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Association between quality of life, cognitive aspects, fear of falling and risk of falling in elderly individuals with Parkinson

Associação entre qualidade de vida, aspectos cognitivos, medo de cair e risco de queda em idosos com Parkinson

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ABSTRACT | INTRODUCTION: Parkinson's Disease (PD) is responsible for impairment in balance and cognitive disorders that reflect on functional capacity and may increase the risk of falls in the elderly. **OBJECTIVE:** Evaluate the association between quality of life, cognitive aspects, fear of falling, and risk of falling in elderly people with PD. **METHOD:** This is a cross-sectional study. Motor signs and symptoms of PD were assessed by the Movement Disorder Society — Unified Parkinson's Disease Rating Scale (MDS-UPDRS part III). The Parkinson's Disease Questionnaire (PDQ-39), the Mini Mental State Examination (MMSE), and the Montreal Cognitive Assessment (MoCA) were also applied. The fear of falling was measured by the Falls Efficacy Scale - International (FES-I), and the risk of falling was assessed by the Timed Up and Go (TUG) test, Functional Reach Test (FRT), and Sit and Stand test (SS). Spearman's association was used for TUG, PDQ-39, MMSE, MoCA, and FES-I, while Pearson's association was used for FRT, SS, and other variables, with $p<0.05$. **RESULTS:** 29 participants were included (70.14 ±8.81 years). PDQ-39 showed a significant, inverse, and regular association with the FRT, while MMSE and MoCA showed a significant, inverse, and strong association with the TUG and SS tests. FES-I was associated with TUG and SS. **CONCLUSION:** Quality of life, cognitive aspects, and fear of falling were associated with the risk of falling in elderly people with PD.

KEYWORDS: Parkinson Disease. Quality of Life. Cognition. Accidental Falls.

RESUMO | INTRODUÇÃO: A Doença de Parkinson (DP) é responsável por gerar déficits no equilíbrio e distúrbios cognitivos que refletem na capacidade funcional e podem aumentar a propensão a quedas em idosos. **OBJETIVO:** Avaliar a associação entre qualidade de vida, aspectos cognitivos, medo de cair e risco de queda em idosos com DP. **MÉTODO:** Estudo observacional transversal. A caracterização dos sinais e sintomas motores foi realizada através da *Moviment Disorder Society – Unified Parkinson's Disease Rating Scale* (MDS-UPDRS parte III). O *Parkinson's Disease Questionnaire* (PDQ-39), o Mini-Exame do Estado Mental (MEEM) e o *Montreal Cognitive Assessment* (MoCA) também foram aplicados. O medo de cair foi mensurado pela Escala Internacional de Eficácia de Quedas (FES-I) e o risco de queda foi avaliado através do teste *Timed Up and Go* (TUG), do Teste de Alcance Funcional (TAF) e do teste de Sentar e Levantar (SL). A associação de *Spearman* foi usada para TUG, PDQ-39, MEEM, MoCA e FES-I, enquanto a associação de Pearson foi usada para TAF e SL, com $p < 0,05$. **RESULTADOS:** 29 participantes foram incluídos (70,14 ± 8,81 anos). O PDQ-39 apresentou associação significativa, inversa e regular com o TAF, enquanto o MEEM e o MoCA apresentaram uma associação significativa, inversa e forte com os testes TUG e SL. FES-I foi associado ao TUG e SL. **CONCLUSÃO:** A qualidade de vida, os aspectos cognitivos e o medo de cair estão correlacionados com o risco de queda em idosos com DP.

PALAVRAS-CHAVE: Doença de Parkinson. Qualidade de Vida. Cognição. Acidentes por Quedas.

