

Motor and process skills of people with Parkinson's disease compared to healthy older adults.

A cross-sectional study

Jorge Alegre-Ayala, Lydia Vela-Desojo, Diego Fernández-Vázquez, Víctor Navarro-López, Yolanda Macías-Macías, Roberto Cano-de-la-Cuerda

Introduction. Both Parkinson's disease (PD) and the process of ageing are associated with functional limitations. The aim of this study was to determine the differences in motor and process skills between individuals with PD and healthy older adults, as well as to observe how disease progression affects motor and process skills performance in PD patients.

Subjects and methods. A cross-sectional study was conducted. The Assessment of Motor and Process Skills (AMPS) measure was employed in order to analyze the differences in the motor and process skills of daily tasks in people with PD and healthy older adults age- and sex-matched. Part III of the Unified Parkinson Disease Rating Scale (UPDRS), the Hoehn and Yahr (HY) scale and the Schwab & England scale was administered to determine the severity of the disease.

Results. Seventy participants (49 patients with PD and 21 healthy older adults) were recruited for this study. Our results showed that even at moderate stages of the disease, both motor and process skills were found deteriorated in PD patients more than older healthy older adults ($p < 0.001$). As PD progresses, motor and process skills present significantly deterioration.

Conclusion. PD leads to a greater deterioration in motor and process skills compared to healthy older adults. As disease stages advance according to the HY scale, performance in motor and process skills deteriorates significantly between moderate and advanced PD stages. According to the AMPS scale, PD patients show no impairment of processing skills up to HY IV, but motor impairment at HY stages II, III and IV.

Key words. Activities of daily living. Assessment of motor and process skills. Functionality. Functional limitations. Functional performance. Parkinson's disease.

Introduction

Parkinson's disease (PD) is the second most common neurodegenerative disease after Alzheimer's. It is characterized by motor symptoms and non-motor symptoms like hyposmia, constipation, behavioral issues, emotional symptoms, and dementia [1].

Both PD and aging impact activities of daily living (ADL) [1-3]. Aging can cause motor problems affecting coordination, speed, balance, gait, and manipulation skills [4], negatively affecting ADL in older people [5]. PD is closely related to aging, with age being a key factor in the disease's manifestation, leading to limitations in daily activities [6]. These limitations worsen with disease progression, reducing independence and quality of life, necessitating assistance from others [7,8]. PD patients often experience postural deformities, balance, and gait disorders while standing, and their coordina-

tion and fine motor skills are affected, affecting object handling [9]. Besides, non-motor symptoms of PD, such as attention deficit, cognitive decline, and executive function disorders, have been related to disruptions on functional performance and task effectiveness [10,11].

The accurate assessment of ADL performance is crucial due to the significant influence of PD symptomatology. Self-assessment questionnaires are commonly used, but they may yield biased information as PD patients tend to underestimate their true capacity [12]. Observational scales like the Assessment of Motor and Process Skills (AMPS) are essential for accurate assessment [13]. AMPS is a standardized observational evaluation instrument used in various populations, but its use in PD patients is limited [14-19].

Therefore, this study aims to determine differences in motor and process skills between PD patients and healthy older adults (HOA) using the

Department of Physiotherapy, Occupational Therapy, Rehabilitation and Physical Medicine. Faculty of Health Sciences. Universidad Rey Juan Carlos (J. Alegre-Ayala, D. Fernández-Vázquez, V. Navarro-López, R. Cano-de-la-Cuerda). Hospital Universitario Fundación Alcorcón. Alcorcón, Spain (L. Vela-Desojo, Y. Macías-Macías).

Correspondence:

Dr. Diego Fernández Vázquez. Departamento de Fisioterapia, Terapia Ocupacional, Rehabilitación y Medicina Física. Universidad Rey Juan Carlos. Avenida de Atenas, s/n. E-28922 Alcorcón.

E-mail:

diego.fernandez@urjc.es

Accepted:

14.12.23.

Conflict of interests:

The authors declare no conflicts of interest.

How to cite this article:

Alegre-Ayala J, Vela-Desojo L, Fernández-Vázquez D, Navarro-López V, Macías-Macías Y, Cano-de-la-Cuerda R. Motor and process skills of people with parkinson's disease compared to healthy older adults. A cross-sectional study. Rev Neurol 2024; 78: 31-9. doi: 10.33588/rn.7802.2023231.

