Research article

Validity and reliability of the Italian version of the short Parkinson's evaluation scale (SPES/SCOPA)

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ARTICLE INFO

ABSTRACT

Background: In the medical and rehabilitative field, it is essential to employ tools such as evaluation scales and performance tests to assess the impact of Parkinson's disease on QoL of affected individuals. The Short Parkinson's Evaluation Scale (SPES) is a reliable and valid tool, applicable both in research and clinical practices, useful in assessing motor damage, activities of daily living, and motor complications in patients with Parkinson's disease. The aim of the study is to investigate validity and reliability of the Italian version of the SPES-SCOPA scale.
Methods: Translation and cultural adaptation were performed. Included patients had diagnosis of Parkinson's disease, no concurrent pathologies, MiniMental test score above 2 and signed informed consent; they were recruited at the Department of Human Neurosciences in Sapienza University of Rome, from February 2023 to November 2023. Test-retest reliability was evaluated through Intraclass Correlation Coefficient (ICC), internal consistency was assessed using Cronbach's Alpha and construct validity using Pearson's correlation between SPES-SCOPA and the gold standard PDQ-39.
Results: 101 patients were recruited. Inter-rater evaluation was conducted on 62 patients, while 39 underwent an intra-rater assessment. The analysis showed statistically significant data with a Cronbach's Alpha value of 0.89 for the entire scale; test-retest reliability results are statistically significant for all subscales. Correlation between PDQ-39 domains and SPES/SCOPA subscales were statistically significant for most measurements.
Conclusion: This research shows that the Italian version of SPES-SCOPA scale has excellent psychometric properties.

1. Background

Parkinson's disease is a chronic neurological condition, classified as the second most common among neurodegenerative diseases in individuals over 60 years old [1–3].

The incidence of the disease varies from 5 to over 35 cases per 100,000 inhabitants per year [4]. Parkinson's disease constitutes the most common neurodegenerative condition within movement disorders, with a prevalence and incidence in Europe estimated at

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approximately 108–257 cases per 100,000 people and 11–19 new cases per 100,000 people per year [5–7]. Due to the progressive aging of the global population, a significant increase in the prevalence of Parkinson's disease is expected, with a projected doubling in the next twenty years [8].

Patients with Parkinson's disease exhibit motor symptoms such as resting tremor, rigidity, bradykinesia, festination, and camptocormia [9]. However, the disturbances are not limited to motor symptoms but can include non-motor symptoms such as depression, anxiety, cognitive decline, psychosis, autonomic dysfunctions, and disturbances in sleep-wake regulation [10,11]. These disturbances become evident throughout the disease, negatively impacting patients' quality of life (QoL) [12]. Therefore, current literature shows that it is essential to implement rehabilitation processes to maximize patient autonomy, considering the specific phase of the disease [13,14]. Although the clinical frame of PD includes non-motor features, motor features define the cardinal set of disease characteristics, and have proved reliable characteristics to measure disease progression [15].

Physiotherapy is an integral part of the rehabilitation treatment, aiming to improve several impairments related to Parkinson's disease [16]. Despite the use of various rehabilitation techniques, there is a need to improve research methodology to assess the long-term effectiveness of treatments [17]. A thorough analysis requires not only interviews and observations of work capacity but also the use of standardized measurement tools [18].

In the medical and rehabilitative field, it is essential to employ tools such as evaluation scales and performance tests to assess motor function and its impact on QoL of affected individuals [19]. Among the most well-known and utilized tools, the Parkinson's Disease Questionnaire 39 (PDQ-39) is a valid and reliable tool for determining perceived disability and its effect on QoL [20,21]. The Parkinson's Disease Questionnaire 8 (PDQ-8), its short version, requires a reduced administration time while simultaneously providing a comprehensive index of the health of Parkinson's patients [22].