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1. Introduction

Parkinson's disease (PD) is a neurodegenerative disorder characterized by four cardinal signs: tremor at rest, stiffness, bradykinesia, and postural instability. In addition, individuals with PD may also experience non-motor characteristics such as orthostatic hypotension, sleep disorders, cognitive changes, and dementia. This combination of symptoms may reduce their functional capacity and often leads to social isolation.[1] The diagnosis of PD is associated with advanced age; its incidence increases five to 10 times between the sixth and ninth decade of life. This underscores the impact of age-related functional deficits, which can be further exacerbated when coupled with a diagnosis of PD.[2]

Balance deficits in individuals with PD result from nigrostriatal degeneration, significantly impacting the performance of activities of daily living (ADL). Among the impairments that exacerbate the challenges faced by individuals with PD, falls have an important impact, leading to limitations in daily life and potential adverse consequences, including increased functional dependence, mobility limitations, fractures, and head injuries.[3] The fall is defined as an unintentional event, where the individual descends to a lower level than their initial position, without enough time for postural correction.[4]

As PD advances, these individuals are prone to falls, occurring twice as often compared to those with other neurological disorders. It is estimated that between 45 to 68% of individuals with PD experience at least one fall annually[5], which can negatively impact the quality of life of these individuals and are closely related to the cognitive challenges often seen in PD.[6]

Fear of falling and the potential recurrent falls are among the additional challenges stemming from fall incidents.[7] Numerous studies have sought to identify the risk factors for falls in people with PD[4,7,8]; however, the understanding remains limited. It is widely believed that a previous history of falls is one of the most important risk factors associated with the attention deficit experienced by individuals with PD.[9] Identifying the factors that are associated with the risk of falling in people with PD can potentially suggest the adoption of preventive measures targeting these aspects, in order to reduce or even prevent falls.[10] Thus, the aim of this study was to assess the association between quality of life, cognitive aspects, fear of falling, and risk of falling in elderly people with PD.

2. Methods

This is a cross-sectional study, developed with the participants from the Viva Ativo extension project, linked to the Laboratório de Pesquisa e Estudos em Massoterapia, Atividades Corporais e Saúde - LAPEMACS (Research and Studies Laboratory in Massotherapy, Body Activities and Health), located at the Centro Olímpico da Faculdade de Educação Física - FEF (Olympic Center of the Faculty of Physical Education), from the Universidade de Brasília (UnB).

Data collection occurred from October 2019 to February 2020. The participants were evaluated by a single evaluator previously trained. Anamnesis involved a questionnaire for sociodemographic characterization and questions related to the health history and time of PD diagnosis. The characterization of the PD motor symptoms was obtained by applying the Movement Disorders Society - Unified Parkinson's Disease Rate Scale (MDS-UPDRS part III), in which the highest score represents the greatest damage. To assess PD staging, the Hoehn & Yahr scale was applied, which comprises five stages of classification, where stages 1, 2, and 3 correspond to mild to moderate disability and stages 4 and 5 to individuals with severe disability.[11] Subsequently, the quality of life was assessed by the Parkinson's Disease Questionnaire

(PDQ-39), in which 39 items are distributed in eight categories, and the score varies from 0 (good health perception) to 100 (worst health perception).[12] Mini Mental State Examination (MMSE) and the Montreal Cognitive Assessment (MoCA) instruments were also applied. The MMSE score varies from 0 to 30 points, in which lower values correspond to possible cognitive deficits. MoCA, with a maximum score of 30 points, assess with a score considered normal over 26.[13]

Fear of falling was measured by the Falls Efficacy Scale - International (FES-I), in which the higher the score, the greater the fear of falling.[12] The risk of falling was assessed through the Timed Up and Go test (TUG), the Functional Reach Test (FRT), and the Sit and Stand test (SS). These three tests present good reliability and good reproducibility. In TUG, a longer test execution is associated with increased functional dependence and a higher risk of falls.[14] In FRT, displacements of less than 15 cm indicate fragility and risk of falling[12], and in the SS, the longer the time to perform the test, the worse the volunteer's functional status and the greater his risk of falling.[15]

The inclusion criteria were elderly people (≥ 60 years), diagnosed with idiopathic PD, with independent functional gait, classified between stages 1 to 3 at the Hoehn & Yahr Scale, and being in the medication ON stage. The exclusion criteria were individuals diagnosed with another neurological disease, with musculoskeletal deficits that make it impossible for them to perform the proposed tests, and individuals who refused to sign the Informed Consent Form (ICF).

