams,” as we considered that not only nightmares could interfere with sleep quality, but negative dreams could have the same effect. We added examples of activities in the item “During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?” since we believed respondents could have some difficulty understanding which activities were involved. In the question “During the past month, how much of a problem has been for you to keep up enough enthusiasm to get things done,” we added the expression “your habitual activities” between brackets.
The scores of the PSQI-BR and of the original PSQI, both answered by 14 bilingual individuals, yielded means (±SD) of 6.1 ± 3.4 and 5.6 ± 3.3, respectively, showing significant correlations \( r = 0.881; \) \( CCI = 0.878; \) \( p < 0.001 \) and indicating a good linguistic interchangeability between the translation and the original questionnaire. The internal consistency of the PSQI-BR and of the original PSQI, measured by Cronbach's \( \alpha \) coefficient, amounted to 0.73 and 0.75, respectively, when applied to this group of bilingual individuals.

3.2. Characteristics of the groups and their respective PSQI-BR scores

A total of 83 patients and 21 controls completed the questionnaire and were included in the study after being submitted to overnight polysomnography. The demographic characteristics of these patients and controls are listed in Table 1. The 83 patients were classified into the following groups: 19 in the depression group, 21 in the insomnia group, and 43 in the OSAS group. The mean score for the Hamilton depression rating scale among patients with depression was 20.9 ± 3.3 (±SD).

The 7-component scores of the PSQI-BR had an overall reliability coefficient (Cronbach's \( \alpha \)) of 0.82, indicating a high degree of internal consistency. The mean (±SD) PSQI-BR score was 2.5 ± 2.0 for control subjects, 8.1 ± 4.0 for OSAS, 12.8 ± 3.7 for insomnia, 14.5 ± 3.7 for depression. The one-way ANOVA demonstrated significant differences in PSQI-BR scores across the 4 diagnostic groups (\( p < 0.001 \)). Post hoc tests between the paired groups revealed that the PSQI-BR scores for OSAS, depression and insomnia were significantly higher than for the controls (\( p < 0.05 \)). The scores for the insomnia group did not differ from those of the depression group (\( p > 0.05 \)), but both were higher than in the OSAS group (\( p < 0.05 \)).

All patients in the insomnia and depression groups had scores greater than 5, and 31 of 43 patients (72.1%) with OSAS had scores greater than 5, as shown in Fig. 1. Note that only one individual in the control group had a score greater than 5.

The one-way ANOVA showed significant difference in terms of age across the 4 groups (\( p < 0.001 \)). Post hoc tests between the paired groups showed significant differences between the OSAS and depression groups comparatively to controls (\( p < 0.05 \)) and between the OSAS and insomnia groups (\( p < 0.05 \)). But there was a weak correlation between age and the PSQI-BR scores (\( r = 0.254; \) \( p = 0.009 \)).

The analysis of covariance (ANCOVA) showed that the differences in PSQI-BR scores across the diagnostic groups were statistically significant even after the adjustments for age, sex, sleep efficiency, AHI, and sleep latency (\( p < 0.001 \)).

No correlations were observed between the PSQI-BR scores and the nadir oxygen saturation (\( p = 0.48 \)) and between the PSQI-BR scores and AHI (\( p = 0.56 \)).

There was a weak correlation between sleep latency obtained by PSG and C2 (sleep latency) assessed by the PSQI-BR (\( r = 0.201; \) \( p < 0.05 \)). The same occurred between sleep efficiency obtained by PSG and C4 (habitual sleep efficiency) assessed by the PSQI-BR (\( r = 0.201; \) \( p < 0.05 \)).

4. Discussion

The scores for the PSQI-BR, measured by Cronbach's \( \alpha \) coefficient components, showed good internal consistency, i.e., each of the 7 components of the questionnaire assesses a particular aspect of sleep quality. Similar internal consistencies were obtained by other validation studies of the PSQI-BR in other languages [16,17]. The application of the questionnaire to the group of bilingual individuals helped to demonstrate the good linguistic interchangeability between the translation and the original questionnaire. The PSQI-BR also showed adequate psychometric properties, which allow its application to different groups of patients, such as the ones assessed in the present study.

