



Validity and Reliability of the Thai Version of the Freezing of Gait Questionnaire in Individuals With Parkinson's disease

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Objective To evaluate the validity and reliability of the Thai version of the Freezing of Gait Questionnaire (FOG-Q) in individuals with Parkinson's disease (PD).

Methods The FOG-Q was translated into Thai according to the standard process. Fifty-six individuals with PD participated in the study. The content validity was assessed using the content validity index (CVI). The construct validity was evaluated by correlating Thai FOG-Q with Thai version of the Movement Disorder Society-sponsored revision of the Unified Parkinson's Disease Rating Scale (MDS-UPDRS) items 2.13 and 3.11, Thai version of the Falls Efficacy Scale-International (FES-I), Timed Up and Go test (TUG) and Berg Balance Scale (BBS) using Spearman's correlation coefficient (r_s). The correlation between Thai FOG-Q and clinical characteristics, for example, duration of PD and modified Hoehn and Yahr (mH&Y) stage was evaluated. Internal consistency and test-retest reliability were evaluated with Cronbach's alpha ($C\alpha$) and intraclass correlation coefficient (ICC), respectively.

Results The Thai FOG-Q had high content validity (CVI=0.96). The mean FOG-Q score was 9.0 ± 4.9 . The construct validity showed a strong positive correlation with MDS-UPDRS item 2.13 ($r_s=0.81$), and moderate correlations with MDS-UPDRS item 3.11, FES-I, and TUG ($r_s=0.42-0.60$). A negative correlation with BBS was found ($r_s=-0.32$). It had a moderate correlation with mH&Y stage ($r_s=0.40$). The Thai FOG-Q had good internal consistency ($C\alpha=0.87$) with excellent test-retest reliability (ICC=0.91).

Conclusion The Thai FOG-Q has excellent validity and reliability. It is a useful instrument for the evaluation of FOG in individuals with PD.

Keywords Validation study, Reproducibility of results, Freezing, Gait, Parkinson disease

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INTRODUCTION

Freezing of gait (FOG), defined as a brief episodic absence or marked reduction in forward progression of the feet despite the intention to walk [1], is a common feature in Parkinson's disease (PD). It is significantly associated with a higher stage of Hoehn and Yahr stages, which was found 27% in the early stages and 79% in the advanced stages, a longer duration of levodopa treatment and a longer duration of the disease [2-5]. FOG has been influenced by emotional and sensory stimuli, for example, it is frequently present in crowded places and stressful situations [6,7]. Furthermore, gait impairment in patients with FOG increases the risk of falling. More than 50% of individuals with PD with FOG (freezer) reported falls in the last 6 months, 20% among non-freezer [8]. It has also been associated with cognitive decline and depression [9]. In fact, all of these problems result in a negative effect on quality of life in individuals with PD [6,10,11].

Seventy-five percent of the freezer reported FOG at home. There was a poor correlation between the observed FOG during examination and the FOG reported at home [12]. Therefore, Giladi et al. [12] constructed the Freezing of Gait Questionnaire (FOG-Q), a six-question clinician administered patient-reported rating scale. It is recommended to assess the frequency and severity of FOG. It has good reliability, validity, and no floor or ceiling effects [13,14]. Furthermore, the FOG-Q is practical, requires little time and has been translated into different languages [15-19]. Each question is assessed with a 5-point Likert scale and the total score ranged from 0 to 24; higher scores correspond to more severe FOG [12].

There is no formal cross-cultural translation of FOG-Q into Thai language or a validity and reliability study. The objectives of this study were to translate FOG-Q into the Thai version and to evaluate the psychometric properties.

MATERIALS AND METHODS

Participants

The sample size was calculated according to the correlation coefficient of Vogler et al. [17]. Fifty-six outpatients diagnosed with idiopathic PD from the Parkinson clinic who met the inclusion and exclusion criteria and were willing to participate were informed and signed informed

consent prior to participation. The protocol for this study was approved by Institutional Review Board, Faculty of Medicine Siriraj Hospital, Mahidol University (COA #: Si 683/2020). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 2013 Helsinki declaration.

The inclusion criteria included patients who were; clinically diagnosed as idiopathic PD (the United Kingdom Parkinson's Disease Society Brain Bank Diagnostic Criteria), fluent Thai language skills, stable medical condition, and capable of walking with or without walking devices at least 6 meters. The exclusion criteria included; associated motor disorders (e.g., stroke), other conditions that could interfere with gait (e.g., recent fracture, blindness, peripheral neuropathies, vertigo, pain in the lower extremities), and modification of antiparkinsonian therapy within 1 week.

