Neurol Sci (2007) 28:270–275
DOI 10.1007/s10072-007-0834-9

ORIGINAL

F. Mondolo • M. Jahanshahi • A. Granà • E. Biasutti • E. Cacciatori • P. Di Benedetto

Evaluation of anxiety in Parkinson's disease with some commonly used rating scales

Received: 14 April 2007 / Accepted in revised form: 12 September 2007

Abstract This study assessed the concurrent validity of the State-Trait Anxiety Inventory (STAI), the Hospital Anxiety and Depression Scale (HADS) and the Hamilton Anxiety Scale (Ham-A) for evaluating anxiety in a group of 46 Parkinson's disease (PD) patients. The magnitude of correlations between the scales was high (all $p<0.01$), indicating a good concurrent validity. The item-by item analysis indicated that the main characteristics of anxiety in PD patients were 'inability to relax', 'restlessness or inability to feel calm' and 'feeling tense'. The association between anxiety, as measured by the HADS-A, with demographic characteristics or clinical features of PD was not significant, supporting existing data suggesting that anxiety in PD is not closely correlated with the severity of motor symptoms or the degree of disability. The HADS-A may be the most appropriate scale for documenting patient-reported anxiety in depression.

Key words Parkinson's disease • Anxiety • Hospital Anxiety and Depression Scale (HADS) • State-Trait Anxiety Inventory (STAI) • Hamilton Anxiety Rating Scale (Ham-A)

F. Mondolo (✉) • A. Granà • E. Biasutti • E. Cacciatori
P. Di Benedetto
Institute of Physical Medicine and Rehabilitation
Gervasutta Hospital
Via Gervasutta 48, I-33100 Udine, Italy
e-mail: federicamondolo@yahoo.it

A. Granà
Department of Psychology
University of Trieste, Trieste, Italy

M. Jahanshahi
Sobell Department of Motor Neuroscience & Movement Disorders, Institute of Neurology
The National Hospital for Neurology & Neurosurgery
Queen Square
London, UK

Introduction

Compared to the now relatively extensive literature on depression in Parkinson's disease (PD), research on the prevalence and specific nature of anxiety in these patients is more limited. Stein et al. [1] studied 24 patients with PD and found that 9 (38%) had anxiety disorders according to Diagnostic and Statistical Manual of Diseases (DSM-III-R) criteria. The severity of anxiety was not correlated with the severity of the motor symptoms, duration or dose of levodopa therapy. Other studies have also found anxiety to be a common experience in patients with PD [2–4]. For example, in the study by Aarsland et al. [4] using the Neuropsychiatric Inventory, anxiety was identified in 20% of the patients with PD. In the majority of studies to date, up to 40% of patients with PD suffer from clinically significant anxiety. This rate is higher than expected for this age group of patients [5–7]. The comorbidity of anxiety and depression in PD has been reported in a number of studies [8–11]. Henderson et al. [8] found co-existing anxiety or panic disorder in 38% of depressed PD patients *vs*. 8% of healthy control subjects. Menza et al. [9] found that 92% of patients with PD who had a diagnosis of anxiety also had a depressive disorder or symptoms and 67% of patients with a depressive disorder had a concomitant anxiety disorder. Shulman et al. [10] assessed 99 patients with PD on the Beck Depression Inventory, Beck Anxiety Scale and the Fatigue Severity Scale. Thirty-six percent reported depression, 33% anxiety and 40% fatigue. Nuti et al. [11] found comorbidity of mood and anxiety disorders in 19.3% PD patients *vs*. 8.6% controls ($p<0.01$).

Even in the small existing literature on anxiety in PD, diverse approaches have been used for determining the presence/absence and severity of anxiety. Some have relied on interviewing the patients and use of DSM criteria [1]. Others have used the 'Present State Examination', a standardised psychiatric interview, and the International Classification of Diseases (ICD-10) criteria to establish that depression and anxiety were the most common psychi-

atric disorders among 40 PD patients [12]. The Neuropsychiatric Inventory, a semi-structured interview with the carer rather than the patient, has been used by others [4]. More commonly, self-rating scales have been used to assess anxiety in PD [2, 10]. The latter have the advantage of being easy to complete and requiring very little time to administer. The primary objective of this study was to examine the concurrent validity of some common anxiety rating scales for assessing the severity of anxiety symptoms in patients with PD. More specifically, we examined the concurrent validity of a number of self-rated scales, namely the Spielberger's State-Trait Anxiety Inventory (STAI [13]), the Hospital Anxiety and Depression scale (HADS-A [14]) and a clinician rated scale, the Hamilton Anxiety Scale (Ham-A [15]).

