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Research Article

Assessing Falls in Parkinson's Disease: The Turkish Adaptation of the Parkinson Disease Falls Questionnaire

Parkinson Hastalığında Düşmelerin Değerlendirilmesi: Parkinson Hastalığı Düşme Anketinin Türkçeye Uyarlanması

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ABSTRACT

Purpose: The Parkinson's Disease Falls Questionnaire (PDF-Q) was developed to systematically assess fall history and associated factors in Parkinson' Disease (PD). This study aimed to adapt the PDF-Q for the Turkish population. **Material and Methods:** A total of 51 individuals diagnosed with PD (aged 40–80) were included. The translation and cross-cultural adaptation of the questionnaire were conducted according to standard guidelines. The test-retest reliability of the Turkish PDF-Q was assessed with a 10-day interval. The Intraclass Correlation Coefficient (ICC) and Kappa statistics were used for analysis. **Results:** Questions assessing the fall experiences in the past 12 months (κ=0.564) and near-falls (κ=0.551) demonstrated moderate agreement, while questions regarding the location of indoor falls (κ=0.848) and near-falls (κ=0.801) showed strong agreement. The ICC values for the number of indoor (0.957) and outdoor (0.939) falls indicated strong agreement, whereas the ICC values for the number of indoor (0.987) and outdoor (0.993) near-falls also demonstrated strong agreement. **Discussion:** The Turkish adaptation of the PDF-Q demonstrated good test-retest reliability and currently stands as the only available validated tool for assessing fall history and circumstances in individuals with PD in Turkish. Although its reliability against other tools has not yet been tested, it can still be effectively used in clinical and research settings to assess falling and inform preventive strategies.

Keywords: Parkinson Disease; Accidental Falls; Parkinson's Disease Falls Questionnaire; Reliability Study.

ÖZ

Amaç: Parkinson Hastalığı Düşme Anketi (PDF-Q), Parkinson Hastalığında (PD) düşme geçmişini ve ilişkili faktörleri sistematik olarak değerlendirmek için geliştirilmiştir. Bu çalışmanın amacı PDF-Q'yu Türk toplumuna uyarlamaktır. **Gereç ve Yöntem**: PD tanısı konmuş toplam 51 birey (yaşları 40-80 arasında) çalışmaya dahil edildi. Anketin çevirisi ve kültürler arası uyarlaması standart kılavuzlara göre yapıldı. Türkçe PDF-Q'nun test-tekrar test güvenilirliği 10 günlük bir aralıkla değerlendirildi. Analiz için Sınıf İçi Korelasyon Katsayısı (ICC) ve Kappa istatistikleri kullanıldı. **Sonuçlar**: Geçtiğimiz 12 aydaki düşme deneyimlerini (κ=0,564) ve tökezlemeleri (κ=0,551) değerlendiren sorular orta düzeyde uyum gösterirken, iç mekanda düşmelerin yeri (κ=0,848) ve tökezleme durumlarını (κ=0,801) değerlendiren sorular güçlü uyum gösterdi. Kapalı alanda (0,957) ve açık alanda (0,939) düşme sayısı için ICC değerleri güçlü bir uyum gösterirken, kapalı alanda (0,987) ve açık alanda (0,993) tökezleme sayısı için ICC değerleri de güçlü bir uyum gösterdi. **Tartışma**: PDF-Q'nun Türkçe uyarlaması, PD'li bireylerde düşme geçmişini ve koşullarını değerlendirmek için güvenilir bir araçtır. Bu doğrulanmış anket, klinik ortamlarda ve araştırmalarda düşme riskini değerlendirmek ve Türk PD hastaları için özel olarak tasarlanmış önleyici stratejiler geliştirmek için etkili bir şekilde kullanılabilir.

Anahtar Kelimeler: Parkinson Hastalığı; Kazara Düşmeler; Parkinson Hastalığı Düşme Anketi; Validasyon Çalışması.

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Parkinson's disease (PD) is one of the most observed neurodegenerative disorders, characterized by primary motor symptoms such as tremors, rigidity, bradykinesia, and postural instability (Balestrino & Schapira, 2020; Canning, Allen, Nackaerts et al., 2020). These motor impairments can significantly complicate daily activities, such as walking, dressing, and eating, even in the early stages of the disease. As the disease progresses, more complex motor symptoms, such as freezing of gait (FOG), may emerge. The PD negatively impacts the ability to perform movements automatically, leading to impairments in walking and balance (Canning et al., 2020; Del Din, Godfrey, Galna et al., 2016). The balance impairments observed in Parkinson's disease can lead to functional limitations, as well as adverse events such as falls and fractures (Inglés, Aguilar-Rodríguez, Sempere-Rubio et al., 2020; Mak & Wong-Yu, 2019).

