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The Psychometric Properties of The Modified Fear of Falling Avoidance Behavior Questionnaire in Parkinson's Disease and Older Adults

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THE PSYCHOMETRIC PROPERTIES OF THE MODIFIED FEAR OF FALLING AVOIDANCE BEHAVIOR QUESTIONNAIRE IN PARKINSON'S DISEASE AND OLDER ADULTS

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ABSTRACT

Background/purpose: The Fear of Falling Avoidance Behavior Questionnaire (FFABQ), developed in 2011 to measure fear of falling avoidance behavior, has good evidence for reliability and validity. However, a recently modified version (mFFABQ) is theorized to be easier to understand for those completing the questionnaire because the Likert responses are more logical in completing the item stem. The purpose of this study was to examine the test-retest reliability and construct validity of the mFFABQ in adults with Parkinson's Disease (PD) and older adults aged 60-90 years.

Methods: Thirty-nine participants (age 72.21 ± 9.5; 29 men, 10 women) diagnosed with PD (diagnosis year median=2007; Hoehn and Yahr median and mode=3.0) and 49 older adults without PD (age 72.86± 5.0; 13 men, 36 women) who were cognitively screened with the Montreal Cognitive Assessment Test participated in the study. For test-retest reliability, the mFFABQ was administered twice, separated by one week. Evidence for construct validity was evaluated by comparing the mFFABQ to the following: self-perceived balance questionnaires [Activities-Specific Balance Confidence Scale (ABC)]; balance-performance using the Berg Balance Scale (BBS), mobility and balance assessments [Timed Up & Go (TUG); 30 second sit to stand (30STS); Sensory Organization Test (SOT)]; psychological self-assessment questionnaires (Zung Anxiety Scale; Beck Depression Inventory; Consequences of Falling Questionnaire), and average daily activity levels using an activity monitor for one week (i.e., time sitting/lying, time standing, time stepping, number of steps).

Results: The mFFABQ had good overall test-retest reliability (ICC(3,1)= .822 (95% confidence interval (CI): 0.739 - 0.881) with a 90% minimal detectable change of 14.775 scale points with a score range from 0 to 56. In addition, the mFFABQ correlated with fall history (r=-0.430) and exhibited high correlation with the ABC (rho= -.804), and moderate correlations with CoFQ (rho=.582), and BBS (rho=-.595). The mFFABQ also correlated with time sitting/lying (rho=.129), time standing (rho=-.072), time stepping (rho=-.298), and number of steps (rho=-.358).

Conclusions: Results from this study offer evidence of good reliability and validity of the mFFABQ in PD and suggest that it may be useful as an outcome tool in patients with fear avoidance behavior. The mFFABQ offers the clinician a way to confidently assess avoidance behavior in those with PD who experience or report fear of falling.

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INTRODUCTION

An estimated 35 to 90% of people with Parkinson's Disease (PD) report at least one fall a year, of which 39% of the falling population are recurrent fallers.[1] After a fall, some individuals begin to develop a fear of falling, which can lead to fear of falling avoidance behavior (FFAB). FFAB can also be seen in those who have not had a recent fall.[2] FFAB can be protective (adaptive) in that it may limit the occurrence of falls in the short term.[3] Specifically, people with PD avoid risky behaviors that threaten their balance. However, excessive FFAB (maladaptive) may lead to reduced physical activity and sedentary behaviors.[3] As a result of decreased activity, other downstream consequences may emerge, notably, diminished balance confidence, increased perceived negative consequences of falls, and greater balance impairments.[4] Conversely, evidence suggests an increase in fall risk when self-reporting activities one avoids, including walking, standing from a chair, and preparing meals.[5] In turn, these motor and non-motor consequences of FFAB may accelerate the decline in physical deconditioning and functional strength.[6] Physical decline ultimately magnifies the consequences of avoidance behavior, thereby creating a vicious cycle. The downstream consequences of FFAB exacerbate functional decline and worsen postural instability, further increasing the risk and consequences of falling and thereby perpetuating FFAB.[3,7]

Prior studies have provided evidence of the reliability and validity that support the notion that the Fear of Falling Avoidance Behavior Questionnaire (FFABQ) measures avoidance behavior.[8] An important objective of this questionnaire was to create a tool for researchers and clinicians to quickly and reliably assess FFAB. The FFABQ score was shown to be associated with future falls in older adults[9] and is related to depression.[10] The FFABQ has also been used to evaluate the impact of FFAB on the relationship between vision impairment and diminished mobility in community-dwelling older adults, demonstrating a positive correlation between vision impairments and FFAB .[11] More recently, the FFABQ has been used in research batteries for multi-morbid populations and those with cognitive deficits,[12-14]

including those who are discharged from inpatient psychiatric care.[15] Furthermore, the FFABQ has contributed to research involving self-efficacy in older adults regarding fall prevention.[16] Although the FFABQ has shown evidence of reliability and validity, anecdotal reports indicated that the Likert responses (completely disagree, disagree, unsure, agree, completely agree) were unclear and did not match the sentence stem "Due to my fear of falling, I avoid…", requiring further revision.

A modified version of the FFABQ (mFFABQ) was created to ensure Likert responses were clear and easily understood. Specifically, the modified version has updated Likert responses for the 14-items, such that they are more consistent with the avoidance activity item stems and would allow quantification rather than agreement. In the FFABQ, the stem of each item reads "Due to my fear of falling, I avoid [insert activity]. For instance, "Due to my fear of falling, I avoid walking in crowded places." In the original FFABQ, individuals would then select one of the following choices for each activity: completely disagree, disagree, unsure, agree, and completely agree. In the mFFABQ, the item stem is the same, but individuals select one of the following choices to indicate their level of avoidance behavior for each activity: never (0% of the time), rarely (25% of the time), sometimes (50% of the time), often (75% of the time), and always (100% of the time). For instance, "Due to my fear of falling, I avoid going up and downstairs *rarely (25% of the time).* The updated mFFABQ responses more clearly align with the stem. The first aim of this study was to examine and quantify the test-retest reliability and minimal detectable change (MDC) of the mFFABQ. The second aim of the study was to provide evidence of the construct validity of the questionnaire in both those with PD and older adults. Another secondary aim was to provide evidence for an optimal cutpoint for the mFFABQ.

