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FEAR OF FALLING: THE FEAR OF FALLING AVOIDANCE

BEHAVIOR QUESTIONNAIRE (FFABQ)

by

Cortney Durand, SPT

Bachelor of Science
University of Nevada, Reno
2008

A doctoral document submitted in partial fulfillment of
the requirements for the

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ABSTRACT

Development of a Scale to Assess Avoidance Behavior Due to Fear of Falling: The Fear of Falling Avoidance Behavior Questionnaire (FFABQ)

by

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Background: A history of falls or imbalance may lead to a fear of falling which may lead to self-imposed avoidance of activity; this avoidance may stimulate a vicious cycle of de-conditioning and subsequent falls.

Objective: The purpose of this study was to develop a questionnaire that would quantify avoidance behavior due to a fear of falling.

Design: This study consisted of two parts, questionnaire development and psychometric testing. Questionnaire development included an expert panel and 39 assisted living residents. Psychometric testing included 63 community dwelling subjects with various health conditions.

Methods: Questionnaire development included the evaluation of face and content validity, and factor analysis of the initial questionnaire. The final result of questionnaire development was the Fear of Falling Avoidance Behavior Questionnaire (FFABQ). In order to determine its psychometrics properties, reliability and construct validity were assessed through administration of the FFABQ to subjects twice one week apart and comparison of the FFABQ to other questionnaires related to fear of falling, functional measures of balance and mobility, and daily activity levels using an activity monitor.

iii

Results: The FFABQ had good overall test-retest reliability (ICC= .812) and was found

to differentiate between those who were considered fallers (i.e., at least one fall in the

past year) and non-fallers (p< .015). The FFABQ predicted time spent sitting or lying,

and endurance.

Limitations: A relatively small number of subjects with a fear of falling were willing to

participate.

Conclusion: Results from this study offer evidence for the reliability and validity of the

FFABQ and support the notion that the FFABQ is measuring avoidance behavior rather

than balance confidence, self-efficacy or fear.

Introduction

It has been reported that 28-35% of individuals 65 years of age and older will fall within a year's time, exposing them to serious potential injury.[1] Although injuries as a result of a fall can be significant,[2-7] a fear of falling may be a more serious problem as it may lead to restricted activity and mobility in the elderly.[2,3,8] Research indicates 50% of individuals have a fear of falling after experiencing just one fall, and a quarter of these persons describe avoiding some activity due to their fear.[6] A fall, however, is not a prerequisite to the fear of falling or subsequent activity restriction.[2,9] Howland et al reported 20% of individuals who had not recently experienced a fall were still somewhat or very afraid of falling.[2] Therefore, fallers and non-fallers alike may have a fear of falling that may lead to inactivity and social isolation which could in turn stimulate de-conditioning, functional decline and decreased quality of life.[2,10-14]

Despite the availability of many balance impairment tools, balance confidence measures, and self-efficacy measures, there is a need for a practical, clinical tool that can help quantify the effect of fear of falling on the International Classification of Functioning, Disability, and Health (ICF) levels of activity and participation. The most commonly used self-perceived balance confidence and efficacy questionnaires (e.g., Activities-specific Balance Confidence Scale (ABC)[15], Falls Efficacy Scale (FES)[16]) appear to be adequate at measuring "confidence" and "self-efficacy," respectively, with activities of daily living (ADLs); however, they both fail to capture the downstream consequence (i.e., activity limitation and participation restriction) that a "lack of confidence" or "decreased self-efficacy" has on performing functional tasks. Furthermore, the ABC and FES do not assess whether this confidence translates into

avoidance-behavior. Instead, these questionnaires are focused on the ICF defined

personal factors rather than activity and participation. In addition, research has also

indicated these fall-related instruments are often used beyond the scope of their original

design to measure fear of falling.[17] Moreover, while performance-based measures of

balance, gait, and fall risk (i.e., Berg Balance Scale (BBS),[18-21] Dynamic Gait Index

(DGI),[7,22-24] Timed Up and Go Test (TUGT),[7,21] Functional Reach Test (FRT),[25-27]

dynamic posturography[28,29]) are good at measuring different aspects of balance and fall

risk, they fail to capture the role and influence that the fear of falling has on activity and

participation. In addition, the use of fall incidence is not an adequate measure of

avoidance behavior, as an individual may avoid activities out of fear without having had

any falls.[8]