Falls are defined as unintentional events caused by a disruption in balance, leading to the body making contact with solid surfaces such as the ground. They represent a significant health concern, particularly for individuals over the age of 65, and are more prevalent among those with PD (Murueta-Goyena, Muiño & Gómez-Esteban, 2024). The risk of falls in individuals with Parkinson's disease is two to four times higher compared to adults of the same age group. Falls in people with Parkinson's disease are complex and influenced by multiple factors, leading to a decrease in quality of life, higher caregiver burden, reduced independence, and a shorter life expectancy (Wales, Moore, Naisby et al., 2024). Understanding the particular characteristics and outcomes of falls among individuals with PD is crucial, as this knowledge can help develop more effective fall prevention strategies and reduce associated risk factors (Harris, Duckham, Daly et al., 2021).

Current fall research predominantly employs semi-structured interviews or self-reported fall diaries (Lamont, Morris, Menz et al., 2017; Pelicioni, Menant, Latt et al., 2019). However, these methods are costly, time-consuming, and associated with high attrition rates, requiring continuous resource allocation (Hunter, Rochester, Morris et al., 2018). As an alternative, questionnaires can be used to collect fall-related information, yet they have certain limitations, such as recall bias (Diefenbach, 2009).

Various questionnaires have been used to assess fall risk and circumstances in community-dwelling older adults (Crenshaw, Bernhardt, Achenbach et al., 2017; Obrist, Rogan & Hilfiker, 2016; Sanders, Lim, Stuart et al., 2017), but most of them lack test–retest reliability data and are not specific to Parkinson's disease. Moreover, they often fail to capture near-falls, which are known predictors of future falls in people with Parkinson Disease (Lindholm, Hagell, Hansson et al., 2015). Standardized tools like the UPDRS and Berg Balance Scale offer a general idea of motor impairment or balance but do not directly reflect real fall events or their consequences (Frank, Bendig, Finkbeiner et al., 2022). Recent studies have also shown their limited accuracy in predicting falls in older adults. Therefore, there is a clear need for practical and PD-specific tools that can reliably assess both falls and near-falls (Park, 2018).

General PD questionnaires may fail to assess disease-specific factors and near-fall events adequately. However, a history of near-falls is a significant predictor of future falls. Therefore, a specialized questionnaire is needed to reliably measure falls and near-fall incidents in individuals with PD (Harris et al., 2021). Validating and assessing the reliability of such assessment tools within the appropriate cultural and linguistic context is essential (Basterra, del, Trumbull, et al., 2011). A comprehensive evaluation of falls in Parkinson's patients is essential for improving their quality of life and preventing fall-related complications. In this context, Harris et al. developed the PD Falls Questionnaire (PDF-Q) to systematically assess fall history and associated factors in individuals with PD (Harris et al., 2021).

This study aims to evaluate the validity and reliability of the Turkish version of the PDF-Q and to determine its suitability as an assessment tool for Turkish-speaking Parkinson's patients. The findings will contribute to a more accurate assessment of fall risk in PD patients and enhance the effectiveness of this tool in clinical practice.

MATERIAL AND METHODS

Sample Size and Ethics

The PDF-Q tool does not provide a total score calculation. Therefore, its relationship with other scales and/or questionnaires could not be evaluated. In the original study where the questionnaire was developed, 41 patients and five caregivers were included. In our study, 51 individuals diagnosed with Parkinson's disease were assessed. The questionnaire was administered to all patients with a test-retest procedure. Additionally, a post-hoc power analysis was conducted using G*Power software (version 3.1.9.7) based on the lowest ICC value obtained from continuous items in the questionnaire (ICC = 0.939, n = 51, $\alpha = 0.05$). The statistical power achieved was >0.99, indicating that the sample size was sufficient to detect the observed reliability effect.

Ethical approval for the study was obtained from the Scientific Research and Publication Ethics Committee of Istanbul Medeniyet University. Patients were verbally informed before participating, and their written consent

was obtained. The study was conducted by the Declaration of Helsinki.

Participants

The study included individuals aged 40–80 years who had been diagnosed with Parkinson's disease, had a history of falls or tripping within the past twelve months, and were in stages 1–4 according to the Hoehn & Yahr classification. Patients with a diagnosis of secondary parkinsonism, those with a concomitant neurological disorder, or those with an orthopedic condition preventing ambulation were excluded from the study.

Translation and Cross-Cultural Adaptation

The linguistic equivalence and cultural adaptation of the PDF-Q were performed following the internationally recognized guidelines for cross-cultural adaptation of self-report measures proposed by Beaton et al. (2000). The process was conducted in five steps:

1. Forward Translation: Two independent bilingual translators translated the questionnaire from English into Turkish. One was an academic physiotherapist specialized in Parkinson's disease rehabilitation, and the other was an academic from the Department of English Language Studies with expertise in linguistics and translation.
2. Synthesis: A third researcher, also a physiotherapist with experience in neurorehabilitation, reviewed both translations and synthesized them into a single preliminary version.
3. Back Translation: The synthesized version was translated back into English by the two bilingual physiotherapists involved in the initial translation due to limited availability of independent translators with clinical expertise.
4. Expert Committee Review: The back-translated version was sent to the original author of the PDF-Q for review and confirmation of conceptual and semantic equivalence.
5. Pre-Testing: A pilot test with 10 patients diagnosed with Parkinson's disease was conducted to assess comprehensibility and clarity. Patient feedback was used to finalize the Turkish version of the PDF-Q.