METHODS

Study design

This study utilized a cross-sectional design for test-retest reliability wherein participants completed the mFFABQ twice, separated approximately by one week. All physical performance measures and additional questionnaires were administered during in-person assessments, except for the second administration of the mFFABQ. A portion of participants also completed the original FFABQ. Participants wore activity monitors for one week following the initial assessments. The second mFFABQ was completed at home before returning the activity monitor. The mFFABQ was compared to the following measures to examine construct validity:

1. **Self-perceived balance confidence:** [17] The Activities-Specific Balance Confidence Scale (ABC);[18]
2. **Balance, mobility, and postural control**: Berg Balance Scale (BBS),[19] 30 Second Sit to Stand (30STS),[20] Timed Up & Go (TUG),[21] 2-minute step test (2MST),[22] and computerized dynamic posturography - Sensory Organization Test (SOT);[23]
3. **Affective function:** Zung Anxiety Scale,[24] Beck Depression Inventory,[25] and Consequences of Falling Questionnaire;[26] and,
4. **Physical activity levels:** average daily activity levels (i.e., time sitting/lying, time standing, time stepping, and number of steps) using a physical activity monitor for one week.

These measures and questionnaires were chosen for known-groups analysis and convergent validity, permitting logical inferences about the validity of the mFFABQ.

Sample size estimation

The sample size was estimated using the confidence intervals for intraclass correlation module in PASS 20.0.6 (NCSS, LLC. Kaysville, Utah, USA). Based on data from the original FFABQ reliability study, a sample of 59 participants was needed for Aim 1 (reliability).[8] This estimation was based on a two-way mixed-effects ANOVA model (Intraclass Correlation Coefficient (3,1)) with each participant measured

two times, a two-sided 95% confidence interval with a width of 0.178, and an ICC estimated at 0.815. For Aim 2 (validity), a sample size of 46 would achieve 80% power to detect a Pearson correlation coefficient of 0.40 for convergent validity analyses using a two-sided hypothesis test with a significance level of 0.05.

Participants

Ninety-one participants were recruited for the study, three participants were excluded due to missing data points, and three more were excluded due to dementia. A total of thirty-nine participants (age 72.21 ± 9.5; 29 men, 10 women) diagnosed with PD (Hoehn and Yahr[27] median and mode=3.0) and forty-nine healthy older adults (age 72.86± 5.0; 13 men, 36 women) participated in the study (Table 1). Participants were excluded if they were not between the ages of 60-90 years old, were unable to read or speak English, exhibited evidence of dementia (Montreal Cognitive Assessment (MoCA) < 18 or Mini-Mental State Exam < 25),[28] were unwilling to wear an activity monitor, or unable to stand unassisted for 10 minutes. Participants were recruited from local PD support groups, senior centers, community events, and community centers via print advertisements and snowball recruitment. The study protocol was approved by the University of Nevada, Las Vegas Biomedical Institutional Review Board. The data for this study has been collected from 2014 to 2023 and all participants were provided written informed consent during this time.

Instrumentation

mFFABQ. The mFFABQ is a 14-item self-administered questionnaire which uses a five-point Likert scale to measure a participant's avoidance behavior and if it has caused a decrease in their daily activity or participation.[8] The item scores are summed to form a total score ranging from 0 to 56. Higher scores indicate a higher level of FFAB.

Self-perceived balance confidence

The ABC is a 16-item self-reported measure that evaluates fear of falling and balance confidence. [29-32]The ABC provides a numerical rating from 0-100% to determine an individual's balance confidence when performing activities of daily living. A higher overall score indicates higher self-perceived balance and better mobility, whereas a lower score can be predictive of future falls.[33] It has evidence of good reliability and validity in determining balance confidence in older adults with and without PD.[34,35]

Balance, mobility, and postural control

BBS. The BBS[25] is a widely used clinical scale developed to measure static and dynamic standing, functional reaching, and transfers in elderly adults by instructing the participant to complete 14 functional balance tasks scored from zero to four. Cumulative scores range from zero to 56, with higher scores indicating a lesser risk of falling.[36] It has good evidence for reliability[37] and validity[19] to predict the risk of falls, multiple falls, and injurious falls in both community-dwelling older adults and adults with PD.[38,39]

30STS. The 30STS was designed to measure lower body strength in older adults by completing as many sit-to-stand movements in 30 seconds with arms crossed against their chest as able.[20] The total number of movement repetitions are compared to normative data in subgroups of age ranges. It has been shown to have excellent inter-rater reliability in people with PD.[40]

TUG. The TUG is a commonly used outcome measure originally created to assess fall risk in older adults.[41] The test consist of the participant standing, walking three meters, turning, and returning to their seat while being timed. A shorter completion time indicates a lower fall risk and better mobility. The TUG demonstrates good inter-rater reliability and validity in those with and without PD.[21]

2MST. The 2-Minute Step Test assesses aerobic capacity. The participant steps in place for two minutes, raising each knee to a minimum height designated by the midpoint between their iliac crest and patella during standing. The amount of times the right knee reaches this point is measured with

more steps within the allotted two minutes suggesting a higher level of aerobic capacity. It has been demonstrated to have good test-retest reliability in older adults.[22]

