Telephone-based application of the Activities of Daily Living Questionnaire in patients with Parkinson's disease

Aplicação por telefone do Questionário de Atividades da Vida Diária em pacientes com doença de Parkinson

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Abstract

Background   The Activities of Daily Living Questionnaire (ADLQ) focuses on assessing the ability to perform activities of daily living (ADLs) based on the self-perception of individuals with Parkinson's disease (PD). A Brazilian Portuguese version of the questionnaire is available (ADLQ-Brazil), and further investigation is needed to fully assess its measurement properties.

Objective   To investigate construct and concurrent validity of the telephone-based administration of the ADLQ-Brazil with community individuals with PD.

Methods   There were 50 adults with PD (mean age: 68 ± 9.5 years) invited to answer the ADLQ-Brazil on two randomized occasions, face-to-face and by telephone, 7 to 10 days apart. Clinical-based measures including the Movement Disorder Society-Sponsored Revision of the Unified Parkinson Disease Rating Scale, Timed Up and Go Test, Nine Hole Peg Test, Mini-Balance Evaluation Systems Test, Apathy Scale, Beck Depression Inventory, Modified Fatigue Impact Scale, and Parkinson Disease Quality of Life Questionnaire were applied during the first session, to establish construct validity.

Results   The total scores on the ADLQ-Brazil were significantly associated with the clinical-based measures, thus providing evidence of construct validity. No significant differences were observed between the mean scores obtained with the face-to-face and telephone-based administration of the questionnaire (95%CI = 0.997). A high level of agreement was found in the total scores obtained between both applications of the ADLQ-Brazil (95%CI = 0.994–0.998), and most of the individual items had, on average, moderate agreement.

Keywords
► Parkinson Disease
► Activities of Daily Living
► Rehabilitation
► Telephone

Conclusion The findings provide psychometric support for the ADLQ-Brazil as a telephone interview to assess the performance of ADLs in individuals with PD.

Resumo

Antecedentes O Questionário de Atividades da Vida Diária (Activities of Daily Living Questionnaire, ADLQ, em inglês) tem como foco avaliar a capacidade de realizar atividades da vida diária (AVDs) com base na autopercepção de indivíduos com doença de Parkinson (DP). Uma versão do questionário em português do Brasil está disponível (ADLQ-Brasil), sendo necessárias mais investigações para avaliar suas propriedades de medidas.

Objetivo Investigar as validades de construto e concorrente da aplicação por telefone do ADLQ-Brasil com indivíduos da comunidade com DP.

Métodos Foram 50 adultos com DP (média de idade: 68 ± 9,5 anos) convidados a responder o ADLQ-Brasil em duas ocasiões aleatórias, presencialmente e por telefone, com intervalo de 7 a 10 dias. Instrumentos clínicos incluindo a Escala Unificada de Avaliação da Doença de Parkinson, o teste Timed Up and Go, o teste Nine Hole Peg, a versão reduzida do teste de equilíbrio Mini-Balance Evaluation Systems, a Escala de Apatia, o Inventário de Depressão de Beck, a Escala de Impacto de Fadiga Modificada e o Questionário de Qualidade de Vida na Doença de Parkinson foram aplicados na primeira sessão para estabelecer a validade de construto.

Resultados Os escores totais do ADLQ-Brasil foram significativamente associados às medidas clínicas, fornecendo, assim, evidências de validade de construto. Não foram observadas diferenças significativas entre as pontuações médias obtidas entre a aplicação presencial e por telefone do questionário (IC95% = 0,997). Foi encontrado alto nível de concordância entre os escores totais do ADLQ-Brasil obtidos nas duas aplicações (IC95% = 0,994–0,998) e a maioria dos itens individuais apresentou, em média, concordância moderada.

Palavras-chave
► Doença de Parkinson
► Atividades Cotidianas
► Reabilitação
► Telefone

Conclusão Os achados fornecem suporte psicométrico para o ADLQ-Brasil como entrevista telefônica para avaliação do desempenho de AVDs em indivíduos com DP.

INTRODUCTION

Parkinson's disease (PD) has shown the fastest growth in prevalence among neurological disorders, and has become one of the leading causes of disability worldwide.[1] This disease primarily manifests through motor symptoms such as bradykinesia, tremor, rigidity, and postural instability, resulting from the depletion of dopamine levels in the basal ganglia.[2] In addition, the impairment of the noradrenergic, serotoninergic, and cholinergic systems also contributes to various non-motor symptoms.[3] These symptoms include neuropsychiatric disorders, sleep disturbances, autonomic dysfunctions, and sensory deficits.[4] Together, motor and non-motor symptoms contribute to a progressive decline in activities of daily living (ADLs), such as walking, talking, and basic tasks like bathing or dressing,[5] encompassing a range of actions that rely on motor, sensory, and cognitive abilities.[5] The loss of postural stability and both static and dynamic balance raise the risk of falls, leading to reduced social participation, increased sedentary behavior, and feelings of depression.[6] Furthermore, fatigue and apathy are associated with difficulties starting and sustaining voluntary activities, and poor quality of life.[7] Given that the inability to

perform ADLs is associated with the progression of PD,[8] the assessment of ADLs is a meaningful health outcome for individuals with PD.[9] This can assist in monitoring disease progression, optimizing care, and reducing the burden of the condition.