This methodology ensured conceptual, semantic, and experiential equivalence between the original and adapted versions of the questionnaire (Beaton et al., 2000).

Assessments

Prior to the assessment, permission was obtained via email from the scale developers. All assessments were conducted face-to-face with the patients in the physical therapy department of a private hospital. A minimum interval of 10 days was maintained between the test and retest evaluations.

Demographic Data Form: Participants' age, sex, height, weight, disease duration, educational level, presence of freezing and tremor, and Hoehn & Yahr stages were recorded.

Parkinson's Disease Falls Questionnaire (PDF-Q): The questionnaire was developed by Harris et al. in 2021 to assess fall history in patients with Parkinson's disease comprehensively (Harris et al., 2021). The PDF-Q consists of six sections and a total of 33 items: the Consent Section (2 items), in which participants confirm their willingness to complete the questionnaire; the Demographic and Disease Status Section (7 items), which gathers information on demographics and disease-related characteristics; the Fall History Section (1 item), which inquires about the presence of a fall history; the Tripping Incidents and Consequences Section (5 items), which assesses tripping events and their outcomes; the Fall Circumstances and Consequences Section (10 items), which evaluates where, how, and under what conditions fall occurred; and the Injury-Related Falls Section (8 items), which examines falls resulting in injury. The questionnaire does not provide a total score; each section is analyzed independently.

Statistical Analysis

In the study, continuous variables were expressed as mean and standard deviation, while categorical variables were presented as frequencies and percentages. Two different analyses were used to calculate the reliability coefficient between test-retest measurements. The Intraclass Correlation Coefficient (ICC) was used to assess the reliability of items containing continuous variables, whereas the Kappa analysis was applied for categorical variables. All analyses were conducted using the Statistical Package for Social Sciences (SPSS v26) software. A value of $p<0.05$ was considered statistically significant.

RESULTS

A total of fifty-one individuals diagnosed with Parkinson's disease were included in this study between April 2024-December 2024 years. The majority of the participants were male 60.80% (n=31). The mean age of the participants was 64.66 years. The tremor was observed in 86.30% (n=44) of the participants, while 58.80% (n=30) reported a history of freezing. The demographic and clinical characteristics of the participants are presented in Table 1.

The PDF-Q-Turkish version was retested on 51 patients with Parkinson's disease to assess the scale's temporal consistency and reliability. Kappa agreement values and intraclass correlation coefficient (ICC) were used as basis. The kappa agreement values obtained from the test-retest results of the fall circumstances section of the PDF-Q ranged between 0.564 and 0.848. The ICC values ranged from 0.939 to 0.957 (Table 2).

