

Properties of the Apathy Scale (AS) for use on Parkinson's patients

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ABSTRACT

Parkinson's Disease is a neurodegenerative disorder characterized by motor, autonomic, and neuropsychiatric symptoms, among the latter, apathy has been found to be present in up to 70% of patients. The main objective of the present study was to assess the psychometric properties of the Apathy Scale for evaluation of Ecuadorian patients with Parkinson's. This was a cross sectional study, with re-test. There were 73 women (34.5%) in the final sample of 211 patients. Mean age was 67.5 ± 10.2 years, mean length of illness was 7.1 ± 5.5 years, and the mean l-dopa dose was 656.1 ± 292.7 mg/day. The mean Apathy Scale score was 12.7 ± 7.1 . Reliability: The Guttman's λ obtained was 0.89. The SEM was 2.34 for the AS. The ICC using an absolute agreement definition was: ICC = 0.78 [(95% IC 0.73 - 0.82) $f = 4.96$; $p \leq 0.000$]. Discriminative validity, analyzed with the Kruskal-Wallis statistic and using H&Y stages as segmentation variable registered an $X(2)$ value of $p < 0.0001$. In conclusion the Apathy Scale proved to have suitable metric attributes in this specific PD patient sample: internal consistency, reliability, stability, and convergent and known-groups validity.

Keywords: Parkinson's Disease; Apathy Associated with Parkinson's Disease; Apathy Scale; Metric Properties

1. INTRODUCTION

Parkinson's disease (PD) is a chronic, progressive neu-

rodegenerative disease that causes motor symptoms (rest tremor, bradykinesia, rigidity and loss of postural reflexes); neuropsychiatric symptoms (depression, anxiety, dementia, apathy, psychosis); autonomic symptoms (urinary incontinence, orthostatic hypotension and erectile dysfunction, among others); and a set of signs and symptoms that do not fit into the previous groups: dysphagia, drooling, seborrhea. Its epidemiology shows an overall prevalence of 1 out of every 1000 inhabitants, and a specific prevalence of 1 out of every 100 inhabitants in the 65+ age group [1].

Apathy has been conventionally defined as the absence or insufficiency of sensation, emotion, interest, or concern. Conceptually, it is closely related to emotionality and motivation [2], may present as a syndrome in itself or as part of other neuropsychiatric disorders, such as depression, despair, abulia, and dementia, in particular [3].

It is thought that apathy develops as a result of the disruption of auto-activation processes, resulting in an inability to think or act for oneself or on one's own, while still maintaining a relatively unimpaired ability to respond or react to external prompting or stimuli [4,5].

Marin [3] was the first to present diagnostic criteria for apathy centered on lack of motivation unattributable to mental deterioration, emotional distress, or diminished level of consciousness, and manifesting as diminished goal-directed behavior, diminished goal-directed cognition, and diminished concomitants of goal-directed behavior.

Some diagnostic criteria have recently been published [6]. The Movement Disorder Society (MDS) Task Force to Assess the Clinimetric Properties of Apathy and Anhedonia Scales in PD patients [7] identified four apathy rating scales: the Apathy Evaluation Scale (AES); the abbreviated version of the AES, known as the Apathy Scale

(AS); the Apathy Inventory (AI); and the Lille Apathy Rating Scale (LARS). The AS, AI, and LARS were specifically developed for patients with PD, but only the AS meets criteria to be “recommended”.

The main objective of the present study was to assess the psychometric properties of the AS [8] for evaluation of Ecuadorian patients with PD.

2. METHOD

2.1. Design

Cross sectional study, with re-test.

2.2. Patients

Consecutive patients with diagnosis of PD regularly followed-up at the Movement Disorders Unit, Neurology Department, Carlos Andrade Marin Hospital (Quito, Ecuador), according to the United Kingdom PD Society Brain Bank criteria [9]. Exclusion criteria were: cognitive impairment more than dubious or slight, evaluated by the Short Portable Mental Status Questionnaire of Pfeiffer (SPMSQ; cutoff 5/6) [10]; neurological impairment or disability due to any condition other than PD (e.g., hemiplegia or blindness) or psychiatric comorbidity (depression) that hindered appropriate evaluation according to the objective of the study.

The study was approved by the (Institutional Review Board) HCAM Teaching and Research Administrative Office. Informed consent was obtained from all patients.

2.3. Assessment

The AS [8] is based on the Apathy Evaluation Scale (AES) by Marin *et al.*, [11] and consists of 14 of the 18 original items. In the AS, each question is read by the examiner and has four options of response: “not at all”, “slightly”, “some”, or “a lot”. Scores range from 0 to 42; higher scores indicate more severe apathy. Items 1 to 8 score: not at all = 3 points; slightly = 2; some = 1; a lot = 0; items 9 to 14 score: not at all = 0; slightly = 1; some = 2; a lot = 3.