There are several general instruments available for assessing the ability to perform ADLs in patients with PD.[8,10] These instruments include the Lawton and Brody Scale,[11] the Measure of Functional Independence,[8,10] and Barthel Index.[8,10] Additionally, there are specific instruments designed for individuals with PD, such as subsection II of the Movement Disorder Society-Sponsored Revision of the Unified Parkinson Disease Rating Scale (MDS-UPDRS),[12] the Parkinson Disease Activities of Daily Living Scale (PADLS)[13] and Schwab and England Scale of Daily Activities (S&E).[14] However, these instruments have certain limitations. For instance, the MDS-UPDRS and S&E do not take into account the individual's subjective perception of their performance in ADLs.[12,14] The PADLS, on the other hand, addresses the aspect of self-perception, although it is less precise in identifying specific tasks that are more or less difficulty.[13]

To address these limitations, the Activities of Daily Living Questionnaire (ADLQ) was developed. This questionnaire

focuses on assessing the ability to perform ADLs based on the self-perception of individuals with PD in specific activities.[15] By considering the subjective experience of patients and targeting specific activities, the ADLQ aims to provide a more comprehensive and accurate evaluation of ADL ability in individuals with PD.

Although a Brazilian Portuguese version of the questionnaire is available,[16] further investigation is needed to fully assess its measurement properties. Additionally, it is important to acknowledge that the coronavirus disease 2019 (COVID-19) pandemic has highlighted a significant need for telephone-based assessments of instruments used in clinic and research settings.[17] While face-to-face assessments provide more detailed data collection, telephone-based assessments offer advantages such as facilitating data collection, reducing dropout rates and costs, and enabling evaluations during periods of restrictions.[18] The objective of this study was to investigate construct validity and concurrent validity of the telephone-based administration of the ADLQ-Brazil with community individuals who have PD. It was hypothesized that this questionnaire would demonstrate adequate construct validity when compared with established measurement instruments of ADL ability, and telephone-based administration produces valid measures in comparison with face-to-face administration.

METHODS

This study was approved by the Research Ethics Committee of Universidade Federal de Minas Gerais (UFMG), Belo Horizonte, Minas Gerais, Brazil (00857218.1.0000.5149), and all participants provided written consent prior to data collection.

Participants were recruited from the general community, between November 2021 and July 2022, using various methods such as advertisements and screening at public rehabilitation services and hospitals. They were included when being: clinically diagnosed with idiopathic PD based on the United Kingdom Parkinson's Disease Society Brain Bank criteria,[19] at least 20-years-old, clinically stable, and up to stage 4 on the Hoehn and Yahr (HY) scale. Individuals with impaired cognitive function as determined by the Mini-Mental State Examination (MMSE) score,[20] as well as those with visual and/or auditory impairments that could hinder their participation, or individuals with other adverse health conditions, such as unrelated neurological, psychiatric, or orthopedic diseases, were excluded. The sample size was oriented by the Consensus-based Standards for the selection of health Measurement Instruments (COSMIN), which recommends a minimum of 50 participants to address validity analyses.[21]

Participants were invited to complete the ADLQ-Brazil on two occasions, face-to-face and by telephone. During the initial meeting, clinical and demographic information was collected, and subsequently, the chosen questionnaire, as well as clinical-based measures such as the MDS-UPDRS II, the Timed Up and Go (TUG) test, the Nine Hole Peg Test (NHPT), the Mini-Balance Evaluation Systems Test (Mini-BESTest), the Apathy Scale (AS), the Beck Depression Inventory (BDI), the Modified Fatigue Impact Scale (MFIS), and the Parkinson Disease Quality of Life Questionnaire (PDQ-39), were administered to assess construct validity.

The ADLQ-Brazil was administered by a trained researcher via telephone to assess the concurrent validity. The interval between the 2 assessments varied from 7 to 10 days to allow sufficient time to prevent recall bias and short enough to ensure that clinical changes had not occurred.[22]

According to the COSMIN criteria, it is necessary to establish predefined hypothesis to evaluate construct validity.[23] Thus, our aim was to estimate the strength of the correlations between the ADLQ-Brazil and clinical-based related to the ability to perform ADLs (MDS-UPDRS II),[12] gait instability (TUG),[24] manual dexterity (NHPT),[25] balance (Mini-BESTest),[26] apathy (AS),[27] depression (BDI),[28] fatigue (MFIS),[29] and quality of life (PDQ-39).[30] These correlations were based on the existing literature.