Materials

Movement Disorder Society-sponsored revision of the Unified Parkinson's Disease Rating Scale

The Movement Disorder Society-sponsored revision of the Unified Parkinson's Disease Rating Scale (MDS-UPDRS) is a revision of the UPDRS. There are four parts: parts II and III are self-administered motor experiences of daily living and motor examination, respectively. Each question has a 5-point scale, where 0 means absence of symptoms and 4 represents the worst stage [13,20]. It is specific and widely used in individuals with PD. It was translated into many languages, including Thai, and showed good reliability and validity [20]. In this study, we used only the Thai version of the MDS-UPDRS items 2.13 and 3.11 (FOG items).

Falls Efficacy Scale-International

Falls Efficacy Scale-International (FES-I) was developed from the original FES to measure fear of falling [21]. There are 16 questions. Each question has a 4-point scale, where 1 means not at all concerned and 4 means very concerned, 64 scores in total. It has good reliability and validity [22,23] as well as the Thai version of the FES-I [24].

Timed Up and Go test

The Movement Disorders Society Rating Scales Committee recommends Timed Up and Go test (TUG) to

measure the locomotor performance in individuals with PD [13]. It is a simple and practical test without the need for special equipment [25]. Studies [25,26] found a high correlation between TUG and FOG-Q.

Berg Balance Scale

Berg Balance Scale (BBS) is recommended by the Movement Disorders Society Rating Scales Committee [13] and is widely used in PD to assess balance. It is safe and simple to implement and also shows good reliability and validity [27,28]. It consists of 14 items that measure sitting, standing, and dynamic balance. The total score ranges from 0 to 56, each item has a 5-point scale, where 0 means an inability to perform the task and 4 means an ability to perform the task independently [28]. The BBS has a negative correlation with UPDRS.

Procedures

Development of the Thai Freezing of Gait Questionnaire

After Nir Giladi granted permission to translate FOG-Q into Thai language, the Thai FOG-Q was developed according to the translation and cross-cultural adaptation of measurements, which consisted of five stages [29].

- Stage 1: Translation. The Thai FOG-Q was independently translated by two native Thai speakers with fluent English language. One is a health professional, another is a naïve translator with no medical background.
- Stage 2: Synthesis. The two translations were conducted to the consensus version by the researchers.
- Stage 3: Back translation. Two native English speakers with fluent Thai language, who had no previous contact with the original version, backward translated into English.
- Stage 4: Expert committee review. Any discrepancies were discussed, and then a pre-final version was adapted.
- Stage 5: Pretesting. The pre-final version was tested with 6 patients similar to the study group to ensure that the meaning of each question was correct, then reported the final version (Supplementary Material S1).

Evaluation of validity and reliability

MDS-UPDRS item 2.13 and FES-I were answered by the participants themselves. The researcher would ask the six items of the Thai FOG-Q, making sure that the partici-

pants clearly understood all the questions. The severity of the disease was evaluated by MDS-UPDRS item 3.11, TUG, and BBS by the physiotherapist in the “on” state with regard to the scheduled dose of antiparkinsonian medication were taken and the PD symptoms were controlled. Finally, Thai FOG-Q were retested by the same researcher at least two hours apart.

Statistical analysis

Statistics were performed using PASW Statistics for Windows, Version 18.0 (SPSS Inc., Chicago, IL, USA).

Characteristics of the participants

The characteristics of the participants were presented in number (%), mean±standard deviation (SD), and median; q1–q3 (minimum–maximum).

Validity

The final version was evaluated with the content validity index (CVI) by an expert committee consisting of two neurologists, two psychiatrists and one physiotherapist who had experience with individuals with PD. The acceptable scaled-level CVI should be more than 0.8. The construct validity, which consist of convergent and divergent validity, was calculated using the Spearman correlation coefficient (r_s). The strength of the correlations was classified as follows: <0.10=negligible, 0.10–0.39=weak, 0.40–0.69=moderate, 0.70–0.89=strong, and 0.90–1.00=very strong [30]. The convergent validity was evaluated by finding the correlations between Thai FOG-Q and MDS-UPDRS items 2.13 and 3.11, FES-I, and TUG. The divergent validity was evaluated with BBS. The mean Thai total FOG-Q score was used to calculate the construct validity.