SOT. The SOT generates individual and composite equilibrium scores based on six balance conditions administered. These six conditions are based on the contributions of the three sensory systems (visual, vestibular and somatosensory) required for balance and postural control. The visual system provides visual feedback of an individual relative to their surroundings. The vestibular system provides information about motion and the position of an indivual's head and body in relation to their surroundings. The somatosensory system is involved in maintaining postural balance by relaying information about body position to the brain (Natalie Vanicek et al 2013 Computerized Dynamic Posturography for Postural Control).[42] The Bertec Balance Computerized Dynamic Posturography (Bertec®, Model 80P-0019, 2500 Citygate Drive Columbus, Ohio 43219) system calculates a composite score based on equilibrium scores on each condition, age, and sex.[43] This composite score is calculated by assessing postural control objectively by isolating and quantifying the contributions of three sensory systems of balance through six conditions. The six conditions are: (1) eyes open, stable support; (2) eyes closed, stable support; (3) sway-referenced vision, stable support; (4) eyes open, sway-referenced support; (5) eyes closed, sway-referenced support; and (6) eyes open, sway-referenced vision, and sway-referenced support.[43] Participants stand on a dynamic force place capable of tilting and simultaneously estimating center of gravity displacement during each of the six balance conditions. Sway-referencing involves an anterior/posterior rotation of the balance platform that occurs in response to the individuals shift in center of pressure. This platform rotation causes information obtained from the ankle joints to be unreliable for balance control. The scores range from zero to 100, with higher scores indicating better balance and postural control. It has good test-retest reliability in older adults[23] and has been shown to be a sensitive tool for identifying fall risk in older adults[44] and those with PD.[45]

Affective function

Zung Anxiety Scale. The Zung Anxiety Scale is a 20-item self-administered questionnaire that quantifies the level of anxiety that a participant is experiencing. Participants are asked to answer questions that best describe how they have felt during the past several days.[24] A composite score is compiled from a minimum of 20 to a maximum of 80, with a higher score indicating a higher level of anxiety.[24]

Beck Depression Inventory. The Beck Depression Inventory is a 21-item self-administered questionnaire that measures the symptoms of depression that a participant is experiencing.[46] Each item is scaled from 0 to 3, and the composite score ranges from a minimum of zero to a maximum of 63, with a higher score meaning a more severe level of depression. The BDI demonstrates high internal consistency for psychiatric and non-psychiatric populations.[47]

Consequences of Falling Questionnaire. The Consequences of Falling Questionnaire is a 12-item self-administered questionnaire that measures the perceived consequences of falling.[26] These items relate to the physical injury, social discomfort, functional incapacity, and subjective anxiety aspects of a fall. Each item is answered on a 4-point scale, with a higher score indicating more severe the perceived consequence of falling. The scale has two subscales; the Damage to Identity subscale (items 1 to 3, 6, 7, and 9) and the remaining items from the Functional Limitations subscale.[26]

Physical activity levels

Activity monitor. Physical activity levels were measured using ActivPAL activity monitors (PAL Technologies Ltd., Glasgow, United Kingdom). The device was placed inside a disposable finger cot and was attached to the participant's right leg for seven consecutive days using Tegaderm adhesive. This adhesive was only to be removed if replacing the adhesive when needed or if the participant had an adverse reaction to the adhesive. The finger cot and the Tegaderm adhesive allowed for the device to be worn in the shower/bath. After seven days, participants were instructed to return the ActivPal devices via mail. Any devices returned with less than five days of data were excluded from the analysis. Data

extracted from the ActivPAL included the number of hours in a day that the participant was sitting, lying down, biking, or standing. In addition, total steps per day were collected. The data were extracted from the ActivPAL devices using the PALconnect, PALanalysis, and PAL batch software (all PAL Technologies Ltd.).

Data analysis

Data were analyzed using SPSS version 28.0 (IBM SPSS Statistics for Windows, IBM Corp, Armonk, NY) with $\alpha = 0.05$. For Aim 1 (reliability), a two-way mixed-effects ANOVA model ICC (3,1) was utilized for the two mFFABQ measures separated by one week. The MDCs were calculated based on Standard Error of Measurement (SEM) using the test-retest reliability statistic (ICC value) where r_{xx}= test-retest reliability: $SEM = baseline\ standard\ deviation \times \sqrt{1 - r_{xx}}$.[48] Once SEM was determined, the MDC at the 95% confidence level (MDC_{95}) was calculated by multiplying the SEM by 1.96 (representing 95% of the area under the curve of a normal distribution) and 1.41 (the square root of 2, to control for possible error associated with calculating the coefficient from two data sets, i.e., test and retest). Aim 2 (validity) of the study was to provide evidence of the construct validity of the modified questionnaire relative to the original FFABQ. Since these scales are ordinal, we compared the mFFABQ to the original FFABQ using Spearman's rho. Additionally, construct validity for the mFFABQ was conducted using known-groups and convergent validity analyses. Known-groups analysis was utilized to determine if there were differences between those with Parkinson's disease and healthy, older adults on the mFFABQ. In addition, differences were explored based on fall history, which included faller or non-faller over the last year (fall status), faller and non-faller within the last month (fall recency), and injurious falls in the last year (fall injury) on mFFABQ scores via t-test or Mann-Whitney analyses if there were violations of homogeneity of variance. Convergent validity was evaluated by comparing the mFFABQ to the aforementioned measures of the same or similar constructs as other balance assessments using correlational statistics (Spearman's rho). Since there was likely a non-linear

relationship between falls and avoidance behavior,[3] the ratio of the number of falls (falls in the last year, last month, and injurious falls) per average daily steps taken was compared to the mFFABQ using Spearman's rho. To determine the optimal cutpoint for the mFFABQ on sedentary behavior (step-defined sedentary lifestyle index of <5000 steps per day)[49] and fall history (1 or more falls in the last year), the area under the ROC curve will be calculated and the Youden Index (maximum vertical distance or difference between the ROC curve and the diagonal or chance line) will be used to optimize the mFFABQ's ability given both sensitivity and specificity.