Another important scale widely used in the neurological field for assessing the severity of Parkinson's disease in patients is the Hoehn and Yahr scale, with postural instability as the primary index of disease severity; it does not fully detect impairments or disabilities resulting from other motor features of PD and does not provide information on non-motor symptoms [23]. An excellent assessment tool for quantifying the impact of Parkinson's disease is the Unified Parkinson's Disease Rating Scale (UPDRS). This tool is considered the Gold Standard of choice in research and clinical contexts related to PD, showing significant inter-rater and intra-rater reliability [24]. Despite its valid correlation with other relevant scales, doubts have emerged regarding content validity linked to the conceptual clarity of the scale and the included items, as well as their overlap during assessment, making the evaluation tool lengthy in administration and therefore limiting in specific clinical hospital contexts [25,26].

The Short Parkinson's Evaluation Scale (SPES/SCOPA) is a reliable and valid tool, applicable both in research and clinical practices; it investigates three different sections: Motor Assessment that comprises 10 different items, Activities of Daily Living that includes 7 different items, Motor Complications that involve 4 different items. Current literature supports the use of SPES/SCOPA scale, in fact it has proven to be a reliable, valid, and conceptually clear tool that is completed in half the time it takes to administer the UPDRS. These advantages may encourage the use of the SPES/SCOPA in evaluating motor function in patients with PD [27]. Moreover, Verbaan et al. developed an algorithm through which SPES/SCOPA-motor scores can easily be converted to MDS-UPDRS motor examination scores and vice versa [19].

Scores for each item range from a minimum of 0 (absent) to a maximum of 3 (severe). Validated in Brazilian, German, English, and Spanish, the estimated time for administration is 8–10 min [27]. This tool is considered easy to use by evaluators who experienced it but has only been used in a few studies.

The development of the SPES scale is included in the SCOPA (Scales for Outcomes in Parkinson's Disease) assessment project, which includes:

- SCOPA-AUT designed to assess autonomic symptoms in patients with Parkinson's disease and those with Multiple System Atrophy (MSA) [28].
- SCOPA-SLEEP aimed at examining sleep quality [29].
- SCOPA-COG, which investigates cognitive, mnemonic, and attentional abilities [30].

The study aims to investigate the psychometric properties of the Italian version of the SPES-SCOPA scale in patients with Parkinson's Disease; in particular, the psychometric properties we aimed to study are validity and reliability. A reliable assessment scale is essential as it provides accurate and reproducible data (in this case about motor function), allowing for consistent comparisons over time and among healthcare providers. Therefore, the scale's reliability is crucial for making clinical decisions and evaluating the effectiveness of therapy, ensuring the best possible care for patients with motor impairments.

2. Materials and methods

This study was conducted by a research group of Sapienza University of Rome RES-Riabilitazione Evidenze e Sviluppo, who were involved in different studies on rehabilitation [31–44]. The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments.

2.1. Cultural adaptation

The translation and cultural adaptation process was performed by six experts, of which two English native-speaking physiotherapists, and four specialists from various medical fields, in particular a neurologist, two physiotherapists and an occupational therapist,

all with a working experience in a foreign country in the past. The process was carried out through a "Forward Translation," in which two native-speaking experts and one expert in the relevant field translated the scale, preserving the intrinsic meaning of the sentences in the original questionnaire. The second step involved the intervention of an "Expert Panel," composed of three specialists from various medical fields, who examined the three translations obtained in the previous phase and merged them into a unified translation while simultaneously proceeding with cultural adaptation. The next phase was the "Back-Translation", in which the scale is translated back into the original language by an expert to verify the absence of content discrepancies. Once the back-translation was complete, the new version was administered to a group of patients to assess their understanding of the items through a test-retest. During this phase, patients could express any opinions and suggestions.

2.2. Participants

In the final stage of this process, the scale's psychometric properties are evaluated, including its reliability, which refers to the ability to produce consistent results even when different operators take measurements at different times.