Reliability

The internal consistency was evaluated with Cronbach's alpha ($C\alpha$). A value more than 0.80 indicate a good internal consistency [31]. The test-retest was evaluated with intraclass correlation coefficient (ICC) and performed on the same day with at least two hours apart to eliminate loss follow-up data. An ICC values less than 0.50 indicate poor reliability, values between 0.50 and 0.75 indicate moderate reliability, values between 0.75 and 0.90 indicate good reliability, and values greater than 0.90 indicate excellent reliability [32]. The correlation between Thai

Table 1. Demographic data

Demographic data	Value (n=56)
Sex, male	32 (57.1)
Age (yr)	65.4±9.9 65; 58-72 (46-85)
PD duration (yr)	9; 5-13 (0.08-27.00)
mH&Y stage	3; 2-3 (1-4)
1	3 (5.4)
2	23 (41.1)
3	24 (42.9)
4	6 (10.7)
History of falling, yes	29 (51.8)
History of DBS, yes	17 (30.4)
LEDD (mg)	575; 375-750 (100-1,889)

Values are presented as number (%), mean±standard deviation, or median; q1-q3 (minimum-maximum).

PD, Parkinson's disease; mH&Y, modified Hoehn and Yahr; DBS, deep brain stimulation; LEDD, levodopa equivalent daily dose.

FOG-Q and clinical characteristics was calculated using point-biserial correlation (r_{pb}) and r_s . The level of statistical significance was set at $p<0.05$.

RESULTS

Demographic data from 56 participants is shown in Table 1. The mean age was 65.4±9.9 years (mean±SD). The median duration of PD was 9; 5-13 years (median; q1-q3). The median modified Hoehn and Yahr (mH&Y) stage was 3; 2-3. There were 51.8% of the participants who had a history of falling at least once in the past year. About 30% of the participants had undergone deep brain stimulation (DBS) surgery. The pretesting was done with six participants. The minimum of Thai FOG-Q score was 1 (5.4%) and the maximum score was 19 (1.8%). None of the participants had a minimum or maximum score; thus, there was no floor or ceiling effect. The mean score was 9.0±4.9. The median of UPDRS items 2.13 and 3.11 and the mean of FES-I, TUG, and BBS are shown in Table 2.

The CVI showed that all questions were rated as agreed except Question 1 which one expert rated as disagreed; however, the scale-level CVI (average proportion) was 0.96 (Table 3) illustrated the high content validity of the questionnaire. A significant positive strong correlation was found between Thai FOG-Q and MDS-UPDRS item

Table 2. Clinical characteristics

Characteristics	1st time	2nd time	Value
FOG-Q (0-24)	9.2±5.2	8.8±4.8	9.0±4.9
MDS-UPDRS 2.13 (0-4)	1; 0-2 (0-4)	-	-
MDS-UPDRS 3.11 (0-4)	0; 0-1 (0-2)	-	-
FES-I (16-64)	32.6±11.4	-	-
TUG (s)	18.6±14.6	-	-
BBS (0-56)	45.7±8.5	-	-

Values are presented as mean±standard deviation or median; q1-q3 (minimum-maximum).

FOG-Q, Freezing of Gait Questionnaire; MDS-UPDRS, Movement Disorder Society-sponsored revision of the Unified Parkinson's Disease Rating Scale; FES-I, Falls Efficacy Scale-International; TUG, Timed Up and Go test; BBS, Berg Balance Scale.

Table 3. Reliability and validity of the Thai Freezing of Gait Questionnaire

Measurements	Value
Content validity ^{a)}	0.96
Internal consistency ^{b)}	0.87
Test-retest ^{c)}	0.91
(95% confidence interval, 0.86-0.95)	

^{a)}Content validity index.

^{b)}Cronbach's alpha.

^{c)}Intraclass correlation coefficient.

2.13 ($r_s=0.81$, $p<0.001$). Thai FOG-Q is moderately correlated with MDS-UPDRS item 3.11, FES-I, and TUG ($r_s=0.42-0.60$, $p<0.001$). A weak negative correlation with BBS was demonstrated ($r_s=-0.32$, $p=0.015$; Table 4).

The Thai FOG-Q showed good internal consistency with a α of 0.87. The test-retest reliability was excellent (ICC=0.91; 95% confidence interval, 0.86-0.95). Table 4 shows the correlation coefficient between Thai FOG-Q and clinical characteristics. The Thai FOG-Q had a significant moderate correlation with the mH&Y stage ($r_s=0.40$, $p=0.002$), but a weak correlation was found with a history of falling ($r_{pb}=0.27$, $p=0.044$) and levodopa equivalent daily dose ($r_s=0.28$, $p=0.046$). The correlation between Thai FOG-Q and sex, age, duration of PD and history of DBS was insignificant.