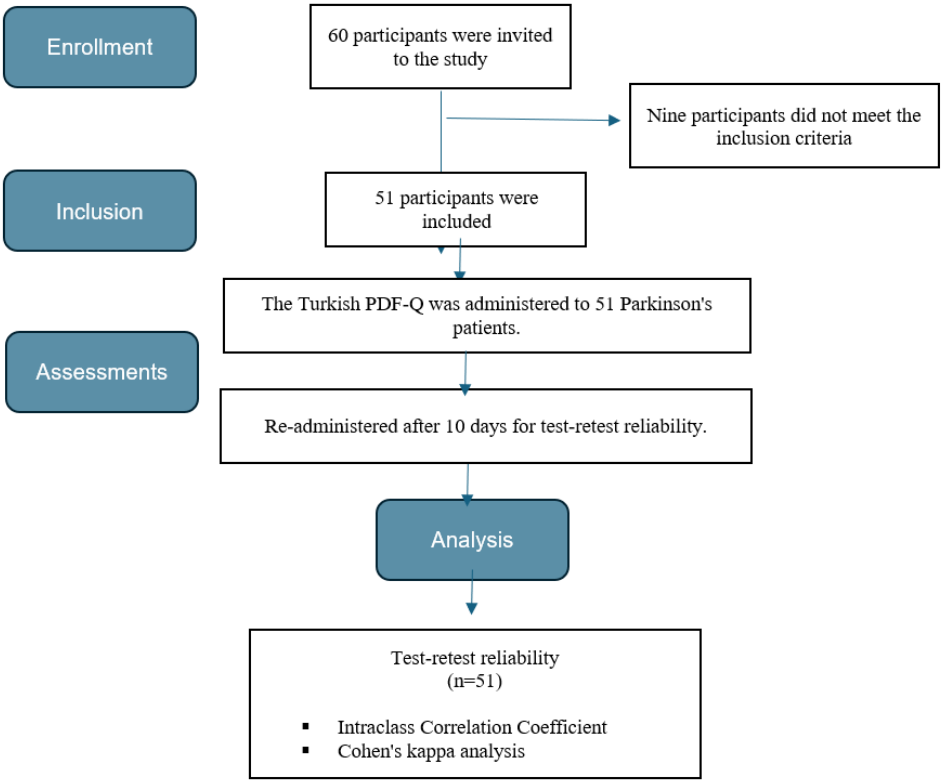

Figure-1. *Flow chart*

Table 1. Demographic characteristics of the Parkinson's disease patients

Characteristics	**Values**
Age (years)	64.66 ± 10.70
Gender n (%)	
Female	20 (39.20)
Male	31 (60.80)
Height (cm)	166.02 ± 8.12
Weight (kg)	76.76 ± 15.63
Duration of Diagnosis (years)	4.52 ± 4.16
Education Levels n (%)	
Primary Education	29 (56.90)
Secondary Education	15 (29.40)
Higher Education	7 (13.70)
Presence of Freezing n (%)	
Yes	30 (58.80)
No	21 (41.20)
Presence of Tremor n (%)	
Yes	44 (86.30)
No	7 (13.70)
Hoehn & Yahr Stage n (%)	
I	6 (11.80)
II	8 (15.70)
III	27 (52.90)
IV	10 (19.60)

Table 2. Results of kappa and interclass correlation statistics for the falls circumstances questions

Fall Questions (N:51)	Test	Retest	Test-Retest Reliability		ICC [%95 CI]
			Kappa	SE	
Have you experienced a fall in the past 12 months? n (%)	44 (86.30)	48 (94.10)	0.564	0.188	-
Number of falls in the past 12 months	4.90 ± 8.61	5.23 ± 9.82	-	-	0.949 [0.954-0.985]
Location of falls in the past 12 months n (%)					
Indoor	22 (50.00)	22 (45.83)	0.848	0.059	-
Outdoor	21 (47.72)	21 (43.75)	0.876	0.056	
Missing Data	1 (2.28)	5 (10.42)	-	-	-
Number of indoor falls in the past 12 months	2.25 ± 4.19	2.41 ± 4.68	-	-	0.957 [0.926-0.975]
Number of outdoor falls in the past 12 months	2.64 ± 4.89	2.78 ± 5.60	-	-	0.939 [0.895-0.964]
Most recent indoor fall circumstances					
Fall 1: Location of Fall					
Kitchen	4 (18.18)	4 (18.18)	0.791	0.067	-
Hallway	4 (18.18)	2 (9.09)			
Living Room	5 (22.73)	5 (22.73)			
Bedroom	1 (4.55)	2 (9.09)			
Bathroom	4 (18.18)	3 (13.64)			
Indoors Stairs	0 (0.00)	1 (4.55)			
In another person's home	4 (18.18)	4 (18.18)			
Other indoors	0 (0.00)	1 (4.55)			
Fall 2: Location of Fall					
Kitchen	2 (11.11)	1 (5.56)	0.824	0.067	-
Hallway	2 (11.11)	2 (11.11)			
Living Room	4 (22.22)	6 (33.33)			
Bedroom	3 (16.67)	1 (5.56)			
Bathroom	5 (27.78)	5 (27.78)			
Indoors Stairs	1 (5.56)	2 (11.11)			
In another person's home	1 (5.56)	1 (5.56)			
Other indoors	0 (0.00)	0 (0.00)			
Missing data	4	4			
Fall 1: Activity During Fall					
Housework	2 (9.09)	1 (4.55)	0.757	0.070	-
Getting out of bed	2 (9.09)	2 (9.09)			
Getting in/out of shower	3 (13.64)	2 (9.09)			
Getting on/off chair	0 (0.00)	1 (4.55)			
Getting on/off toilet	3 (13.64)	3 (13.64)			
Getting up/downstairs	1 (4.55)	0 (0.00)			
Walking between rooms	4 (18.18)	5 (22.73)			
Bending down or turning	6 (27.27)	7 (31.82)			
Other indoors activity	1 (4.55)	1 (4.55)			
Fall 2: Activity During Fall					
Housework	2 (11.11)	1 (5.56)	0.713	0.075	-
Getting out of bed	3 (16.67)	1 (5.56)			
Getting in/out of shower	0 (0.00)	2 (11.11)			
Getting on/off chair	4 (22.22)	1 (5.56)			
Getting on/off toilet	0 (0.00)	1 (5.56)			
Getting up/downstairs	2 (11.11)	1 (5.56)			
Walking between rooms	7 (38.89)	10 (55.56)			
Bending down or turning	0 (0.00)	1 (5.56)			
Missing Data	4	4			
Fall 1: How fall occurred					
Tripped	4 (18.18)	6 (27.27)	0.812	0.066	-
Slipped	3 (13.64)	2 (9.09)			
Freezing of Gait	8 (36.36)	6 (27.27)			
Faint	6 (27.27)	7 (31.82)			
Others	1 (4.55)	1 (4.55)			