The ADLQ-Brazil assesses the self-perceived disability of individuals with PD in specific activities.[16] This questionnaire consists of 20 items that measure the level of disability in performing ADLs using a six-level scale. The response options range from "zero" (indicating no difficulty) to "five" (indicating inability to perform).[15] The total score of the ADLQ, obtained by summing all the items, can range from 0 to 100. It demonstrates adequate internal consistency (0.96–0.97) and test-retest reliability (0.63–0.98).[15]

The MDS-UPDRS subsection II is widely recognized as the gold standard for assessing the performance of ADLs.[12] This subsection comprises 13 items, each with five response options (0–4), with results ranging from 0 to 52. It involves various aspects such as speech, chewing, swallowing, gait, and balance.[12] Previous studies have demonstrated the satisfactory reliability (Intraclass Correlation Coefficient, ICC = 0.90) and validity of subsection II when applied to individuals with PD.[12]

The TUG is a measure of the time it takes, in seconds, to complete a series of movements: transitioning from sitting-to-standing, walking in a straight line for 3 meters, returning and transferring from standing to sitting.[24] The TUG demonstrates excellent test-retest reliability (ICC = 0.85) among individuals with PD.

The NHPT is commonly used assessment tool for evaluating hand dexterity function.[25] It involves measuring an individual's ability to place nine pins into a pegboard and then remove them, returning them to their original positions.[25] The dominant hand is evaluated first with two consecutive series, and then for the nondominant hand, also with two consecutive series. In this study, the final score is obtained by calculating the average execution time (in seconds) for each hand.[25] In PD, this test has shown satisfactory reliability (ICC = 0.88 for the dominant hand, and ICC = 0.91 for the nondominant hand) and adequate validity.

The Mini-BESTest is reliable assessment tool for identifying impairments in both static and dynamic balance. It consists of 14 items, each one is scored on a three-point ordinal scale, ranging from zero to two, with a higher score indicating better performance. The total score can range from

0 to 30, as item three is scored separately for the right and left sides. It was translated into Brazilian Portuguese and its measurement properties were analyzed by Maia et al., showing adequate reliability (ICC = 0.95) for the total score when applied to individuals with PD.[26]

The AS consists of 14 questions that aim to explore various aspects of apathetic symptomatology.[27] Each question allows a rating from zero to three, resulting in a total score ranging from 0 to 42. Higher scores indicate a greater severity of symptoms.[27]

The BDI is a widely used self-assessment tool in clinical settings for evaluating depressive symptoms.[28] It consists of 21 sets of statements that assess symptoms and attitudes experienced during the past week. Each question is scored on a scale of zero to three, resulting in a total score ranging from 0 to 63.[28] Higher scores indicate greater severity of depressive symptoms.

The MFIS is a multidimensional measure that assesses the impact of fatigue on physical, cognitive, and psychosocial functions.[29] Comprising of 21 items, each item offers five response options ranging from "never" (0) to "always" (4). The total score is calculated by summing all the item scores. Schiehser et al.[31] validated the scale for individuals with PD, and Lopes et al.[32] conducted a cross-cultural adaptation to Brazilian Portuguese, resulting in an ICC of 0.80 (MFIS-PD/BR). In this study, we used the total MFIS score as an indication of the individual's level of fatigue, with higher scores signifying a greater degree of fatigue.

The PDQ-39 is a well-established and reliable tool for evaluating the quality of life in individuals with PD. The questionnaire comprises 39 items categorized into eight dimensions: mobility (10 items), activities of daily living (6 items), emotional well-being (6 items), stigma (4 items), social support (3 items), cognition (4 items), communication (3 items) and body discomfort (3 items).[30] Each item is scored on a scale from 0 to 4, with 0 representing "never"; 1 for "occasionally"; 2 for "sometimes"; 3 for "frequently," and 4 for "always." The total score ranges from 0 (no problem) to 100 (maximum level of problems), with lower scores indicating a poorer perception of quality of life.[30] The Brazilian Portuguese version of the PDQ-39 was validated by Carod-Artal et al.[33], who showed its satisfactory reliability (ICC = 0.86) and validity in assessing the quality of life among individuals with PD in Brazil. In this study, we used the total score derived from summing all the questionnaire items.

Data normality was assessed using the Kolmogorov-Smirnov. The data were expressed as absolute values and percentages, mean and standard deviation (SD), or median and interquartile range (IQR, represented as Q1-Q3).

