Article published online: 2023-08-22

https://doi.org/10.1590/0004-282X20180108

ARTICLE

Development of the Brazilian Portuguese version of the "Grading scale for idiopathic normal pressure hydrocephalus": cross-cultural adaptation, reliability and validity

Validação da escala de hidrocefalia de pressão normal idiopática para o português brasileiro: aplicação, confiabilidade e validade

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ABSTRACT

Objective: The current study translated to Portuguese and validated the normal pressure hydrocephalus (NPH) scale originally developed in English as the Grading Scale for Idiopathic Normal Pressure Hydrocephalus. **Methods:** Following Guillemin's validation protocol, the last version of the Portuguese NPH scale was applied to 121 consecutive patients with a diagnosis of normal pressure hydrocephalus (73 men and 48 women) from the Group of Cerebral Hydrodynamics from July 2010 to March 2012. **Results:** The mean age was 71.09 years old, ranging from 35 to 92 years. The rate of agreement and reproducibility was high, as confirmed by Cohen's Kappa coefficient, with excellent intraobserver correlation for the NPH scale items individually evaluated: gait (0.80), dementia (0.90) and incontinence (0.87). **Conclusions:** The Portuguese version of the Grading Scale for Idiopathic Normal Pressure Hydrocephalus was successfully translated and validated for use in Brazilian patients.

Keywords: Hydrocephalus, normal pressure; translations; validation studies; surveys and questionnaires.

RESUMO

Objetivos: o presente estudo valida para a língua portuguesa a escala de hidrocefalia de pressão normal (HPN) desenvolvida em língua inglesa como "Escala de classificação para hidrocefalia de pressão normal idiopática". **Métodos:** Usando o método de Guillemin, uma versão traduzida da escala foi aplicada em 121 pacientes consecutivos com diagnóstico de hidrocefalia de pressão normal (73 homens e 48 mulheres) no Grupo de Hidrodinâmica Cerebral do Hospital das Clínicas da FMUSP de julho de 2010 a março de 2012. **Resultados:** a média de idade foi de 71,09 anos, variando de 35 a 92 anos. A taxa de concordância e reprodutibilidade foi alta, conforme confirmado pelo coeficiente Kappa, com excelente correlação intraobservador para itens de escala HPN que avaliou a marcha (0,80), demência (0,90) e incontinência (0,87). **Conclusões:** a versão em português da escala de graduação para pacientes com HPN foi traduzida e validada com sucesso para uso em pacientes brasileiros de ambos os sexos.

Palavras-chave: hidrocefalia de pressão normal; traduções; estudos de validação; inquéritos e questionários.

Normal pressure hydrocephalus (NPH) is a neurological disease characterized predominantly by progressive development of gait apraxia, cognitive disturbances and urinary incontinence. Other neuropsychiatric symptoms may also occur[1,2,3,4,5,6,7]. It promotes the patient's functional dependence and is responsible for family and social burden[8,9,10,11,12,13,14,15]. However, in many cases, symptoms may be mitigated with appropriate surgical treatment and multidisciplinary neurocognitive rehabilitation[9].

Many scales are widely applied to evaluate NPH; however, most of them are not specific, having been adapted from the evaluation of cognitive deficits (Mini Mental

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Conflict of interest: There is no conflict of interest to declare.
Received 17 March 2018; Received in final form 24 May 2018; Accepted 03 July 2018.
Support: The present study was approved by the Ethics Committee for Analysis of Research Projects (CAPpesq) of the Hospital das Clínicas of the Faculty of Medicine of the University of São Paulo (HCFMUSP).

State Examination, Cambridge Cognitive Assessment and Montreal Cognitive Assessment) and from motor evaluations (Timed Up and Go, Dynamic Gait Index, Berg Balance Scale, and others)[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15].

However, a specific scale has been developed to address all three components of the triad. The Grading Scale for Idiopathic Normal Pressure Hydrocephalus was originally developed in Japan in the English language, based on a cooperative study, between 1996 and 1999, to determine the most predictive diagnostic criteria for NPH patients[13]. It comprises three domains (gait, dementia and urinary incontinence) with scores ranging from 0 to 12 (the higher the score, the worse the symptoms). It is easily and rapidly applied and may be used as a follow-up evaluation tool, correlating with post treatment symptoms and results[1].

The objective of the present study was to validate the Grading Scale for Idiopathic Normal Pressure Hydrocephalus developed in English that was translated into Portuguese as the Normal Pressure Hydrocephalus Patient Graduation Scale (NPHPGS).

METHODS

A cross-sectional, observational study was performed on 121 patients of both genders, aged over eighteen years of age, with a medical diagnosis of NPH. Patients were recruited by means of a consecutive sample, according to the following criteria.