Methods

Sample

Forty-six patients with PD (28 males and 18 females), diagnosed according to the clinical criteria of the United Kingdom Parkinson's Disease Society Brain Bank (UK-PDS-BB) [16], participated. They were outpatients and consecutive referrals from the Department of Physical Medicine of the "Gervasutta" Rehabilitation Hospital, Udine, for a standardised 'mental status' examination and for a rehabilitation programme specifically for PD patients with motor, speech and/or urinary dysfunction. Patients were screened for dementia using the Mini Mental State Examination (MMSE [17]) and those with a score below 24 were excluded. Patients' motor disability was evaluated using the motor part of the Unified Parkinson's Disease Rating Scale (UPDRS [18]). Severity of PD was rated according to the Hoehn and Yahr staging system [19] in the 'on' medication state. Only four patients had motor fluctuations. Patients with atypical Parkinsonism, vascular Parkinsonism, drug-induced Parkinsonism and those with Parkinsonism following dementia were excluded. Demographic and clinical features of the PD patients are summarised in Table 1.

Table 1 Demographic and clinical features of the PD patients (n=46)

	Means	SD
Age (years)	67.7	8.2
Sex (female/male)	18 (39)	
Age at Onset (years)	62.6	9.9
Duration of illness (years)	6.0	4.0
Positive family history	9 (19.6)	
Hoehn and Yahr score:		
Stage I	n=6	
Stage II	n=26	
Stage III	n=13	
Stage IV	n=1	
UPDRS Motor score	28.7	12.1
MMSE	27.8	1.5
Education (years)	7.8	3.8
Antidepressant medication	6 (13)	
Dopamine agonists medication	36 (78)	
Daily levodopa dose (mg)	411.9	252.8

Values in parentheses are %

Procedure

The 'mental state' examination consisted of a semi-structured interview with a neurologist using the Ham-A [15], for the diagnosis of anxiety disorder. All patients were asked to complete the STAI [13] and the HADS-A [14]. All patients completed the anxiety rating scales during two different testing sessions with a psychologist, with a gap of one week between the two sessions. In the first session, patients completed the STAI [13]. In the second session they were asked to complete the HADS-A [14]. At the end of the second session, there was a semi-structured interview with a neurologist using the Ham-A [15]. The Hoehn & Yahr [19] staging of illness was completed by a neurologist during a semi-structured clinical interview and neurological examination. Details of the patients' medical history were extracted from their general practitioners' records.

Anxiety rating scales

The STAI is composed of two separate 20-item scales constructed to measure "state" and "trait" anxiety, using 4-point scales. On the State Scale, the respondent is asked to indicate "how [he/she] feels right now, that is, at this moment" with respect to each of 20 different items. On the Trait Scale, the respondent is asked to indicate "how [he/she] generally feels" with respect to each of 20 different items.

The HADS consists of seven depression items and seven anxiety items. In this study we consider only the anxiety subscale. All items are rated on a four-point scale, ranging from the absence of a symptom (scoring 0) to maximal symptomatology, which scores 3. On the HADS, higher scores (range 0–21) indicate more severe anxiety, the cut-off score for mild anxiety was 8 (≥8 indicates mild to moderate anxiety) and the cut-off score for moderate to severe anxiety used was 11 (≥11 indicates definite anxiety).

The Ham-A scale consists of 14 items, each defined by a series of symptoms including anxiety, fear or phobias, insomnia, depression, palpitations, breathing difficulty and restlessness. Each symptom is rated on a 5-point scale, ranging from 0 (absent) to 4 (severe).

Statistical analysis

For each scale, scores were calculated according to the respective scoring algorithms. Akinesia scores were calculated as the sum of items 19 and 23 to 26 of the UPDRS for both sides, and the tremor score from items 20 and 21 for both sides. We selected non-parametric tests to analyse the data because of the ordinal nature of the scales. Mean values were compared by the Mann–Whitney test, and Spearman rank correlation coefficients were calculated to assess the direction and magnitude of association between variables. All the significance tests were two tailed. All statistical analyses were performed with SPSS for Windows [20].

Results

Demographic and clinical features of the PD patients are summarised in Table 1.

On the Ham-A the mean score for the 46 patients was 5.28 (SD 5.31; range 0–22). On the HADS-A the average score for the sample was 6.59 (SD 3.23; range 1–16). On the STAI-trait and STAI-state, the average scores for the sample were respectively 39.41 (SD 9.65; range 21–64) and 36.46 (SD 9.23; range 20–58). We compared the scores obtained by PD patients on the STAI-trait and STAI-state with the Italian normative data for normal subjects of a comparable age (people over 49 years).

