

# WHOQOL-OLD assessment of quality of life in elderly patients with Parkinson's disease: influence of sleep and depressive symptoms

## *Qualidade de vida (WHOQOL-OLD) em idosos com doença de Parkinson: influência de sintomas do sono e depressivos*

Regina Margis,<sup>1</sup> Karina Carvalho Donis,<sup>1</sup> Suzana Veiga Schönwald,<sup>2</sup> Carlos R. M. Rieder<sup>1,2</sup>

<sup>1</sup> Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, RS, Brazil

<sup>2</sup> Neurology Section, Movement Disorders Unit, Hospital de Clínicas de Porto Alegre (HCPA), Porto Alegre, RS, Brazil

### Abstract

**Objective:** Parkinson's disease is a neurodegenerative disease with a number of motor and non-motor features that can affect quality of life. In this study, we aimed to assess quality of life, as well as to evaluate the potential determinants of quality of life, such as sleep quality, motor and depressive symptoms, in elderly patients with Parkinson's disease.

**Method:** This was a cross-sectional study in which we applied the World Health Organization Quality of Life Assessment for Older Adults in 57 Parkinson's disease patients over 60 years of age. **Results:** Total World Health Organization Quality of Life Assessment for Older Adults score was found to be associated with Parkinson's disease severity ( $r_s = -0.43$ ;  $p \leq 0.001$ ). World Health Organization Quality of Life Assessment for Older Adults scores for sensory abilities (facet 1) and social participation (facet 4) were higher among the patients with mild Parkinson's disease than among those in the more advanced stages ( $r_s = -0.43$ ;  $p \leq 0.001$ ). Facet 1 scores were found to be associated with Pittsburg Sleep Quality Index and Parkinson's Disease Sleep Scale score ( $r_p = -0.46$  and  $r_p = 0.41$ ;  $p < 0.001$ , respectively). The Geriatric Depression Scale score showed an association with the total score on the World Health Organization Quality of Life Assessment for Older Adults ( $r_p = -0.70$ ;  $p < 0.001$ ). **Conclusion:** Quality of life in Parkinson's disease patients can be assessed by the World Health Organization Quality of Life Assessment for Older Adults. Greater Parkinson's disease severity can worsen patient quality of life, as can the presence of depressive symptoms.

**Descriptors:** Quality of life; Parkinson disease; Depression; Sleep; Aged

### Resumo

**Objetivo:** A doença de Parkinson é uma enfermidade neurodegenerativa com diversas manifestações motoras e não-motoras que podem provocar impacto na qualidade de vida. Este estudo teve como objetivo avaliar a qualidade de vida em pacientes com doença de Parkinson com idade superior a 60 anos por meio do questionário World Health Organization Quality of Life Assessment for Older Adults e possíveis fatores determinantes, tais como qualidade de sono, sintomas motores e depressivos. **Método:** Foi realizado estudo transversal avaliando a qualidade de vida pelo questionário World Health Organization Quality of Life Assessment for Older Adults em 57 pacientes com doença de Parkinson. **Resultados:** World Health Organization Quality of Life Assessment for Older Adults total apresentou associação com a severidade da doença de Parkinson ( $r_s = -0,43$ ;  $p \leq 0,001$ ). As facetas de habilidade sensorial e de participação social apresentaram maior pontuação nos indivíduos com estágio leve em comparação ao grupo com doença de Parkinson avançada. World Health Organization Quality of Life Assessment for Older Adults (faceta-1) apresentou associação com Índice de Qualidade de Sono de Pittsburg e Escala de Sono na Doença de Parkinson ( $r_p = -0,46$  e  $r_p = 0,41$ ;  $p < 0,001$ , respectivamente). A Escala Geriátrica de Depressão apresentou associação com World Health Organization Quality of Life Assessment for Older Adults ( $r_p = -0,70$ ;  $p < 0,001$ ). **Conclusão:** A qualidade de vida em pacientes com doença de Parkinson pode ser avaliada pelo questionário World Health Organization Quality of Life Assessment for Older Adults e foi demonstrado que a severidade da doença de Parkinson e os sintomas depressivos podem comprometer negativamente a qualidade de vida.