Inclusion criteria

Patients with an idiopathic or secondary NPH diagnosis, older than eighteen years of age, of both genders, who agreed to participate. The NPH diagnosis was considered in patients with at least one of the constituent symptoms of the classic triad (urinary incontinence, memory impairment, or gait apraxia), and evidence of hydrocephalus on neuroimaging (CT or MRI).

Exclusion criteria

Patients with an altered level of consciousness, patients with clinically decompensated systemic diseases or malignancies.

The present study was approved by the Ethics Committee for Analysis of Research Projects of the Hospital das Clínicas of the Faculty of Medicine of the University of São Paulo.

Translation

The Grading Scale for Idiopathic Normal Pressure Hydrocephalus was translated into Portuguese in a standardized way to guarantee the quality and reliability of the original version, according to the method by Guillemin et al.[16].

Translation was carried out by two bilingual Brazilian neurologists, experienced in the validation of instruments, and the two final translations were compared by the translators, correcting the inconsistencies, and developing a consensual translation. Afterwards, the back-translation to English was performed by two other bilingual neurologists, who were different from the previous ones and did not know the original scale.

Additionally, a comparison of the versions was made by a multidisciplinary committee, comprising physicians and physiotherapists who were not involved in the translation process, defining the Portuguese version of the scale as "Escala de Graduação do Paciente com Hidrocefalia de Pressão Normal" (the above-mentioned NPHPGS). This Portuguese version of the scale is shown in Figure 1.

Validation

Patients were individually evaluated at two different times, with a one-week interval. Data were collected by physiotherapist A and, subsequently, by physiotherapist B, sequentially evaluating the same patient. In this way, it was possible to compare the results and avoid errors between observers. On the first day, the initial protocol was determined, so that these results could be compared to test the reliability of the new instrument containing personal data by application of the Functional Independence Measure (FIM), Berg Balance Scale (BBS), Dynamic Gait Index (DGI), Timed Up and Go (TUG) and the NPHPGS by physiotherapist A. On the same day, the second physiotherapist B applied the NPHPGS to verify reproducibility between observers.

The TUG test evaluates the time taken to walk a short distance and has been proven to be a good option for diagnosis, outcome prediction, and postoperative follow-up, although there have been no studies of isolated TUG performance in the setting of NPH[1,17,18,19,20,21,22].

The FIM is a scale that evaluates disability in neurological patients according to their ability to perform routine daily personal activities, such as self-care, sphincter control, mobility and locomotion, communication and social cognition[17,18,19,20,21,22].

The DGI assesses an individual's ability to modify balance while walking, in the presence of external demands. The test is performed with a marked distance of 20 feet and can be performed with or without an assistive device. Eight tasks are graded on a score from 0 to 3 (0, severe impairment; 1, moderate impairment; 2, minimal impairment; 3, no gait dysfunction), for a maximum score of 24. The eight tasks include 1) level surface gait, 2) change in gait speed, 3) gait with horizontal head turns, 4) gait with vertical head turns, 5) gait with pivot turn, 6) stepping over obstacles, 7) stepping around obstacles, and 8) stair climbing[17,18,19,20,21,22].

The BBS is one of the most widely-used and recognized balance measures. It has been validated in several populations, including stroke, and cut-off scores have been determined to identify those at risk of falls and those who need a gait aid for ambulation. It is commonly applied during inpatient rehabilitation, and has been shown to predict length of stay and discharge destination[17-22].

After one week, the patients underwent a new evaluation of the NPHPGS by the initial physiotherapist A, to verify the intraobserver (test/retest) reproducibility.

RESULTS

A total of 121 patients were studied, with a higher percentage of male patients (60.33%). The overall age range was between 35 and 92 years, with a higher concentration of patients between 71 and 80 years. The mean age was 71.09 years with standard deviation = 2.8 years. Primary NPH was present in 50 patients, while secondary NPH was present in 71 patients (usually following meningitis, trauma or subarachnoid hemorrhage). As for the domains, there was a higher frequency of gait impairment (96.69%), followed by dementia (85.95%) and urinary incontinence (79.33%). The summary of results are presented in the Table.

To evaluate the reliability and reproducibility, the scale was applied by the same evaluator with a one-week interval (intraobserver analysis) and different raters on the same day (interobserver analysis). The results were analyzed by Cohen's Kappa coefficient for measuring agreement. For intraobserver agreement, a general Kappa value was obtained, with an excellent concordance for the gait items (0.80), dementia (0.90) and incontinence (0.87).

Subsequently, an analysis of the validation of the method was carried out through the interobserver agreement, with excellent agreement for the gait items (0.91), dementia (0.86) and incontinence (0.87).