Fall 2: How fall occurred					
Tripped	3 (16.67)	4 (22.22)			
Slipped	4 (22.22)	3 (16.67)			
Freezing of Gait	9 (50.00)	9 (50.00)	0.746	0.076	-
Faint	2 (11.11)	2 (11.11)			
Others	0 (0.00)	0 (0.00)			
Missing data	4	4			
Fall 1: Direction of fall					
Forwards	7 (31.82)	11 (50.00)			
Backwards	6 (27.27)	3 (13.64)	0.784	0.069	-
Side (Left)	5 (22.73)	5 (22.73)			
Side (Right)	4 (18.18)	3 (13.64)			
Fall 2: Direction of fall					
Forwards	7 (38.89)	7 (38.89)			
Backwards	5 (27.78)	5 (27.78)	0.785	0.072	-
Side (Left)	2 (11.11)	4 (22.22)			
Side (Right)	4 (22.22)	2 (11.11)			
Missing data	4	4			
Most recent outdoor falls circumstances					
Fall 1: Location of fall					
Garden	3 (15.79)	3 (14.29)			
Pavement	10 (52.63)	12 (57.14)			
Green space/beach	1 (5.26)	0 (0.00)			
Public transport	4 (21.05)	4 (19.05)	0.807	0.071	-
Carpark	1 (5.26)	1 (4.76)			
Other outdoors	0 (0.00)	1 (4.76)			
Missing Data	2	0			
Fall 2: Location of fall					
Garden	1 (5.88)	2 (11.76)			
Pavement	5 (29.41)	7 (41.18)			
Green space/beach	7 (41.18)	6 (35.29)			
Public transport	4 (23.53)	2 (11.76)	0.737	0.076	-
Carpark	0 (0.00)	0 (0.00)			
Other outdoors	0 (0.00)	0 (0.00)			
Missing data	4	4			
Fall 1: Activity undertaken when fell					
Gardening	0 (0.00)	0 (0.00)			
Putting out rubbish	1 (4.76)	2 (9.52)			
Going up/downstairs	1 (4.76)	2 (9.52)			
Getting in/out of the vehicle	5 (23.81)	4 (19.05)	0.803	0.068	-
Walking	11 (52.38)	11 (52.38)			
Exercising	1 (4.76)	0 (0.00)			
Bending or turning	2 (9.52)	2 (9.52)			
Missing data	0	0			
Fall 2: Activity undertaken when fell					
Gardening	0 (0.00)	1 (6.25)			
Putting out rubbish	3 (18.75)	2 (12.50)			
Going up/downstairs	0 (0.00)	1 (6.25)			
Getting in/out of vehicle	2 (12.50)	0 (0.00)	0.701	0.075	-
Walking	8 (50.00)	8 (50.00)			
Exercising	1 (6.25)	1 (6.25)			
Bending or turning	2 (12.50)	3 (18.75)			
Missing data	5	5			
Fall 1: How fall occurred					
Tripped	7 (33.33)	7 (33.33)			
Slipped	2 (9.52)	1 (4.76)			
Freezing of Gait	10 (47.62)	8 (38.10)	0.771	0.071	-
Faint	2 (9.52)	5 (23.81)			
Missing data	0	0			

Fall 2: How fall occurred					
Tripped	6 (35.29)	5 (29.41)			
Slipped	1 (5.88)	2 (11.76)			
Freezing of Gait	7 (41.18)	8 (47.06)	0.736	0.076	-
Faint	3 (17.65)	2 (11.76)			
Missing data	4	4			
Fall 1: Direction of fall					
Forwards	12 (57.14)	11 (55.00)			
Backwards	4 (19.05)	2 (10.00)			
Side (Left)	4 (19.05)	4 (20.00)	0.868	0.059	-
Side (Right)	1 (4.76)	3 (15.00)			
Missing data	0	1			
Fall 2: Direction of fall					
Forwards	10 (62.50)	8 (53.33)			
Backwards	3 (18.75)	5 (33.33)			
Side (Left)	2 (12.50)	1 (6.67)	0.848	0.067	-
Side (Right)	1 (6.25)	1 (6.67)			
Missing data	5	6			

***SE**: Standard Error; **ICC**: Intraclass Correlation Coefficient; **CI**: Confidence Interval*

The kappa agreement values obtained from the test-retest results of the near-falls circumstances section of the PDF-Q ranged between 0.486 and 0.801. The ICC values ranged from 0.981 to 0.993 (Table 3).