RESULTS

Aim 1 (reliability)

The mFFABQ demonstrated good overall reliability, ICC(3,1) = .822 (95% confidence interval (CI): 0.739 - 0.881) for all participants including those with mild cognitive impairment. The mFFABQ demonstrated good overall test-retest reliability for older adults and people with PD, ICC (3,1) = 0.780 (95% confidence interval (CI): 0.636 - 0.871) and 0.806 (95% CI: 0.658 - 0.894), respectively. The 90% minimal detectable change (MDC) was 14.775 scale points for the overall sample and 12.238 and 17.666 scale points for older adults and people with PD, respectively. The correlation between the mFFABQ (average of the two scores) with the FFABQ was .874, $p < .001$.

Aim 2 (validity) - known-groups validity

People with PD had higher mFFABQ scores (mean = 16.4, SEM = 2.3) than healthy older adults (mean = 7.6, SEM = 1.3), $p < .001$, Cohen's d= 0.78 (Table 2). A subset of the sample, who all had a diagnosis of PD (n = 39), also completed the original FFABQ. Participants who reported at least one fall in the last year ("fallers") during the in-person assessment, had higher mFFABQ scores (mean = 16.4, SEM = 2.1) than non-fallers (mean = 6.3, SEM = 1.1), $p < .001$, Cohen's d= 0.92 (Table 2). Participants who had experienced a fall within the last month ("recent faller") had higher mFFABQ scores (mean = 15.1, SEM = 2.4) than non-recent fallers (mean = 10.8, SEM = 1.5), $p = .208$, Cohen's d= 0.36 (Table 2). There was no difference between those who had experienced a fall injury in the last year (mean = 13.3, SEM = 2.1) compared to those who had not (mean = 11.0, SEM = 1.6), $p = .471$, Cohen's d= -0.18 (Table 2).

Aim 2 (validity) - convergent validity

For all participants, the mFFABQ significantly correlated with fall history (fall status rho= -.430 ($p < .001$) and fall recency rho = -.235 ($p = .031$)) but not with fall injuries (rho = .173 ($p = .113$)). The correlations between mFFABQ and a ratio of steps per day and falls (fall-to-step) were stronger than fall history: falls/year/step rho = .630 ($p < .001$), falls/month/steps rho = .209 ($p = .189$), injurious

falls/year/steps rho = .172 (p=.282). The mFFABQ also correlated with the ABC (rho = -.804, p <.001), BBS (rho = -.595, p <.001), TUG (rho = .560, p <.001), and 30STS (rho = -.386, p <.001). The mFFABQ correlated with the ZAS (rho = .428, p <.001), BDI (rho = .606, p <.001), and CoFQ (rho = .582, p <.001) including the damage to identity (rho= .608, p <.001) and functional limitation (rho= .497, p <.001) subscales of the CoFQ. For physical activity, the mFFABQ correlated with time sitting/lying (rho = 0.129, p=.248), time standing (rho = -.072, p= .520), time stepping (rho = -.298, p=.007), and number of steps (rho = -.358, p <.001) in the direction consistent with the hypotheses and the construct.

Aim 3 (cut-point)

The area under the ROC curve was .720 (95% CI: .613 to .828) with a cut-point of 11.5 on the mFFABQ for sedentary behavior (<5000 steps per day)[49] (Figure 1).

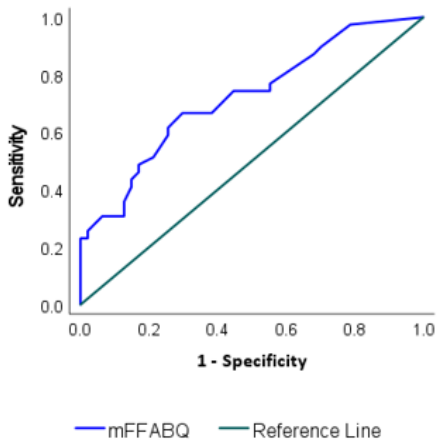

Figure 1: ROC curve for the mFFABQ on sedentary activity (<5000 steps per day)

The sensitivity and specificity of the 11.5 cut-point were .667 and .702, respectfully. The area under the ROC curve for fall history (1 or more falls in the last year), was .723 (95% CI: .618 to .827) and the optimal cut-point was 13.5 with sensitivity at .551 and specificity as .810 (Figure 2).

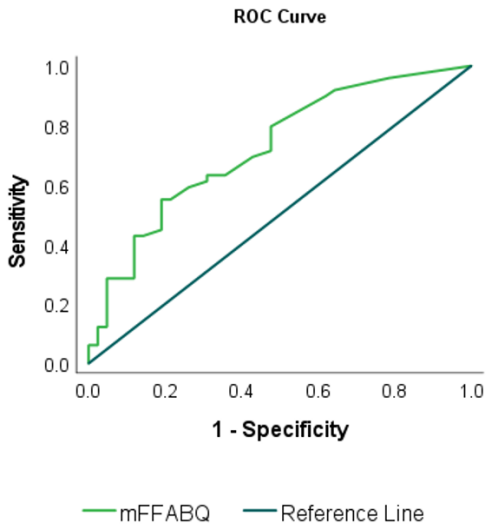

Figure 2: ROC curve for the mFFABQ on fall history (1 or more falls in the last year).