DISCUSSION

FOG-Q was recommended to evaluate and detect the

Table 4. Correlation coefficients with the Thai Freezing of Gait Questionnaire

Characteristics	Correlation	p-value
Sex	0.24 ^{a)}	0.072
Age	-0.09 ^{b)}	0.418
PD duration	0.13 ^{b)}	0.352
mH&Y stage	0.40 ^{b)}	0.002**
History of falling	0.27 ^{a)}	0.044*
History of DBS	0.04 ^{a)}	0.778
LEDD	0.28 ^{b)}	0.046*
MDS-UPDRS 2.13	0.81 ^{b)}	<0.001**
MDS-UPDRS 3.11	0.46 ^{b)}	<0.001**
FES-I	0.60 ^{b)}	<0.001**
TUG	0.42 ^{b)}	0.001**
BBS	-0.32 ^{b)}	0.015*

PD, Parkinson's disease; mH&Y, modified Hoehn and Yahr; DBS, deep brain stimulation; LEDD, levodopa equivalent daily dose; MDS-UPDRS, Movement Disorder Society-sponsored revision of the Unified Parkinson's Disease Rating Scale; FES-I, Falls Efficacy Scale-International; TUG, Timed Up and Go test; BBS, Berg Balance Scale.

^{a)}Point-biserial correlation coefficient.

^{b)}Spearman correlation coefficient.

* $p < 0.05$, ** $p < 0.01$.

effect of FOG treatment in individuals with PD since it was reliable and valid [14]. This questionnaire was appropriate for the outpatient setting because it can be completed in 5 to 10 minutes without training and has been widely used. The FOG-Q item score can be used to evaluate in all phases of freezing, e.g., at starting or turning; therefore, the rehabilitation program can be prescribed individually to minimize the activity limitations. It was also useful in the research.

The baseline characteristics of our participants were similar to previous validation studies [14,17,18] in age and duration of PD, so the total score of FOG-Q was comparable to the total score of Thai FOG-Q. On the other hand, Candan et al. [19] showed a very low total FOG-Q score that could be due to the fact that they included patients with very short duration of PD. The construct validity demonstrated a significant strong correlation between Thai FOG-Q and MDS-UPDRS item 2.13 that corresponded to the study by Vogler et al. [17]. In the same way, other studies [15,16,18] showed a strong correlation with the UPDRS item 14 (freezing when walking), which

was a subjective evaluation of FOG either [14]. Thai FOG-Q showed a moderate correlation with MDS-UPDRS item 3.11. MDS-UPDRS item 3.11 was the physician-derived motor evaluation at "on" time, which might not totally reflect the worst symptoms that affect patients mostly at home. Interestingly, Thai FOG-Q was correlated with both subjective and objective data. Similar to the finding in other studies [15,16,18,19], Thai FOG-Q was moderately correlated with fear of falling using the FES-I. The fear of falling was a predictor of an ability to walk in the community [33] and a mobility limitation that leads to social isolation and depression in the freezer [34]. The correlation between Thai FOG-Q and TUG was moderate, in agreement with the previously translated versions [14,15,18,19]. The TUG was a recommended measurement instrument used to assess posture, gait, and balance in individuals with PD [9]. It measures the ability to sit, stand, walk straight, turn 180°, and approach a chair. All these actions, especially initiating walking and turning, could be triggers of FOG. We also found a weak negative correlation between FOG-Q and BBS, which was the same as Baggio et al. [16]. FOG is just one of many causes of balance dysfunction in PD, others included bradykinesia, rigidity, impaired proprioception, and postural attention. Therefore, FOG may not be strongly correlated with the balance measured by BBS [35].

Our study showed good internal consistency ($\alpha = 0.87$) and excellent test-retest reliability ($ICC = 0.91$) of the Thai FOG-Q. It was comparable to other languages that α ranged between 0.83–0.95 [14–18]. In contrast to the previous study [15,16,19], Thai FOG-Q was not correlated with the duration of PD but was moderately correlated with mH&Y stage. This could be explained by the fact that a large number of participants with a history of DBS were included in this study, which could be a confounding factor. FOG increased the risk of falling and more than 50% of the freezer had incidents of falls that were higher than in non-freezer [8]. In the same way, Thai FOG-Q showed a significant correlation with a history of falling. Due to the morbidity and mortality of falls in individuals with PD, early detection and prevention are important issues. The cut-off point for FOG-Q related falls should be studied further to determine the appropriate rehabilitation program and intervention to prevent falls.