      There are few surveys that measure the effect of fear of falling on activity. The

Survey of Activities and Fear of Falling in the Elderly (SAFFE) is an interview-based, 11

item survey intended to differentiate those who restrict their activity because of fear of

falling from those who do not restrict their activity but still have a fear of falling.[30] While

no test-retest reliability was published for the original SAFFE measure, the authors did

provide evidence for convergent validity of the SAFFE.[30,31] Evidence for reliability and

validity of the SAFFE has also been found recently for individuals with Parkinson's

Disease (PD).[32] SAFFE scores indicating severe and moderate activity restriction have

also been found to be an independent predictor of increasing independent ADL

disability.[33] On the other hand, Hotchkiss et al found that the SAFFE was unable to

accurately predict frequency of falls, activity limitation and frequency of leaving home.[34]

In fact, the FES was a better predictor of people who exhibited activity restriction when

compared to the SAFFE even though the FES is not intended to measure activity restriction.[34] While the SAFFE survey instrument has items consistent with the ICF levels of activity and participation, it is a six page document that involves qualitative and quantitative components, making it less user-friendly as well as time consuming to complete and score. The SAFFE was designed to be administered in a face-to-face interview and has been described by researchers as "too long and burdensome" to administer, making it less practical for clinicians and researchers.[17,35]

A modified version of the SAFFE (Modified Survey of Activities and Fear of Falling in the Elderly (mSAFFE)) is a 17 item scale directed at activity avoidance.[36] It was designed to be a self-administered questionnaire which would be more efficient and less time consuming to administer, complete and score than its predecessor. The mSAFFE was found to have satisfactory test-retest reliability (rho= .75) but no validity was reported.[36] Moore and Ellis compared the SAFFE and mSAFFE and reported that the mSAFFE may be a more useful measure of fear of falling and its effects on activity restriction, but indicate that more research needs to support the measure prior to its use.[17]

The Geriatric Fear of Falling Measure (GFFM) was created as a quick and culturally relevant measure of fear of falling for community-dwelling older adults living in Taiwan.[37] It includes three subscales (psychosomatic symptoms, risk prevention, modifying behavior) with 15 points total that are intended to measure activity restriction.[37] It has good test-retest reliability ($r= 0.88$) but poor validity ($r=0.29$) when compared to the FES.[37] However, generalizability is also an issue for the GFFM as the authors acknowledge the data is limited to Taiwanese elders and suggest reliability and validity should be investigated further.[17,37] The body of research on these measures

emphasizes the effect of fear-avoidance behaviors on mobility. However, given the existing methodological limitations, there is still a need for a convenient and reliable clinical tool that can be used on heterogenous populations to standardize avoidance-behavior at the level of activity and participation.

To address this need, we are proposing a new, practical self-assessment measurement tool, the Fear of Falling Avoidance Behavior Questionnaire (FFABQ), which quantifies avoidance-behavior (activity limitation and participation restriction) related to the fear of falling. This new questionnaire was based on the fear avoidance model of exaggerated pain perception presented by Lethem and Troup.[38,39] This model is used to understand the psychogenic component of an individual's condition that may cause avoidance of certain activities.[40] The model explains that individuals learn through operant conditioning to fear situations or stimuli that cause harm or stress and, as a result, to avoid that situation or stimuli.[40] The premise for the FFABQ was that individuals with a fear of falling (secondary to a previous fall or awareness of the negative consequences of falling) would avoid activities that put them at a risk for a fall. Therefore, the FFABQ would capture the avoidance of activities that would result from a fear of falling.

An important goal of this project was to create an assessment tool that would aid the researcher and the clinician alike in quickly, objectively, and reliably assessing avoidance behavior (activity limitation and participation restriction) for use in examination, diagnosis, prognosis, and treatment outcomes in individuals with various diagnoses. The primary purpose of this study was to outline the development of this questionnaire and to examine its psychometric properties and validity, so that it may be used in conjunction with other measurement tools to help create a more complete picture

of the influence that falls, fall avoidance behavior, and balance deficits have on the individual's life. Our specific hypothesis was that those with a fall history would report more fear-avoidance behavior. In addition, because we believe that the FFABQ measures a different, but tangentially-related construct from other commonly used clinical balance tests, we hypothesized that there would be moderate correlations with these other tests. Lastly, we expect the FFABQ to contribute a unique amount of the variation beyond what is accounted for by other scales with a similar construct.