Concurrent validity was assessed by the agreement between face-to-face and telephone-based applications of the ADLQ-Brazil. The mean difference (MD) between face-to-face and telephone-based administration was calculated according to the 95% confidence interval (95%CI) to investigate concurrent validity.[22] ICC[21] was calculated to investigated the agreement between the ADLQ-Brazil total scores obtained by face-to-face and telephone-based administra-

tion, values less than 0.5, between 0.5 and 0.75, between 0.75 and 0.9, and greater than 0.90 are indicative of poor, moderate, good, and excellent reliability, respectively. Weighted kappa statistics (κw) was used to investigated the agreement between the individual items of the ADLQ-Brazil. Kappa coefficients were interpreted as follows: weak (κ ≤ 0.19), fair (κ ranging from 0.20 to 0.39), moderate (κ ranging from 0.40 to 0.59), good (κ ranging from 0.60 to 0.79), and almost perfect (κ > 0.80). Furthermore, a Bland-Altman plot was utilized to visually demonstrate the agreement between sessions, depicting the mean differences and the limits of agreement (LA). The 95%CI for LA was determined as follows: 95%CI for LA = mean difference (d) ± 1.96 * SD.

Construct validity was evaluated by testing hypotheses.[21] Based upon previous findings,[8,10,15] the following hypotheses were formulated: the correlations between the ADLQ-Brazil and the ability to perform ADLs and clinical-based measures would demonstrate a positive and moderate to excellent association. The hypotheses suggested that there is a positive correlation between the ADLQ and the MDS-UPDRS II, TUG, TUG dual-task, NHPT for both sides, AS, BDI, MFIS, and PDQ-39. Additionally, there is an expected negative correlation between ADLQ and Mini-BESTest. The Spearman correlation coefficients were calculated; rho ≥ 0.31 was considered satisfactory. To determine the adequacy of construct validity, it was considered satisfactory if more than 75% of the hypotheses were confirmed.

Statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS, Inc. Chicago, IL, USA) version 15.0, and the VassarStats website to calculate the Kappa coefficient. Graphs were created using the jamovi (jamovi project, Sydney, Australia) software. A significance level < 0.05 was adopted for all analyses.

RESULTS

There were 50 participants with PD, 30 men, with a mean age of 68 years (SD = 9.5) and time since the onset of the symptoms of 7.5 (IQR = 4–12) years, all of whom were evaluated and underwent all procedures. The descriptive data are summarized in ►**Table 1**.

Concurrent validity
No significant differences were observed in the average scores between face-to-face and telephone-based administration of the ADLQ-Brazil. The ICC was calculated to be 0.997 (95%CI = 0.994–0.998, p < 0.001), indicating a high level of agreement. The majority of individual items exhibited perfect agreement (k > 0.80), with one item having perfect agreement (k = 1). The data are presented in ►**Table 2**.

The Bland-Altman plot (►**Figure 1**) illustrates a comparison between the mean differences obtained from two evaluation sessions: face-to-face and telephone-based. The plot demonstrated a symmetrical distribution around the mid-line, indicating a lack of bias. Additionally, no systematic errors were observed in the total scores obtained on both occasions, and the mean difference was not statistically significant from zero.

Table 1 Demographic and clinical characterization of the study participants

Variable		N = 50
Age (years), mean ± SD (min-max)		68 ± 9.5 (45–88)
Sex (male), n (%)		30 (60)
Education (years), median (Q1-Q3)		9 (5–12)
MMSE (0–30), median (Q1-Q3)		26 (24–29)
Marital status, n (%)	Single	8 (16)
	Married	26 (52)
	Divorced	9 (18)
	Widower	9 (18)
Time of symptoms (years), median (Q1-Q3)		9 (5–13)
Time since diagnosis (years), median (Q1-Q3)		7.5 (4–12)
PD onset side (left), n (%)		21 (42)
Use of levodopa (yes), n (%)		48 (96)
Hoehn and Yahr scale, median (Q1-Q3)		2 (1–2)
MDS-UPDRS subsection III, median (Q1-Q3)		29.5 (18–49)
Tremor-dominant phenotype, n (%)		6 (12)
Postural instability and gait difficulty phenotype, n (%)		41 (82)
Indeterminate phenotype, n (%)		3 (6)

Abbreviations: MDS-UPDRS, Movement Disorder Society-Sponsored Revision of the Unified Parkinson Disease Rating Scale; MMSE, Mini-Mental State Examination; PD, Parkinson's disease; Q, quartile; SD, standard deviation.

Table 2 The Kappa coefficient values for the items in the Activities of Daily Living Questionnaire (ADLQ-Brazil)

Item	Kappa coefficient values
1. Getting in/out of bed	0.9677
2. Turning over in bed	0.9461
3. Sitting/standing up from the floor	0.9674
4. Sitting/standing up from a chair	0.9348
5. Get dressed	0.9236
6. Staying upright	0.9093
7. Having a bath	0.9678
8. Using the toilet	1.0000*
9. Writing	0.9175
10. Using a spoon or fork	0.8774
11. Swallowing	0.8991
12. Talking	0.8963
13. Walking	0.9806
14. Taking the first step	0.9427
15. Turning around	0.8936
16. Moving an object	0.9591
17. Going up/down the stairs	0.9400
18. Crossing the street	0.9821
19. Getting in/out of a car	0.9540
20. Getting in/out of a subway	0.9724

Note: *There were no disagreements.