General demographic and clinical information was collected from each patient. In addition to the AS, the following assessment instruments were applied: Short Parkinson's Evaluation Scale (SPES/SCOPA) for evaluation of motor dysfunction [12]; Hoehn & Yahr for staging (H&Y); Schwab & England Activities of Daily Living Scale (S&E) for disability; Hospital Anxiety and Depression Scale (HADS) for mood disorder [13]; Parkinson's Impact Scale (PIMS) for health-related quality of life status (HRQoL) [14]; and Clinical Impression of Severity Index (CISI-PD) for global evaluation [15]. All the patients were evaluated in the ON state and the same day.

A cut-off point ≥ 14 from the total score of the AS was

used to dichotomize the sample into apathetic and non-apathetic patients [8].

2.4. Statistical Analysis

The following attributes were explored:

Data was considered acceptable [16]. Observed scores should cover the range of the scale scores and mean should be near the theoretical median (an arbitrary limit 10% for the difference was proposed) [17]. Floor and ceiling effect must not exceed 15% and skewness should be between -1 to $+1$ [18].

Internal consistency. The inter-item correlation matrix (Spearman rho) (limits: ≥ 0.20 to ≤ 0.75) [19] and the item homogeneity index (threshold, 0.30) were obtained [20]. In addition, the corrected Item-total correlation was determined. As coefficient of internal consistency, the Guttman's lambda (λ) was determined because assumptions for use of Cronbach's alpha were not met [21]. Agreement (test-retest agreement). Seventy-one patients, randomly chosen, repeated the AS assessment 6 days after the first evaluation (range: from 4 to 9 days). Test-retest agreement was analysed by mean of the intraclass correlation coefficients (ICC) using an absolute agreement definition (2-way, random effects, intraclass correlation coefficient).

Precision. The standard error of measurement (SEM) for the AS was calculated ($SEM = SD \cdot \sqrt{1 - ICC}$) [22].

Spearman rank correlation coefficient was used to determine the association between the AS and other measures in the study. A close association ($rS \geq 0.50$) [23], was hypothesized between AS and HADS, a moderate ($rS = 0.35 - 0.50$) or low ($rS \leq 0.34$) correlation was expected between AS and the other scales. To analyze known-groups validity the H&Y stages were used for stratification and the Kruskal-Wallis (KW) test for statistical analysis. We also used a HADS score cut-off ≥ 11 , to consider the patients anxious or depressed [24] and AS score was compared between groups with and without the respective disorder applying the Mann-Whitney test. For both analyses, a p value ≤ 0.05 was accepted as significant [25].

3. RESULTS

There were 73 women (34.5%) in the final sample of 211 patients, distributed according to H&Y stages as follows: 29 (13.7%) in Stage I; 47 (22.2%) in II; 98 (46.4%) in III; and 37 (17.7%) in IV, including two Stage V patients. Mean age was 67.5 ± 10.2 years, mean length of illness was 7.1 ± 5.5 years, and the mean l-dopa dose was 656.1 ± 292.7 mg/day. The mean AS score was 12.7 ± 7.1 .

Classifying the patients according to the AS and the HADS, we found 33 patients with apathy alone (15.7%);

121 patients with neither apathy nor depression nor anxiety (57.3%); 42 patients with apathy and depression and/or anxiety (19.9%); finally, 15 patients with depression and/or anxiety without apathy (7.1%). There were no missing data. The difference between the mean and the median in the AS was 1.78 points. The floor and ceiling effects were 1.42 and 2.36, respectively; skew and kurtosis were 0.65 and -0.26 , respectively (**Table 1**).

Internal consistency: Analysis of the correlation matrix showed the average interitem correlation was located between 0.21 and 0.37, with the exception of items 3 (-0.066) and 4 (-0.145). The item homogeneity index was 0.21. **Reliability:** The Guttman's λ obtained was 0.89. When analyzing AS behavior—specifically the Guttman's λ value—we observed that when the item was eliminated, items 3 and 4 would allow raising the reliability index to 0.9 (**Table 2**).

The SEM was 2.34 for the AS: values were 2.94 in H&Y Stage 1; 1.85 in Stage 2; 1.96 in Stage 3; and 2.65 in Stage 4.

Agreement (test-retest agreement). Seventy-one patients repeated the AS assessment 6 days after the first evaluation (range: from 4 to 9 days). The ICC using an absolute agreement definition was: ICC = 0.78 [95% IC 0.73 – 0.82] $f = 4.96$; $p \leq 0.000$.

When analyzing the correlations of the AS with the Spearman's rho statistic, we obtained values of 0.49 with the HADS anxiety total, 0.48 with the depression section of that same scale, and 0.56 with the PIMS. The values were lower with the other tools.

Discriminative validity (Known-groups validity), analyzed with the Kruskal-Wallis statistic and using H&Y

stages as segmentation variables—registered an X(2) value of 22.68 = $p < 0.0001$ (**Table 3**).

Using the HADS (a cut-off ≥ 11 , to consider the patients anxious or depressed), the difference between groups was significant ($p \leq 0.001$) (**Table 4**).

4. DISCUSSION

The data quality obtained from the AS is good, and only the difference between the mean and the median (1.78) is outside the ($-1 - +1$) range. There was no floor or ceiling effect, and the skew and kurtosis fell within accepted values. AS reliability was measured according to internal consistency and the reliability index and obtained optimal values (Guttman's $\lambda = 0.89$). In the first validation study [8] it showed a Cronbach's α value of 0.76. The scale would improve if we were to eliminate Items 3 and 4 (“Are you concerned about your condition?” “Do you put much effort into things?”) from this study sample. These items obtained the lowest correlation values. Moreover, the reliability coefficient improves if they are eliminated.