Methods

The overall design of the study involved two main components: questionnaire development and testing of the questionnaire psychometrics. Questionnaire development included face validity, content validity and a pilot study analysis of the initial questionnaire. The goal of this phase was to improve the syntax and appropriateness of the individual items on the questionnaire by using an expert panel of physical therapists and patients with a fall history. In addition, other questions or items that were not presently in the questionnaire would be added if the item domain was missing or under-represented. A secondary goal of the development was to remove items that were redundant or very similar to other items. Ultimately, this process would shape the questionnaire into a final iteration, which would then undergo psychometric testing. This testing would include analysis of the reliability and construct validity of the final questionnaire. The goal of this phase was to establish the psychometric properties of this questionnaire. This study was approved by the University of Nevada, Las Vegas

Institutional Review Board (IRB) and written informed consent was completed by all subjects.

Questionnaire Development – face validity, content validity and pilot study analysis

An expert panel of 13 (seven physical therapy educators (four of which have published research related to balance or falls), one physical therapist who was a generalist, three physical therapists whose specialty was balance, and two patients with a fall history), were involved in determining the face and content validity of the original 21 item questionnaire which was conceptualized by the authors. In addition to being physical therapists, several of the panel members provided additional breadth and depth of expertise through their experiences in community-based programs for persons with PD and/or with family members who had restricted their activity due to a fear of falling. They were asked to assess the overall face and content validity of the questionnaire through an assessment of the language and the relevance of each individual item.

Each item was stated as follows: "Due to my fear of falling, I avoid…(*activity or participation*)" with the following anchors: completely disagree, disagree, unsure, agree, completely agree. Each statement was scored using a Likert-style, five-point ordinal scale (0= completely disagree to 4= completely agree) resulting in a total possible score of 84. A higher score would indicate greater activity limitation and participation restriction as a result of the fear of the falling.

The initial version of the questionnaire was pilot tested on 39 residents (mean age = 85.03, SD=5.1; 16 fallers/23 non-fallers; 11 male/28 female) of an assisted living facility to assess each of the items of the questionnaire with factor analysis. These subjects were recruited using convenience sampling and consented under IRB approval.

Factor analysis was used to reduce the number of items of the questionnaire by identifying items that had high intercorrelations. Results from the expert panel and the factor analysis guided several changes to the questionnaire. Items that resulted in high intercorrelations were combined or eliminated. Based on the panel recommendations, several items were reworded to be more consistent with the ICF model of activity limitation and participation restriction (Table 1), while those items that were not consistent with the ICF model were dropped. The final version of the questionnaire, the Fear of Falling Avoidance Behavior Questionnaire (FFABQ), consisted of 14 total items (Appendix 1) ranked using the same Likert-style, five-point ordinal scale as described above, resulting in a total possible score of 56. A high score would indicate greater activity limitation and participation restriction as a result of the fear of the falling.

<u>Questionnaire Psychometrics - reliability and construct validity</u>

Subjects

The goal of subject recruitment for this portion of the study was to achieve variability in the amount of fear of falling and avoidance behavior. Therefore, a heterogenous sample with relatively equivalent populations of those with and without fear of falling was needed. In order to get this desired sample, healthy subjects (presumably without balance problems) as well as those with pathologies known to have high prevalence of balance problems were the target populations for recruitment. Subsequently, sixty-three subjects (23 men and 40 women) with a mean age of 72.2 ±7.2 years (range 60-88) were recruited as a convenience sample through snowball sampling at local senior centers, physical therapy balance clinics, and various support groups (e.g., PD support group, stroke support group) in Las Vegas, Nevada. The inclusion criteria

were that the subjects must be English-speaking and community dwelling individuals of 60 years of age or older. In addition, the Mini-Mental State Exam (MMSE) was used to determine the level of cognition of the subjects. Subjects with moderate cognitive impairment (<21 on the MMSE) were excluded.[41,42] The subjects' primary health conditions were as follows: 25 were healthy, 16 had PD, 11 with history of cerebrovascular accident (CVA), six with diabetes, and five had a cardiovascular diagnosis (e.g., coronary artery bypass, angina, etc.). Nine subjects had secondary diagnoses (e.g., diabetes), but had a primary diagnosis that was more pronounced (e.g., CVA).

