# Psychometric properties of the Brazilian version of the Sunnybrook Facial Grading System

*Propriedades psicométricas da versão brasileira do Sunnybrook Facial Grading System*

Thamires Kely Mendonça de Melo [1]
Priscila Feitosa Andrade [2]
Sérgio Ricardo Menezes Mateus [2]
Clarissa Cardoso dos Santos-Couto-Paz [2*]

[1] Escola Superior de Ciências da Saúde (ESCS), Fundação de Ensino e Pesquisa em Ciências da Saúde (FEPECS), Brasília, DF, Brazil

[2] Universidade de Brasília (UnB), Brasília, DF, Brazil

**\* Correspondence:** clarissacardososcp@gmail.com

## Abstract

**Introduction:** The Sunnybrook Facial Grading System (SFGS) is a scale to evaluate facial function in three domains, namely resting symmetry, voluntary movements, and synkinesis. It is commonly used in scientific research and clinical practice to assess and monitor people with facial paralysis. **Objective:** To translate and cross-culturally adapt the SFGS, develop a version for the Brazilian population (SFGS - Brazil) and analyze its psychometric properties, including validity, interrater reliability and responsiveness. **Methods:** A multidisciplinary panel translated and adapted the SFGS into Brazilian Portuguese, creating the SFGS-Brazil version. Next, content validation was carried out by a panel of four physical therapists with clinical experience in caring for people with facial paralysis, in addition to interrater reliability and scale responsiveness after physical therapy intervention. **Results:** For SFGD validation, committee agreement rate and the content validity index were greater than 90%. Agreement (interrater reliability) was excellent for most items and overall (intraclass correlation coefficient = 0.99; p < 0.000) and the scale proved to be responsive, indicating post-intervention improvement (t = 10.66; p = 0.000). **Conclusion:** The domains and items of the SFGS-Brazil are conceptually equivalent to those of the original version, and the instrument displays adequate psychometric properties, including validity, agreement and responsiveness. The SFGS-Brazil is suitable for the Brazilian population and can be used in scientific studies and clinical practice.

**Keywords:** Assessment scale. Bell´s palsy. Data accuracy. Validation study.

### Resumo

***Introdução:*** *O* Sunnybrook Facial Grading System *(SFGS) é uma escala para avaliar a função facial em três domínios, incluindo simetria em repouso, movimentos voluntários e sincinesias. Essa escala é comumente utilizada em pesquisas científicas e na prática clínica para a avaliação e acompanhamento de pessoas com paralisia facial.* ***Objetivo:*** *Traduzir e adaptar transculturalmente o SFGS, elaborar a versão para a população brasileira (SFGS-Brasil) e analisar suas propriedades psicométricas, incluindo validade, confiabilidade interexaminadores e responsividade.* ***Métodos:*** *Um comitê multidisciplinar traduziu e adaptou o SFGS para o português do Brasil, gerando a versão SFGS-Brasil. Após esta fase, realizou-se a validação de conteúdo por um comitê de quatro fisioterapeutas com experiência clínica em atendimento de pessoas com paralisia facial, além da confiabilidade interexaminadores e a responsividade da escala após intervenção fisioterapêutica.* ***Resultados:*** *Para a validação do SFGS, a taxa de concordância do comitê total e o índice de validade do conteúdo mostraram-se maiores que 90%. A concordância (confiabilidade interexaminadores) mostrou-se excelente para maioria dos itens e para o total (coeficiente de correlação intraclasse = 0,99; p < 0,000), e o instrumento mostrou-se responsível, podendo-se identificar melhora segundo o SFGS-Brasil após a intervenção (t = 10,66; p = 0,000).* ***Conclusão:*** *O SFGS-Brasil possui equivalência conceitual dos domínios e itens à versão original, possui propriedades psicométricas adequadas, incluindo validade, concordância e responsividade. O SFGS-Brasil é adequado para a população brasileira, podendo ser usado em estudos científicos e na prática clínica.*