**Descritores:** Qualidade de vida; Doença de Parkinson; Depressão; Sono; Idoso

### Introduction

Parkinson's disease (PD) is a chronic neurodegenerative disease affecting 1.8-3.3% of subjects 65 years of age or older.<sup>1,2</sup> Patients with PD are characterized with motor symptoms—resting tremor,

bradykinesia, rigidity and loss of postural reflexes<sup>3</sup>—as well as with non-motor symptoms—autonomic and sensory dysfunction, sensory and neuropsychiatric manifestations.<sup>4</sup> The most common

Submitted: April 8, 2009  
Accepted: September 14, 2009

Correspondence  
Regina Margis  
R. Marques do Pombal, 1824/102.  
90540-000 Porto Alegre, RS, Brazil  
E-mail: regina.margis@terra.com.br

non-motor symptoms include sleep disturbances (fragmented sleep, painful dystonia, muscle cramps, motor symptoms, and daytime sleepiness) and depression.<sup>4-7</sup>

In PD patients, disability can result from distinct features such as motor impairment, non-motor complications,<sup>4,8</sup> and treatment side effects. Studies have shown that PD-related motor symptoms,<sup>9-13</sup> affective disorder,<sup>13-17</sup> and cognitive dysfunction<sup>14</sup> can be determinants of quality of life. According to the World Health Organization (WHO), quality of life (QOL) is "individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns".<sup>18</sup> Studying quality of life in elderly people might require attention to particular characteristics of this population.

The WHO Quality of Life Assessment for Older Adults (WHOQOL-OLD) was originally developed by the WHOQOL group for the investigation of quality of life in older adults.<sup>19</sup> It consists of six facets: sensory abilities; autonomy; past, present and future activities; social participation; (thoughts on) death & dying; and intimacy.

The present study aimed to assess quality of life, as well as to evaluate its possible determinants (such as sleep quality, motor symptoms and depressive symptoms), in PD patients over 60 years of age.

## Method

This was an observational, cross-sectional study carried out between May 2007 and July 2008 at the Movement Disorders Clinic of the Porto Alegre *Hospital de Clínicas*, located in the city of Porto Alegre, Brazil, and operated by the Universidade Federal do Rio Grande do Sul. The study design was approved by the Research Ethics Committee of the Hospital, and all patients gave written informed consent.

### 1. Patients

We included consecutive patients diagnosed with PD according to the United Kingdom Parkinson's Disease Society Brain Bank clinical diagnostic criteria.<sup>3</sup> Clinical interviews were conducted in order to determine whether patients met the inclusion criteria. Exclusion criteria were being below the age of 60 and presenting a low score on the Mini-Mental State Examination (MMSE).<sup>20,21</sup> A low MMSE score was defined as below 20 for illiterate subjects and below 24 for subjects with any schooling.<sup>22</sup>

### 2. Assessment

Patients were selected for assessment on the basis of their scores on questionnaires evaluating disease severity—the Hoehn and Yahr Scale<sup>23</sup> and the Unified Parkinson's Disease Rating Scale (UPDRS)<sup>24</sup>—as well as on the basis of general clinical findings. Somnolence was measured by the Epworth Sleepiness Scale.<sup>25,26</sup> Sleep quality was evaluated by the Pittsburg Sleep Quality Index (PSQI)<sup>27,28</sup> and the Parkinson's Disease Sleep Scale (PDSS).<sup>29,30</sup> Depressive symptoms were measured with the Portuguese-language version of the 30-item Geriatric Depression Scale (GDS30), which has been validated for use in Brazil.<sup>31-33</sup>

The WHOQOL-OLD<sup>19,34</sup> comprises 24 items (rated on a five-point Likert scale), divided into six facets. Facet 1 evaluates sensory abilities based on the following items: sensory impairment (taste, smell, sight, hearing and touch) affecting daily life; a loss of sensory abilities that affects participation in activities; problems with sensory functioning affecting social interaction; and rating of sensory functioning. Facet 2 evaluates autonomy based on the following items: freedom to make decisions; feeling in control of one's future; people around oneself being respectful of one's freedom; ability to do things one would like to do. Facet 3 includes questions regarding past, present and future activities in order to determine the following: satisfaction with the current availability of opportunities to achieve goals; having received the recognition one deserves in life; satisfaction with what one has achieved in life; and confidence that one has things to look forward to. Aspects of social participation are evaluated in facet 4: perception that one has a sufficient number of activities to perform each day; satisfaction with the way in which one is using one's time; perception of an appropriate activity level; and satisfaction with the number of opportunities one has to participate in community activities. Facet 5 evaluates the attitudes an individual has toward death & dying; concerns regarding the way in which one will die; fear of not being able to control one's own death; fear of dying itself; and fear of a painful death. Facet 6 includes questions related to intimacy in order to determine the following: feeling a sense of companionship in life; experiencing love in life; having opportunities to love; and having opportunities to be loved. Higher scores indicate better quality of life in each domain. This questionnaire was administered on a face-to-face basis, and the period assessed was the previous two weeks. The WHOQOL-OLD was validated for use in Brazil by Fleck et al.<sup>34</sup>

The UPDRS is a composite scale consisting of six sections, in which most of the items are rated from zero (normal) to four (severely affected): part I (UPDRS-I) consists of four items, assessing mentation, behavior and mood; part II (UPDRS-II) consists of thirteen items describing the ability to perform a number of activities of daily living, as well as ratings of any difficulty walking, tremor, and sensory symptoms; part III (UPDRS-III) is a fourteen-item rating of motor signs based largely on items in the Columbia Disability scale; part IV (UPDRS-IV) rates complications of therapy, including questions regarding the duration/severity of dyskinesias and motor fluctuations, together with a three-item section concerning anorexia, sleep disturbance and orthostatic hypotension—some UPDRS-IV items are rated as present or absent; part V (UPDRS-V) is a modified version of the Hoehn and Yahr scale; and part VI (UPDRS-VI) is a disability scale, estimating the degree of dependency in activities of daily living.