The sample size was recruited by convenience, in which the study population was made up of volunteers from the extension group. After data collection, the data were tabulated in Excel and then they were exported and analyzed using the software SPSS version 24. The categorical variables were exposed in the form of absolute and relative frequency (sociodemographic characterization, nosological profile, and PD staging on the Hoehn & Yahr scale). After the normal distribution analysis, variables that exhibited a normal distribution were presented with mean and standard deviation, while those classified as non-normal distribution were presented with median and interquartile range. The variables PDQ-39, MMSE, MoCA, FES-I, FRT, and SS displayed a normal distribution, whereas TUG showed a non-normal distribution. Spearman's correlation was used to assess the association between TUG and PDQ-39, MMSE, MoCA, and FES-I, while Pearson's correlation was used in the association between FRT and SS, and PDQ-39, MMSE, MoCA, and FES- I, with a significance level of $p < 0.05$. The straight-line regression equation was used to build the figures and analyze the influence of the dependent variables on the independent ones. The research was performed according to resolution 466/2012, and all procedures were conducted after approval by the local Research Ethics Committee under protocol No. 3,452,202 (CAAE 14837319,2,0000,8093).

3. Results

All participants in the extension project were evaluated; a total of 29 participants. The mean age was 70.14 (± 8.81) years and the mean time of diagnosis of PD was 5.11 (± 3.89) years. Sociodemographic characterization is shown in Table 1.

Table 1. Sociodemographic characterization in elderly people with Parkinson, 2023

		Mean	SD	%	n
Age		70.14	8.81		29
Height		1.65	0.08		29
Weight		73.2	13.7		29
Gender	Male			62.1	18
	Female			37.9	11
Skin color	White			37.9	11
	Brown			37.9	11
	Black			10.3	3
	Yellow			13.8	4
Marital status	Single			10.3	3
	Married			68.96	20
	Divorced			10.3	3
	Stable union			10.3	3
Resides	Spouse			55.2	16
	Alone			20.68	6
	Family			24.1	7
Instruction level	Illiterate			3.4	1
	Incomplete Elementary School			31	9
	Complete Elementary School			3.4	1
	Incomplete High School.			0	0
	Complete High School.			10.3	3
	Higher education			51.7	15
Income	1 salary			27.58	8
	2 salaries			17.24	5
	> 2 salaries			55.2	16

Source: the authors (2023).

The nosologically profile sampling was: 65.51% no sedentary lifestyle, 96.5% no smoking, and 72.41% never suffer falls (Table 2).

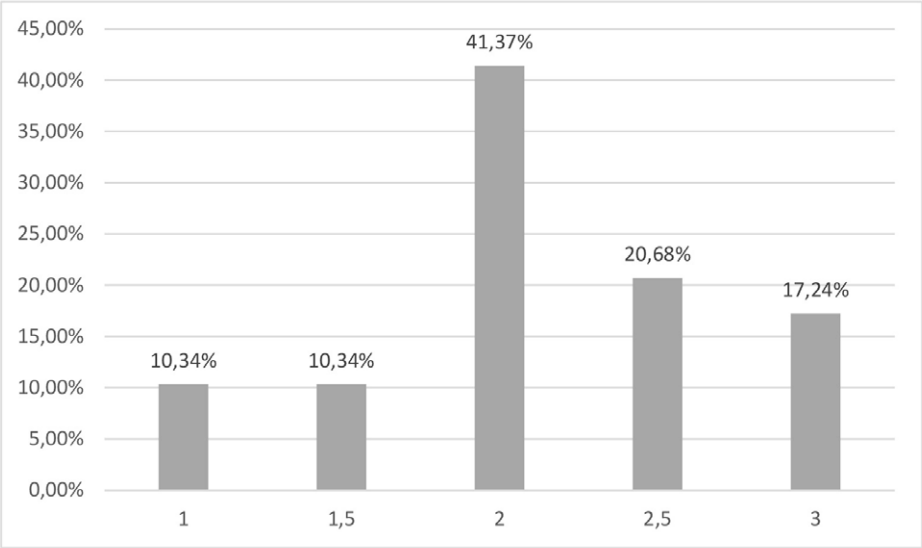
Table 2. Nosologically profile in elderly people with Parkinson's, 2023