Versión española disponible en www.neurologia.com

© 2024 Revista de Neurología



AMPS scale in their usual environments, also to observe how disease progression affects PD patients' motor and process skills. The hypothesis is that people with PD from stage II of the Hoehn & Yahr (HY) scale have motor and processing impairments compared to HOA.

Subjects and methods

Design

A cross-sectional study was performed. The Strengthening the Reporting of Observational Studies in Epidemiology guidelines were followed for observational studies [20]. The research ethics committee of the Alcorcon Foundation University Hospital approved the study (reference: 10/79; 2-11-2010) and informed consent was obtained from all participants.

Participants

Patients diagnosed with idiopathic PD were recruited from the unit of movement disorders of the neurology service at Alcorcon Foundation University Hospital. Patients included in the present study had to meet the following inclusion criteria: a) a clinical diagnosis of idiopathic PD according to the United Kingdom Parkinson's Disease Society Brain Bank criteria [21]; b) in HY stage II, III, or IV [10]; c) exhibiting stable or slightly fluctuating motor response to pharmacological treatment; d) in the 'on' phase of medication; and e) possessing cognitive ability to understand test instructions. Exclusion criteria were: a) scoring less than 26 points on the Montreal Cognitive Assessment [22]; b) having Parkinsonian disorders other than PD; c) having any other condition limiting functional capacity, such as joint problems, pain, or oncologic conditions; and d) being in HY stages I or V.

Regarding HOA participants, we included those who matched the sex and age of the PD group and recruited them from the family environment of the PD group. They had to present good health status, with no previous diseases diagnosed by a physician. Moreover, they needed to score more than 25 points on the Montreal Cognitive Assessment [22] and less than 13 on the Beck Depression Inventory [23].

Study procedure

Data collection occurred in two stages. In the first stage, patients provided informed consent and were

evaluated by a neurologist specializing in movement disorders during the 'on' phase of medication, within two hours of taking anti-Parkinsonian medication, within two hours of the administration of anti-parkinsonian medication, as this is the period during which patients do most of their daily activities, following a previous procedure described in prior investigations published by our research group [2,3]. HOA subjects follow the same procedure.

The severity of the disease was assessed using Part III of the Unified Parkinson Disease Rating Scale [24], the HY scale, and the Schwab & England scale [25]. Participants' cognitive situation, level of depression, and health-related quality of life were determined through the Montreal Cognitive Assessment, Beck Depression Inventory, Parkinson Disease Questionnaire [26], and EuroQoL scale [27], respectively.

The second stage of the study took place at each participant's home for both groups. An occupational therapist asked patients to perform two tasks of daily living, according to their functional status, which were assessed by the Assessment of Motor and Process Skills (AMPS) between one and two hours after the first dose of medication. All participants from the PD group were assessed during the *on* phase of medication, and the home visit lasted approximately 90 minutes for each participant.

Assessment tools

The AMPS scale is designed to assess competence in ADL by evaluating the safety, efficiency, effort, and independence with which everyday tasks are performed [2,3]. The use of the AMPS has been recommended in older people due to its sound psychometric properties and appropriate sensitivity to change. The motor and process skills detailed in this scale have been shown to be reliable indicators of the level of independence in the community [28]. It is based on observation and measures motor and process skills used in the performance of two activities to estimate the level of independence in the community [14,29]. The person being analyzed performs two tasks from a total of 125 standardized tests. Each task is analyzed for 16 types of motor skills and 20 process skills, scored for quality of performance in four values (competent, questionable, ineffective, and markedly deficient). The administration and scoring of this scale require between 30 and 60 minutes. All scores obtained through the AMPS were input and scored using a specific software program [28]. The cut-off scores of the AMPS scale are scores less than two points

for motor skills, and less than one point for processing skills. Scores below these cutoff points indicate that the person may need some type of assistance to live in the community [14,29]. The motor skills analyzed include body positions, obtaining and holding objects, moving self and objects, and sustaining performance. Process skills are divided into sustaining performance, applying knowledge, temporal organization, organizing space and objects, and adapting performance. The AMPS scale was administered by occupational therapists who have completed a training and calibration workshop in the use of the scale.