Construct validity

►**Table 3** presents significant positive correlations between the total score of the ADLQ-Brazil and the total scores of clinical-based measures MDS-UPDRS II ($r_s = 0.891$), TUG ($r_s = 0.857$), TUG dual task ($r_s = 0.856$), NHPT more ($r_s = 0.750$) and less ($r_s = 0.615$) affected sides, AS ($r_s = 0.614$), BDI ($r_s = 0.693$), MFIS ($r_s = 0.511$), and PDQ-39 ($r_s = 0.825$). Additionally, a significant negative correlation was observed between the ADLQ-Brazil total score and Mini-BESTest total score ($r_s = -0.861$). These findings validate 100% of the pre-determined hypotheses.

DISCUSSION

The aim of this study was to investigate construct validity and concurrent validity of the ADLQ-Brazil in individuals with PD. Our findings indicate that the telephone-based application of the ADLQ-Brazil is a valid tool for assessing patients' ability to perform ADLs. The scores obtained though the telephone-based assessment did not differ significantly from those obtained through face-to-face, and there was a high level of agreement between the total scores and
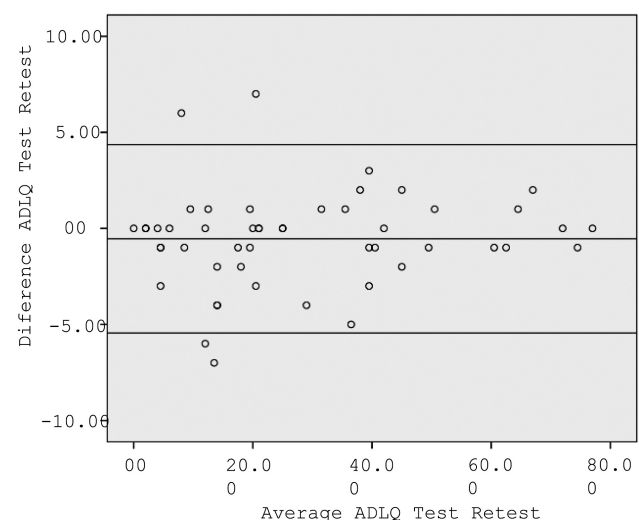

Figure 1 The Bland-Altman concordance graph illustrates the test-retest scores of ADLQ-Brazil (n = 50). The x-axis represents the average scores obtained from both the initial test and the subsequent retest, while the y-axis indicates the difference between the scores obtained in the first (test) and second (retest) application of the ADLQ-Brazil.

Table 3 The ADLQ construct validity hypothesis test with the expected and observed outcomes ($n = 50$)

Hypothesis	Expected value	Observed value*	Confirmed
1. A moderate to strong positive correlation between the ADLQ and the MDS-UPDRS II is expected.	$r = 0.31–0.99$	$r_s = 0.891$	Yes
2. A moderate to strong positive correlation between the ADLQ and the TUG is expected.	$r = 0.31–0.99$	$r_s = 0.857$	Yes
3. A moderate to strong positive correlation between the ADLQ and the dual-task TUG is expected.	$r = 0.31–0.99$	$r_s = 0.856$	Yes
4. A moderate to strong positive correlation between the ADLQ and the NHPT (most affected side) is expected.	$r = 0.31–0.99$	$r_s = 0.750$	Yes
5. A moderate to strong positive correlation between the ADLQ and the NHPT (less affected side) is expected.	$r = 0.31–0.99$	$r_s = 0.615$	Yes
6. A moderate to strong negative correlation between the ADLQ and the Mini-BESTest is expected.	$r = 0.31–0.99$	$r_s = -0.861$	Yes
7. A moderate to strong positive correlation between the ADLQ and the apathy scale is expected.	$r = 0.31–0.99$	$r_s = 0.614$	Yes
8. A moderate to strong positive correlation between the ADLQ and the BDI is expected.	$r = 0.31–0.99$	$r_s = 0.693$	Yes
9. A moderate to strong positive correlation between the ADLQ and the MFIS is expected.	$r = 0.31–0.99$	$r_s = 0.511$	Yes
10. A moderate to strong positive correlation between the ADLQ and the PDQ-39 is expected.	$r = 0.31–0.99$	$r_s = 0.825$	Yes

Abbreviations: ADLQ, Activities of Daily Living Questionnaire; BDI, Beck Depression Inventory; MDS-UPDRS, Movement Disorder Society-Sponsored Revision of the Unified Parkinson Disease Rating Scale; MFIS, Modified Fatigue Impact Scale; Mini-BESTest, Mini- Balance Evaluation Systems Test; NHPT, Nine Hole Peg Test; PDQ-39, Parkinson Disease Quality of Life Questionnaire; TUG, Timed Up and Go. Note: Spearman rank correlation coefficients ($p < 0.001$) were calculated for all hypotheses.

individual items. Furthermore, this study has shown adequate construct validity. These values will facilitate a more precise interpretation of ADLQ-Brazil scores in future studies and clinical settings.