***Palavras-chave:*** *Escala de avaliação. Paralisia de Bell. Confiabilidade dos dados. Estudo de validação.*

## Introduction

Peripheral facial palsy (PFP) is partial or complete impairment of facial nerve function, the seventh cranial nerve. This nerve performs multiple functions, including innervation of the facial mimetic muscles, receiving taste sensations from the anterior two thirds of the tongue, and controlling the salivary and lacrimal glands.[1,2] AThe prevalence of facial palsy is approximately 15 to 40 cases per 100,000 people[3] and its main causes are traumatic, infectious, neoplastic, congenital, toxic and idiopathic,[4] with the last being responsible for more than 60% of cases, also known as Bell's palsy.[5] According to VanSwearingen,[6] neuromotor disorders resulting from PFP can be classified into four categories, two acute (initiation and facilitation) and two chronic phases (movement control and relaxation).

Patient recovery category depends on the type of nerve injury (neuropraxia, axonotmesis or neurotmesis), among other factors. It is known that 85% of individuals with PFP partially or completely recover facial movements within three weeks.[7] However, impaired facial expression and possible complications may remain, including severe functional and psychosocial issues.[7]

Pinho[8] observed that physical therapists assess PFP based only on neurological signs and symptoms, do not use assessment scales translated and adapted for the Brazilian population, and are unaware of the possible complications of this condition. Furthermore, the proposed treatments are not based on the specific categories of PFP, as described by VanSwearingen.[6] The lack of structured assessment and specific instruments for PFP results in incomplete and ineffective evaluation in terms of tailoring the necessary treatment to each situation. In addition, instruments should be objective in order to quantitatively assess the severity of facial dysfunction and, subsequently, the progression of the proposed therapy, allowing monitoring of the patient's evolution.[8]

Other facial function classification systems have been proposed, such as the House e Brackmann,[9] Lacôte et al.[10] and Satoh et al.[11] scales. Additionally, the Functional Disability Index has been suggested for assessing well-being and psychosocial factors in individuals with PFP.[12] Ross et al.[13] introduced the Sunnybrook Facial Grading System (SFGS), a scale used to evaluate facial function, subdivided into three domains: (1) symmetry of the resting position of the eyes, cheek (nasolabial crease) and corner of the mouth (labial commissure); (2) symmetry of voluntary movements (facial movements/expressions such as raising eyebrows, closing eyes gently, smiling showing teeth, raising the upper lip and whistling), and (3) synkinesis associated with the voluntary movements tested. Each of the three domains receives a score, with resting symmetry and voluntary movements carrying greater weight in the final score, the former multiplied by five and the latter by four. The composite score is determined through a simple calculation (SFGS total = symmetry of voluntary movements - symmetry at rest - synkinesis), with values varying between 0 and 100 (the higher the score, the lower the impairment).[13]

SFGS use is encouraged as a valid and useful scale for clinical practice that guides assessment by health professionals[14,15] by facilitating the diagnosis of different PFP stages.[6] This easy-to-apply and rapidly completed scale exhibits almost perfect reliability (intraclass correlation coefficient - ICC = 0.997)[15] and is sensitive to post-intervention clinical changes (p = 0.0000).[13]

Difficulty using scales to assess PFP in Brazilian clinical physiotherapy practice and the adequate psychometric properties of the SFGS make it important to translate and cross-culturally adapt the scale for the Brazilian population. Moreover, the new version will allow comparisons between studies carried out in different locations, facilitating the characterization of PFP and decision-making for intervention. The aim of the present study was to translate and cross-culturally adapt the SFGS for the Brazilian population, validate the SFGS-Brazil and analyze its reliability and responsiveness.

## Methods

### Translation and cross-cultural adaptation

The translation and cross-cultural adaptation of the SFGS for the Brazilian population was based on the guidelines described by Beaton et al.[16] and consisted of five stages, as described below. Prior authorization was obtained from the authors of the original scale to carry out cross-cultural adaptation.

### Step 1: Translation into Portuguese

The original scale was translated into two Brazilian Portuguese versions (SFGS-Brazil 1 and 2) by independent translators, with the aim of comparing the differences between them. To that end, two Brazilian translators fluent in English were chosen, one with and the other without experience in facial palsy.

### Step 2: Synthesis of the translations

In order to compile SFGS-Brazil version 3, the results of the translations were synthesized by the two translators and by an observer with a PhD in neuroscience and 15 years of experience.