DISCUSSION

An important objective of the original FFABQ was to create a reliable, clinically feasible, and accessible tool to assess FFAB.[8] The changes made in the modified version of the FFABQ were implemented with the intention to improve clarity and thus improve the reliability and validity of the mFFABQ. Our results provided evidence that the mFFABQ has acceptable reliability for those with PD (ICC (3,1) = 0.781 (95% CI: 0.636 - 0.871) and healthy older adults (0.806 (95% CI: 0.658 - 0.894)). This has increased compared to the reliability of the original FFABQ in those with PD (ICC (3,1) = .751 (95% CI: .524-.878) and healthy older adults (ICC [3,1] = .798 (95% CI: .593-.905).[8] It was expected that with easier-to-understand Likert options, the ICC would increase because participants would respond more consistently during their first and second mFFABQ completion. Increased comprehensibility is a possible explanation for a higher ICC value.

Similar to the original FFABQ,[8] the modified version of the questionnaire strongly correlated with performance-based balance measures such as the BBS, TUG, and 30STS. Fall history was not consistent with FFAB, reinforcing the idea that individuals with high FFAB may avoid activities that compromise their balance. The correlation between mFFABQ and these measures suggest that individuals with increased avoidance behavior due to fear of falling are likely to demonstrate impaired balance with functional activities.[3] This supports the notion that increased FFAB may decrease fall frequency but does not decrease one's postural instability.[50]

As functional balance declines, a person is likely to cope typically through increased sedentary behaviors and avoiding activities that challenge balance.[51] The results of this study are consistent with this notion as the area under the ROC curve demonstrates an acceptable diagnostic accuracy. The mFFABQ shows improved predictive ability for of sedentary behaviors at a cut-off score of 11.5. There was a moderate, positive correlation between mFFABQ scores and time spent sitting/lying. This suggests people with higher FFAB spend more time in sedentary behaviors. Likewise, there were negative

correlations between mFFABQ scores and level of physical activity, such that greater FFAB was associated with decreased time spent standing, stepping, and daily number of steps. In line with the theory of a vicious cycle[7] – this may indicate that sedentary behavior may be a safety mechanism to minimize the perceived risk of falling. Additionally, the mFFABQ demonstrates a good predictive ability for fall history with the area under the ROC curve of .723 with a cutpoint of 13.5. further supporting the notion that increased activity avoidance contributes to a higher likelihood of fall history.

The mFFABQ also demonstrated a moderate, positive correlation with the ABC, ZAS, BDI, and CoFQ. The strongest correlation was found with the ABC, which aligns with previous literature regarding the impact of balance confidence in those who avoid activity due to their fear of falling. Furthermore, catastrophization, as measured by the CoFQ, – especially the damage to identity subsection – has previously been found to be a predictor of FFABQ scores in those with PD.[52] In a clinical context, it may prove beneficial to address the consequences of falling when attempting to mitigate the downstream consequences of FFAB. Fear of falling is a multifactorial phenomenon that requires a multifaceted approach to maximize the effectiveness of interventions. This approach can include physical examination of function, regular tracking of activity levels, psychosocial monitoring and appropriate referral, and coordination with social support systems surrounding a person with FFAB.

The mFFABQ is a tool that can be completed in under five minutes[8] and can give healthcare providers insight into the specific activities being avoided and to the greater belief system a person may hold about reducing the risk of falls. By evaluating specific activities, the mFFABQ will enable practitioners across disciplines to target interventions (including education) toward reducing fear and increasing self-efficacy in the identified activities. The mFFABQ contributes to a thorough assessment of an individual who may present with balance impairments or history of falls by more accurately measuring avoidance behavior as opposed to other outcomes, which target self-efficacy (ABC), motor performance (i.e., BBS and 30STS) or psychosocial experiences (i.e., BDI and ZAS). The mFFABQ

contributes to a more holistic overview of an individual's level of participation because it directly measures both activity and participation restrictions based on the International Classification of Functioning, Diability, and Health (ICF).[53] This study provides evidence, based on the psychometric properties, that the mFFABQ is suitable for use in research regarding falls and FOF in the populations observed.

Limitations of this study include data collection that spanned from 8 years (from 2014 to 2022) due to difficulties with participant recruitment. Despite other measures gaining evidence for their validty in PD in this period, continuity in objective measures was necessary. One example is the use of the BBS, which tests anticipatory and lower extremity functional strength, as opposed to the Mini Balance Evaluation Systems Test (MiniBEST), which includes these and assesses gait and reactive balance.[54-56] The recruitment of older adults with a history of falls and/or FFAB proved challenging. It is possible that individuals who have had a fall or falls will avoid physical activity and are therefore less likely to participate in a research study that they perceive may challenge their balance.

Further research should focus on multidisciplinary interventions to treat FFAB as measured by the mFFABQ to investigate if reductions in FFAB significantly correlate to quality of life, global health, social engagement, and disease progression. Falls in older adults can be detrimental to their health,[57] but an increasing body of research also shows the detriment of FFAB on function and social engagement in older adults with[3] and without PD.[5,58] More research should further examine the relationship between the mFFABQ and its utility for predicting future falls, given that previous literature has established fall history as an inappropriate way to predict future falls in those with high FFAB.[9] Another area for expansion would be the use of the mFFABQ in concert with measures of balance abilities to assess safety, thus allowing clinicians to assess goals for returning home safely and/or discharge planning beyond functional mobility.[59]

CONCLUSION

The results from this study support the use of the new mFFABQ as a reliable and valid tool for older adults with and without PD. This also supports the notion that the updated Likert responses in the mFFABQ are easier to understand, yielding more reliable scores. Reductions in physical activity and increases in sedentary behaviors are hallmarks of FFAB. The results support the original inference that the mFFABQ would be comparable to the FFABQ as demonstrated by the significant correlations between mFFABQ scores, physical activity levels, and established outcome measures/questionnaires.

APPENDIX

Table 1. Descriptive statistics for the overall sample and those with PD and healthy, older adults.