Statistical analysis

Data were analyzed using the SPSS statistical program (SPSS Inc., Chicago, IL; version 27.0). The scores provided by the AMPS scale were provided via means and the standard deviation. Shapiro and Wilk's test was used to screen all data for normality of distribution. The nonparametric Kruskal-Wallis test was used to determine differences between HY stage and AMPS motor and process skills, and the Mann-Whitney U test was used to compare the differences between HY stages when the Kruskal-Wallis test was significant. A significance level of $p < 0,05$ was considered significant for all analyses. Cohen's d was used to estimate the effect size. An effect size of 0,2 was considered small; 0,5, moderate; and 0,8, large.

Results

54 patients with idiopathic PD were initially recruited, of whom 49 completed the study. There were five dropouts: four due to refusal to continue with the study and one deceased participant. Additionally, 21 age and sex-matched HOA completed the study.

In total, 70 participants took part, divided into PD ($n = 49$) (23 men and 26 women) and HOA ($n = 21$) (eight men and thirteen women). The PD group had a mean age of 72,45 (8,6) with an evolution of 10,58 (6,19) years (range 2-30), while the HOA group had a mean age of 70,95 (8). The PD group consisted of 20 participants in HY stage II, 13 in stage III, and 16 in stage IV, with a mean HY scale of 2,92 (0,86). No significant difference was observed between the PD and HOA groups regarding cognitive situation and level of depression. Further sociodemographic and clinical characteristics are shown in table I.

Differences in the scores of the AMPS motor and process sections between the PD and the HOA group

Statistically significant differences with moderate effect sizes were found between the PD and the HOA groups in both AMPS motor skills ($p < 0,001$, $d = 0,788$) and AMPS process skills ($p < 0,001$, $d = 0,566$).

Additionally, within the PD group, as the disease advanced (HY stages), the scores for AMPS motor and process skills were significantly lower. When comparing each HY stage group with the HOA group, statistically significant differences were observed in all stages. The effect size for AMPS motor skills was large in all HY stages, while for AMPS process skills, it was moderate in stages III and IV, and small in stage II (Table II).

Differences in the scores of the AMPS motor and process sections between the different HY stages of the PD group

Motor and process skills were different between groups ($p < 0,001$ for both motor and process skills). In the analysis between groups, significant differences were observed between stages II HY and III HY for AMPS motor skills ($p < 0,001$) with a moderate effect size ($d = 0,6$), and for AMPS process skills ($p < 0,041$) with a small effect size ($d = 0,36$). There were also significant differences between III HY and IV HY stages for AMPS motor skills ($p < 0,002$) with a moderate effect size ($d = 0,582$), and for AMPS process skills ($p = 0,028$) with a small effect size ($d = 0,407$) (Table III). Comparing people with moderate PD (II and II HY) with people with advanced PD (IV HY), we obtain differences for motor skills ($p < 0,001$) with a moderate effect size ($d = 0,662$), and also for process skills ($p = 0,001$) with a small effect size ($d = 0,495$).

Discussion

This study identified performance differences between PD and HOA. Also, as PD progressed according to HY scale, both process and motor skills significantly deteriorated. Processing skills scores decreased significantly as PD advanced, falling below the cutoff point at HY IV stage. Regarding motor skills, our PD sample showed scores under the cut-off points, indicating that from the initial stages of the PD (HY II), motor skills could be already affected, although process skills assessed by AMPS

Table I. Sociodemographic and clinical characteristics of the study participants ($n = 70$).

Variables	HY II $n = 20$	HY III $n = 13$	HY IV $n = 16$	Total PD group $n = 49$	Healthy older adults $n = 21$	p
Age, mean (SD)	71.4 (6.78)	73.69 (10.79)	72.75 (9.1)	72.45 (8.6)	70.95 (8)	0.49
Sex, women/men	5/15	8/5	13/3	26/23	13/8	0.6
MoCA, median mean (SD)	26.4 (2.52)	26.42 (1.5)	26.78 (1.78)	26.49 (2.07)	26.62 (2.87)	0.94
BDI, mean (SD)	5.9 (3.78)	10.08 (7.27)	14 (6.53)	8.88 (7.23)	6.09 (4.17)	0.1
EQ-5D, mean (SD)	0.88 (0.16)	0.72 (0.16)	0.3 (0.14)	0.65 (0.29)	-	-
LEDD, mean (SD)	961.1 (416.62)	843 (316.79)	1049.86 (433.19)	804.69 (309.32)	-	-
Motor symptoms (UPDRS III), mean (SD)	27.9 (8.07)	33.08 (6.31)	45.50 (8.28)	34.89 (13.37)	-	-
Schwab & England, mean (SD)	77.5 (4.44)	70 (11.54)	58.67 (14.57)	70 (15.28)	-	-
PD-39, mean (SD)	17.25 (10.39)	37.31 (18.94)	65.07 (17.89)	34.81 (29.6)	-	-