The ADLQ is designed to assess the ability of individuals with PD to perform ADLs. It includes items that focus on specific activities commonly impacted by the symptoms of this disease.[15] The activities evaluated by this questionnaire reflect real-life situations and require skills such as balance, manual dexterity, gait stability, and cognitive functioning. It is worth noting that our study is the first to validate the use of this questionnaire over the telephone and, thus, there is currently no existing research to support our specific findings.

This study has demonstrated a significant correlation between the ADLQ-Brazil and various measures related to the ability to perform ADLs, including mobility, manual dexterity, balance, apathy, depression, fatigue, and quality of life. These findings confirmed all of the predetermined hypotheses. Consequently, based on the COSMIN criteria, it has demonstrated sufficient validity by meeting the established expectations. The correlations between the ADLQ and the MDS-UPDRS II can be attributed to the construct being evaluated, as both instruments assess patients' ability to perform ADLs. Additionally, they share certain items such as dressing, writing, walking, and turning over in bed. This correlation was also observed in a study by Lee et al.,[15] further supporting our findings. Similar correlations between the ADLs and measures of balance impairment and

manual dexterity have been reported in other studies, demonstrating that individuals who struggle to maintain balance also have more difficulty with ADLs.[35] These associations may be attributed to dopaminergic depletion, which impairs automatic motor function and leads to increased cognitive demand and a higher risk of falls, particularly in dual task activities.[36] Other potential factors contributing to these correlations include bradykinesia, reduced strength and torque, and apraxia.[37]

In relation to non-motor symptoms in PD, the existing literature supports the findings of this study, which showed a correlation between apathy, depression, and fatigue, and their impact on the ability to perform ADLs. Wen et al. have found an inverse correlation between apathy and brain metabolism in several regions, including the striatum, cerebellum, prefrontal cortex, temporal lobe, parietal lobe, and limbic areas.[38] These regions are known to be associated with executive functions and are affected by PD.[39] Additionally, fatigue in this disease results from the interaction of several trigger factors, such as poor night's sleep and a busy day,[40] and often limits the ability of patients with PD to work, as well as to participate in social activities, hobbies, and physical activity.[39] Loss of dopaminergic, noradrenergic, and serotoninergic neurons contributes to depression and cognitive decline,[3] which has a detrimental impact on ADLs.[39]

Moreover, the ADLQ is a strong predictor of quality of life among patients with PD.[15] As the severity of the disease increases, it becomes positively associated with depression

accompanied by other non-motor symptoms such as cognitive decline, sleep disturbances, fatigue, apathy, and pain, all of which significantly affect both quality of life and patients' ability to perform ADLs.[40]

One significant strength of this study is its groundbreaking examination of the telephone-based concurrent validity of the ADLQ-Brazil. Furthermore, the study adhered to the COSMIN criteria, an internationally recognized guideline that ensures research quality. However, it is important to acknowledge that the sample size, while satisfactory, is not extensive enough. Therefore, further longitudinal studies are necessary to explore the additional measurement properties of the ADLQ-Brazil.

In conclusion, the findings of this study demonstrated that the ADLQ-Brazil exhibits acceptable concurrent validity when administered via telephone. Additionally, this instrument shows appropriate construct validity and will facilitate a more precise interpretation of the questionnaire scores in future studies and clinical settings. Considering the crucial role that the ability to perform ADLs plays in maintaining the independence of PD patients and its correlations with disease progression, the use of the ADLQ-Brazil has the potential to enhance assessments in both clinical and research settings.

Authors' Contributions
RMSR: conceptualization, data curation, formal analysis, investigation, visualization, writing – original draft; IFF: conceptualization, data curation, formal analysis, methodology, project administration, supervision, validation, visualization, writing – original draft, writing – review & editing; PLS: conceptualization, data curation, formal analysis, methodology, project administration, supervision, validation, visualization, writing – original draft, writing – review & editing.

Conflict of Interest
The authors have no conflict of interest to declare.

References

1 Dorsey ER, Sherer T, Okun MS, Bloem BR. The Emerging Evidence of the Parkinson Pandemic. J Parkinsons Dis 2018;8(s1):S3–S8. Doi: 10.3233/JPD-181474

2 Simon DK, Tanner CM, Brundin P. Parkinson Disease Epidemiology, Pathology, Genetics, and Pathophysiology. Clin Geriatr Med 2020;36(01):1–12. Doi: 10.1016/j.cger.2019.08.002

3 Braak H, Del Tredici K, Rüb U, de Vos RA, Jansen Steur EN, Braak E. Staging of brain pathology related to sporadic Parkinson's disease. Neurobiol Aging 2003;24(02):197–211. Doi: 10.1016/s0197-4580(02)00065-9