		Overall (n=88)	People with PD (n=39)	Healthy, older adults (n= 49)
Demographics	Age	72.57±7.3	72.21±9.5	72.86±5.0
	Sex	42 male, 46 female	29 male, 10 female	13 male, 36 female
	Year of diagnosis	Median= 2007 Mode= 2008	Median= 2007 Mode= 2008	N/A
	Hoehn and Yahr	0.0=7 1.0=3 1.5=1 2.0=6 2.5=1 3.0=20 4.0=1 None=49	0.0=7 1.0=3 1.5=1 2.0=6 2.5=1 3.0=20 4.0=1	N/A
Self-perceived balance confidence				
	ABC	75.23±24.5	64.19±25.9	84.20±19.2
Balance, mobility, and postural control	Falls in the last year	6.82±37.7	14.46±56.1	.73±1.0
	Falls in the last month	.68±3.3	1.44±5.0	.08±.3
	Injurious falls in the last year	.43±1.1	.62±1.4	.29±.7
	BBS	49.80±9.5	44.36±12.1	54.12±2.4
	30STS	10.20±5.5	8.51±7.1	11.55±3.4
	TUG	10.88±5.0	13.40±6.3	8.88±2.3
	2MST	65.84±34.0	50.03±37.2	78.43±25.2
	SOT	62.42±18.0	65.33±26.6	62.24±17.7
Affective function	ZAS	41.43±10.5	43.67±11.1	39.65±9.7
	BDI	8.83±8.0	12.23±9.3	6.12±5.5
	CoFQ	24.73±6.6	27.36±5.1	22.63±7.0
Physical activity levels	Time sitting and lying pe day	18.80±2.4	19.48±2.2	18.22±2.3
	Time standing per day	3.74±1.9	3.61±1.8	3.86±2.0
	Time stepping per day	1.28±.7	.92±.6	1.58±.7
	Number of daily steps	6131.63±3696.5	4471.38±2964.5	7533.62±3699.1

Table 2. Known-groups validity comparisons.

Comparison	Group	Means	SEM	Cohen's D with 95% CI (Hedges correction)	Statistic	P value
Diagnosis	People with PD (n=38)	16.4	2.3	.777 (.335 to 1.215)	t=3.596	<.001
	Healthy older adults (n=47)	7.6	1.3			
Fall status	Fallers (n=44)	16.4	2.1	.917 (.471 to 1.359)	t=4.264	<.001
	Non-fallers (n=41)	6.3	1.1			
Fall recency	Recent faller (n=15)	15.1	2.4	.357 (-.199 to .912)	t= 1.268	.208
	Non-recent faller (n=70)	10.8	1.5			
Fall injury	Fall injury (n=20)	13.3	2.1	-.184 (-.681 to .314)	t= -.725	.471
	Non-fall injury (n=65)	11.0	1.6			

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CURRICULUM VITAE

Arturo Aldaco
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Education

- Doctor of Physical Therapy – Graduation anticipated May 2023
  University of Nevada, Las Vegas
- Bachelor of Science: Kinesiology – May 2018
  University of Nevada, Las Vegas

Licensure

- Nevada State Board of Physical Therapy – License pending graduation, May 2023

Clinical Experience

- Encompass Health & Rehab – January 2023 through March 2023 Las Vegas, NV.
  Inpatient Rehab.
- Cleveland Clinic Lou Ruvo Center – September 2022 through December 2022 Las Vegas, NV.
  Outpatient neurological exclusively serving neurodegenerative diseases.
- Renown Regional Medical Center – July 2022 through September 2022 Reno, NV.
  Acute care.
- Physical Therapy Partners of Nevada – June 2021 through July 2021 Fernley, NV.
  Outpatient orthopedics with an emphasis on low back pain.

Related Employment

- Physical Therapy Technician – May 2019 through May 2022
  Nevada Community Enrichment Program: Las Vegas, NV.

Professional Organization Memberships

- American Physical Therapy Association – June 2020, currently held

Awards

- Keith Kleven, P.T., M.S. Endowed Scholarship – April 2022

Ashley Haller, SPT, BS (they/them)
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Education

Doctorate in Physical Therapy at University of Nevada, Las Vegas, 2020-2023

- **Bachelor of Science in Exercise and Sports Science at Oregon State University, 2013-2018**

Employment History

- **August 2021 – July 2022: Student Worker for Administrative Assistant, University of Nevada, Las Vegas Physical Therapy Department**
    - Organize and set up hosting events, maintain the graduate alumni list, and manage classroom supplies
- **July 2018 – May 2020: Physical Therapy Technician, Upstream Rehabilitation in Eugene, Oregon**
    - Execute therapeutic exercise and activity plans, maintain cleanliness, submit insurance authorization forms, schedule patient appointments

Associated Experience

- **January 2023 – March 2023: Doctoral Internship in Acute Care, Johns Hopkins Hospital in Baltimore, MD**
    - Completed acute care evaluations and treatments in coordination with other professions with patients on medical floors, intermediate care units, and the medical intensive care unit.
    - Collaborated on literature review for outcome measures in acute care for brain injuries for employee education.
- **September 2022 – December 2022: Doctoral Internship in Inpatient Rehabilitation, PAM Rehabilitation Center in Las Vegas, NV**
    - Evaluated, treated, and created plans of care for patients with diagnoses of stroke, organ injuries, diabetic complications, and general mobility disorders.
    - Prepared home discharge recommendations as appropriate.
- **July 2022 – September 2022: Specialty Doctoral Internship in Outpatient Neurology, Cleveland Clinic in Las Vegas, NV**
    - Treated patients experiencing degenerative diseases including Parkinson's Disease, multiple sclerosis, Dementia, Alzheimer's Disease, and other neurodegenerative conditions
    - Presented a Lunch & Learn topic *Managing Spasticity in Multiple Sclerosis: A Team Effort*
- **June 2021 – July 2021: Doctoral Internship in Outpatient Orthopedics, Dignity Health Physical Therapy – Blue Diamond, in Las Vegas, NV**
    - Treated patients with musculoskeletal conditions such as fractures, post-surgical rehabilitation, and chronic pain