As shown in Table 2, we found a significant difference between the mean scores on the STAI-state of males (t=–2.63; p<0.05) and females (t=–2.29; p<0.05) of our sample compared to the means of normative data. On the STAI-trait there was a significant difference for males compared to the normative data (t=–2.36; p<0.05), but not for females (t=0.38).

On the HADS-A, 5 patients (11%) met the criteria for severe anxiety, 11 (24%) met the criteria for mild anxiety and 30 (65%) were non-anxious.

In order to identify the specific components of anxiety in PD, we undertook an item-by-item analysis of the patients' scores on the HADS-A and on the STAI-state. For the HADS-A we calculated the percentage of patients obtaining scores of 0–3 for each item separately (see Table 3). Item-by-item analysis of the HADS-A suggested that 'inability to relax', 'restlessness', 'frightened feeling', experience of 'worrying thoughts' and 'feeling tense' were the main characteristics of anxiety for these patients (see Table 3).

For the STAI-state we calculated the percentage of patients obtaining scores of 1–4 for each item separately (see Table 4). Item-by-item analysis of the STAI-state suggested that 'inability to feel calm', 'feeling insecure', 'inability to feel at ease', 'feeling dissatisfied', 'inability to relax', 'feeling not content' and 'inability to feel steady' were the main characteristics of state anxiety for these patients (see Table 4).

Association between anxiety scales

There was a moderate, but significant, correlation between the Ham-A and the HADS-A (r=0.53, p<0.01), the Ham-A and the STAI-state (r=0.45, p<0.01) and the Ham-A and the STAI-trait (r=0.64, p<0.01). We found a moderate, but significant, correlation between the HADS-A and the STAI-state (r=0.53, p<0.01) and the HADS-A and STAI-trait (r=0.62, p<0.01). Finally, we also found a moderate, but significant, correlation between the STAI-trait and the STAI-state (r=0.52, p<0.01).

Table 2 Means and standard deviation scores on the STAI for our sample and for normative data for people aged 49+

		Normative data		PD patients (n=46)	
		Males	Females	Males	Females
STAI-state	Mean	39.68	43.85	35.50*	37.94*
	SD	10.88	12.06	8.41	10.94
STAI-trait	Mean	39.94	43.25	36.36*	44.17
	SD	10.55	9.85	8.01	10.26

*Significant at p<0.05

Table 3 Item-by-item analysis for the HADS-A

	0	1	2	3
Item 1. I feel tense or 'wound up'	4 (9%)	36 (78%)	1 (2%)	5 (11%)
Item 4. I get a sort of frightened feeling like 'butterflies' in the stomach	12 (26%)	26 (57%)	8 (17%)	0 (0%)
Item 5. I get a sort of frightened feeling as if something awful is about to happen	11 (24%)	27 (59%)	5 (11%)	3 (6%)
Item 8. I feel restless as if I have to be on the move	8 (17%)	26 (57%)	10 (22%)	2 (4%)
Item 9. Worrying thoughts go through my mind	27 (59%)	15 (33%)	0 (0%)	4 (8%)
Item 12. I get sudden feelings of panic	24 (52%)	19 (41%)	3 (7%)	0 (0%)
Item 13. I can sit at ease and feel relaxed	8 (17%)	17 (37%)	21 (46%)	0 (0%)

Table 4 Item-by-item analysis for the STAI-state

	1	2	3	4
Item 1. I feel calm	8 (17%)	22 (48%)	14 (31%)	2 (4%)
Item 2. I feel secure	19 (41%)	13 (28%)	11 (24%)	3 (7%)
Item 3. I am tense	22 (48%)	17 (37%)	6 (13%)	1 (2%)
Item 4. I feel strained	32 (70%)	8 (17%)	6 (13%)	0 (0%)
Item 5. I feel at ease	17 (37%)	15 (32%)	10 (22%)	4 (9%)
Item 6. I feel upset	35 (76%)	7 (15%)	4 (9%)	0 (0%)
Item 7. I am presently worrying over possible misfortunes	25 (55%)	18 (39%)	1 (2%)	2 (4%)
Item 8. I feel satisfied	6 (13%)	26 (57%)	8 (17%)	6 (13%)
Item 9. I feel frightened	36 (78%)	10 (22%)	0 (0%)	0 (0%)
Item 10. I feel comfortable	19 (42%)	18 (39%)	7 (15%)	2 (4%)
Item 11. I feel self-confident	15 (33%)	18 (39%)	11 (24%)	2 (4%)
Item 12. I feel nervous	29 (63%)	10 (22%)	4 (8%)	3 (7%)
Item 13. I am jittery	31 (67%)	8 (17%)	5 (11%)	2 (5%)
Item 14. I feel indecisive	28 (61%)	12 (26%)	4 (9%)	2 (4%)
Item 15. I am relaxed	7 (15%)	21 (46%)	15 (33%)	3 (6%)
Item 16. I feel content	8 (17%)	20 (44%)	13 (28%)	5 (11%)
Item 17. I am worried	21 (46%)	18 (39%)	5 (11%)	2 (4%)
Item 18. I feel confused	31 (68%)	13 (28%)	2 (4%)	0 (0%)
Item 19. I feel steady	9 (19%)	15 (33%)	16 (35%)	6 (13%)
Item 20. I feel pleasant	11 (24%)	23 (50%)	10 (22%)	2 (4%)