		%	n
Sedentary lifestyle	Yes	34.48	10
	No	65.51	19
Alcoholism	Yes	10.34	3
	No	89.65	26
Smoking	Yes	3.44	1
	No	96.5	28
History of falls	Did not suffer falls	72.41	21
	1 fall	13.79	4
	2 or more	13.79	4
CND:	No	20.68	6
	Yes	79.31	23
	SAH	37.93	11
	DM	21.03	9
	SAH e DM	20.68	6
	Arthrosis	3.44	1
	Hypothyroidism	3.44	1
	Ulcerative Colitis	3.44	1

CND: Chronic Noncommunicable Diseases; SAH: Systemic Arterial Hypertension; DM: Diabetes Mellitus.
Source: the authors (2023).

Figure 1 contains the percentage distribution in the classification of the Hoehn & Yahr Scale, and the average obtained on the UPDRS III scale was 32.50 (± 11.06).

Figure 1. Percentage distribution in the classification of the Hoehn & Yahr scale in elderly people with Parkinson's, 2023



Source: the authors (2023).

Table 3 presents the scores obtained in the assessment instruments.

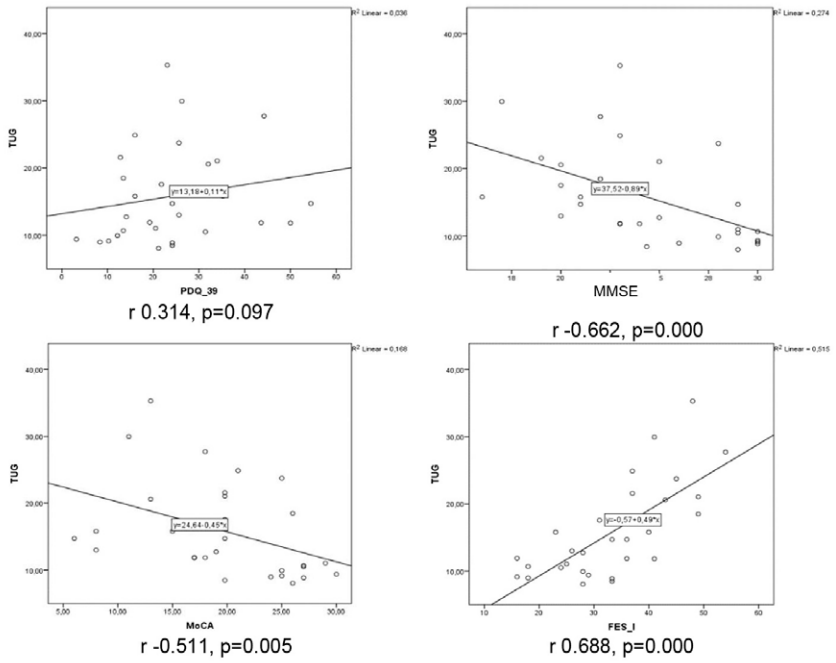
Table 3. Score obtained from the assessment instruments in elderly people with Parkinson's, 2023

Instruments	Minimum	Maximum	Mean	Standard deviation
PDQ-39	3	54	24.16	12.51
MMSE	16	30	24.36	4.20
MoCA	6	30	19.79	6.56
FES-I	16	54	33.31	10.46
TUG	8.03	35.30	15.79	7.16
FRT	5	39	23.54	9.57
SS	11.11	41.30	21.09	7.87

Source: the authors (2023).