### 3. Data analysis

Data were analyzed using the Statistical Package for the Social Sciences, version 15 (SPSS Inc., Chicago, IL, USA). Results are expressed as mean  $\pm$  standard deviation. The WHOQOL-OLD scores were linearly transformed in order to range from 0 to 100. The normal distribution of all variables was tested by the

Kolmogorov-Smirnov test. Most variables were not significant on the Kolmogorov-Smirnov test, the exceptions being UPDRS-I score, UPDRS-IV score and disease duration. The ratings of PD severity were based on the Hoehn and Yahr scale: patients with scores from 1 to 1.5 were classified as having mild PD; those with scores from 2 to 2.5 were classified as having moderate PD; and those with scores from 3 to 5 were classified as having advanced PD. In order to compare those groups (stratified by PD severity), we used one-way analysis of variance, followed by Dunnett's T3 post hoc test for UPDRS-III and Tukey's post hoc test for other variables.

On the basis of the UPDRS-III scores, we divided the patients into three groups by PD type: the akinetic rigid type (ART) group; the tremor-dominant type (TDT) group; and the mixed type (MT) group. We then calculated a score for each group, as previously described.<sup>35</sup> The tremor score was derived from the sum of UPDRS-III items 20 (tremor at rest) and 21 (postural tremor) divided by seven (the number of sub-items included). The non-tremor score was derived from the sum of the UPDRS-III items 18 (speech), 19 (facial expression), 22 (rigidity), 27 (arising from chair), 28 (posture), 29 (gait), 30 (postural stability) and 31 (body bradykinesia) divided by twelve (the number of sub-items included) for each body region. Patients with a non-tremor score at least twice as high as the tremor score were classified as having ART PD, whereas those with a tremor score at least twice as the non-tremor score were classified as having TDT PD. The remaining patients were classified as having MT PD. The Kruskal-Wallis test was used to compare variables among these groups.

Spearman's correlation coefficient ( $r_s$ ) was used to test whether the WHOQOL-OLD score was associated with the UPDRS-I

score, UPDRS-IV score or disease duration. Pearson's correlation coefficient ( $r_p$ ) was used to evaluate association between WHOQOL-OLD and other variables.

Patients were divided into two groups (PD with depression and PD without depression) according to the GDS30 cutoff score of 10 proposed for depression screening in PD.<sup>36</sup> A GDS30 score  $\geq 10$  indicates the presence of depressive symptoms. Differences between those two groups were analyzed by Student's t-test. Values of  $p < 0.05$  were assumed to indicate statistical significance in all tests.

## Results

Fifty-seven patients were evaluated. Of those, 53% were male. In the sample as a whole, the mean age was 70.3 (standard deviation = 6.8) years (range, 60-86 years), the mean MMSE score was 26.8 (SD = 2.7) and the mean disease duration was 7.5 (SD = 5.8) years (range, 1-31 years). Most (73.7%) of the patients were married, the remaining patients being either single (7%), widowed (5.3%) or divorced (14%). Forty-nine patients (86%) were taking at least one antiparkinsonian drug (levodopa, pramipexole, amantadine, biperiden, entacapone or tolcapone); 14 were receiving some combination of these drugs. Nine patients (15.8%) were receiving benzodiazepines, 17 (29.8%) were receiving antidepressants, and four (7%) were taking an antipsychotic drug. Age did not differ significantly among the PD severity groups. The most common PD subtype was MT (in 47.4%), followed by ART (in 43.9%) and TDT (in 8.8%). Motor symptoms of PD (UPDRS-III scores), sleep measures and GDS30 scores are shown in Table 1.