BDI: Beck Depression Inventory; EQ-5D: EuroQoL; HY: Hoehn and Yahr Scale; LEDD: Levodopa Equivalent Daily Dose; MoCA: the Montreal Cognitive Assessment; PD: Parkinson's disease; PDQ-39: the Parkinson Disease Questionnaire; Schwab & England, Schwab and England Activities of daily living Scale; UPDRS: Unified Parkinson's Disease Rating Scale. Significant with $p < 0.05$.

seem to influence the functionality in more affected stages. In HY IV, the deterioration of process skills might be explained by the existence of attention and execution problems in PD. These are common problems that could begin to be addressed early, although they do not deteriorate below the AMPS scale cut-off point until the later stages, or the AMPS scale may not be sensitive enough to detect such alterations [2,3].

PD participants had lower scores in both skills compared to HOA –process skills 1,03 (0,69) vs. 1,47 (0,46); motor skills, 1,03 (1,07) vs. 2,71 (0,34) –. Compared to other PD groups, as in the study conducted by Garcia-Neves et al [30], our motor skills scores were lower –1,03 (1,07) vs. 1,34 (1,89) –, but process skills scores were higher –1,03 (0,69) vs. 0,59 (0,52) –, possibly due to PD progression observed in HY scale –2,9 (.86) vs. 1,75 (0,57) –. No previous studies were found comparing different HY stages in PD and HOA using the AMPS scale.

The study examined PD stages from HY II onwards, revealing deterioration in motor skills compared to the HOA group. As the disease progressed (II vs. III; III vs. IV; II vs. IV; II-III vs. IV), scores significantly decreased, indicating the need for early rehabilitation approaches even in mild stages.

The early deterioration of motor skills, rather than processing skills, in PD could be related to the prevalence of motor alterations in the early stages of the disease, with neuropsychological alterations being less common [31]. As more than one third of PD patients eventually develop dementia [32], the deterioration of processing skills in HY IV could be crucial for detecting these events as the illness progresses.

Motor skills were significantly impaired in the PD group compared to HOA, likely due to motor symptoms caused by PD. Functional tasks were affected by balance and gait issues, leading to difficulties in body positioning, displacements, and object manipulation during ADL performance. The inability to use the upper limbs accurately, the presence of hypokinesia, rigidity and tremor, may be responsible for difficulties in reaching and manipulating objects, impacting ADL performance [33, 34]. Regarding process skills, they were also significantly impaired in the PD group compared to HOA. These activities scored significantly lower in the PD group as the disease progressed, falling below the cut-off point only in people with advanced PD (HY IV). The decline in processing skills can be attributed to attention and execution problems in

Table II. AMPS motor and process differences between healthy older adults and PD participants according to HY stages.

	HOA n = 21	Total PD Group n = 49	HY II n = 20	HY III n = 13	HY IV n = 16	Kruskal-Wallis (p)		
AMPS	Median (IR)	Median (IR)	Median (IR)	Median (IR)	Median (IR)			
Motor skills	2.71 (0.34)	1.03 (1.07)	1.41 (0.45)	0.91 (0.7)	-0.17 (1.58)	<0.001 ^a		
Process skills	1.47 (0.46)	1.03 (0.69)	1.22 (0.35)	1.05 (0.54)	0.53 (0.78)	<0.001 ^a		
AMPS	HOA vs. Total PD Group		HOA vs. II HY		HOA vs. III HY		HOA vs. IV HY	
	p d		p d		p d		p d	
Motor skills	<0.001 ^a 0.788		<0.001 ^a 0.855		<0.001 ^a 0.830		<0.001 ^a 0.847	
Process skills	<0.001 ^a 0.566		0.002 ^a 0.479		<0.001 ^a 0.693		<0.001 ^a 0.696	

HOA: healthy older adults; HY: Hoehn and Yahr scale; IR: interquartil range; PD: Parkinson's disease; ^a Significant with $p < 0,05$.