Submitting all study participants to PSG was a determining factor in the selection of the groups. This allowed excluding patients with depression or insomnia who had a concomitant diagnosis of OSAS. PSG also permitted a more accurate assessment of controls,

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**Table 1**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Depression (n = 19)</th>
<th>Insomnia (n = 21)</th>
<th>OSAS (n = 43)</th>
<th>Controls (n = 21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>45.4 ± 10.3</td>
<td>40.9 ± 12.8</td>
<td>49.9 ± 9.1</td>
<td>36.1 ± 8.0</td>
</tr>
<tr>
<td>(19–60)</td>
<td>(18–61)</td>
<td>(27–65)</td>
<td>(23–46)</td>
<td></td>
</tr>
<tr>
<td>Female/male</td>
<td>15/4</td>
<td>14/7</td>
<td>19/24</td>
<td>12/9</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>26.9 ± 7.1</td>
<td>24.2 ± 2.9</td>
<td>30.9 ± 7.0</td>
<td>23.0 ± 2.7</td>
</tr>
<tr>
<td>(16.7–47.0)</td>
<td>(17.4–30.1)</td>
<td>(18.3–58.4)</td>
<td>(18.4–29.2)</td>
<td></td>
</tr>
<tr>
<td>AHI</td>
<td>1.83 ± 1.36</td>
<td>0.68 ± 0.93</td>
<td>30.39 ± 24.78</td>
<td>0.77 ± 0.95</td>
</tr>
<tr>
<td>(0.2–4.8)</td>
<td>(0–3.7)</td>
<td>(5.5–104.8)</td>
<td>(0–3.7)</td>
<td></td>
</tr>
<tr>
<td>PSQI-BR Score</td>
<td>14.5 ± 3.7abc</td>
<td>12.8 ± 3.7abc</td>
<td>8.1 ± 4.0abc</td>
<td>2.5 ± 2.0</td>
</tr>
<tr>
<td>(6–20)</td>
<td>(8–20)</td>
<td>(2–17)</td>
<td>(0–8)</td>
<td></td>
</tr>
</tbody>
</table>

OSAS, obstructive sleep apnea–hypopnea syndrome; AHI, apnea–hypopnea index; BMI, body mass index.

* Data are presented as mean ± SD (range) unless otherwise stated.

a p < 0.05 compared with controls group.

b p < 0.05 compared with OSAS group.

c p > 0.05 compared with insomnia group.
excluding those individuals with abnormal polysomnographic findings, even if they were seemingly unrelated to clinical conditions.

The mean PSQI-BR scores were similar to those of the original questionnaire in the control group. As with the OSAS, insomnia and depression groups, the mean PSQI-BR scores were higher than those obtained by Buysse et al. [8]. These dissimilar findings may be ascribed to the differences between groups, since the diagnostic criteria used for the development of the PSQI were established according to the classification of 1979 [18], whereas in this study, the OSAS and insomnia groups were defined according to AASM criteria [15]. In any case, the results obtained with the original questionnaire regarding the comparison between groups were reproduced in the present study, i.e., the scores achieved by control individuals were significantly different from those of the OSAS, depression and insomnia groups, and the scores for the insomnia and depression groups were higher than those for the OSAS group. The fact that the scores for the insomnia group were not significantly different from those of the depression group, as Buysse et al. [8] had found, comes as no surprise, since insomnia is the most common sleep disorder among patients with depression.

As in the study for the development of the PSQI and further publications [8,19], the PSQI-BR scores were not correlated with polysomnographic findings. The different sleep patterns observed every night and the effect of spending the first night in a sleep laboratory may be related to the differences between polysomnographic findings and the subjective sleep parameters. Also, it should be highlighted that the questionnaire assessed sleep quality over the past month and that it is not sensitive to daily fluctuations in sleep patterns.

Selecting diverse groups for this study apparently did not interfere with the results, since such results were similar to those obtained in other PSQI validation studies.

The discriminatory power of the PSQI-BR between “good sleepers” and “poor sleepers” was properly demonstrated by the results of the present study. By using a cutoff score of 5, as recommended in the original study [8], one observes that all patients diagnosed with insomnia or depression had scores greater than 5, which suggests poor sleep quality. Nevertheless, 12 out of 43 patients with OSAS (27.9%) had scores lower than 5. This finding may be related to the fact that poor sleep quality is not the major complaint by patients with OSAS, as it is common knowledge that these patients usually seek medical care due to snoring and apnea [20]. In addition, one should take into account that the PSQI-BR is a subjective tool for the assessment of sleep quality and, therefore, it is open to individual interpretations.

5. Conclusions

The results of the present study demonstrate that the PSQI-BR is a valid and reliable instrument for the assessment of sleep quality, being equivalent to its original version when applied to individuals who speak Brazilian Portuguese. The PSQI-BR can be easily understood and answered combined with the advantage of allowing differentiation between “good sleepers” and “poor sleepers.” Therefore, given its considerable advantage of combining quantitative and qualitative sleep data, the PSQI-BR is useful for the assessment of patients with disorders that are likely to affect sleep quality.

6. Disclosure statement

The authors report no conflicts of interest.