**Table 1 - Sleep characteristics, depressive symptoms and quality of life according to PD severity**

Score	HY Stage				p
	All subjects (n = 57)	Mild (n = 12)	Moderate (n = 26)	Advanced (n = 19)	
		HY1 (n = 9) and HY1.5 (n = 3)	HY2 (n = 19) and HY2.5 (n = 7)	HY3 (n = 10), HY4 (n = 6) and HY5 (n = 3)	
<b>UPDRS part III (motor signs)</b>	28.5 ± 16.2	11.7 ± 6.4*	25.8 ± 10.9**	42.8 ± 14.7***	0.02
<b>PSQI</b>	9.3 ± 4.6	8.6 ± 4.7*	9.3 ± 4.6*	9.7 ± 4.7*	0.8
<b>ESS</b>	7.8 ± 4.4	5.5 ± 3.4*	8.8 ± 4.5*	7.8 ± 4.5*	0.09
<b>PDSS</b>	91.5 ± 29.7	95.5 ± 25.1*	88.1 ± 29.3*	93.6 ± 7.7*	0.07
<b>GDS30</b>	11.0 ± 6.7	6.7 ± 3.1*	10.6 ± 6.8**	14.2 ± 6.8**	0.007
<b>WHOQOL-OLD</b>					
Sensory abilities	60.8 ± 23.7	77.6 ± 16.5**	58.2 ± 24.4*	53.9 ± 22.4*	0.02
Autonomy	61.3 ± 16.4	66.1 ± 13.4*	60.6 ± 15.5*	59.2 ± 19.2*	0.5
Past, present and future activities	66.0 ± 18.4	70.8 ± 13.7*	68.0 ± 20.6*	60.2 ± 17.2*	0.3
Social participation	58.3 ± 20.8	70.3 ± 14.1**	60.1 ± 21.0**	48.3 ± 20.1*	0.01
Death & dying	67.5 ± 25.2	71.9 ± 21.7*	71.9 ± 22.7*	58.9 ± 29.3*	0.2
Intimacy	70.2 ± 20.2	79.2 ± 10.4*	68.3 ± 23.4*	67.1 ± 19.3*	0.2
Total	63.9 ± 14.0	72.6 ± 9.7**	64.5 ± 15.0**	57.6 ± 12.2*	0.01

HY = Hoehn and Yahr (scale); UPDRS = Unified Parkinson's Disease Rating Scale; PSQI = Pittsburg Sleep Quality Index; ESS = Epworth Sleepiness Scale; PDSS = Parkinson's Disease Sleep Scale; GDS30 = 30-item Geriatric Depression Scale; WHOQOL-OLD = World Health Organization Quality of Life Assessment for Older Adults.

\*, \*\* and \*\*\* indicate statistically significant differences between groups.

**Table 2 - Correlations between World Health Organization Quality of Life Assessment for Older Adults scores, Parkinson's disease scores and depressive symptoms scale score**

WHOQOL-OLD score	Score						
	Total WHOQOL-OLD	UPDRS I	UPDRS II	UPDRS III	UPDRS IV	HY	GDS30
	$r_p$	$r_s$	$r_p$	$r_p$	$r_s$	$r_s$	$r_p$
<b>Domain 1</b>							
Sensory abilities	0.64	-0.37	-0.50	-0.41	-0.30	-0.31	-0.52
<b>Domain 2</b>							
Autonomy	0.66	-0.53	NS	NS	-0.47	NS	-0.61
<b>Domain 3</b>							
Past, present and future activities	0.84	-0.28	-0.29	-0.31	-0.39	-0.31	-0.52
<b>Domain 4</b>							
Social participation	0.79	-0.28	-0.39	-0.42	-0.39	-0.43	-0.44
<b>Domain 5</b>							
Death & dying	0.45	NS	NS	NS	NS	NS	NS
<b>Domain 6</b>							
Intimacy	0.70	-0.26	NS	NS	NS	NS	-0.56
<b>Total</b>	1.00	-0.35	-0.39	-0.37	-0.38	-0.43	-0.70

WHOQOL-OLD = World Health Organization Quality of Life Assessment for Older Adults; UPDRS = Unified Parkinson's Disease Rating Scale; HY = Hoehn and Yahr (scale); GDS30 = 30-item Geriatric Depression Scale;  $r_p$  = Pearson's Correlation Coefficient;  $r_s$  = Spearman's Correlation Coefficient; NS = non significance.

Quality of life (total WHOQOL-OLD score) showed an inverse association with PD severity ( $r_s = -0.43$ ;  $p \leq 0.001$ ) and was worse in advanced compared to mild disease ( $p = 0.01$ ). Sensory abilities and social participation facets scored higher in mild PD than in the advanced PD group (Table 1). In terms of social participation (WHOQOL-OLD facet 4 scores), a significant difference was observed among the ART, TDT and MT groups ( $p = 0.03$ ), scores being lowest in the ART group. There were also significant differences among those same three groups regarding the UPDRS-III and UPDRS-IV scores ( $p = 0.04$  and  $p = 0.01$ , respectively). Facet score correlations with total WHOQOL-OLD score and UPDRS part scores are presented in Table 2. Scores for the WHOQOL-OLD facets 1, 3 and 4 showed inverse correlations with all UPDRS part scores, as did the total WHOQOL-OLD score. Scores for facets 2 and 6 also showed inverse correlations with the UPDRS-I score. In other words, cognition, behavior and mood symptoms (UPDRS-I score) showed an inverse association with most WHOQOL-OLD facets. Facet 5 scores did not show any correlation with PD severity or UPDRS part scores. In this sample, the WHOQOL-OLD scores did not correlate significantly with age, gender, disease duration or MMSE score.