Table III. AMPS motor and process skills differences between the different stages of the HY scale in the PD group.

	HY II n = 20	HY III n = 13	HY IV n = 16	HY II vs. HY III		HY III vs. HY IV		HY II vs. HY IV	
AMPS	Median (IR)	Median (IR)	Median (IR)	p	d	p	d	p	d
Motor skills	1.41 (0.45)	0.91 (0.7)	-0.17 (1.58)	0.001 ^a	0.6	0.002 ^a	0.582	<0.001 ^a	0.775
Process skills	1.22 (0.35)	1.05 (0.54)	0.53 (0.78)	0.041 ^a	0.36	0.028 ^a	0.407	<0.001 ^a	0.597
AMPS	II and III HY n = 33	IV HY n = 16	HY II and III HY vs IV						
	Median (IR)	Median (IR)	p	d					
Motor skills	1.3 (0.63)	-0.17 (1.58)	<0.001	0.662					
Process skills	1.16 (0.35)	0.53 (0.78)	0.001	0.495					

HY: Hoehn and Yahr scale; IR: interquartil range; PD: Parkinson's disease; ^a Significant with $p < 0,05$.

PD [35], which could be addressed early, although they deteriorate below the cut-off point only in later stages as HY progresses. People with PD experience more distractions, disorganization in action planning, concentration difficulties [35], and impaired task sequencing and prospective memory [36]. These are common problems that could begin to be addressed early, although they do not deteriorate below the AMPS scale cut-off point until

an advanced stage of the disease, making a difference between stages II-III and stage IV of HY, indicating a possible further deterioration when people with PD become more severely affected. These cognitive issues, along with increased reaction time, can lead to safety limitations and higher risk of accidents [37].

While many studies have observed specific symptomatology in different disease phases, few have

evaluated motor and process skills in ADLs between PD phases. Our results align with studies assessing disease progression in motor symptomatology and activity performance. For instance, a study compared PD subjects without cognitive impairment to HOA in instrumental ADLs using the Performance Assessment of Self-care Skills scale [38]. The PD group showed less independence and a greater need for aids during ADLs, especially in more cognitively demanding activities like shopping, cooking, administrative tasks, or medication management [39]. Similarly, a prospective study over eight years with 144 people with PD showed significant deterioration in motor function and disability, which corresponds to the observed decline in motor skills in our study [40].

Considering the differences between the different PD stages, the stage of the disease seems to influence the motor and process skills of PD patients, with this effect being slightly greater in stage IV compared to moderate stages (HY II and III). Despite the fact that the mean motor skills scores of patients in HY stage II were lower than the cut-off point of the AMPS scale, the deterioration was more pronounced in stage III. These results are consistent with the functional loss described by other authors, indicating that functional problems in PD suffer greater deterioration in HY stage III, this stage being considered a key step in the progression of disability and loss of functional mobility, indicating that disease levels beyond HY stage III are those in which there is a greater need for assistance in ADLs [2,41,42]. Our study reflects significant differences between all HY stages with motor skills scores across the AMPS scale, finding significant differences between stages also in AMPS processing skills. These findings explain how PD patients in more advanced stages of the disease, according to HY scores, experience greater impairment in the skills needed to perform ADLs, and a greater need for help from their environment. Continuous rehabilitation over time would be necessary, as motor performance declines with disease progression, consistent with previous studies [41]. Motor skills require earlier establishment of rehabilitation, and it should begin by focusing on motor skills from the moderate stages of PD (II and III) and including cognitive rehabilitation in the more advanced stages of the disease or when signs and symptoms are present.

Finally, the use of the AMPS scale for observing task performance provides valuable information

about the deterioration in performance skills. AMPS scale enabled us to rapidly obtain useful clinical information to determine how the PD displayed values below what was expected for their age. Even people with moderate PD (HY II and III), when great functional limitations are not quite evident, motor and process skills necessary for completing ADLs seem to be deteriorated compared to HOA. The importance of administering this type of scale, in people with PD, lies in the need for a more exhaustive analysis of how ADLs are developed, which is not limited exclusively to indicating whether they present difficulties in performing them. The use of task observation in the everyday clinical examination of people in risk of dependency might have a great preventive use, enabling work on specific problematic skills, as the sole use of self-assessment scales does not normally reveal the disability in initial stages of some diseases [2,3].