Table 5 Spearman correlation coefficients between the different anxiety scales

	HADS A	STAI-Trait	STAI-State	HAM-A
HADS A		r=0.62**	r=0.53**	r=0.53**
STAI-Trait			r=0.52**	r=0.64**
STAI-State				r=0.45**
HAM-A				

** Correlation is significant at $p<0.01$ level (2-tailed)

Association of HADS-A with patient and disease characteristics

There was no significant correlation between the HADS-A and age, age at onset, disease duration, UPDRS scores, Hoehn and Yahr ratings, levodopa dose, MMSE scores or tremor scores; with the magnitude of the correlations ranging from 0.04 to 0.27 (all $p>0.05$). There was a trend for an association between the HADS-A and the akinesia scores ($r=0.30$, $p=0.05$; see Table 5). Using the Mann–Whitney test, there was no significant difference in anxiety between patients receiving antidepressant medication and patients not receiving it ($Z=-0.39$, $p=0.69$), and there was also no difference in anxiety between patients receiving dopamine agonist medication and patients not receiving it ($Z=-0.65$, $p=0.52$). Using the Mann–Whitney test, we found that females had significantly higher anxiety scores then males ($Z=-2.84$, $p=0.004$).

Discussion

In this study we investigated the concurrent validity of some commonly used rating scales to evaluate anxiety (Ham-A, HADS-A and STAI) in patients with PD. We found a good convergent validity between the scales. In addition, we investigated the association between anxiety, as measured by the HADS-A, with demographic characteristics (age, sex) or clinical features of PD (age at onset, disease duration, UPDRS scores, Hoehn and Yahr ratings, MMSE scores and tremor scores), and we did not found any significant correlation, confirming that anxiety in PD is not closely correlated with the severity of motor symptoms or the degree of disability.

There are many different varieties of anxiety disorder, including generalised anxiety disorder, panic disorder, agoraphobia, social phobia and anxiety associated with obsessive–compulsive disorder. However, the specific nature or

types of anxiety experienced by patients with PD has remained unclear. The item-by-item analysis of the anxiety scales clarified the main components of the experience of anxiety in PD. The main characteristics of anxiety that emerged were 'inability to relax', 'restlessness or inability to feel calm and at ease' and 'feeling tense or inability to feel steady'.

Research has not yet conclusively determined what factors give rise to anxiety in patients with PD. Anxiety may be a psychological response to the physical symptoms. Patients with PD often report feelings of embarrassment about their motor impairment [5] particularly the tremor, stooped posture and shuffling gait, and may avoid social situations because of the fear of negative evaluation. The uncertainty associated with a number of motor symptoms of PD can give rise to anxiety. The unpredictability of function associated with on–off fluctuations, the disturbance of balance and risk of falls when walking are among the symptoms likely to contribute to anxiety. A specific form of anxiety, 'fear of falling', is quite common in PD, reported by 46% of patients [21]. Because of this 'fear of falling', venturing outside the home can be considered risky and often avoided. This avoidance can, in the long term, result in social isolation. The mood swings that can accompany motor on–off fluctuations in PD can also involve increased anxiety and panic attacks in the 'off' state [22, 23]. Severe anxiety can, in turn, make the motor symptoms of PD worse. With the exception of significantly higher anxiety scores on the HADS-A in females than males and a trend for an association between the HADS-A and akinesia scores, we did not find any significant associations between anxiety with demographic characteristics (age, sex) or clinical features of PD (age at onset, disease duration, UPDRS scores, Hoehn and Yahr ratings, MMSE scores and tremor scores). As in previous studies [1, 9], this pattern of results confirms that anxiety in PD is not closely correlated with the severity of motor symptoms or the degree of disability, thus supporting the notion that this mood disorder does not have a simple linear relationship with PD disease severity or duration. It is possible that the association between anxiety and PD disease severity or duration of illness is more complex and non-linear. For example, anxiety may be high shortly after diagnosis but abate as the patients adapt to the diagnosis and increasingly cope with the experience of living with the illness, but it may increase again in the late stages with progression of PD and development of on–off fluctuations. Alternatively, it is possible that anxiety is not simply a reaction to the illness but rather is related to the central biochemical disturbances that accompany PD. Two lines of evidence lend support to this. The first is that anxiety disorders occur more often in patients with PD than in patients with other equally debilitating diseases, such as multiple sclerosis, type I diabetes and rheumatoid arthritis [9, 24, 25]. The second is that some PD patients clearly experience anxiety symptomatology prior to the onset of the motor symptoms of PD [6], suggesting some underlying, shared neurobiologic vulnerability to PD and anxiety. Taken together, these results suggest that in PD the motor disease process induces neurochemical changes that may predispose patients to anxiety.