In our patient sample, sleep measures did not differ significantly among the PD severity groups (Table 1). In terms of quality of life, only the scores for WHOQOL-OLD facets 1 and 2 correlated significantly with sleep measures. In fact, the scores for facet 1 showed associations with PSQI and PDSS scores ( $r_p = -0.46$  and  $r_p = 0.41$ , respectively,  $p < 0.001$  for both), whereas those for facet 2 (autonomy) showed an inverse association with PSQI ( $r_p = -0.37$ ;  $p < 0.01$ ).

Depressive symptoms, as evaluated by the GDS30, were negatively correlated with total WHOQOL-OLD score

( $r_p = -0.70$ ;  $p < 0.001$ ), denoting a strong association between depressive symptoms and quality of life. The correlations between WHOQOL-OLD facet scores and the GDS30 score are presented in Table 2. Five facet scores showed an inverse association with the GDS30 score. Significant associations were also observed between the GDS30 score and UPDRS part scores (UPDRS-I:  $r_s = 0.51$ ,  $p < 0.001$ ; UPDRS-II:  $r_p = 0.43$ ,  $p = 0.001$ ; UPDRS-III motor symptoms:  $r_p = 0.29$ ,  $p = 0.03$  and UPDRS-IV treatment complications:  $r_s = 0.53$ ,  $p < 0.001$ ). Twenty-eight subjects showed depressive symptoms ( $GDS30 \geq 10$ ). Comparisons of variable scores by GDS30 cut-off point are presented in Table 3. Patients with depressive symptoms showed statistically significant worse quality of life than did those without ( $p = 0.001$ ). The  $GDS30 \geq 10$  group showed statistically significant worse scores for WHOQOL-OLD facets 1, 2, 3 and 6, facets 4 and 5 showing a trend towards significance. The  $GDS30 \geq 10$  group showed worse results than did the  $GDS30 < 10$  group in terms of the PSQI score ( $p = 0.002$ ) and PDSS score ( $p = 0.01$ ). The GDS30 scores did not show any significant relationship with age, gender or MMSE score.

## Discussion

The results of the present study show that PD has an impact on quality of life, as evaluated by the WHOQOL-OLD, and this is consistent the findings of with previous studies using questionnaires that are less age-specific.<sup>12,14,15,37-39</sup> In our study, patients in the advanced stages of PD (Hoehn and Yahr score 3-5) showed worse quality of life than did those with mild PD. Although various factors can be involved, it should be borne in mind that patients with advanced PD present a number of motor limitations. Some studies have indicated that postural

**Table 3 - Comparison of variables scores according to Geriatric Depression Scale**

Score	GDS30 score		P-value*
	< 10 (n = 29)	≥ 10 (n = 28)	
<b>WHOQOL-OLD</b>			
Sensory abilities	69.2 ± 21.4	52.2 ± 23.1	0.006
Autonomy	67.9 ± 14.1	54.5 ± 16.0	0.001
Past, present, future activities	71.1 ± 13.0	60.7 ± 21.7	0.03
Social participation	63.4 ± 19.3	53.1 ± 21.3	0.06
Death & dying	73.9 ± 19.2	60.9 ± 29.2	0.06
Intimacy	75.9 ± 13.5	64.3 ± 24.2	0.03
Total	70.2 ± 11.0	57.4 ± 13.9	0.001
<b>PSQI</b>	7.5 ± 4.3	11.2 ± 4.2	0.002
<b>ESS</b>	6.7 ± 4.8	8.9 ± 3.7	0.06
<b>PDSS total</b>	100.9 ± 29.1	81.8 ± 27.6	0.01
<b>UPDRS part III (motor signs)</b>	26.1 ± 17.4	31.1 ± 14.8	0.2

\*Student's t-test

GDS30 = 30-item Geriatric Depression Scale; WHOQOL-OLD = World Health Organization Quality of Life Assessment for Older Adults; PSQI = Pittsburg Sleep Quality Index; ESS = Epworth Sleepiness Scale; PDSS = Parkinson's Disease Sleep Scale; UPDRS = Unified Parkinson's Disease Rating Scale.

instability, gait difficulties<sup>40</sup> and motor complications (dyskinesia and fluctuation)<sup>13</sup> are predictors of health-related quality of life. In the present study, total WHOQOL-OLD scores showed an inverse association with all UPDRS part scores.