4 Leite Silva ABR, Gonçalves de Oliveira RW, Diógenes GP, et al. Premotor, nonmotor and motor symptoms of Parkinson's Disease: A new clinical state of the art. Ageing Res Rev 2023;84:101834. Doi: 10.1016/j.arr.2022.101834

5 Parry R, Buttelli O, Riff J, et al. "The whole perimeter is difficult": Parkinson's disease and the conscious experience of walking in everyday environments. Disabil Rehabil 2019;41(23):2784–2791. Doi: 10.1080/09638288.2018.1479779

6 Iucksch DD, Siega J, Leveck GC, de Araujo LB, Mélo TR, Israel VL. Improvement of Balance, Motor Aspects, and Activities of Daily Living in Parkinson's Disease after a Sequential Multimodal Aquatic- and Land-Based Intervention Program. Rehabil Res Pract 2023;2023:2762863. Doi: 10.1155/2023/2762863

7 Siciliano M, Trojano L, Santangelo G, De Micco R, Tedeschi G, Tessitore A. Fatigue in Parkinson's disease: A systematic review and meta-analysis. Mov Disord 2018;33(11):1712–1723. Doi: 10.1002/mds.27461

8 Bouça-Machado R, Fernandes A, Ranzato C, Beneby D, Nzwalo H, Ferreira JJ. Measurement tools to assess activities of daily living in patients with Parkinson's disease: A systematic review. Front Neurosci 2022;16:945398. Doi: 10.3389/fnins.2022.945398

9 Bloem BR, Okun MS, Klein C. Parkinson's disease. Lancet 2021;397 (10291):2284–2303. Doi: 10.1016/S0140-6736(21)00218-X

10 Shulman LM, Armstrong M, Ellis T, et al. Disability Rating Scales in Parkinson's Disease: Critique and Recommendations. Mov Disord 2016;31(10):1455–1465. Doi: 10.1002/mds.26649

11 Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. Gerontologist 1969;9(03):179–186

12 Goetz CG, Tilley BC, Shaftman SR, et al; Movement Disorder Society UPDRS Revision Task Force. Movement Disorder Society-sponsored revision of the Unified Parkinson's Disease Rating Scale (MDS-UPDRS): scale presentation and clinimetric testing results. Mov Disord 2008;23(15):2129–2170. Doi: 10.1002/mds.22340

13 Hobson JP, Edwards NI, Meara RJ. The Parkinson's Disease Activities of Daily Living Scale: a new simple and brief subjective measure of disability in Parkinson's disease. Clin Rehabil 2001;15(03):241–246. Doi: 10.1191/026921501666767060

14 Fahn S, Elton RL. UPDRS Program MembersUnified Parkinson's disease rating scale. In S. Fahn, C. D. Marsden, M. Goldstein, & D. B. Calne (Eds.), Recent developments in Parkinson's disease (Vol. 2). New Jersey: Macmillan Healthcare Information; 1987

15 Lee SY, Kim SK, Cheon SM, Seo JW, Kim MA, Kim JW. Activities of daily living questionnaire from patients' perspectives in Parkinson's disease: a cross-sectional study. BMC Neurol 2016;16:73. Doi: 10.1186/s12883-016-0600-9

16 Alves WLT, Faria-Fortini I, Galvão ACDR, Cardoso FEC, Scalzo PL. Cross-cultural adaptation of the Activities of Daily Living Questionnaire-Brazil in Parkinson's disease. Arq Neuropsiquiatr 2021;79(12):1101–1108. Doi: 10.1590/0004-282X-ANP-2020-0396

17 Monaghesh E, Hajizadeh A. The role of telehealth during COVID-19 outbreak: a systematic review based on current evidence. BMC Public Health 2020;20(01):1193. Doi: 10.1186/s12889-020-09301-4

18 Stellefson M, Paige SR, Tennant B, et al. Reliability and Validity of the Telephone-Based eHealth Literacy Scale Among Older Adults: Cross-Sectional Survey. J Med Internet Res 2017;19(10):e362. Doi: 10.2196/jmir.8481

19 Hughes AJ, Daniel SE, Kilford L, Lees AJ. Accuracy of clinical diagnosis of idiopathic Parkinson's disease: a clinico-pathological study of 100 cases. J Neurol Neurosurg Psychiatry 1992;55(03):181–184. Doi: 10.1136/jnnp.55.3.181

20 Bertolucci PH, Brucki SM, Campacci SR, Juliano Y. O Mini-Exame do Estado Mental em uma população geral. Impacto da escolaridade. Arq Neuropsiquiatr 1994;52(01):1–7

21 Prinsen CAC, Mokkink LB, Bouter LM, et al. COSMIN guideline for systematic reviews of patient-reported outcome measures. Qual Life Res 2018;27(05):1147–1157. Doi: 10.1007/s11136-018-1798-3

22 Portney LG, Watkins MP. Foundantions of Clinical Research: Applications to practice. 3rd ed. Upper Saddle River, NJ: Prentice-Hall; 2009