Patients had to meet the following inclusion criteria: diagnosis of Parkinson's disease; no concurrent pathologies; MiniMental test score above 22; signed informed consent.

The MMSE is a 30-point questionnaire used widely in clinical and research settings to measure cognitive impairment, including simple tasks regarding the following areas: the test of time and place, the repeating lists of words, arithmetic such as serial subtractions of seven, language use and comprehension, and basic motor skills [45].

The exclusion criteria were the presence of concomitant pathologies, such as cardiopulmonary diseases or outcomes of surgical operations, and the presence of other neurological conditions.

Participants were recruited at the Department of Human Neurosciences at Sapienza University of Rome from February 2023 to November 2023.

Before administering the questionnaire, detailed information about the study was provided. Any doubts or concerns were carefully clarified, and participants were invited to provide their informed consent for processing personal data. Additionally, they were asked to complete a form requiring specific personal information.

2.3. Statistical analysis

Psychometric properties such as test-retest reliability, internal consistency, and construct validity will be evaluated. The Intraclass Correlation Coefficient (ICC) was calculated for test-retest reliability, and a value greater than 0.70 was considered statistically significant. Internal consistency was assessed using Cronbach's Alpha, which should exceed 0.70 for statistical significance. Construct validity was determined using Pearson's correlation between SPES-SCOPA and the selected gold standard PDQ-39. All statistical analyses were performed using SPSS version 27.

Table 1
Alpha deleted analysis.

	Mean	Standard Deviation	Alpha di Cronbach if the element is eliminated
Item 1	0.72	0.850	0.793
Item 2	0.69	0.771	0.782
Item 3	0.93	0.752	0.758
Item 4	0.77	0.747	0.774
Item 5	0.51	0.730	0.754
Item 6	0.74	0.986	0.764
Item 7	0.88	0.725	0.749
Item 8	0.74	0.627	0.767
Item 9	0.41	0.681	0.784
Item 10	0.48	0.743	0.770
Motor Assessment			**0.79**
Item 11	0.54	0.686	0.879
Item 12	0.57	0.712	0.876
Item 13	0.95	0.841	0.844
Item 14	0.86	0.825	0.849
Item 15	0.94	0.798	0.870
Item 16	0.86	0.800	0.852
Item 17	1.31	0.797	0.867
Activities of Daily Living			**0.88**
Item 18	0.28	0.634	0.848
Item 19	0.25	0.555	0.832
Item 20	0.17	0.426	0.871
Item 21	0.18	0.456	0.867
Motor Complications			**0.89**
Total scale			**0.89**

3. Results

The study sample consisted of 101 patients. An inter-rater evaluation was conducted on a subset of 62 patients, while 39 patients underwent an intra-rater assessment.

Among the 101 patients, 71 were male (70.29 %). The overall average age of the sample was 70.5 years (9.37), with an average disease onset duration of 7 years.

Of the 101 patients in the sample, 67.90 % were retired, 11.90 % were unemployed, 11.90 % were employed, and the remaining 8.3 % worked in the healthcare, managerial, and labor sectors.

Regarding the staging of disease 39.39 % of patients belonged to stage 1 of the H&Y classification, 40.9 % belonged to stage 2, 15.15 % to stage 3, 1.51 % to stage 4, and 3.03 % to stage 5.

3.1. Internal consistency

Internal consistency was evaluated for the entire scale and the three subscales. The analysis showed statistically significant data with a Cronbach's Alpha value of 0.89 for the entire scale, 0.79 for motor evaluation, 0.88 for activities of daily living, and 0.89 for motor complications. The Alpha deleted analysis shows that, for each of the factors described, all items concur with the assessment of the construct.

The detail for each of the items is available in Table 1.

3.2. Test-retest reliability

The Intraclass Correlation Coefficient (ICC) was calculated to assess reliability. Table 2 shows the data for inter-operator reliability, with a total score of 0.996 (CI 95 % 0.993–0.998) instead Table 3 shows the results for intra-operator reliability with a total score of 0.827 (CI 95 % 0.670–0.909). The data are statistically significant for all subscales.