The association that we found between the HADS-A and akinesia scores confirmed the results found by Starkstein et al. [26] for depression. In fact, they found that patients with akinetic-rigid PD had a significantly higher prevalence of major (but not minor) depression (38% *vs*. 15%, respectively; $p<0.01$) compared with the classic variant of PD (that is, tremor plus rigidity and/or bradykinesia).

In this study, mean scores on the STAI were comparable to those reported by Siemers et al. [27] but they were notably lower than those reported by Gotham et al. [2]. The differences in the scores obtained by PD patients on the HADS-A *vs*. the STAI may relate to several factors. First, the specific instructions of the two questionnaires differ. On the HADS-A, the patient is instructed to complete the scale in order to reflect his or her state in the past week. In contrast, on the STAI-state the patient is instructed to complete the scale in order to indicate how he or she feels right now, that is, at this moment. On the STAI-trait the patient is instructed to complete the scale in order to indicate how he or she generally feels. A second factor is the number of items of the two questionnaires. The HADS-A consists of only seven items compared to the 40 items of the STAI (20 items of the STAI-state and 20 items of the STAI-trait). This difference is related to the fact that the HADS-A is an efficient screening instrument for assessing presence or absence of clinically significant degrees of anxiety and cut-off scores aim to minimise the proportion of false positives or negatives. In contrast, the STAI-trait scale represents a personality inventory, because it evaluates the existence of stable individual differences in the tendency to respond with state anxiety in the anticipation of threatening situations. In this sense, the STAI-trait scale is administered to evaluate psychopathological anxiety traits and is not a screening test for anxious mood disorder. Finally, the HADS-A items were selected to distinguish the effects of physical illness from mood disorders, and so symptoms likely to be present in both (e.g. dizziness and headaches) were not included. It was also necessary to exclude symptoms which might equally arise from somatic as from mental disease such as insomnia, lack of energy and fatigue. Moreover, symptoms relating to severe mental disorder (such as phobic avoidance) were excluded; although such symptoms are common in patients attending psychiatric clinics they are less common in patients attending other hospital clinics and are therefore less likely to be useful. This item selection is very important when, as in this study, patients are affected by a disease where the main symptoms are physical. In this sense, the HADS-A has some advantages relative to the Ham-A, where many of the items refer to somatic symptoms. The HADS-A may be the most appropriate scale for documenting patient-reported anxiety in PD.

Acknowledgements This study was supported by the Association of Rehabilitation of Friuli Venezia Giulia (ART).

Sommario *Questo studio indaga la validità nel valutare l'ansia in un gruppo di 46 pazienti con malattia di Parkinson dell'Inventario per l'ansia di stato e di tratto (STAI-Y), della Hospital Anxiety and Depression Scale (HADS) e della scala Hamilton per l'ansia (Ham-A). Il livello di correlazione tra le scale è elevato ($p<0.01$), indicando una buona validità convergente. L'analisi dei singoli items mostra che le principali caratteristiche dell'ansia nei pazienti con malattia di Parkinson sono "l'incapacità a rilassarsi", "l'irrequietezza o incapacità a stare calmo" e "il sentirsi teso". L'associazione tra l'ansia, misurata con l'HADS, e le caratteristiche demografiche del campione e/o gli aspetti clinici della malattia di Parkinson non è significativa. Tale risultato sostiene i dati presenti in letteratura che suggeriscono che l'ansia nella malattia di Parkinson non è strettamente correlata con la gravità dei sintomi motori o con il livello di disabilità.*

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