23 Terwee CB, Prinsen CAC, Chiarotto A, et al. COSMIN methodology for evaluating the content validity of patient-reported outcome measures: a Delphi study. Qual Life Res 2018;27(05):1159–1170. Doi: 10.1007/s11136-018-1829-0

24 Morris S, Morris ME, Iansek R. Reliability of measurements obtained with the Timed "Up & Go" test in people with Parkinson disease. Phys Ther 2001;81(02):810–818. Doi: 10.1093/ptj/81.2.810

25 Proud E, Morris ME, Bilney B, et al. Hand dexterity assessment in Parkinson's disease: construct validity of the 9-Hole peg test for the more affected hand. Disabil Rehabil 2021;43(26):3834–3838. Doi: 10.1080/09638288.2020.1754474

26 Maia AC, Rodrigues-de-Paula F, Magalhães LC, Teixeira RL. Cross-cultural adaptation and analysis of the psychometric properties of the Balance Evaluation Systems Test and MiniBESTest in the elderly and individuals with Parkinson's disease: application of the Rasch model. Braz J Phys Ther 2013;17(03):195–217. Doi: 10.1590/s1413-35552012005000085

27 Leentjens AF, Dujardin K, Marsh L, et al. Apathy and anhedonia rating scales in Parkinson's disease: critique and recommendations. Mov Disord 2008;23(14):2004–2014. Doi: 10.1002/mds.22229

28 Schrag A, Barone P, Brown RG, et al. Depression rating scales in Parkinson's disease: critique and recommendations. Mov Disord 2007;22(08):1077–1092. Doi: 10.1002/mds.21333

29 Friedman JH, Alves G, Hagell P, et al. Fatigue rating scales critique and recommendations by the Movement Disorders Society task force on rating scales for Parkinson's disease. Mov Disord 2010;25(07):805–822. Doi: 10.1002/mds.22989

30 Martinez-Martin P, Jeukens-Visser M, Lyons KE, et al. Health-related quality-of-life scales in Parkinson's disease: critique and recommendations. Mov Disord 2011;26(13):2371–2380. Doi: 10.1002/mds.23834

31 Schiehser DM, Ayers CR, Liu L, Lessig S, Song DS, Filoteo JV. Validation of the Modified Fatigue Impact Scale in Parkinson's disease. Parkinsonism Relat Disord 2013;19(03):335–338. Doi: 10.1016/j.parkreldis.2012.11.013

32 Lopes J, AraÚjo HAGO, Smaili SM. Fatigue in Parkinson's disease: Brazilian validation of the modified fatigue impact scale. Arq Neuropsiquiatr 2020;78(08):473–480. Doi: 10.1590/0004-282X20200033

33 Carod-Artal FJ, Martinez-Martin P, Vargas AP. Independent validation of SCOPA-psychosocial and metric properties of the PDQ-39 Brazilian version. Mov Disord 2007;22(01):91–98. Doi: 10.1002/mds.21216

34 Koo TK, Li MY. A Guideline of Selecting and Reporting Intraclass Correlation Coefficients for Reliability Research. J Chiropr Med 2016 Jun;15(02):155–63. doi: 10.1016/j.jcm.2016.02.012. Epub 2016 Mar 31. Erratum in: J Chiropr Med. 2017 Dec;16(04):346. PMID: 27330520; PMCID: PMC4913118

35 Mehdizadeh M, Martinez-Martin P, Habibi SA, et al. The Association of Balance, Fear of Falling, and Daily Activities With Drug Phases and Severity of Disease in Patients With Parkinson. Basic Clin Neurosci 2019;10(04):355–362. Doi: 10.32598/bcn.9.10.295

36 Gilat M, Bell PT, Ehgoetz Martens KA, et al. Dopamine depletion impairs gait automaticity by altering cortico-striatal and cerebellar processing in Parkinson's disease. Neuroimage 2017;152:207–220. Doi: 10.1016/j.neuroimage.2017.02.073

37 Foki T, Pirker W, Geißler A, et al. Finger dexterity deficits in Parkinson's disease and somatosensory cortical dysfunction. Parkinsonism Relat Disord 2015;21(03):259–265. Doi: 10.1016/j.parkreldis.2014.12.025

38 Wen MC, Chan LL, Tan LC, Tan EK. Depression, anxiety, and apathy in Parkinson's disease: insights from neuroimaging studies. Eur J Neurol 2016;23(06):1001–1019. Doi: 10.1111/ene.13002

39 Christopher L, Marras C, Duff-Canning S, et al. Combined insular and striatal dopamine dysfunction are associated with executive deficits in Parkinson's disease with mild cognitive impairment. Brain 2014;137(Pt 2):565–575. Doi: 10.1093/brain/awt337

40 Zhao N, Yang Y, Zhang L, et al. Quality of life in Parkinson's disease: A systematic review and meta-analysis of comparative studies. CNS Neurosci Ther 2021;27(03):270–279. Doi: 10.1111/cns.13549