3.3. Construct validity

To assess the construct validity of the scale, PDQ-39 was used as gold standard. As for the Motor Assessment domain, this is correlated for a $p < 0.01$ with the domains: Mobility (correlation index of 0.633); Activities of Daily Living (0.533) and Emotional Well-being (0.542); the Activities of Daily Living domain shows the highest correlations with: Mobility (0.744); Activities of Daily Living (0.713) and Emotional Well-being (0.544), again with a p-value <0.01. Finally, the Motor Complication domain appears to be correlated with the Social Support domain (0.288) for a p-value <0.05.

Details are reported in Table 4.

4. Discussion

The main objective of this study was to conduct a cultural adaptation of the SPES-SCOPA scale into the Italian language and investigate its psychometric properties. Specifically, the focus was measuring internal consistency, intra- and inter-rater reliability, and construct validity through comparison with the PDQ-39. Results demonstrated that the adapted scale has excellent psychometric properties. The scale's internal consistency was remarkable, with particular emphasis on the subscales "Activities of Daily Living" and "Motor Complications." Intra- and inter-rater reliabilities were also excellent, suggesting that the Italian version of the SPES/SCOPA scale is stable and capable of producing consistent and reliable results regardless of the rater. Regarding construct validity, most measurements' correlation results between PDQ-39 domains and SPES/SCOPA subscales were statistically significant. However, it was observed that the "Communication" and "Physical Discomfort" domains did not show a significant correlation with motor complications of the SPES/SCOPA. This result could be due to the prevalence of motor symptom assessment in the SPES/SCOPA, which doesn't include communication and personal consideration of patients' physical discomfort. The statistical analysis allowed us to assess the internal consistency and reliability of the entire instrument, providing an essential measure of the coherence of responses across different questions and statements. The results obtained from the analysis of Cronbach's Alpha demonstrated the remarkable internal consistency of the entire measurement instrument, highlighting a strong correlation among the responses to the various items. Furthermore, the analyzed psychometric properties, which were thoroughly assessed, include inter-observer and intra-observer reliability. These reliability measures confirmed that the scale is stable and capable of producing consistent results, regardless of

Table 2
Inter-operator analysis.

	Operator 1		Operator 2		ICC	IC 95 % Lower Limit	IC 95 % Upper Limit
	Mean	Standard Deviation	Mean	Standard Deviation			
Motor Assessment	6.66	4.281	6.84	4.270	0.989	0.982	0.994
Activities of Daily Living	5.87	3.864	5.89	3.781	0.993	0.988	0.996
Motor Complications	0.56	1.288	0.55	1.327	0.978	0.963	0.987
Total scale	13.10	7.783	13.27	7.610	0.996	0.993	0.998

Table 3

Intra-operator analysis.

	Test		Retest		ICC	IC 95 % Lower Limit	IC 95 % Upper Limit
	Mean	Standard Deviation	Mean	Standard Deviation			
Motor Assessment	5.67	4.080	5.72	3.980	**0.986**	0.973	0.993
Activities of Daily Living	4.85	3.836	4.87	3.518	**0.979**	0.961	0.989
Motor Complications	2.31	3.412	1.15	2.207	**0.973**	0.948	0.986
Total scale	11.59	7.680	11.74	7.433	**0.827**	0.670	0.909

Table 4

Construct validity.