Study limitations

This study presents some limitations. The present study was limited by its relatively small sample size. Future studies should aim to have a larger sample of PD and HOA participants. It would have been interesting to make comparisons considering the gender or the presence of fatigue of the sample. Future studies should be conducted establishing differences if postural impairments and gait disorders are present. Furthermore, we did not perform a more profound examination of the cognitive functions, which may have helped understand more about the decline of process skills in individuals without dementia affected by PD. Our results are not extrapolable to other stages of the disease (HY I and V). Finally, although the AMPS scale seems to be a useful tool in PD patients, the use of AMPS requires a certified evaluator, and it takes between 60-90 minutes to complete the test.

Conclusion

PD leads to a greater deterioration in motor and process skills compared to HOA. As disease stages advance according to the HY scale, performance in motor and process skills deteriorates significantly between moderate and advanced PD stages. According to the AMPS scale, PD patients show no impairment of processing skills up to HY IV, but motor impairment at HY stages II, III and IV.

References

- Rand D, Eng JJ. Arm-hand use in healthy older adults. *Am J Occup Ther* 2010; 64: 877-85.
- Alegre-Ayala J, Vela L, Fernández-Vázquez D, Navarro-López V, Macías-Macías Y, Cano-de-la-Cuerda R. The impact of Parkinson's disease severity on performance of activities of daily living: an observational study. *Rev Neurol* 2023 16; 76: 249-55.
- Alegre-Ayala J, Vela-Desojo L, Fernández-Vázquez D, Navarro-López V, Macías-Macías Y, Cano-de-la-Cuerda R. Occupational performance skills in Parkinson's disease: relationship with health-related quality of life and caregiver burden. *Rev Neurol* 2023; 77: 3-11.
- Buchman AS, Boyle PA, Wilson RS, Fleischman DA, Leurgans S, Bennett DA. Association between late-life social activity and motor decline in older adults. *Arch Intern Med* 2009; 169: 1139-46.
- Seidler RD, Bernard JA, Burutolu TB, Fling BW, Gordon MT, Gwin JT, et al. Motor control and aging: links to age-related brain structural, functional, and biochemical effects. *Neurosci Biobehav Rev* 2010; 34: 721-33.
- Foster ER, Bedekar M, Tickle-Degnen L. Systematic review of the effectiveness of occupational therapy-related interventions for people with Parkinson's disease. *Am J Occup Ther* 2014; 68: 39-49.
- Berganzo K, Tijerom B, González-Eizaguirre A, Somme J, Lezcano E, Gómez-Esteban JC, et al. Motor and non-motor symptoms of Parkinson's disease and their impact on quality of life and on different clinical subgroups. *Neurologia* 2016; 31: 585-91.
- Kudlicka A, Hindle JV, Spencer LE, Clare L. Everyday functioning of people with Parkinson's disease and impairments in executive function: a qualitative investigation. *Disabil Rehabil* 2018; 40: 2351-63.
- Moustafa AA, Chakravarthy S, Phillips JR, Gupta A, Keri S, Polner B, et al. Motor symptoms in Parkinson's disease: a unified framework. *Neurosci Biobehav Rev* 2016; 68: 727-40.
- Phillips KM, Siwik C, Rodgers A, Salmon P, Litvan I, Sephton SE, et al. Association of stress-health factors among Parkinson's disease patient/caregiving-partner dyads. *Arch Clin Neuropsychol* 2022; 37: 12-8.
- Sturkenboom IH, Thijssen MCE, Gons-van de Elsacker JJ, Jansen IJH, Maasdam A, Schulten M, et al. Guidelines for occupational therapy in Parkinson's disease rehabilitation. Nijmegen, The Netherlands/Miami (FL), USA: ParkinsonNet/NPF; 2011.
- Shulman LM, Pretzer-Aboff I, Anderson KE, Stevenson R, Vaughan CG, Gruber-Baldini AL, et al. Subjective report versus objective measurement of activities of daily living in Parkinson's disease. *Mov Disord* 2006; 21: 794-9.
- Geusgens CA, Van Heugten CM, Hagedoren E, Jolles J, van den Heuvel W. Environmental effects in the performance of daily tasks in healthy adults. *Am J Occup Ther* 2010; 64: 935-40.
- Fisher AJ. Assessment of motor and process skills: Volume I - Development, standardization, and administration manual, sixth edition. Paris: Three Star Press; 2005.