A previous study conducted by our group evaluated quality of life in PD patients using the brief (26-item) version of the WHOQOL (WHOQOL-BREF), a multidimensional scale comprising physical, psychological, social relationships and environment domains. In the PD patients, there was a moderate inverse correlation between the WHOQOL-BREF psychological domain score and disease duration, as well as between the WHOQOL-BREF social domain score and disease severity (assessed by the Hoehn and Yahr scale).<sup>10</sup> In another study, PD patients were evaluated by the 100-item version of the WHOQOL (WHOQOL-100); scores for the level of independence and physical capacity domains of the WHOQOL-100 were found to be inversely associated with quality of life.<sup>39</sup>

In the present study, the association between worse quality of life and PD symptoms was significant for features related to the perception of sensory impairment interfering with routine and social interaction, for general satisfaction with achievements (past, present and future) and with social participation. In addition, differences were observed among ART, TDT and MT groups in terms of the WHOQOL-OLD domain 4 scores. Although previous studies have demonstrated that these PD subtypes have different courses,<sup>41,42</sup> ours is the first to show that the level of social participation differs among them.

We found that aspects such as freedom to make decisions, feeling in control of one's own future, people around oneself being

respectful of one's freedom and ability to do things one would like to do showed an inverse association with sensory abilities, although not with activities of daily living or motor symptoms. In a previous study, disability (UPDRS-II score) was weakly correlated with the total score on the 39-item Parkinson's Disease Questionnaire (PDQ-39).<sup>13</sup> The absence of such an association in the present study might be attributed to the autonomy concept applied. It could be argued that the UPDRS-II evaluates activities of daily living considering motor autonomy, whereas the WHOQOL-OLD autonomy facet seems to explore mainly subjective perceptions of autonomy and freedom.

Although PD is primarily considered in terms of motor disability, non-motor symptoms, such as sleep disturbances and depression, can be major quality of life determinants.<sup>4,8,17,42</sup> Therefore, various manifestations can have a negative effect on quality of life.<sup>13,37,38</sup> This underscores the notion that non-motor symptoms should be evaluated. In the present study, a quality of life score related to sensory abilities (WHOQOL-OLD facet 1) was found to be associated with sleep measures. Olfactory and sleep disturbances can both be observed in PD patients.<sup>4</sup> However, the above-mentioned results might not be attributed specifically to olfactory disturbance, since Facet 1 questions do not distinguish among senses. This remains an interesting point to be evaluated in future research.

Another of the non-motor manifestations evaluated in the present study was the occurrence of depressive symptoms which, as would be expected, was strongly correlated with worse quality of life. Patients with depressive symptoms showed worse scores in four facets: sensory abilities; past, present and future activities; autonomy; and intimacy. Other authors have assessed quality of life in PD with different instruments, such as the Medical Outcomes Study 36-item Short-form Health Survey<sup>15</sup> and the PDQ-39.<sup>12-14,17,37</sup> Those studies showed that depression has an influence on quality of life, lending further credence to the idea that mood disorders must be actively investigated and treated in PD patients.

One study,<sup>13</sup> also conducted in Brazil, demonstrated that the principal determinants of health-related quality of life in elderly PD patients are mood disorders (as shown in the present study), disability, PD complications and years of education. It is of note that, in the present study, scores for the UPDRS parts related to death & dying and to intimacy did not correlate significantly with PD severity. Although no conclusions can be drawn from this isolated finding, it highlights the fact that quality of life is a broad concept, susceptible to interference from several factors.

This study has some limitations, primarily the fact that it was uncontrolled. It might have been useful to evaluate a control group composed of healthy subjects or of patients with chronic disease. Another limitation was the small sample size. In particular, the small size of the TDT subgroup limited the statistical analyses. Due to these limitations, our findings cannot be generalized to the PD patient population at large, and further studies are warranted.

However, despite these shortcomings, this is, to our knowledge, the first study to employ the WHOQOL-OLD in the investigation of quality of life in PD.

## Conclusion

Here, we have shown that quality of life in older PD patients can be successfully assessed with an age-specific questionnaire, as well as that disease severity and depression can be determinants of poor quality of life in elderly PD patients.

## Disclosures

Writing group member	Employment	Research grant <sup>1</sup>	Other research grant or medical continuous education <sup>2</sup>	Speaker's honoraria	Ownership interest	Consultant/ Advisory board	Other <sup>3</sup>
Regina Margis	UFRGS	-	*	-	-	-	CNPq
Karina Carvalho Donis	UFRGS	-	-	-	-	-	-
Suzana Veiga Schönwald	HCPA	-	-	-	-	-	-
Carlos R. M. Rieder	HCPA	CNPq	*	*	-	*	-

\* Modest

\*\* Significant

\*\*\* Significant: Amounts given to the author's institution or to a colleague for research in which the author has participation, not directly to the author.

Note: UFRGS = Universidade Federal do Rio Grande do Sul; HCPA = Hospital de Clínicas de Porto Alegre; CNPq = Conselho Nacional de Desenvolvimento Científico e Tecnológico.

For more information, see Instructions for authors.