This study was carried out in the tertiary care hospital; therefore, individuals with PD were more severe and one

third of them had undergone DBS surgery, which may not represent the entire population. We did not assess the level of education and the cognitive function of the participants.

In conclusion, the Thai FOG-Q shows high content validity and good construct validity with MDS-UPDRS items 2.13 and 3.11 which are subjective and objective FOG related scales and the gait and postural assessment instruments like FES-I, TUG, and BBS. It has good internal consistency and excellent test-retest reliability in individuals with PD.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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AUTHOR CONTRIBUTION

Conceptualization: Tanvijit P. Methodology: Taweekitikul A, Tanvijit P, Tantisuvanitchkul P. Formal analysis: Taweekitikul A, Tanvijit P. Funding acquisition: Taweekitikul A, Tanvijit P, Tantisuvanitchkul P. Investigation: Taweekitikul A, Tanvijit P, Srivanitchapoom P, Pitakpatapee Y, Khobkhun F, Akkathap P. Visualization: Taweekitikul A, Tanvijit P. Writing – original draft: Taweekitikul A, Tanvijit P. Writing – review and editing: Taweekitikul A, Tanvijit P, Khobkhun F. Approval of final manuscript: all authors.

SUPPLEMENTARY MATERIALS

Supplementary materials can be found via <https://doi.org/10.5535/arm.22149>.

REFERENCES

1. Nutt JG, Bloem BR, Giladi N, Hallett M, Horak FB, Nieuwboer A. Freezing of gait: moving forward on a mysterious clinical phenomenon. *Lancet Neurol* 2011;10:734-44.
2. Tan DM, McGinley JL, Danoudis ME, Iansek R, Morris ME. Freezing of gait and activity limitations in people with Parkinson's disease. *Arch Phys Med Rehabil* 2011;92:1159-65.
3. Forsaa EB, Larsen JP, Wentzel-Larsen T, Alves G. A 12-year population-based study of freezing of gait in Parkinson's disease. *Parkinsonism Relat Disord* 2015;21:254-8.
4. Giladi N, Treves TA, Simon ES, Shabtai H, Orlov Y, Kandinov B, et al. Freezing of gait in patients with advanced Parkinson's disease. *J Neural Transm (Vienna)* 2001;108:53-61.
5. Giladi N, McMahon D, Przedborski S, Flaster E, Guillery S, Kostic V, et al. Motor blocks in Parkinson's disease. *Neurology* 1992;42:333-9.
6. Bloem BR, Hausdorff JM, Visser JE, Giladi N. Falls and freezing of gait in Parkinson's disease: a review of two interconnected, episodic phenomena. *Mov Disord* 2004;19:871-84.
7. Lamberti P, Armenise S, Castaldo V, de Mari M, Iliceto G, Tronci P, et al. Freezing gait in Parkinson's disease. *Eur Neurol* 1997;38:297-301.
8. Georgy E. Freezing of gait in Parkinson's disease: impact on falls risk, walking aids utilization, and assistance-seeking behavior. *Eur J Adapt Phys Act* 2010;3:49-59.
9. Giladi N, McDermott MP, Fahn S, Przedborski S, Jankovic J, Stern M, et al. Freezing of gait in PD: prospective assessment in the DATATOP cohort. *Neurology* 2001;56:1712-21.
10. Moore O, Peretz C, Giladi N. Freezing of gait affects quality of life of peoples with Parkinson's disease beyond its relationships with mobility and gait. *Mov Disord* 2007;22:2192-5.
11. Santos García D, de Deus Fonticoba T, Suárez Castro E, Borrué C, Mata M, Solano Vila B, et al. Non-motor symptoms burden, mood, and gait problems are the most significant factors contributing to a poor quality of life in non-demented Parkinson's disease patients: results from the COPPADIS Study Cohort. *Parkinson-*