- Hartman ML, Fisher AG, Duran L. Assessment of functional ability of people with Alzheimer's disease. *Scand J Occup Ther* 1999; 6: 111-8.
- Doble SE, Lewis N, Fisk JD, Rockwood K. Test-retest reliability of the assessment of motor and process skills in elderly adults. *Occup Ther J Res* 1999; 19: 203-15.
- Sturkenboom IH, Graff MJ, Borm GF, Veenhuizen Y, Bloem BR, Munneke, et al. The impact of occupational therapy in Parkinson's disease: a randomized controlled feasibility study. *Clin Rehabil* 2013; 27: 99-112.
- García-Neves A, Fernández-Baizán C, Fernández-García MP, Menéndez-González M, Méndez M, Fernández-Artamendi S. Performance on daily life activities and executive functioning in parkinson disease. *Top Geriatr Rehabil* 2020; 36: 252-9.
- Hoehn MM, Yahr MD. Parkinsonism: onset, progression and mortality. *Neurology* 1967; 17: 427-42.
- von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet* 2007; 370: 1453-7.
- Hughes AJ, Ben-Shlomo Y, Daniel SE, Lees AJ. What features improve the accuracy of clinical diagnosis in Parkinson's disease: a clinicopathologic study. *Neurology* 1992; 42: 1142-6.
- Julayanont P, Tangwongchai S, Hemrungron S, Tunvirachaisakul C, Phanthumchinda K, Hongsawat J, et al. The Montreal Cognitive Assessment-Basic: a screening tool for mild cognitive impairment in illiterate and low-educated elderly adults. *J Am Geriatr Soc* 2015; 63: 2550-4.
- Beck AT, Ward CH, Mendelson M, Mock JE, Erbaugh JK. An inventory for measuring depression. *Arch Gen Psychiatry* 1961; 4: 561-71.
- Fahn S, Elton R, members of the UPDRS Development Committee. The Unified Parkinson's Disease Rating Scale. In Fahn S, Marsden CD, Calne DB, Goldstein M, eds. *Recent developments in Parkinson's disease*. Vol. 2. Florham Park; McMellam Health Care Information; 1987. p. 153-63.
- Schwab RS, England AC. Projection technique for evaluating surgery in Parkinson's disease. In Billingham FH, Donaldson MC, eds. *Third Symposium on Parkinson's Disease*. Edinburgh: Churchill Livingstone; 1969. p. 152-7.
- Martínez P, Frades B. Quality of life in Parkinson's disease: validation study of the PDQ-39 Spanish version. Grupo Centro for Study of Movement Disorders. *J Neurol* 1998; 245: 34-8.
- Badia X, Roset M, Montserrat S, Herdman M, Segura A. The Spanish version of EuroQol: a description and its applications. *European Quality of Life scale*. *Med Clin (Barc)* 1999; 112: 79-85.
- Fisher AG, Merritt BK. Conceptualizing and developing the AMPS within a framework of modern objective measurement. In Fisher AG, Jones KB, eds. *Assessment of motor and process skills*. Vol. 1. Development, standardization, and administration manual. 7 ed. revised. Fort Collins, CO: Three Star Press; 2012; p. 1-22.
- Bernspang B, Fisher AG. Differences between persons with right or left cerebral vascular accident on the Assessment of Motor and Process Skills. *Arch Phys Med Rehabil* 1995; 76: 1144-51.
- García-Neves A. Impacto de los déficits cognitivos en planificación y atención-control inhibitorio sobre la capacidad para realizar actividades de la vida diaria en la enfermedad de Parkinson. Tesis doctoral. Sevilla: Universidad Loyola; 2021.
- Bloem BR, Okun MS, Klein C. Parkinson's disease. *Lancet* 2021; 397: 2284-303.
- Radder DLM, Sturkenboom IH, van Nimwegen M, Keus SH, Bloem BR, de Vries NM. Physical therapy and occupational therapy in Parkinson's disease. *Int J Neurosci* 2017; 127: 930-43.
- Bugalho P, Ladeira F, Barbosa R, Marto JP, Borbinha C, Fernandes M. Progression in Parkinson's disease: variation in motor and non-motor symptoms severity and predictors of decline in cognition, motor function, disability, and health-related quality of life as assessed by two different methods. *Mov Disord Clin Pract* 2021; 8: 885-95.
- Schapira AH, Chaudhuri K, Jenner P. Non-motor features of Parkinson disease. *Nat Rev Neurosci*, 2017; 18: 435-50.
- Poliakoff E, Smith-Spark JH. Everyday cognitive failures and memory problems in Parkinson's patients without dementia. *Brain Cogn* 2008; 67: 340-50.
- Pirogovsky E, Martinez-Hannon M, Schiehser DM, Lessig SL, Song DD, Litvan I, et al. Predictors of performance-based measures of instrumental activities of daily living in nondemented patients with Parkinson's disease. *J Clin Exp Neuropsychol* 2013; 35: 926-33.