The kappa agreement values obtained from the test-retest results of the injurious circumstances section of the PDF-Q ranged from 0.703 to 1.000. The ICC values ranged from 0.611 to 0.759 (Table 4).

Table 3. Results of kappa and interclass correlation statistics for the near-falls circumstances questions

Near-Fall Questions (N:51)	**Test**	**Retest**	**Test-Retest Reliability**		**ICC [%95 CI]**
			Kappa	**SE**	
Have you experienced a near-fall in the past 12 months?; n (%)	49 (96.08)	48 (94.12)	0.551	0.224	-
Number of near-falls in the past 12-months	25.88 ± 24.84	24.82 ± 24.32	-	-	0.981 [0.983-0.994]
Location of near-falls in the past 12 months; n (%)					
Indoor	39 (76.47)	40 (78.43)	0.801	0.059	-
Outdoor	46 (90.20)	46 (90.20)	0.792	0.058	
Missing Data	3	2	-	-	-
Number of indoor near-falls in the past 12 months	10.68 ± 12.84	10.35 ± 12.49	-	-	0.987 [0.976-0.992]
Number of outdoor near-falls in the past 12-months	15.01 ± 14.36	15.17 ± 14.29	-	-	0.993 [0.988-0.996]
Most recent near-falls circumstances; n (%)					
Near fall 1: How the near-fall occurred?					
Tripped	25 (51.02)	22 (47.83)			
Slipped	2 (4.08)	2 (4.35)			
Freezing of Gait	13 (26.53)	12 (26.09)	0.716	0,075	-
Fainted	7 (14.29)	9 (19.57)			
Freezing while walking	2 (4.08)	1 (2.17)			
Other	0 (0.00)	0 (0.00)			
I don't remember	0	0	-	-	-
Near fall 2: How the near-fall occurred?					
Tripped	8 (18.18)	12 (26.09)			
Slipped	11 (25.00)	7 (15.22)			
Freezing of Gait	20 (45.45)	18 (39.13)	0.520	0.081	-
Fainted	3 (6.82)	6 (13.04)			
Freezing while walking	2 (4.55)	3 (6.52)			
Other	0 (0.00)	0 (0.00)			
I don't remember	5	0	-	-	-

Near fall 1: What activities you are doing?					
Transitioning	19 (40.43)	13 (28.26)	0.771	0.075	-
Walking	19 (40.43)	23 (50.00)			
Turning/Bending over	5 (10.64)	6 (13.04)			
Other	4 (8.51)	4 (8.70)			
I don't remember	2	0	-	-	-
Near fall 2: What activities you are doing?					
Transitioning	12 (27.27)	17 (36.96)	0.486	0.094	-
Walking	26 (59.09)	21 (45.65)			
Turning/Bending over	5 (11.36)	8 (17.39)			
Other	1 (2.27)	0 (0.00)			
I don't remember	5	0	-	-	-
Near fall 1: Which direction did you nearly fall?					
Forwards	27 (56.25)	27 (58.70)	0.731	0.080	-
Backwards	8 (16.67)	6 (13.04)			
Side (Left)	11 (22.92)	9 (19.57)			
Side (Right)	2 (4.17)	4 (8.70)			
I don't remember	1	0	-	-	-
Near fall 2: Which direction did you nearly fall?					
Forwards	24 (55.81)	24 (53.33)	0.672	0.084	-
Backwards	4 (9.30)	8 (17.78)			
Side (Left)	8 (18.60)	8 (17.78)			
Side (Right)	7 (16.28)	5 (11.11)			
I don't remember	6	1	-	-	-

***SE**: Standard Error; **ICC**: Intraclass Correlation Coefficient; **CI**: Confidence Interval*

Table 4. Results of kappa and interclass correlation statistics for the injurious circumstances questions

Injurious Fall Questions	Test	Retest	Test-Retest Reliability		ICC (%95 CI)
			Kappa	SE	
Have you suffered an injurious fall in the past 12-months?	22 (43.10)	22 (43.10)	1.000	0.000	-
Number of injurious indoor falls	0.92 ± 2.39	0.90 ± 2.36	-	-	0.759 [0.577-0.862]
Number of injurious outdoor falls	0.94 ± 2.36	1.25 ± 3.39	-	-	0.611 [0.406-0.758]
Of the injurious indoor/outdoor falls in the past 12-months, how many times did you see a healthcare professional? n (%)					
1-2	10 (45.45)	11 (50.00)	0.937	0.043	-
3-4	4 (18.18)	4 (18.18)			
5-6	1 (4.55)	1 (4.55)			
7-8	1 (4.55)	1 (4.55)			
≥ 9	0 (0.00)	0 (0.00)			
Missing data	6 (27.27)	5 (22.73)	-	-	-
Most recent injurious falls					
Fall 1: Did you suffer from any of the following injuries? n (%)					
Cuts/abrasions	20 (54.05)	19 (51.35)	0.894	0.059	-
Bruises	7 (18.92)	7 (18.92)	1.000	0.000	-
Back pain	4 (10.81)	5 (13.51)	0.881	0.117	-
Muscle strain	4 (10.81)	3 (8.11)	0.848	0.148	-
Other	2 (5.41)	3 (8.11)	0.793	0.201	-
Did you seek any medical treatment for the injuries? n (%)					
Hospitalization	0 (0.00)	0 (0.00)	0.921	0.052	-
Stitches	0 (0.00)	0 (0.00)			
Dressing of injury	1 (6.25)	1 (6.25)			
X-ray/CT scan/MRI	6 (37.50)	5 (31.25)			
Physiotherapy/Occupational Therapy	3 (18.75)	2 (12.50)			
Other	6 (37.50)	8 (50.00)			
Have you had a fall resulting in a fracture in the last 12-months?; n (%)	8 (15.70)	8 (15.70)	1.000	0.000	-
How many times you had a fall resulting in a fracture in the last 12-months?	1.00 ± 0.00	1.00 ± 0.00	-	-	1.000