- ism Relat Disord 2019;66:151-7.
12. Giladi N, Shabtai H, Simon ES, Biran S, Tal J, Korczyn AD. Construction of freezing of gait questionnaire for patients with Parkinsonism. *Parkinsonism Relat Disord* 2000;6:165-70.
 13. Bloem BR, Marinus J, Almeida Q, Dibble L, Nieuwboer A, Post B, et al. Measurement instruments to assess posture, gait, and balance in Parkinson's disease: critique and recommendations. *Mov Disord* 2016;31:1342-55.
 14. Giladi N, Tal J, Azulay T, Rascol O, Brooks DJ, Melamed E, et al. Validation of the freezing of gait questionnaire in patients with Parkinson's disease. *Mov Disord* 2009;24:655-61.
 15. Nilsson MH, Hagell P. Freezing of Gait Questionnaire: validity and reliability of the Swedish version. *Acta Neurol Scand* 2009;120:331-4.
 16. Baggio JA, Curtarelli MB, Rodrigues GR, Tumas V. Validity of the Brazilian version of the freezing of gait questionnaire. *Arq Neuropsiquiatr* 2012;70:599-603.
 17. Vogler A, Janssens J, Nyffeler T, Bohlhalter S, Vanbelingen T. German translation and validation of the "freezing of gait questionnaire" in patients with Parkinson's disease. *Parkinsons Dis* 2015;2015:982058.
 18. Tambasco N, Simoni S, Eusebi P, Ripandelli F, Brahim E, Sacchini E, et al. The validation of an Italian version of the Freezing of Gait Questionnaire. *Neurol Sci* 2015;36:759-64.
 19. Candan SA, Çatuker A, Özcan TŞ. Psychometric properties of the Turkish version of the freezing of gait questionnaire for patients with Parkinson's disease. *Neurol Sci Neurophysiol* 2019;36:44-50.
 20. Goetz CG, Tilley BC, Shaftman SR, Stebbins GT, Fahn S, Martinez-Martin P, et al. Movement Disorder Society-sponsored revision of the Unified Parkinson's Disease Rating Scale (MDS-UPDRS): scale presentation and clinimetric testing results. *Mov Disord* 2008;23:2129-70.
 21. Yardley L, Beyer N, Hauer K, Kempen G, Piot-Ziegler C, Todd C. Development and initial validation of the Falls Efficacy Scale-International (FES-I). *Age Ageing* 2005;34:614-9.
 22. Jonasson SB, Nilsson MH, Lexell J. Psychometric properties of four fear of falling rating scales in people with Parkinson's disease. *BMC Geriatr* 2014;14:66.
 23. Winser SJ, Kannan P, Bello UM, Whitney SL. Measures of balance and falls risk prediction in people with Parkinson's disease: a systematic review of psychometric properties. *Clin Rehabil* 2019;33:1949-62.
 24. Thiamwong L. Psychometric testing of the Falls Efficacy Scale-International (FES-I) in Thai older adults. *Songkla Med J* 2011;29:277-87.
 25. Morris S, Morris ME, Iansek R. Reliability of measurements obtained with the Timed "Up & Go" test in people with Parkinson disease. *Phys Ther* 2001;81:810-8.
 26. Krzysztoń K, Stolarski J, Kochanowski J. Evaluation of balance disorders in Parkinson's disease using simple diagnostic tests-not so simple to choose. *Front Neurol* 2018;9:932.
 27. Brusse KJ, Zimdars S, Zalewski KR, Steffen TM. Testing functional performance in people with Parkinson disease. *Phys Ther* 2005;85:134-41.
 28. Qutubuddin AA, Pegg PO, Cifu DX, Brown R, McNamee S, Carne W. Validating the Berg Balance Scale for patients with Parkinson's disease: a key to rehabilitation evaluation. *Arch Phys Med Rehabil* 2005;86:789-92.
 29. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine (Phila Pa 1976)* 2000;25:3186-91.
 30. Schober P, Boer C, Schwarte LA. Correlation coefficients: appropriate use and interpretation. *Anesth Analg* 2018;126:1763-8.
 31. Taber KS. The use of Cronbach's alpha when developing and reporting research instruments in science education. *Res Sci Educ* 2018;48:1273-96.
 32. Koo TK, Li MY. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *J Chiropr Med* 2016;15:155-63. Erratum in: *J Chiropr Med* 2017;16:346.
 33. Elbers RG, van Wegen EE, Verhoef J, Kwakkel G. Is gait speed a valid measure to predict community ambulation in patients with Parkinson's disease? *J Rehabil Med* 2013;45:370-5.
 34. Adkin AL, Frank JS, Jog MS. Fear of falling and postural control in Parkinson's disease. *Mov Disord* 2003;18:496-502.
 35. Park JH, Kang YJ, Horak FB. What is wrong with balance in Parkinson's disease? *J Mov Disord* 2015;8:109-14.