The comparison of the NPHPGS with the other scales was performed using Pearson's correlation coefficient, followed by the hierarchy shown in the graphs obtained from the ANOVA test values and multiple comparisons of the Tukey Test.

A satisfactory correlation was found in the NPHPGS and FIM scales, using Pearson's correlation (0.842). The hierarchy was obtained according to NPH values: below 40, between 40 and 79 and above 80 (Figure 2).

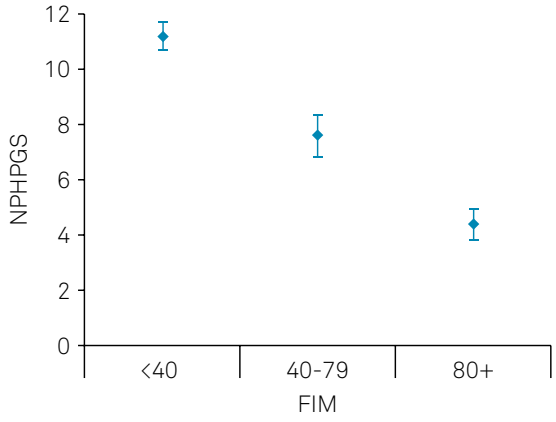
Escala de Graduação de HPN

Distúrbio de Marcha
0 Ausente
1 Marcha instável, mas independente
2 Anda com 1 apoio
3 Anda com 2 apoios ou andador
4 Não é possivel andar

Demência
0 Ausente
1 Sem demência aparente, mas apático
2 Socialmente dependente, mas independente na residência
3 Parcialmente dependente na residência
4 Totalmente dependente

Incontinencia urinaria
0 Ausente
1 Ausente, mas com polaciúria ou urgência miccional
2 As vezes, apenas a noite
3 As vezes, mesmo durante o dia
4 Frequente

Figure 1. Portuguese version of the Grading Scale for Idiopathic Normal Pressure Hydrocephalus[13] – the Normal Pressure Hydrocephalus Patient Graduation Scale.



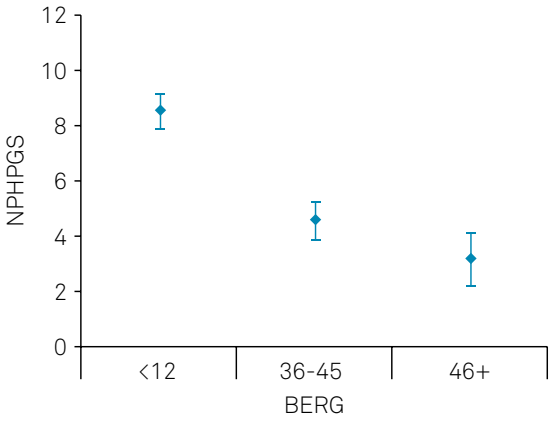
NPHPGS: Normal pressure hydrocephalus patient graduation scale; FIM: Functional independence measure;

Figure 2. Correlation of data of the Portuguese NPHPGS and the FIM. Confidence interval = mean ± 1.96 * standard deviation / √ (n-1).

Table. Summary of results, with evaluation of correlation and observer agreement.

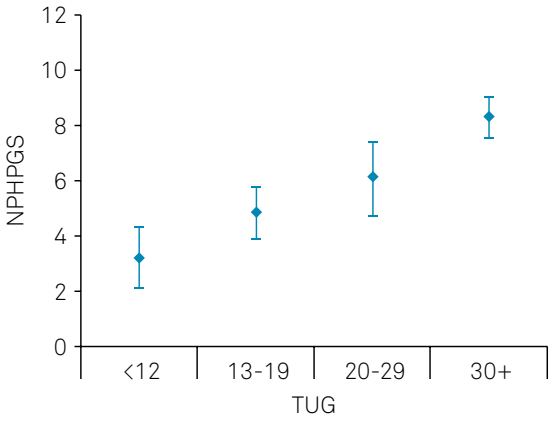
Variable			Statistical analysis	
			Cohen's Kappa coefficient for measuring agreement	
		Patients		
Female (n)	38		Intraobserver	Interobserver
Male (n)	73	Gait	0.80	0.91
Mean age (years)	71	Dementia	0.90	0.86
		Urinary incontinence	0.87	0.87
Symptoms (%)			Pearson's Correlation	
Gait apraxia	96		NPHPGS and FIM	0.842
Dementia	85		NPHPGS and BBS	0.803
Urinary incontinence	79		NPHPGS and DGI	0.694
			NPHPGS and TUG	0.557

FIM: Functional independence measure; BBS: Berg balance scale; DGI: Dynamic gait index; TUG: Timed up and go; NPHPGS: Normal pressure hydrocephalus patient graduation scale.