### Step 3: Back translation

Two translators blind to the original version of the questionnaire back translated SFGS-Brazil 3 to rule out possible conceptual errors in this version.

### Step 4: Expert panel

The panel consisted of language experts, translators and health professionals who had contact with people with PFP. The authors of the original scale were contacted for authorization before cross-cultural adaptation. The role of the panel was to compile a provisional final Brazilian version to be tested in the field based on all the reports, translations and back translations, reaching a consensus on possible divergences. If they did not understand an item, they were also asked to propose changes and justify their doubts, thus obtaining a final Brazilian version based on the panel's suggestions.

### Step 5: Testing the final version

The last stage of the process was applying the final version of the questionnaire to 30 physical therapists with or without experience in the area. The objective was to investigate their understanding of the scale as a whole and of each item.

### Validation, reliability and responsiveness

Following translation and cross-cultural adaptation, the psychometric properties of the SFGS-Brazil were evaluated. The first step was validation, which aimed to test the hypothesis that the translated items adequately represent and/or incorporate the domains of the desired construct. An expert panel of four judges was selected to assess content validity, based on their experience with and knowledge of the scale's proposal and their expertise in caring for patients with PFP. The panel analyzed the questionnaire in two phases, in accordance with the guidelines and suggestions of Coluci et al.[17] and Souza et al.[18]

In the first phase, members were instructed to evaluate the scale as a whole, determining its scope, whether each domain or concept was adequately responsive to the set of items and if all dimensions were included, stating whether or not they agreed with the content. They also assessed whether the content was appropriate and if

the domain structure and content were correct. At this stage, participants could suggest changes to the items and the committee agreement rate. This rate refers to the proportion or percentage of participants that were in agreement with the instrument as a whole.

In the second phase, the panel members evaluated the clarity and representativeness of the items. Clarity was assessed on an ordinal 4-point Likert scale and members were asked to answer 1 = not clear, 2 = unclear, 3 = quite clear, 4 = very clear. Judges also analyzed the representativeness of each item by stating whether the items really reflected the concepts involved, were relevant and appropriate to achieve the proposed objectives. To that end, they were instructed to answer 1 = not representative, 2 = not very representative, 3 = quite representative, 4 = very representative. For each item, judges could provide suggestions and comments to improve it. The content validity index (CVI) was then calculated, using the equation: CVI = no. of answers scored "3" or "4" ÷ total no. of answers.

In order to determine reliability and responsiveness, 31 adults classified into different categories of PFP were recruited by convenience. Sample size was calculated based on Beaton et al.,[16] who proposed between 30 and 40 participants to test the final version.

The present study was approved by the Research Ethics Committee (REC) of the University of Brasília (protocol number: 1,168,662). All the participants provided written informed consent and signed an audio/visual image release form. After being advised of the study objectives and providing informed consent, participants were submitted to an initial assessment to characterize the clinical and demographic variables. Next, the SFGS-Brazil was applied and the assessment filmed for subsequent use by two trained evaluators to fill out the scale. Their scores were analyzed to determine the scale's reliability.

In addition to the assessment, participants attended a physical therapy intervention program twice a week for eight weeks, with each session lasting 40 minutes. The intervention was performed by a previously trained physical therapist, considering the limitations of each individual. Participants were reassessed after the intervention period and the two assessments compared to evaluate scale responsiveness.

After analyzing the normality of SFGS-Brazil data, interrater reliability (agreement) was assessed using the intraclass correlation coefficient (ICC). According to Cicchetti et al.,[19] an ICC less than 0.40 indicates poor clinical significance; 0.40 to 0.59 weak; 0.60 to 0.74 good; and 0.75 to 1.00 excellent. In order to determine the responsiveness of the SFGS-Brazil, the data obtained before and after intervention were submitted to comparative analysis. Statistical analyses were performed using the paired t-test, in SPSS software version 26, and significance was set at $\alpha = 0.05$. Figure 1 shows the study flowchart.