Appendix Índice. de qualidade de sono de Pittsburgh (PSQI-BR)

Nome: ___________________________________________ Idade: _____ Data: __________

Instruções:

As seguintes perguntas são relativas aos seus hábitos de sono durante o último mês somente. Suas respostas devem indicar a lembrança mais exata da maioria dos dias e noites do último mês. Por favor, responda a todas as perguntas.

1. Durante o último mês, quando você geralmente foi para a cama à noite?
   Hora usual de deitar_____

2. Durante o último mês, quanto tempo (em minutos) você geralmente levou para dormir à noite?
   Número de minutos_____

3. Durante o último mês, quando você geralmente levantou de manhã?
   Hora usual de levantar ________________

4. Durante o último mês, quantas horas de sono você teve por noite? (Este pode ser diferente do número de horas que você ficou na cama).
   Horas de sono por noite ________________

Para cada uma das questões restantes, marque a melhor (uma) resposta. Por favor, responda a todas as questões.

5. Durante o último mês, com que frequência você teve dificuldade de dormir porque você...

   (a) Não conseguiu adormecer em até 30 minutos
      Nenhuma no último mês _____ Menos de 1 vez/ semana _____
      1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____

   (b) Acordou no meio da noite ou de manhã cedo
      Nenhuma no último mês _____ Menos de 1 vez/ semana _____
      1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____

   (c) Precisou levantar para ir ao banheiro
      Nenhuma no último mês _____ Menos de 1 vez/ semana _____
      1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____

   (d) Não conseguiu respirar confortavelmente
      Nenhuma no último mês _____ Menos de 1 vez/ semana _____
1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____

(e) Tossiu ou roncou forte
Nenhuma no último mês _____ Menos de 1 vez/ semana _____
1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____

(f) Sentiu muito frio
Nenhuma no último mês _____ Menos de 1 vez/ semana _____
1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____

(g) Sentiu muito calor
Nenhuma no último mês _____ Menos de 1 vez/ semana _____
1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____

(h) Teve sonhos ruins
Nenhuma no último mês _____ Menos de 1 vez/ semana _____
1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____

(i) Teve dor
Nenhuma no último mês _____ Menos de 1 vez/ semana _____
1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____

(j) Outra(s) razão(ões), por favor descreva ______________________________

Com que freqüência, durante o último mês, você teve dificuldade para dormir devido a essa razão?
Nenhuma no último mês _____ Menos de 1 vez/ semana _____
1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____

6. Durante o último mês, como você classificaria a qualidade de seu sono de uma maneira geral?

Muito boa _____
Boa _____
Ruim _____
Muito ruim _____

7. Durante o último mês, com que freqüência você tomou medicamento (prescrito ou “por conta própria”) para lhe ajudar a dormir?
Nenhuma no último mês _____ Menos de 1 vez/ semana _____
1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____

8. No último mês, com que freqüência você teve dificuldade de ficar acordado enquanto dirigia, comia ou participava de uma atividade social (festa, reunião de amigos, trabalho, estudo)?
Nenhuma no último mês _____ Menos de 1 vez/ semana _____
1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____

9. Durante o último mês, quão problemático foi para você manter o entusiasmo (ânimo) para fazer as coisas (suas atividades habituais)?
Nenhuma dificuldade _____
Um problema leve _____
Um problema razoável _____
Um grande problema _____

10. Você tem um(a) parceiro [esposo(a)] ou colega de quarto?
Não _____
Parceiro ou colega, mas em outro quarto _____
Parceiro no mesmo quarto, mas não na mesma cama _____
Parceiro na mesma cama _____

Se você tem um parceiro ou colega de quarto, pergunte a ele/ela com que freqüência, no último mês, você teve ...

(a) Ronco forte
Nenhuma no último mês _____ Menos de 1 vez/ semana _____
1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____

(b) Longas paradas na respiração enquanto dormia
Nenhuma no último mês _____ Menos de 1 vez/ semana _____
1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____

(c) Contrações ou puxões nas pernas enquanto você dormia
Nenhuma no último mês _____ Menos de 1 vez/ semana _____
1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____

(d) Episódios de desorientação ou confusão durante o sono
Nenhuma no último mês _____ Menos de 1 vez/ semana _____
1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____

(e) Outras alterações (inquietações) enquanto você dorme; por favor, descreva _____________________________________

Nenhuma no último mês _____ Menos de 1 vez/ semana _____
1 ou 2 vezes/ semana _____ 3 ou mais vezes/ semana _____
Conflict of Interest

The ICMJE Uniform Disclosure Form for Potential Conflicts of Interest associated with this article can be viewed by clicking on the following link: doi:10.1016/j.sleep.2010.04.020.

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