## References

- De Rijk MC, Launer LJ, Berger K, Breteler MM, Dartigues JF, Baldereschi M, Fratiglioni L, Lobo A, Martinez-Lage J, Trenkwalder C, Hofman A. Prevalence of Parkinson's disease in Europe: a collaborative study of population-based cohorts. Neurologic Diseases in the Elderly Research Group. *Neurology*. 2000;54(11 Suppl 5):S21-3.
- Barbosa MT, Caramelli P, Maia DP, Cunningham MCQ, Guerra HL, Lima-Costa ME, Cardoso F. Parkinsonism and Parkinson's disease in the elderly: a community-based survey in Brazil: (the Bambuí study). *Mov Disord*. 2006;21(6):800-8.
- Hughes AJ, Daniel SE, Kilford L, Lees AJ. Accuracy of clinical diagnosis of idiopathic Parkinson's disease: a clinic-pathological study of 100 cases. *J Neurol Neurosurg Psychiatry*. 1992;55(3):181-4.
- Poewe W. Non-motor symptoms in Parkinson's disease. *Eur J Neurol*. 15(Suppl 1):14-20.
- Lees AJ, Blackburn NA, Campbell V. The nighttime problems of Parkinson's Disease. *Clin Neuropharmacol*. 1988;11(6):512-9.
- Tandberg E, Larsen JP, Karlsen K. A community-based study of sleep disorders in patients with Parkinson's disease. *Mov Disord*. 1998;13(6):895-9.
- McDonald WM, Richard IH, DeLong MR. Prevalence, etiology and treatment of depression in Parkinson's Disease. *Biol Psychiatry*. 2003;54:363-75.
- Adler CH. Nonmotor complications in Parkinson's Disease. *Mov Disord*. 2005;20(suppl 11):S23-9.
- Chrischilles EA, Rubenstein LM, Voelker MD, Wallace RB, Rodnitzky RL. The health burdens of Parkinson's disease. *Mov Disord*. 1998;13(3):406-13.
- Schestatsky P, Zanatto VC, Margis R, Chachamovich E, Reche M, Batista RG, Ficke D, Rieder CRM. Quality of life in a Brazilian sample of patients with Parkinson's disease and their caregivers. *Rev Bras Psiquiatr*. 2006;28(3):209-11.
- Hirayama MS, Gobbi S, Gobbi LTB, Stella F. Quality of life (QoL) in relation to disease severity in Brazilian Parkinson's patients as measured using WHOQOL-BREF. *Arch Gerontol Geriatr*. 2008;46(2):147-60.
- Rahman S, Griffin HJ, Quinn NP, Jahanshahi M. Quality of life in Parkinson's Disease: the relative importance of the symptoms. *Mov Disord*. 2008;23(10):1428-34.
- Carod-Artal FJ, Vargas AP, Martinez-Martin P. Determinants of quality of life in Brazilians patients with Parkinson's disease. *Mov Disord*. 2007;22(10):1408-15.
- Schrag A, Jahanshahi M, Quinn N. What contributes to quality of life in patients with Parkinson's disease? *J Neurol Neurosurg Psychiatry*. 2000;69(3):308-12.
- Kuopio AM, Marttila RJ, Helenius H, Toivone M, Rinne UK. The Quality of Life in Parkinson's disease. *Mov Disord*. 2000;15(2):216-33.
- The Global Parkinson's Disease Survey (GPDS) Steering Committee. Factors Impacting on Quality of life in Parkinson's Disease: results from an International Survey. *Mov Disord*. 2002;17(1):60-7.
- Scalzo P, Kummer A, Cardoso F, Teixeira AL. Depressive symptoms and perception of quality of life in Parkinson's disease. *Arq Neuropsiquiatr*. 2009;67(2A):203-8.
- The World Health Organization quality of life assessment (WHOQOL): position paper from the World Health Organization. *Soc Sci Med*. 1995;41:1403-10.
- Power M, Quinn K, Schmidt S. WHOQOL-OLD Group. Development of WHOQOL-OLD module. *Qual Life Res*. 2005;14(10):2197-214.
- Folstein M, Folstein S, McHugh P. "Mini Mental State": a practical method for grading the cognitive states of patients for the clinician. *J Psy Res*. 1975;12:189-98.
- Bertolucci PFH, Brucki SMD, Campacci SR, Juliano Y. O minixame do estado mental em uma população geral: impacto da escolaridade. *Arq Neuropsiquiatr*. 1994;52:1-7.
- Almeida OP. Minixame do estado mental e o diagnóstico de demência. *Arq Neuropsiquiatr*. 1998;56:605-12.
- Hoehn MH, Yahr MD. Parkinsonism: onset, progression, and mortality. *Neurology*. 1967;17(5):427-47.
- Fahn S, Elton RL and Members of the UPDRS Development Committee. Unified Parkinson's disease rating scale. In: Fahn S, Marsden CD, Calne D, Goldstein M, editors. *Recent Developments in Parkinson's Disease*. Florham Park, N.J.: Macmillan Healthcare Information; 1987. p.153-63.
- Johns MW. A new method for measuring daytime sleepiness: the Epworth Sleepiness Scale. *Sleep*. 1991;14(6):540-5.