## Results

### Translation and cross-cultural adaptation

Following translation, synthesis and back translation, the scale was submitted to a panel of four experts (step 4) who suggested the following modifications: change the word "excursion" to "muscle contraction", "whistle" to "puckered lips" and "eyelid surgery" to "droopy eyelid". The word "excursion" was maintained because it refers to range of motion and not only a muscle contraction. The expression "whistling" was also kept because the translated scale must match the original, and this activity is common among Brazilians. "Eyelid surgery" refers to suturing by a physician to prevent ophthalmologic complications in individuals unable to close their eyes. Therefore, the suggested substitution would not cover the appropriate content. In the pre-test phase (step 5), the physical therapists had no doubts about the scale constructed and were able to apply it to individuals with peripheral facial palsy, thereby consolidating, the final version of the SFGS-Brazil.

### Validation

Evaluators with an average age of  36.5 ± 1.5 years, training time of 13.75 ± 1.6 years and 5.2 ± 1.0 years' experience with PFP patients participated in the study. With respect to content validity, most items displayed an agreement rate above 90% (Table 1). As such, the scale adequately reflects the construct it is intended to measure.

The evaluators' responses regarding the clarity and representativeness of the assessment items (Table 2) showed that total CVI was 92.3 and 96.1%, respectively. Thus, it can be inferred that the scale exhibits adequate construct validity to assess individuals with PFP, considering the resting, movement and synkinesis domains.
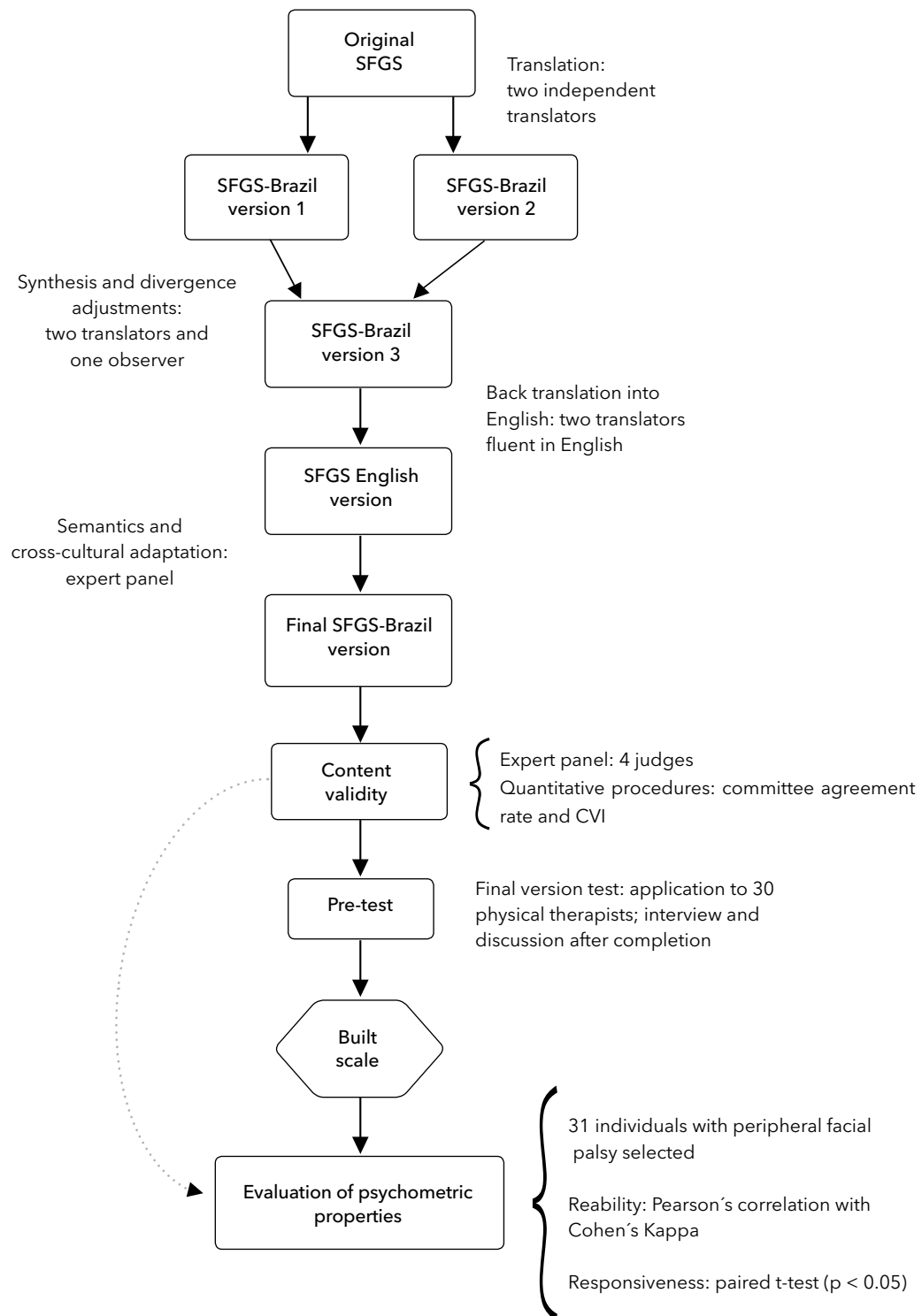
**Figure 1 -** Flowchart of the creation of the SFGS-Brazil scale.