Region of the fracture					
Wrist	0 (0.00)	3 (37.50)			
Humerus	3 (37.50)	0 (0.00)			
Clavicula	0 (0.00)	0 (0.00)			
Scapula	0 (0.00)	0 (0.00)			
Sculp	0 (0.00)	1 (12.50)			
Vertebra	1 (12.50)	1 (12.50)			
Costa	1 (12.50)	1 (12.50)	1.000	0.000	-
Toes	1 (12.50)	1 (12.50)			
Ankle	1 (12.50)	0 (0.00)			
Lower Leg	0 (0.00)	0 (0.00)			
Femur	0 (0.00)	0 (0.00)			
Femur Head	0 (0.00)	1 (12.50)			
Pelvis	1 (12.50)	3 (37.50)			
Did you seek any medical treatment for the fracture?					
Hospitalization	1 (12.50)	0 (0.00)			
Emergence Response	0 (0.00)	0 (0.00)			
Resting at home	2 (25.00)	3 (37.50)			
Use of split or plaster	3 (37.50)	3 (37.50)	0.931	0.065	-
Hanging	1 (12.50)	1 (12.50)			
Surgical fixation	1 (12.50)	1 (12.50)			
X-ray	0 (0.00)	0 (0.00)			

***SE**: Standard Error; **ICC**: Intraclass Correlation Coefficient; **CI**: Confidence Interval*

DISCUSSION

This study was conducted to evaluate the reliability of the Turkish version of the PDF-Q as a measurement tool within the Turkish population. The results indicate that the PDF-Q is reliable for assessing the conditions and consequences of falls and near-falls in individuals with Parkinson's disease.

Approximately 70% of individuals with Parkinson's disease are reported to experience at least one fall each year throughout the illness. This poses a significant concern, as such incidents can result in serious injuries, including hip fractures and head trauma (Contreras & Grandas, 2012). Therefore, it is important to evaluate the causes and consequences of falls to prevent falls in Parkinson's patients. The Falls Efficacy Scale-International and the Fear of Falling Scale are among the most commonly utilized questionnaires for evaluating falls in individuals with Parkinson's disease. However, these scales primarily evaluate the fear of falling and do not encompass assessments of the causes, frequency, or consequences of falls. Moreover, they are not specific to Parkinson's disease and are more commonly applied to geriatric populations (Liu, Tung, Zhang et al., 2022). The PDF-Q scale is specifically designed for individuals with Parkinson's disease and evaluates various aspects related to falls, including the history of falls and near-falls, the circumstances surrounding falls, the conditions of near-falls, and the consequences of falling. To the best of our knowledge, no adapted version of the PDF-Q scale has been developed for use in other countries that has demonstrated reliability comparable to the original scale.

This study represents the first effort to adapt the PDF-Q for use in other countries. The initial sections of the PDF-Q scale address consent, demographic characteristics, and clinical features of the disease, while the subsequent sections provide a detailed assessment of fall history, near-fall scenarios, and the consequences of falls (Harris et al., 2021). Reliability analyses were performed for each section to test the reliability of the Turkish version. In the fall and near-falls circumstances sections, the reliability of the question 'Have you experienced a fall in the past 12 months?' was determined to be moderate (κ=0.564), while other items showed higher agreement levels (κ=0.609–0.848), which can be considered good reliability (Blackman & Koval, 2000). This relatively lower agreement for the fall history question may be explained by the time interval between test and retest administrations. The scale was administered to participants twice, with a minimum interval of 10 days between assessments. During this period, participants may have experienced additional falls, potentially resulting in a higher number of falls reported in the second measurement compared to the first. Another influencing factor is the participants' memory ability, as they may have inaccurately remembered the number of falls. It has been reported that cognitive functions are impaired in individuals with Parkinson's disease, with memory being particularly affected, even in the early stages of the condition (Citro, Lazzaro, Cimmino et al., 2024). It is seen that the majority of the Parkinson's patients participating in this study are in stages 3 and 4 according to the Hoehn & Yahr stage.