37. Allcock LM, Rowan EN, Steen IN, Wesnes K, Kenny RA, Burn DJ. Impaired attention predicts falling in Parkinson's disease. *Parkinsonism Relat Disord* 2009; 15: 110-5.
38. Foster ER. Instrumental activities of daily living performance among people with Parkinson's disease without dementia. *Am J Occup Ther* 2014; 68: 353-62.
39. Foster ER, Carson LG, Archer J, Hunter EG. Occupational therapy interventions for instrumental activities of daily living for adults with Parkinson's disease: a systematic review. *Am J Occup Ther* 2021; 75: 7503190030p1-24.
40. Terhorst L, Holm MB, Toto PE, Rogers JC. Performance-based impairment measures as predictors of early-stage activity limitations in community-dwelling older adults. *J Aging Health* 2017; 29: 880-92.
41. Shulman LM, Gruber-Baldini AL, Anderson KE, Vaughan CG, Reich SG, Fishman PS, et al. The evolution of disability in Parkinson disease. *Mov Disord* 2008; 23: 790-6.
42. Skidmore FM, Mackman CA, Pav B, Shulman LM, Garvan C, Macko RF, et al. Daily ambulatory activity levels in idiopathic Parkinson disease. *J Rehabil Res Dev* 2008; 45: 1343-8.

Habilidades motoras y de procesamiento en personas con enfermedad de Parkinson en comparación con adultos mayores sanos. Un estudio transversal

Introducción. Tanto la enfermedad de Parkinson (EP) como el proceso de envejecimiento están asociados con limitaciones funcionales. El objetivo de este estudio fue determinar las diferencias en habilidades motoras y de procesamiento entre individuos con EP y adultos mayores sanos, así como observar cómo la progresión de la enfermedad afecta al desempeño de las habilidades motoras y de procesamiento en pacientes con EP.

Sujetos y métodos. Se realizó un estudio transversal. Se empleó la medida de la *Assessment of Motor and Process Skills* (AMPS) para analizar las diferencias en las habilidades motoras y de procesamiento de tareas cotidianas entre personas con EP y adultos mayores sanos, emparejados en edad y sexo. Se administró la sección III de la *Unified Parkinson Disease Rating Scale*, la escala de Hoehn y Yahr (HY) y la escala de *Schwab & England* para determinar la gravedad de la enfermedad.

Resultados. Se reclutó a 70 participantes (49 pacientes con EP y 21 adultos mayores sanos). Nuestros resultados mostraron que incluso en estadios moderados de la enfermedad, tanto las habilidades motoras como las de procesamiento se encontraron deterioradas en los pacientes con EP en comparación con los adultos mayores sanos ($p < 0,001$). A medida que avanza la enfermedad, las habilidades motoras y de procesamiento presentan un deterioro significativo en las personas con EP.

Conclusiones. La EP conduce a un mayor deterioro de las habilidades motoras y de procesamiento en comparación con adultos mayores sanos. A medida que avanzan los estadios de la enfermedad según la escala HY, el rendimiento en las habilidades motoras y de procesamiento se deteriora significativamente entre los estadios moderados y avanzados de la EP. Según la escala AMPS, los pacientes con EP no muestran un deterioro en las habilidades de procesamiento hasta el estadio HY IV, pero muestran deterioro motor en los estadios HY II, III y IV.

Palabras clave. Actividades de la vida diaria. Enfermedad de Parkinson. Funcionalidad. Habilidades motoras y de procesamiento. Limitaciones funcionales. Rendimiento funcional.