

Original Article

Psychometric properties of the stroke specific quality of life scale for the assessment of participation in stroke survivors using the rasch model: a preliminary study

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Abstract. [Purpose] The aim of the present study was to analyze the psychometric properties of the Stroke Specific Quality of Life (SS-QOL) scale for the assessment of social participation following a stroke. [Methods] A preliminary analysis was performed of the SS-QOL items that address the participation category. For this, the scoring patterns of the answers of individuals and internal consistence were determined using the Rasch model. Reliability was assessed by intraclass correlation coefficients (ICC). [Results] The reliability coefficients analyzed by the Rasch model were 0.91 for the items and 0.87 for the patients. The separation index was 3.19 for the items and 2.58 for the patients. The findings indicate that the items separated the patients into three levels of participation: low, medium, and high. Among the 26 items addressing participation, three did not fit the model. All items showed adequate reliability ($ICC \geq 0.60$). [Conclusion] The Rasch analysis detected three items with erratic behavior; however, the erratic patterns of these items may be explained by individual peculiarities among the patients. These items should be monitored to determine if the problems found in the present study persist. If so, the items should also be revised or possibly even eliminated.

Key words: Stroke, International classification of functioning, disability and health, Psychometrics

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INTRODUCTION

The incidence of stroke is high^{1, 2}. In the USA alone, approximately 795,000 individuals suffer a stroke each year, which translates to an average of one case every 40 seconds³. In a study addressing 291 health conditions, stroke was identified as the third most common cause of disability worldwide⁴. Stroke is one of the first health conditions to attract the attention of research groups seeking to investigate functionality using the structure proposed by the International Classification of Functioning, Disability and Health (ICF)^{5, 6}, which is based on a biopsychosocial approach integrating the biological, individual and social dimensions of health.

Based on the conceptual framework of the ICF⁷, participation is considered the most complex component to

evaluate using existing assessment tools^{8, 9}. Recently, our research group^{10, 11} demonstrated that the Stroke Specific Quality of Life (SS-QOL) Scale appears to be the most complete measure for assessing social participation among stroke survivors. However, only 26 of the 49 items on the scale address participation capacity¹⁰. It is therefore necessary to perform an accurate evaluation of the psychometric properties of the SS-QOL items that only assess participation.

The aims of the present study were to investigate the validity of the scoring standards of the SS-QOL items and patient responses, pinpoint the drawbacks of the measure, and propose the revision or exclusion of any items that do not exhibit suitable psychometric qualities. This study sought to lend scientific credibility to the process of evaluating individuals with hemiparesis stemming from a stroke by providing important data for the development of appropriate treatment plans aimed at enhancing social participation among stroke survivors.

SUBJECTS AND METHODS

A preliminary analysis was performed of the SS-QOL items that address the ICF participation category. For this, a methodological cross-sectional study was carried out

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involving 33 stroke survivors with chronic hemiparesis. The subjects were recruited from the outpatient clinic of the Physical Therapy Department of the University Nove de Julho (Brazil).

The following were the inclusion criteria: clinical diagnosis of primary or recurrent stroke with a history of more than six months and weakness and/or spasticity on the affected side of the body. The exclusion criteria were the presence of another clinical condition associated with hemiparesis caused by stroke, motor or comprehension aphasia and cognitive impairment established using the Mini-Mental State Examination with the cutoff points proposed by Bertolucci¹².

All participants signed a statement of informed consent and were informed of the possibility of dropping out of the study at any time without penalty. This study received approval from the Human Research Ethics Committee of the University Nove de Julho (São Paulo, Brazil) under protocol number protocol 313.776/13.

Identification of the items of the SS-QOL that address the ICF participation component was based on a study by Silva et al.¹¹, who found that 26 of the 49 SS-QOL items evaluated participation, spanning eight subscales (family roles, language, mobility, self-care, social roles, thinking, upper extremity function, and work/productivity). Five response options are offered for each item, with item scores ranging from 1 to 5. Thus, the minimum overall score for the questionnaire is 26 (lowest social participation), and the maximum score is 130 (highest social participation)¹¹.

The volunteers were evaluated by a single examiner who had undergone training for the administration of the data collection instruments through theoretical and practical exercises. Considering the sociocultural characteristics of the sample, the participants could opt to have the questionnaires administered in interview form.

Descriptive statistics were performed for characterization of the sample and distribution of the scores. Measures of central tendency (mean) and dispersion (standard deviation) were used for quantitative variables, and frequency was used for categorical variables. Nonparametric variables were expressed as medians and interquartile ranges.

Rasch analysis allows calibration of the difficulty of items and the level of ability of individuals on a simple linear continuum at equal intervals along which each item and each individual are aligned^{13, 14}. In the present study, the basic assumption was that individuals with a better participation capacity would achieve higher scores on all items of the SS-QOL scale, regardless of whether the tasks addressed were easy or difficult, whereas any individual is likely to achieve a higher score on items addressing easy tasks¹⁵. When all items of a test meet these expectations, the test is then fitted to a measurement model¹⁵, and those individuals with greater competence in the domain of a given function (participation, in the present case) are more likely to achieve higher scores than those with lesser competence. These principles are only applicable if the set of items measures a one-dimensional skill¹⁶.