According to these findings, it can be concluded that the memory factor may have an effect on the results. On the other hand, in the test-retest results of the question "Have you suffered an injurious fall in the past 12-months" in the Injurious Circumstances section of the PDF-Q, it is seen that the kappa agreement is excellent. Injuries related to falls may be easier to recall than the falls or near-falls themselves. This is because the outcomes of fall-related injuries, such as scars on the body, hospital visits, and medical reports, may reinforce the memory of the fall and its consequences. Overall, the test-retest reliability of the PDF-Q, as assessed by ICC, demonstrated excellent consistency across repeated measurements, supporting the stability and reproducibility of the scale for clinical and research applications (Liljequist, Elfving & Roaldsen, 2019).

These findings are consistent with those reported in the original study by Harris et al. (2021), which also investigated the reliability of the PDF-Q in people with Parkinson Disease. Comparison with the original study by Harris et al. (2021) further supports the reliability of the PDF-Q across different populations. In their study, the authors reported moderate to strong agreement levels for most questions, especially regarding the consequences and circumstances of falls and near-falls, but relatively weaker reliability for the number of falls and near-falls recalled over the past 12 months. Our findings showed a similar pattern: while most items demonstrated good to excellent test-retest reliability, agreement levels for questions involving recall of fall/near-fall frequency were relatively lower. This may be explained by the 12-month recall period used in both studies, which could introduce memory bias, especially in patients with advanced Parkinson's disease or mild cognitive impairments. Additionally, both studies found that fall-related injuries were more reliably recalled than the falls themselves, possibly due to their more traumatic or medically documented nature. These consistent results support the idea that the PDF-Q is a reliable tool for capturing fall-related circumstances in people with Parkinson Disease; however, future adaptations might consider shortening the recall period to enhance the reliability of quantitative items.

The kappa agreement values reported in the original study that developed the PDF-Q are comparable to those observed in the reliability study of the PDF-Q (Harris et al., 2021). Both studies demonstrate that the PDF-Q scale is a reliable assessment tool. We believe that a detailed assessment tool for evaluating falls and their consequences in individuals with Parkinson's disease will make a valuable contribution to the literature by aiding in fall prevention. Falls in individuals with Parkinson's disease can result in severe secondary complications, including hemorrhage, fractures, and pain, and are associated with an increased risk of mortality (Liu et al., 2022). Moreover, falls intensify both the physical and psychological stress experienced by patients, diminishing their self-care capacity and significantly lowering their overall quality of life (Rahman, Griffin, Quinn et al., 2008; Soh, McGinley, Watts et al., 2013). The medical expenses related to hospitalizations due to falls also place a substantial financial burden on patients, their families, and society at large (Macchi, Koljack, Miyasaki et al., 2020; Dorsey, Elbaz, Nichols et al., 2018). Therefore, falls should be taken seriously and thoroughly evaluated. We believe that the Turkish adaptation of the PDF-Q, designed to comprehensively assess falls in individuals with Parkinson's disease, has the potential to support physiotherapists in developing tailored rehabilitation programs for this population. However, further validation studies are needed to confirm its clinical utility.

The strengths of this study have been outlined previously. However, despite these strengths, the study also has certain limitations. This study assessed only the reliability of the PDF-Q scale. As the PDF-Q scale lacks a total score and no comparable scale exists, its construct validity could not be evaluated. Another limitation of this study is the non-homogeneous distribution of participants with Parkinson's disease across the Hoehn and Yahr stages. Although a post-hoc power analysis indicated that the sample size (n = 51) was statistically sufficient to detect the observed reliability effect, the overall sample size was relatively small compared to general recommendations for psychometric validation studies, which may limit the generalizability of the findings.

In conclusion; this study demonstrated that the Turkish version of the PDF-Q is a reliable tool for comprehensively assessing falls in individuals with Parkinson's disease. It may assist clinicians and researchers in evaluating falls within the context of Parkinson's rehabilitation, supporting patient-centered quality management and identifying potential needs. However, it should be noted that the original version of the questionnaire used in this study, and of course the Turkish version, has not yet been validated, so the results should be interpreted with caution.

Ethics Approval

The study was approved by the Scientific Research and Publication Ethics Committee of Istanbul Medeniyet University (registration number: 2024/9) and conducted in consideration of Helsinki's Declaration principles.

Author's Contributions

The authors confirm their contribution to the paper as follows. Investigation: EŞ, VA, EM; Conceptualization: EŞ, VA, EM; Data collection: TE, AA; Formal analysis: EŞ; Methodology, Writing – review, editing: EŞ, VA, EM, TE, AA. All authors reviewed the results and approved the final version of the manuscript.

Conflict of Interest

The authors declare no conflict of interest.

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