Service

- **Professional**
    - 7/30/2022: Cleveland Clinic Brain Health Day Fall Screening in Mesquite, NV (6 hours)

- 9/18/2021: UNLV Hosted Falls Prevention Screening with Occupational Therapy students (3.5 hours)
- 1/22/2021: UNLVPT Interview Day (4 hours)

- **Community**
  - 6/26/2021: Native American/Hawaiian Youth Basketball Tournament (4.5 hours)
    - Distributed and promoted with UNLVPT goodies, talked with players, and assessed injuries under the supervision of Dr. Keoni Kins
  - 4/10/2021: Funny Bunny Race (4 hours)
    - Arranged tables, checked temperatures for COVID protocol, and registered participants

Honors and Awards

- **2023 ACAPT Honors Society Inductee**
- **2021 & 2022 Recipient of a UNLV Physical Therapy Department Scholarship**
- **2021 Recipient of the Alpha Kappa Chapter Graduate Scholarship from Kappa Delta Sorority**

Leadership

- **December 2021 – 2022: Centennial Scholar of the American Physical Therapy Association**
  - Mentor: Dr. Ryan Balmes PT, DPT
  - I attended monthly trainings, completed a capstone project, and participated in a day of learning in Washington D.C.
- **July 2021 – 2022: President of the Diversity, Equity, and Inclusion Club**
  - Plan monthly meetings, lead executive board, plan events, and discuss goals
  - Manage the club budget, engage with member requests

Research

- **Present**
  - 2/23/2023: Combined Sections Meeting Poster Presentation *The reliability and validity of the modified Fear of Falling Avoidance Behavior Questionnaire*
  - 9/14/2022: Cleveland Clinic Lou Ruvo Center for Brain Health Lunch & Learn titled *Managing Spasticity in Multiple Sclerosis: A Team Effort*
  - 2/3-5/2022: 5x5 Presentation of APTA Centennial Scholars Capstone in APTA Pavilion at the 2022 Combined Sections Meeting in San Antonio, TX
- **Participate/Create**
  - 2020-2023: Student researcher: "*Reliability and Validity of the Modified Fear of Falling and Avoidance Behavior Questionnaire"* Landers M, Aldaco A, La B
  - 8/2020-3/2021: APTA Centennial Scholars Individual Capstone *"OnRamp: An anti-racism workshop for white-identifying students and faculty at UNLVPT"*
  - 1/28/21: Participant in "*Resilience, Grit, and Optimism"* Webinar. Moderated by Jennifer Green-Wilson, PT, MBA, EdD. Panelists: Cara Schildmeyer, DPT Student - Class of 2023, University of Cincinnati; Darren Joffe, SPT; Lauren Petrisin, SPT, PhD student; Yusra Iftikhar, PT, DPT
- **Consume/Share**
  - UNLVPT Diversity, Equity, and Inclusion Club
    - 2022-2023: Student Member
    - 2021-2022: President

        - 2020-2021: Student Member
    - UNLVPT Spanish Club
        - 2020-2023: Student Member
    - Friends of Parkinson's Medical Symposium
        - 8/20/2022: Mike Studer, PT, DPT, MHS, NCS, CEEAA, CWT, CSST, FAPTA "Neuroplasticity in Parkinson's Disease: How do we Achieve this in the Clinic?"
    - Distinguished Lecture Series
        - 10/13/2022: Ellen Hillegass, PT, PhD, CCS, FAPTA "Tales of the Heart: Inspiration to Motivate Change in Clinical Practice and Education"
        - 11/19/2021: Julie Fritz, PhD, PT, ATC "Pain Management in a Time of Dueling Pandemics"
        - 11/5/2020: Catherine Lang, PT, PhD, FAPTA "Wearable sensors are changing how we think about movement and rehabilitation"
        - 11/6/2020: Catherine Lang, PT, PhD, FAPTA "Attempting to improve stroke rehabilitation across the translational pathway"
    - UNLVPT Brown Bag Lecture Series
        - 2022 topics have included faculty positions and pathways, compassion in patient care, and musculoskeletal pain in Parkinson's Disease
        - 2021 topics included Lynda D. Woodruff Lecture, return to sport, and the 52nd Mary McMillan Lecture
        - 2020 topics included Native American health, administration, global health, and standardized care
    - Combined Sections Meeting,
        - 2/3-5/2022: San Antonio, TX
            - Topics for lectures attended include acute care, ICU, Home Health, hospice care, ageism, DEI, COVID-19, oncology
    - 2021 APTA Combine Sections Meeting
    - 2020 National Student Conclave

Membership in Professional Organizations

- 2020 – Present: Member American Physical Therapy Association; Member #: 892201
    - Section Memberships:
        - Acute Care
        - Geriatrics
        - Leadership and Innovation
- 2022 – Present: Student Subcommittee Member of PT Proud Podcasts and Webinars

Billy La, SPT
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Education

- University of Nevada, Las Vegas: Graduation Anticipated May 2023
    - Doctor of Physical Therapy (DPT)

- University of California, Davis: Graduated June 2015
    - Bachelor of Science (BS) – Exercise Biology
    - Minor in Psychology

Certification

- American Heart Association: First Aid, CPR, AED Certification
- OTAGO Training Certification
- CITI Program, Human Subjects Research – Basic Course 1
- The McKenzie Institute Course: Part A

Work Experiences

- Teaching Assistant: University of Nevada, Las Vegas: 6/2021 – 6/2022
    - Facilitated discussion, graded exams, and tutored students in the course DPT 741 - Musculoskeletal I - Orthopedic Principles lectures taught by Dr. Kai-Yu Ho, one of the research faculty at the UNLV DPT program.
    - Assist in the development of protocol for research in measuring the balance and gait in individuals with down syndrome.
- Environmental, Health, and Safety Specialist: Amazon Fulfillment Center – RNO4: 4/2016 – 4/2020
    - Serve as designated safety representative of assigned fulfillment center (FC), coordinating and implementing all areas of the Amazon Global Safety Program as directed by Safety Manager of the regional node.
    - Conduct risk assessments related to jobs performed (Job Hazard Analysis) and new equipment introductions. Recommend appropriate risk mitigation measures to Management, including ergonomic considerations, in all such efforts.