26. Bertolazi AN, Fagondes SC, Perin C, Schönwald SV, John AB, Miozzo I, et al. Validation of the Epworth Sleepiness Scale in the Brazilian Portuguese language. *Sleep*. 2008;31(Suppl):A347.
27. Buysse DJ, Reynolds III CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice research. *Psychiatry Res*. 1989;28(2):193-213.
28. Bertolazi AN, Fagondes SC, Perin C, Schönwald SV, John AB, DeBarba M, et al. Validation of the Pittsburgh sleep quality index in the Brazilian Portuguese language. *Sleep*. 2008;31(Suppl):A347.
29. Chaudhuri KR, Pal S, DiMarco A, Whately-Smith C, Bridgman K, Mathew R, Pezzella FR, Forbes A, Hogl B, Trenkwalder C. The Parkinson's disease sleep scale: a new instrument for assessing sleep and nocturnal disability in Parkinson's disease. *J Neurol Neurosurg Psychiatry*. 2002;73(6):629-35.
30. Margis R, Donis K, Schönwald SV, Fagondes SC, Monte T, Martín-Martínez P, Chaudhuri KR, Kapczinski F, Rieder CRM. Psychometric properties of the Parkinson's Disease Sleep Scale – Brazilian Version. *Parkinsonism Relat Disord*. 2009;15(7):495-9.
31. Yesavage JA, Brink TL, Rose TL, Lum O, Huang V, Adey M, Leirer VO. Development and validation of Geriatric Depression Screening scale: a preliminary report. *J Psy Res*. 1982;17(1):37-49.
32. Stoppe Junior A, Facob Filho W, Louzã Neto MR. Avaliação da depressão em idosos através da "Escala de Depressão em Geriatria": resultados preliminares. *Rev ABP-APAL*. 1994;16(4):149-53.
33. McDonald WM, Holtzheimer PE, Haber M, Vitek JL, McWhorter K, DeLong M. Validity of the 30-item geriatric depression scale in patients with Parkinson's disease. *Mov Disord*. 2006;21(10):1618-22.
34. Fleck MP, Chachamovich E, Trentini C. Development and validation of the Portuguese version of the WHOQOL-OLD module. *Rev Saude Publica*. 2006;40(5):785-91.
35. Spiegel J, Hellwig D, Samnick S, Jost W, Möllers M-O, Fassbender K, Kirsch C-M, Dillmann U. Striatal FP-CIT uptake differs in the subtypes of early Parkinson's Disease. *J Neural Neural Transm*. 2007;114(3):331-5.
36. Schrag A, Barone P, Brown RG, Leetjens AFG, McDonald WM, Starkstein S, Weintraub D, Poewe W, Rascol O, Sampaio C, Stebbins GT, Goetz CG. Depression rating scales in Parkinson's Disease: critique and recommendations. *Mov Disord*. 2007;22(8):1077-92.
37. Souza RG, Borges V, Silva SMCA, Ferraz, HB. Quality of life scale in Parkinson's disease PDQ-39 - (Brazilian Portuguese version) to assess patients with and without levodopa motor fluctuation. *Arq Neuropsiquiatr*. 2007;65(3B):787-91.
38. Lana RC, Álvares LMRS, Nasciutti-Prudente C, Goulart FRP, Teixeira-Salmela LF, Cardoso FE. Perception of quality of life in individuals with - Parkinson's disease using the PDQ-39. *Rev Bras Fisioter*. 2007;11(5):397-402.
39. Valeikiene V, Ceremnych J, Alekna V, Juozulynas A. Differences in WHOQOL-100 domain scores in Parkinson's disease and osteoarthritis. *Med Sci Monit*. 2008;14(4):221-7.
40. Schrag A, Quinn N. Dyskinesias and motor fluctuations in Parkinson's disease. A community-based study. *Brain*. 2000;123(Pt 11):2297-305.
41. Rajput AH, Sitte HH, Rajput A, Fenton ME, Pifl C, Hornykiewicz O. Globus pallidus dopamine and Parkinson motor subtypes. *Neurology*. 2008;70(16 Pt 2):1403-10.
42. Rajput AH, Voll A, Rajput MI, Robinson CA, Rajput A. Course in Parkinson disease subtypes: a 39-year clinicopathologic study. *Neurology*. 2009;73(3):206-12.
43. Tumas V, Rodrigues GG, Farias TL, Crippa JA. The accuracy of diagnosis of major depression in patients with Parkinson's disease: a comparative study among the UPDRS, the geriatric depression scale and the Beck depression inventory. *Arq Neuropsiquiatr*. 2008;66(2A):152-6.