In the present study, the analysis of the calibration of the SS-QOL items was carried out using the BIGSTEPS program. This program calculates *MnSq* values and associated *t*

Table 1. Demographic and clinical characteristics of the subjects

Variable	(n=33)
Male	19 (54%)
Female	14 (46%)
Age (years)	59±15
Time since stroke (years)	4±3
Affected hemisphere	
Right	13 (40%)
Left	20 (60%)
Marital status	
Married	22 (67%)
Single	5 (15%)
Divorced	4 (12%)
Widower	2 (6%)
Schooling (years)	4±3
Mini-Mental State Examination	23 (22/28)

Data expressed as absolute and relative frequencies, mean ± SD, for parametric variables and medians and interquartile ranges (25% and 75%) for nonparametric variables.

values, which indicate whether the relationship between an individual's ability and item difficulty fulfill the assumptions of the model. Linacre and Wright¹⁷ suggest *MnSq* = 1 ± 0.3 with an associated *t* = ± 2 as reasonable values indicating the suitability of items.

Test-retest reliability was assessed using the intraclass correlation coefficients (ICCs) which were interpreted as follows: less than 0.40 = poor reliability, 0.40 to 0.75 = moderate reliability, 0.75 to 0.90 = good reliability, and greater than 0.90 = excellent reliability¹⁸. In all inferential analyses, the level of significance was set to $\alpha = 0.05$.

RESULTS

Sixty-four individuals with chronic hemiparesis were recruited for the present study, 10 of whom were excluded due to aphasia, nine of whom were excluded due to cognitive impairment, and 12 of whom were excluded due to other adverse health conditions associated with stroke. Thus, the final sample consisted of 33 individuals. Table 1 displays the demographic and clinical characteristics of the sample.

Table 2 displays the results of the Rasch analysis, in which the *MnSq* and *t* (*infit* and *outfit*) calibration values were discriminated for each item. For example, item 15 (*I did my hobbies and recreation for shorter periods of time than I would like*) had the lowest gross score (62), and item 14 (*Did you need help to use the toilet?*) had the highest gross score (156). Three of the 26 items (items 14, 15, and 17) did not fulfill the expectations of the model (*MnSq* > 1.3 and *t* > 2).

The separation index for individuals was 2.58, indicating that the items divided the individuals on more than one level of participation. The separation index for the items was 3.19 (three levels of difficulty: low, medium, and high). The estimate of the internal consistency (stability of the calibrations)

Table 2. Calibration of SS-QOL items that assess ICF participation components

Item	Measure		Infit Outfit	
	Measure	Error	MnSq	MnSq
I devoted less time leisure*	1.26	0.16	1.32	2.6
Sex less often*	1.01	0.14	1.28	1.89
I have found many friends	0.86	0.14	1.21	1.29
Difficulty doing the work before	0.78	0.14	0.80	0.73
It was hard to concentrate	0.67	0.13	0.86	0.77
Do not participate in leisure with family	0.36	0.13	1.24	1.19
Lost balance lower	0.29	0.14	1.24	1.28
Difficulty writing or typing	0.21	0.14	0.89	1.01
Difficulty walking	0.17	0.14	0.95	1.28
Had to be repeated	0.11	0.14	1.21	1.26
Difficulty buttoning clothes**	0.07	0.14	0.74	0.69
Difficulty standing**	0.05	0.15	0.69	0.85
Help to prepare food	-0.11	0.16	0.85	0.83
Difficulty doing housework**	-0.11	0.16	0.61	0.66
Difficulty in completing tasks	-0.11	0.16	0.86	0.89
Difficulty putting on socks	-0.16	0.16	0.77	0.70
Difficulty climbing stairs	-0.19	0.16	0.78	0.81
Difficulty using a zipper	-0.24	0.17	0.80	0.76
Difficulty speaking	-0.27	0.17	1.20	1.25
Help to eat**	-0.33	0.17	0.62	0.72
Difficulty opening a jar**	-0.45	0.19	0.53	0.47
Difficult to raise	-0.53	0.20	0.78	1.16
Difficulty talking on the phone	-0.57	0.20	1.30	1.29
Help to dress**	-0.61	0.21	0.67	0.71
Help with bathing**	-1.06	0.28	1.00	0.48
Help using toilet*	-1.14	0.30	1.78	2.63

* Erratic item ($MnSq > 1.3$ and $t > 2$); ** deterministic item ($MnSq < 0.7$)

was 0.91 for items and 0.87 for individuals.

Figure 1 displays a map that illustrates the level of difficulty of the items in relation to the participation of the individuals in the sample, with the participation continuum of the sample on the left of the map and item difficulty on the right. The items are well distributed toward the top of the continuum in terms of difficulty. Two items toward the bottom proved very easy, and no individuals exhibited such a low degree of participation.