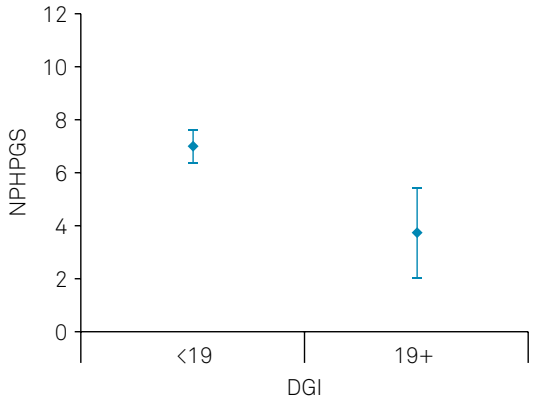
NPHPGS: Normal pressure hydrocephalus patient graduation scale; BBS: Berg balance scale.

Figure 3. Correlation of data of the Portuguese NPHPGS and the BBS. Confidence interval = mean ± 1.96 * standard deviation / √ (n-1).



NPHPGS: Normal pressure hydrocephalus patient graduation scale; DGI: Dynamic gait index.

Figure 4. Correlation of data of the Portuguese NPHPGS and the DGI. Confidence interval = mean ± 1.96 * standard deviation / √ (n-1).



NPHPGS: Normal pressure hydrocephalus patient graduation scale; TUG: Timed up and go.

Figure 5. Correlation of data of the Portuguese version of the NPHPGS Scale and the TUG. Confidence interval = mean ± 1.96 * standard deviation / √ (n-1).

A satisfactory correlation was found between the NPHPGS and BBS scores using Pearson's correlation (0.803). The hierarchy was obtained according to the NPH values: below 36, between 36 and 45, and above 46 (Figure 3).

A moderate correlation was found between the NPHPGS and DGI, using Pearson's correlation (0.694). The hierarchy was obtained according to the NPH values: below 19, equal to, or above 19 (Figure 4).

A moderate correlation was found between the NPHPGS and TUG, using Pearson's correlation (0.557). The hierarchy was obtained according to NPH values: below 12, between 13 and 19, between 20 and 29, and above 30 (Figure 5).

DISCUSSION

The lack of evaluation instruments aimed at NPH patients that have been translated and validated for Portuguese may restrict the research in this field. We translated and validated the Grading Scale for Idiopathic Normal Pressure Hydrocephalus. This instrument was designed to quantify the degree of deficit in patients with NPH[13].

In the intraobserver evaluation, the agreement was 0.80 for gait, 0.90 for dementia and 0.87 for urinary incontinence, all classified as excellent concordance. The same classification was found for the interobserver evaluation, with 0.91 for gait, 0.86 for dementia and 0.87 for urinary incontinence. These results favor the use of the evaluated instrument.

Although there is no gold standard for NPH evaluation, many scales have already been developed and used in the literature to assess the severity of the NPH triad. However, the main problem faced is the similarity between items in these domains, which often hinders the interviewer's scoring.

Kubo[23] developed the grading scale for the evolution of NPH symptoms. However there has been criticism regarding items in the cognitive domain that tended to dubiously score amnesia, inattention and disorientation. In the gait domain, there was also an inconsistency of classification, as the scale had a different classification for the imbalance item, but without distinction of an objective gait disorder. Cordero Tous et al.[24] carried out a prospective study using clinical scales and radiological findings to evaluate 40 patients with NPH. The items of the NPH scale in the cognitive domain were confusing, including the vegetative state, severe dementia and personality changes, which were difficult to stage and describe.

Owler et al.[25] described a modified scale for NPH for the clinical classification of patients. However, this scale subjectively evaluated daily life activities, and sphincter domain symptoms were only described as present or absent, which was also subjective and not elucidating. Thus, the NPH evaluated in the study by Mori[13] seemed to be more objectively applied and complete.

Regarding the evaluation of the scores of the new NPHPGS, the scores compared with other widely-used and validated scales. In the comparison with the FIM total

score, there was a high concordance of the findings, as the patients who presented with the greatest impairment on the NPHPGS were concomitantly classified with greater impairments in the FIM scale. Correlation was statistically satisfactory (-0.842). The same response was observed for the BBS (-0.803), DGI (-0.694) and TUG (-0.557). The above results confirm that the Grading Scale for Idiopathic Normal Pressure Hydrocephalus[13] and its Portuguese-validated version correlates with NPH symptoms and should be applied to evaluate these patients.

In conclusion, the present study showed a statistically significant correlation between the NPHPGS and the TUG, FIM, DGI and BBS. Additionally, the NPHPGS scale had also satisfactory interobserver and intraobserver agreement in the analysis of scores in the translated version. Thus, the Portuguese version is validated and may be used in assessing NPH.

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