Clinical Experiences

- PAM Health Rehabilitation Hospital of Centennial Hills – Las Vegas, NV: 1/2023-3/2023
    - Collaborated with physicians, occupational therapy, speech-language pathology, nursing, and social work in providing comprehensive rehabilitation services for adult and geriatric patients.

    - Participated in multi-disciplinary team meetings, patient/family conferences, and conducted family/caregiver education and training.
- St. Mary's Regional Medical Center – Reno, NV: 9/2022 – 12/2022
    - Evaluated and treated patients of various ages, backgrounds, and a wide array of diagnoses in an acute hospital setting.
    - Collaborate with physicians, nurses, and interprofessional medical team on safe discharge planning.
- The Orthopedic Specialty Hospital – Salt Lake City, UT: 7/2022 – 9/2022
    - Evaluated and treated patients of various ages, backgrounds, and a wide array of diagnoses in an outpatient rehabilitation clinic.
    - Provided treatments, modalities and therapeutic exercise programs encompassing active and passive ranges of motion, neuromuscular re-education, massage, blood flow restriction, shockwave therapy.
- Active Physical Thearpy – Reno, NV: 6/2021 – 7/2021
    - Evaluated and treated patients of various ages, backgrounds, and a wide array of diagnoses in an outpatient rehabilitation clinic.
    - Directed physical therapy technicians in the treatment of patients.
    - Worked closely with the clinical instructor to provide exceptional care with the McKenzie Diagnosis and Treatment (MDT) method.

Service

- Professional
    - UNLV DPT Virtual Information Session and Application Workshop (4/27/2022); 1.5 hours
        - Participated on a panel of current UNLV DPT students to answer questions for prospective students.
- Community
    - Ballet West: Musculoskeletal Screening (8/4/2022); 6 hours
        - Volunteered in an interprofessional event with athletic trainers to conduct a musculoskeletal and injury risk screening on dancers in the Ballet West Dance Company
    - Rock Steady Boxing Student Volunteering (11/29/2021); 2 hours
        - Volunteered with the RockSteady Boxing staff to help set up, clean up, and participate/facilitate the RockSteady Boxing class for individuals with Parkinson's Disease
    - Cleveland Clinic - Balance and Memory Screening (9/18/2021); 3 hours
        - Volunteered in an interprofessional event with the Occupation Therapy students to conduct a balance and memory screen on older adults.
    - C3 Logix Baseline Concussion Testing (7/30/2021); 3 hours
        - Conducted baseline concussion testing for high school football players at Bishop Gorman high school.
    - Friends of Parkinson's Funny Bunny Race (4/1/2021); 2 hours
        - Assisted with set up, participant registration, temperature readings, and clean up.

Leadership

- Qualities/Roles/Positions:
    - Teaching Assistant (6/9/2021 – 6/15/2022)
        - Teaching assistant for Dr. Kai-Yu Ho, one of the research faculty at UNLV DPT.
        - I attend and help facilitate discussion during DPT 741 - Musculoskeletal I - Orthopedic Principles lectures.
        - Assist with Dr. Ho's research projects.
    - Diversity, Equity, and Inclusion Club Executive Board Member (5/15/2021 – 6/15/2022)
        - Part of a board that organizes presentations for the monthly meetings for the UNLV DPT program.

- Leadership skill development pathways:
    - Student Delegate: Nevada APTA House of Delegates (HOD) (8/13/2022-8/15/2022)

Research

- **Consume/Share**
    - UNLV PT Brown Bag:
        - 6/8/22: Dr. Lisa VanHoose, PT, PhD, MPH, FAPTA, FAAPT, "DEI Fatigue? RST is the Intervention
        - 3/9/2022: Ryan Duncan, PT, DPT, MSCI, Washington University, "Musculoskeletal Pain in Parkinson's Disease: Why Should We Care?"
    - 2023 Combined Sections Meeting:
        - 2/23/2023: NE-13769 Blood Flow Restriction Training: Applications in the Neurologic Population - Jenna Lynn Encheff, PT, PhD, Nicole Ann Walter, PT and Tricia L. Widenhoefer, PT, DPT, MS
        - 2/23/2023: GR-14820 Clinical Practice Guideline for the Management of Falls in Community-Dwelling Older Adults - Timothy A. Hanke, PT, PhD, Keith G. Avin, PT, PhD, Christine M. McDonough, PT, PhD, Neva Jillaine Kirk-Sanchez, PT, PhD and Jennifer A. Blackwood, PT, PhD
        - 2/24/2023: AC-14802 Talk the Talk, Walk the Walk: Implications for Dual Tasking in Acute Care PT - Kimberly Moore Levenhagen, PT, DPT, Jason Keith Longhurst, PT, DPT, PhD, Joshua Kurt Johnson, PT, DPT, PhD and Nicole J. Neveau, PT, DPT
        - 2/24/2023: CP-14722 Everybody Has a Plan Until They Get Punched in the Face - John William Connell, PT
        - 2/25/2023: OR-13907 Navigating a Rewarding Career Path in Occupational Health - Joshua Prall, PT, DPT, EdD, Wayne Allen Macmasters, PT, DPT, Leslie Jan Pickett, PT, DPT and Katie Payne McBee, PT, DPT

Awards

- 2023 AJ Koval Scholarship Award