Figure 2 contains data related to TUG associations with the variables PDQ-39, MMSE, MoCA, and FES-I through Spearman correlation.

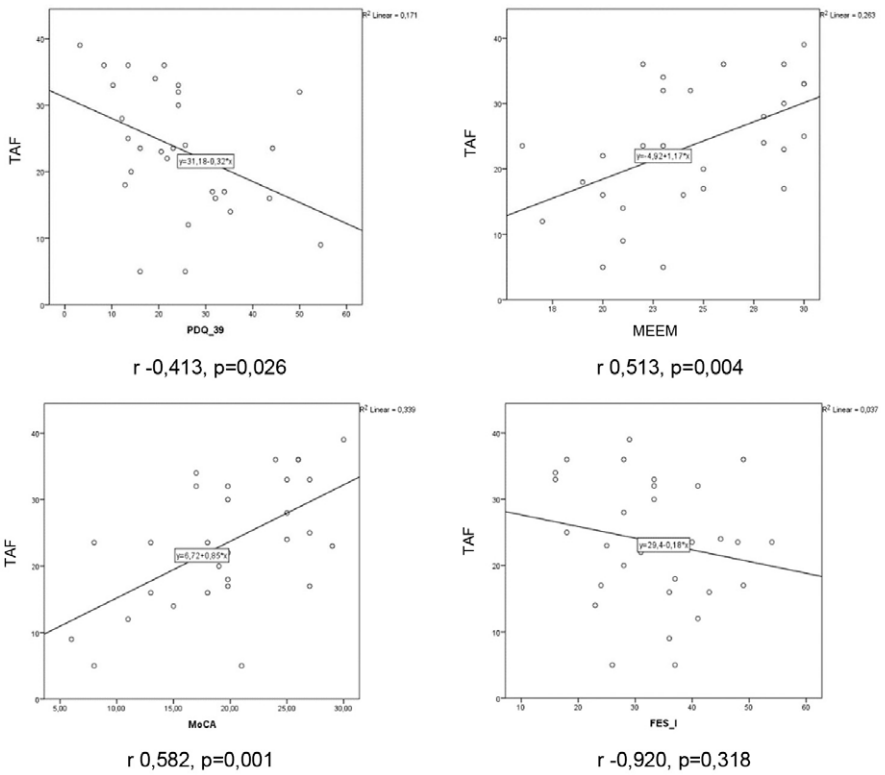
Figure 2. Association of TUG with PDQ-39, MMSE, MoCA, and FES-I through Spearman correlation



Source: the authors (2023).

Figure 3 shows the associations of FRT with the variables PDQ-39, MMSE, MoCA, and FES-I through Pearson's correlation.

Figure 3. Association of FRT with PDQ-39, MMSE, MoCA, and FES-I through Pearson's correlation



Source: the authors (2023).