Convergent validity showed appropriate values when correlated with the PIMS (Spearman's rho of 0.56) and with the HADS anxiety and depression subscales (Spearman's rho of 0.498 and 0.485), which were higher than others reported [26], even though in general it is reportedly comparable to other instruments for evaluating depression and anxiety. These correlations are similar to others obtained. The highest value was obtained vis-à-vis the PIMS, which would indicate that apathy is a quality-of-life determinant [27].

Known-groups validity demonstrated that there were

Table 1. Descriptives of the sample (N (f/m) 211 (73/138)).

	Median	Mean \pm SD	Minimum	Maximum	Skewness	Kurtosis
Age (years)	68	67.5 \pm 10.2	38	86	-0.08	-0.4
Disease (years)	6	7.1 \pm 5.5	0,2	25	1.3	1.5
Years wit l-dopa	4	5.3 \pm 4.7	0	20	1	0.6
Doses of l-dopa (mg/day)	750	656.1 \pm 292.7	0	1.550	0	0
SPES/SCOPA total	28	29.9 \pm 11.1	10	61	0.6	0.1
S&E	70	70.3 \pm 15.6	20	90	-1.1	1.2
CISI total	10	10.7 \pm 4.1	3	19	0.3	-0.7
SPMSQ	0	1.3 \pm 1.6	0	7	1.2	1.3
HADS anxiety	8	8.3 \pm 4	1	17	0.3	-0.6
HADS depression	7	7.2 \pm 4.2	0	19	0.5	0.1
PIMS	15	15.9 \pm 8.8	0	35	0	-0.7
AS	11	12.7 \pm 7.1	1	31	0.6	-0.2

SPES/SCOPA: Short Parkinson's Evaluation Scale; S&E: Schwab & England Activities of Daily Living Scale; CISI: Clinical Impression of Severity Index; SPMSQ: Short Portable Mental Status Questionnaire of Pfeiffer; HADS: Hospital Anxiety and Depression Scale; PIMS: Parkinson's Impact Scale; AS: Apathy Scale.

Table 2. Metric properties of the AS.

	Corrected item—total correlation	Guttman's lambda if item deleted
Item_1	0.51	0.87
Item_2	0.55	0.87
Item_3	-0.1	0.9
Item_4	-0.23	0.91
Item_5	0.47	0.89
Item_6	0.68	0.87
Item_7	0.72	0.86
Item_8	0.56	0.88
Item_9	0.45	0.88
Item_10	0.49	0.87
Item_11	0.48	0.88
Item_12	0.46	0.88
Item_13	0.38	0.89
Item_14	0.66	0.88

Table 3. Discriminat validity for “known groups” (Kruskal-Wallis test).

	I	II	III	IV	χ^2	p≤
Number of patients	29	47	98	37		
Mean ± (SD) of AS score	11.6 ± 9	11.2 ± 5.6	11.8 ± 6	17.8 ± 8.1	22.67	<0.001

SD = Standard deviation; p ≤ 0.05 as significant. AS: Apathy Scale.

Table 4. Discriminat Validity for “known groups”. Apathy Scale, total score between groups (HADS cut/off). (Mann-Whitney Test).

	Non depression	Depression	p≤	Non anxiety	Anxiety	p≤
Number of patients	175	36		164	47	
Mean ± (SD)	10.7 ± 5.5	22.5 ± 6.2	<0.001	11.1 ± 6.2	18.4 ± 7.3	<0.001

SD = Standard deviation; p ≤ 0.05 as significant.

differences between the degree of apathy and the H&Y stages (**Table 3**); this is in keeping with significant differences found between AS score and illness times and age. This finding is similar to another that has recently been reported [27], where Parkinson patients in the most advanced H&Y stages showed higher scores for apathy.

When we compared the patient group with apathy to the patient group without apathy or anxiety and/or depression, we found that apathetic patients were, in general, older and had both a longer period of illness and

more greatly compromised motor ability, HADS anxiety and depression subscale scores and PIMS scores. These apathy results in Parkinson's patients have not been reported in other publications [28,29].

Analyzing the apathy group in comparison with the apathy and anxiety and/or depression group, the latter had statistically significant higher scores on the AS and in the HADS anxiety and depression subscales (Mann-Whitney test p = 0.001), **Table 4**. These findings are similar to those reported by P. Sockeel *et al.* [30].

5. CONCLUSIONS

In conclusion, apathy is a frequent entity in PD; 35.54% of patients show signs of it. In a Group of Parkinson's patients, apathy coexists with depression and/or anxiety in 19.9%. Apathy negatively impacts the quality of life of these subjects. The AS proved to have suitable metric attributes in this specific PD patient sample: internal consistency, reliability, stability, and convergent and known-groups validity. Finally, it is important to be able to rely on consensual diagnostic criteria that can provide common elements for studying apathy in PD.

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