Note: SFGS = Sunnybrook Facial Grading System; CVI = content validity index.

**Table 1 -** Committee agreement rate of the panel regarding the scale as a whole

| Item | % |
|---|---|
| The scale is comprehensive | 75 |
| Each domain or concept is appropriately responsive to the set of items | 100 |
| All dimensions of facial function were included | 75 |
| Content is appropriate for individuals with peripheral facial palsy | 100 |
| The structure and content of the scale are correct | 100 |
| **Total** | **91.7** |

**Table 2 -** Description of the content validity index of the panel for each item

| Item | Clarity (%) | Repres. (%) |
|---|---|---|
| **Resting symmetry** | | |
| Eyes | 100 | 75 |
| Cheek (nasolabial fold) | 100 | 100 |
| Mouth (labial commissure) | 100 | 100 |
| **Symmetry during Movement** | | |
| Wrinkle forehead | 100 | 100 |
| Close eyes (without squinting) | 100 | 100 |
| Smile showing teeth | 100 | 100 |
| Raise the upper lip | 50 | 75 |
| Whistle | 100 | 100 |
| **Synkinesis** | | |
| Wrinkle forehead | 100 | 100 |
| Close eyes (without squinting) | 100 | 100 |
| Smile showing teeth | 75 | 100 |
| Raise the upper lip | 75 | 100 |
| Whistle | 100 | 100 |
| **Total** | **92.3** | **96.1** |

Note: Repres. = representativeness.

After evaluating the suggestions, the panel considered the scale suitable for testing. In the pre-test stage, 30 physical therapists were selected, with an average age of 24.4 ± 2.8 years. They were instructed to answer a questionnaire regarding their understanding of the items, classifying them as "completely understand", "partially understand" or "do not understand". Of the 30 participants, 22 (73.4%) fully understood all items, 6 (20.0%) partially understood at least one item, and 2 (6.6%) understood none. The main items that were partially or not understood were related to resting symmetry ("eyes" and "cheek") and the symmetry during movement and synkinesis ("raise the upper lip") domains.

### Reliability

Table 3 describes the sociodemographic and clinical characteristics of participants with PFP. Thirty-one individuals took part in this study, with an average age of 40.12 ± 15.53. Most were women (61.3%) whose right side was affected (71%), with 11 participants in the "initiation" category, seven "facilitation", eight "movement control", and five in the "relaxation" category.

**Table 3 -** Clinical and demographic characterization of participants with peripheral facial palsy (PFP)

| Group with PFP (n = 31) | |
|---|---|
| Age (years) | 40.12 ± 15.53 |
| **Sex** | |
| Women | 19 (61.3%) |
| Men | 12 (38.7%) |
| **PFP category** | |
| Iniciation | 11 (35.5%) |
| Facilitation | 07 (22.6%) |
| Movement control | 08 (25.8%) |
| Relaxation | 05 (16.1%) |
| **Affected side** | |
| Right | 22 (71.0%) |
| Left | 9 (29.0%) |

Two trained examiners were selected to analyze agreement. Analysis of interrater reliability data (Table 4) showed excellent agreement in twenty-three items (between 0.80 and 0.98) and good agreement (between 0.65 and 0.75) for three. Agreement was excellent (0.95) for the total score and none of the items displayed moderate, weak or poor agreement.