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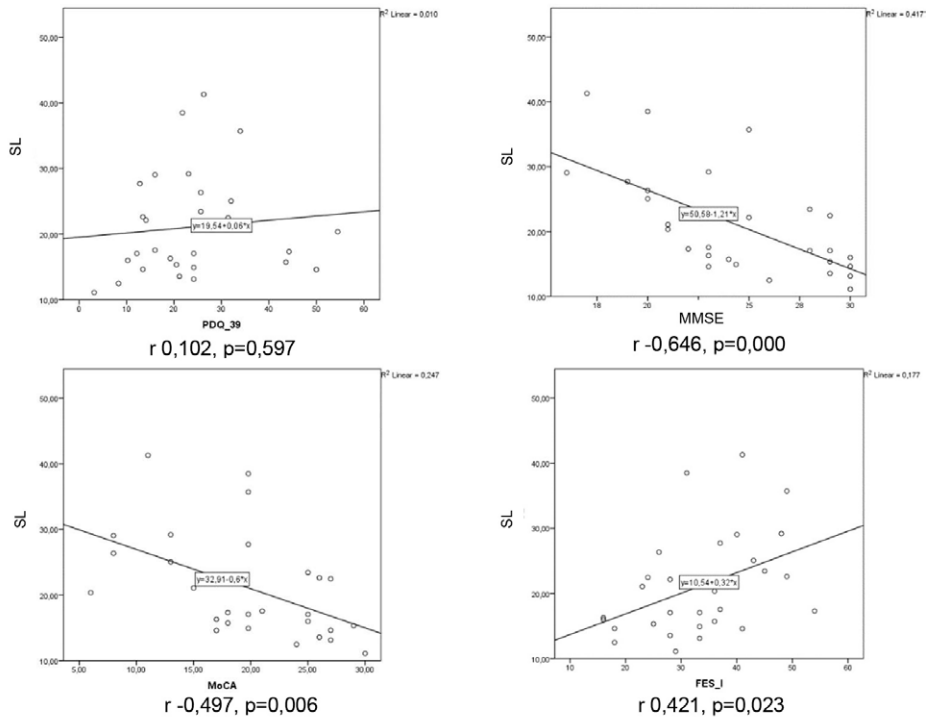
Figure 4 shows the associations of the SS with the variables PDQ-39, MMSE, MoCA, and FES-I through Pearson's correlation.

Figure 4. Association of SS with PDQ-39, MMSE, MoCA, and FES-I through Pearson's correlation



Source: the authors (2023).

4. Discussion

The present study aimed to investigate the association between quality of life, cognitive aspects, and fear of falling with the risk of falling for elderly people with PD. In this study, individuals with PD presented a low risk of falling, according to TUG, FRT, and SS tests, and demonstrated a satisfactory performance when looking at the average of the tests. When the independent variables were associated, it can be observed that cognition and fear of falling were associated with functional mobility but not with quality of life.

The quality of life in individuals with PD may be compromised due to the reduction in functional independence caused by balance deficits, which make them prone to falls, leading to social isolation.[6] In a previous randomized controlled clinical trial16 with 35 elderly people with PD divided into two groups —one underwent resistance training in addition to the standard pharmacological treatment, while the control group only maintained their standard pharmacological treatment—, the authors observed that the participants in the intervention group showed reduced levels of anxiety and, consequently, improved quality of life measured by the PDQ-39. In our study, the association between PDQ-39 with TUG, FRT, and SS tests showed a significant, inverse, and regular association only with the FRT, indicating that a lower score on the PDQ-39 is associated with a better subjective perception of the individuals' quality of life and a greater distance in the FRT test. This suggests a better static balance in these individuals. Thus, it can be suggested that better balance contributes to increased functional independence, reflecting on the subjective perception of quality of life.[17]

Falls have a direct impact on the quality of life of individuals with PD, and maintaining an adequate level of balance is crucial in reducing the risk of falls.[10] Exercises can improve the performance of individuals with PD in activities that require an appropriate level of balance. In addition, such exercises may lead to long-term adherence and potentially reduce the rate of falls in individuals with PD.[18] In this study, no instruments were used to measure the level of physical activity of the participants; however, they were asked if they considered themselves self-sedentary or not. 65.51% reported they were not sedentary; however, it's important to note that the information may contain some bias as we did not use a validated instrument.

Cognitive impairments in individuals with PD are related to attentional deficits, changes in memory, visuospatial capacity, and executive functions. These impairments are as disabling as motor changes and are closely associated with social isolation and a negative impact on quality of life.[19] A preserved cognitive function is important to avoid falls since a deficit in this function can make the elderly with PD more prone to falls. Executive function deficits lead to difficulties in performing dual-task activities and, consequently, increase the risk of falling. Thus, using instruments such as the MoCA to identify such losses from the early stages of PD becomes important in order to recognize such deficits and set goals to circumvent such risks.[14] In this study, the MMSE and MoCA were used to assess cognitive impairments, whereas the second instrument is considered a good alternative for the identification of cognitive deficits in patients without detectable impairment in the MMSE.[20] Both the MMSE and MoCA tests showed a significant, inverse, and strong association with the TUG and SS tests. This result suggests that as cognitive impairment decreases, the risk of falling also decreases.[21,22]