All items demonstrated moderate to excellent; statistically significant reliability ($ICC \geq 0.60$).

DISCUSSION

The global coefficient of SS-QOL reliability was 0.91, which indicates stability with regard to item calibration. For individuals, this coefficient was 0.87, which means that the answers of the subjects were also reliable. Thus, these measures can be reproduced in subsequent applications.

The Rasch analysis detected three items (11.5%) with

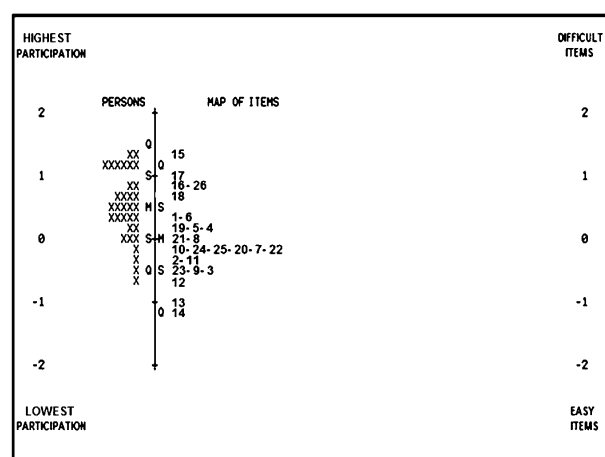


Fig. 1. Map illustrating the distribution of individuals in relation to the difficulty of SS-QOL items and different levels of participation

erratic behavior (items 14, 15, and 17), which is higher than the recommended rate (5%) indicating that an instrument measures a one-dimensional concept. However, one should consider that the implementation of some activities among the SS-QOL items for the assessment of participation may not be sufficient to explain the real involvement of individuals in a social context, representing only an evaluation of “activity” and not “participation,” which may be a limitation of the use of this instrument for this purpose.

With regard to item 14 (*Did you need help to use the toilet?*), patients with more severe motor impairment had higher scores. This finding may be related to the fact that the sample was composed of patients in the chronic phase of hemiparesis, when individuals learn to cope with the limitations of their conditions, which seems to have a positive effect on functional independence and the performance of activities daily of living^{19,20}, such as using the toilet without assistance.

For item 15 (*I did my hobbies and recreation for shorter periods of time than I would like*), low scores were found even though the sample was composed of individuals with moderate to high degrees of participation. However, one must consider that leisure activities depend on the habits of each individual and may not necessarily reflect an inability to perform, but rather a lack of practice or resources (family support and the use of quality transportation). Indeed, this was a common complaint among the subjects in the present study.

Another problem was found regarding item 17 (*I had less sex than I would like to*). However, sexual issues may not have been fundamental due to the age of the participants or the fact that 33% of the subjects did not have a partner. In contrast, most married men reported wanting to have more sex regardless of their health state and functioning. The diversity of factors that can influence one’s opinion regarding this item explains the considerable variability in responses, making this an item erratic.

A previous study evaluated the calibration of the SS-QOL items and concluded that it is a clinically useful instrument

for the assessment of health-related quality of life among stroke survivors²¹). However, the study found four erratic items, among which only item 17 (I had sex less often than I would like) was also considered to be erratic in the present study. Thus, changes to item 17 (after consultation and approval from the authors) followed by subsequent studies to assess the behavior of the revised item are suggested. Moreover, other erratic items should be monitored to determine if the problems found in the present study persist. If so, such items should also be revised or possibly even eliminated.

The value found for the separation index of individuals (2.58) indicates that the sample was divided into more than two levels of participation: low, medium, and high. In the analysis of a test such as the SS-QOL, a small number of individuals would be expected in the upper portion of the continuum (i.e., few individuals with a high degree of participation) as well as the lower portion of the continuum (i.e., few highly impaired individuals with a low degree of participation). Most would be distributed along the middle third of the continuum, characterizing a moderate degree of participation, which was indeed found in the present study (Fig. 1).

Others inferences can be made from the distribution of individuals along the continuum displayed in Fig. 1. The inclusion of both easy and difficult items constitutes an advantage of the SS-QOL scale. The former ensure that this measure can be administered to more debilitated or institutionalized individuals, and the latter allow its use for individuals with a higher degree of participation. The SS-QOL items that assess the participation component of the ICF demonstrated an adequate distribution along the continuum, with easy items for the assessment of individuals with more participation restrictions and difficult items for the assessment of those with fewer restrictions.

All items analyzed demonstrated adequate reliability. Item 6 (Did you lose your balance when bending over or reaching for something?) and item 16 (I didn't see as many of my friends as I would like) had the lowest correlation coefficients (0.64 and 0.60, respectively); but nonetheless demonstrated acceptable reliability¹⁸).

The present findings are important to the field of physical therapy and can contribute to effective assessment of social participation among stroke survivors, allowing the rehabilitation process to be directed at specific objectives focused on the individual.

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