	Total SCOPA	Motor Assessment (1–10)	Activities of Daily Living (11–17)	Motor Complications (18–21)
Domain 1: Mobility 1–10	0.751[a]	0.633[a]	0.744[a]	0.082
Domain 2: Activities of Daily Living 11–16	0.713[a]	0.533[a]	0.713[a]	0.140
Domain 3: Emotional Well-being 17–22	0.577[a]	0.542[a]	0.544[a]	0.074
Domain 4: Social Stigma 23–26	0.434[a]	0.274	0.396[a]	0.128
Domain 5: Social Support 27–29	0.399[a]	0.159	0.359[b]	0.288[b]
Domain 6: Cognition 30–33	0.547[a]	0.492[a]	0.508[a]	0.106
Domain 7: Communication 34–36	0.459[a]	0.234	0.450[a]	0.043
Domain 8: Physical Discomfort 37–39	0.667[a]	0.469[a]	0.632[a]	0.225

[a] $p < 0.01$.

[b] $p < 0.05$.

the healthcare professional administering it. Finally, the analysis of construct validity showed statistically significant relationships between the subscales of the SPES-SCOPA and the domains of the PDQ-39. This reinforced the ability of our scale to measure the desired constructs and contributed to emphasizing the reliability and adequacy of our instrument.

These results align with the current literature; in the study conducted by J. Marinus et al. results showed excellent psychometric properties, had good internal consistency, and correlated with 3 broad evaluations of disease disability, as the UPDRS [24]. A difference between SPES/SCOPA and UPDRS scale is the duration: UPDRS mean completion time is 30 min, including 15 min for the motor examination part only; the SPES/SCOPA has a much shorter total administration time of 8.1 min, a good alternative for motor examination. Literature, in fact, demonstrated that SPES/SCOPA-motor scores can easily be converted to UPDRS motor examination scores and vice versa, with specific equation models [19]. Moreover, SPES/SCOPA has already been widely used in clinical trials and several cross-sectional studies to evaluate motor symptoms and activities of daily living; for example, in the study by Yousefi et al. it was used to assess activities of daily living, while in that of Popa et al. SPES/SCOPA scale was used to evaluate changes in motor impairments, in particular bradykinesia, in patients with Parkinson's disease who undergone functional electrical stimulation [46,47]. It is important to use validated outcome measures in clinical trials, in order to provide comparable outcomes and perform systematic reviews and meta-analysis, consequently achieving a higher level of evidence. For example, psychometric properties of PDQ-39 and PDQ-8 were widely investigated and to date those are considered the most used tools to evaluate QoL in patients with PD, as well as UPDRS for motor symptoms [48,49]; SPES/SCOPA scale needs to be studied in future research to better understand its validity and reliability, also in different groups of patients with PD.

In the future, conducting further research to assess the scale's responsiveness in detecting changes over time would be of great interest. This would help determine whether the scale can sensitively and accurately detect changes in the health status of patients over time, which is crucial for its clinical utility. Moreover, it would be recommended in future studies to include a larger sample to assess cultural validity of SPES/SCOPA scale, as mentioned in COSMIN statement [50].

5. Conclusion

This study has delved into the instrument's psychometric properties, in particular validity and reliability, demonstrating its internal consistency, reliability, and construct validity. These results represent a significant step toward providing a valid, consistent, and reliable tool for assessing relevant aspects of the studied population. In conclusion, this research has yielded promising results regarding cultural adaptation and psychometric properties of the SPES-SCOPA scale in the Italian language. However, additional studies are needed to explore its validity and ability to detect changes over time further, contributing to its clinical application and assessing patients' health.

Ethics statement

This study was reviewed and approved by Ethics Committee of "Sapienza University of Rome", with the approval number: 0428/2020 Rif. 5830. All participants provided informed consent to participate in the study.

Data availability

Supplementary data are available from the corresponding author.

CRediT authorship contribution statement

S.R. Pisaltu: Writing – original draft, Investigation, Data curation. **I. Ruotolo:** Writing – review & editing, Supervision, Methodology. **G. Sellitto:** Writing – review & editing, Supervision. **A. Berardi:** Writing – review & editing, Supervision, Conceptualization. **R. Simeon:** Methodology, Data curation. **G. Fabbrini:** Supervision, Methodology. **G. Galeoto:** Supervision, Project administration, Formal analysis.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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