The study by Scheffels et al.[23] aimed to investigate the association between the three tests used in the screening of cognitive impairments —MMSE, MoCA, and the Parkinson Neuropsychometric Dementia Assessment (PANDA). Ninety-six individuals with idiopathic PD and stages II to IV on the Hoehn & Yahr scale were evaluated, and the study showed that the three instruments were highly related and that age and level of education influenced the MMSE and MoCA scores. Ninety-four of the 96 volunteers did not show cognitive impairments when assessed by the MMSE, while 64,9% demonstrated such a deficit by applying MoCA. The authors' conclusion emphasizes the importance of early screening for mild cognitive impairments in individuals with PD. They also suggest that if a first instrument is deemed to be insufficient for such identification, an additional and more specific instrument for individuals with PD should be used.

Elderly individuals with PD are more prone to falls, experiencing twice the rate compared to healthy elderly individuals. Among the prevention strategies, the regular practice of physical activity is highlighted and stands out.[3] However, regular physical activity alone does not seem to be sufficient to maintain an adequate balance and to prevent falls. Activities involving training that defy balance associated with instruction of attentional focus and cognitive demands seem to have positive effects on postural sway, consequently improving balance and reducing the risk of falls.[24]

A previous history of falls in individuals with PD is an important risk factor for future falls[25], reflecting the fear of falling again and promoting a cascade of events: fear of falling, restriction on movement, social isolation, and impact on quality of life.[7] In this research, the previous history of falls was present in 13.79% of the individuals, in which at least one and/or two falls suffered in the last year were reported. The data may be subject to memory bias; however, the individuals demonstrated favorable cognitive functioning by the MMSE and MoCA instruments.

A previous study[26] compared progressive strength training with balance, fear of falling and changes in cognitive function in individuals with a moderate degree of PD. The authors concluded that strength training promotes beneficial effects on balance, reduces the fear of falling, and is strongly associated with improvement in the cognitive response of individuals with PD. The fear of falling among the individuals in the present study was 33.31 (± 10.46) and had a significant association with the TUG and SS tests. The regular practice of physical activity promotes direct benefits on the balance of people with PD, reducing the fear of falling and implying a better subjective perception of quality of life.[27]

Among the study's limitations, we highlight the small sample size, which does not allow data to be extrapolated to the general population with PD. In addition, the study design does not allow us to infer the cause-and-effect relationship; instead, it allows us to make assumptions that certain factors may contribute to an increased risk of falling in individuals with PD. To minimize the potential bias, we made efforts to control the sample and identify individuals' characteristics in order to maintain a homogeneous sample as possible. As a result, we chose to restrict the sample exclusively to the individuals from the extension project.

5. Conclusion

The quality of life, cognitive aspects, and fear of falling are associated with the risk of falling in elderly individuals with PD. The higher the risk of falls, the worse the subjective perception of the quality of life of people with PD, since the risk of falling influences functional independence and, when reduced, promotes social isolation of people with PD. Cognitive impairments showed an association with the risk of falling, where the attention deficit seems to significantly influence the risk of falling for people with PD, and the fear of falling was associated with the risk of falling measured by TUG and SS.

Authors' contributions

Silva JCA, Souza PVN, and Santos YMA worked on data collection. Silva JCA, Paiva TAF, and Queiroz LMC participated in the statistical analysis and scientific writing of the manuscript. Silva JCA and Bezerra LMA participated in the preparation of the project, the conception of the research question, the search and statistical analysis of data, and the final writing of the manuscript.

Conflicts of interest

No financial, legal, or political conflicts involving third parties (government, private companies, and foundations, etc.) were declared for any aspect of the submitted work (including but not limited to grants and funding, advisory board participation, study design, manuscript preparation, statistical analysis, etc.).

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