### Responsiveness

In order to determine SFGS responsiveness to a motor training program, the total score before (SFGS total = 42.85 ± 23.28) and after (SFGS total = 59.78 ± 29.15) an eight-week intervention based on task-oriented mental practice was compared.[20] Individuals with PFP obtained

better scores after the intervention (t = 10.66; p = 0.000). Thus, the SFGS-Brazil can detect clinical changes before and after an intervention program, suggesting its clinical applicability.

**Table 4 -** Interrater reliability

| Item | Interrater reliability |
|---|---|
| **Resting symmetry** | |
| Eyes | 0.75 |
| Cheek (nasolabial sulcus) | 0.95 |
| Mouth (labial commissure) | 0.84 |
| **Symmetry during movement** | |
| Wrinkle forehead | 0.96 |
| Close eyes without squinting | 0.94 |
| Smile showing teeth | 0.96 |
| Raise upper lip | 0.89 |
| Whistle | 0.98 |
| **Synkinesis** | |
| Wrinkle forehead | 0.97 |
| Close eyes without squinting | 1.00 |
| Smile showing teeth | 1.00 |
| Raise upper lip | 0.92 |
| Whistle | 1.00 |
| **Total** | **0.95** |

Note: Cohen's Kappa = K ≤ 0 = no agreement; 0 < K ≤ 0.19 = poor agreement; 0.20 ≤ K ≤ 0.39 = weak agreement; 0.40 ≤ K ≤ 0.59 = moderate agreement; 0.60 ≤ K ≤ 0.79 = strong agreement; 0.80 ≤ K ≤ 0.99 = almost perfect agreement; K = 1.00 = perfect agreement.

## Discussion

The SFGS-Brazil is easy to understand and can be used in clinical practice, since the pre-test phase indicated that 73.4% of evaluators fully understood all items. This corroborates the findings of Hu et al.,[21] who reported that both experienced and inexperienced health professionals are able to use the SFGS correctly; however, the items "eyes - eyelid surgery" and "raise the upper lip" may not be clearly understood by inexperienced evaluators, making it necessary to standardize assessment. This is proposed by Neely et al.,[22] who provide explanatory criteria for the scale to facilitate its use by less experienced professionals. According to Brazilian professionals, the items of the SFGS-Brazil adequately represent and incorporate the domains of the desired construct, as observed for SFGS versions already validated in other languages.[23,24]

Assessment of voluntary movement symmetry showed higher correlation values than those of resting symmetry; however, resting symmetry assessment is more widely used in clinical practice.[13] These findings corroborate those of Kanerva et al.[15] and Pavese et al.,[25] but contrast with Neely et al.,[22] who reported greater correlation for resting symmetry. Interrater reliability exhibited adequate values, enabling comparison between scores obtained by previously trained individuals. However, it is important to emphasize the need for training and experience with the scale.[22]

In a study by Lindsay et al.,[24] physical exercises and individualized guidelines were used as intervention according to the PFP treatment category. The average pre-and post-intervention Facial Grading Scale (FGS) scores were 56 ± 21 and 70 ± 18, respectively. There was a statistically significant increase in the FGS score after treatment (p = 0.001), which lasted an average of 12 weeks. These results confirm that the SFGS can be used in clinical practice because it quantitatively detects changes after an intervention. The present study also demonstrated that the SFGS-Brazil version is responsive even to short-term interventions.

## Conclusion

It can be concluded that the domains and items of the SFGS-Brazil are conceptually equivalent to those of the original version, and that the instrument is adapted to the Brazilian population. In addition, its psychometric properties of validation, reliability and responsiveness are adequate in measuring the physical function of individuals with PFP. Thus, the SFGS-Brazil can be used in future studies and clinical practice to assess and monitor patient response to an intervention.

## Authors' contributions

TKMM and PFA performed sample selection and data collection. CCSCP was responsible for study conception and design, data analysis and interpretation. All the authors contributed to writing the manuscript; and CCSCP and SRMM revised it.

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