Subjects were also classified using their recollection of their fall history. Twenty-five subjects were classified as a faller, defined as an individual who had at least one unexplained event where they descended to the floor in the past year (Table 2). Twelve subjects were defined as frequent fallers, defined as two or more falls within the last year. Eleven subjects were classified as recent fallers, defined as a fall within the last month. An injured faller was defined as an individual who sustained an injury from a fall that required medical assistance within the last year. Eleven subjects were classified as injured fallers. These categories of classification were not mutually exclusive; as a result, a subject may have been placed in more than one category (Table 2).

Reliability

In order to determine test-retest reliability, the FFABQ was administered to 63 subjects approximately one week apart. The first FFABQ was timed to determine the average length for completion. Two subjects were not included in reliability analysis because they experienced a fall during the test-retest period. Minimal detectable change

(MDC) was calculated based on Standard Error of Measurement (SEM) using the test-retest reliability statistic where r_{xx}= test-retest reliability:[43-45]

$SEM = baseline\ standard\ deviation \times \sqrt{1 - r_{xx}}$. Once SEM was determined, the MDC at a 95% confidence level (MDC$_{95}$) for the questionnaire 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)).[43]

Construct validity

Construct validity was assessed via known-groups analysis and convergent validity. The purpose of the known-groups analysis was to compare a known characteristic, related to the construct of interest, which would allow logical inferences about the validity of the measurement tool (i.e., FFABQ). For this study, our known-groups was the dichotomous response (yes or no) of the subjects' history as a faller, frequent faller, recent faller, and injured faller (Table 2). Independent samples t-tests would be utilized to determine if there was a difference between those with and without fall histories (i.e., faller, frequent faller, recent faller, and injured faller) on their FFABQ scores. It was presumed that those with a fall history would have more avoidance behavior than those without a fall history.

Convergent validity was evaluated by comparing the FFABQ to measures of the same or similar constructs as other balance assessments using correlational statistics (Pearson product moment correlations) and multiple regression analysis (stepwise entry). In this study, the FFABQ was compared to the following three categories of assessment tools: self-perceived balance confidence and self-efficacy questionnaires (Table 3),

performance-based balance assessment tools (Table 4), and endurance and activity level

measures (Table 5).

Activity levels were measured using activPAL[i] monitors which measured the

number of hours each day a subject spent sitting or laying down, standing upright and

stepping. The monitor also measured the number of times the subject transitioned from

sitting to standing or vice versa (up/down transitions) and metabolic equivalent of tasks

(METs) performed each day. These types of activity monitors have been used in the past

as a measure of participation in spinal cord injury and patients with cerebral palsy.[46,47]

Activity levels, as measured by these monitors, are not a direct measurement of activities

or participation; they are, however, an indirect indicator of more movement which would

occur if someone was active (e.g., walking). In a general sense, this would allow some

logical inferences about whether or not someone was active (i.e., high FFABQ scores) or

not (i.e., low FFABQ scores). Someone who has significant activity limitation or

participation restriction would not be moving around very much and would logically

register very low activity levels on activity monitors. On the other hand, someone who is

engaged in activities and participation would register high activity levels on the activity

monitors. Subjects were asked to wear the activity monitors for seven days; however,

only data from days two through six were included and averaged for use in analysis since

on days one and seven subjects did not have the monitor for a full day.

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[i] PAL Technologies Ltd, 141 St James Road, Glasgow G4 0LT, United Kingdom, telephone number: +44 (0) 141 552 6085

Results

Reliability

Overall test-retest reliability was .812 (95% confidence interval (CI): .706 to .883), with 90.9 seconds as the average time of completion for the FFABQ (mean=90.9 seconds, SD=49.5 seconds). The test-retest reliability for neurologically involved subjects (i.e., cerebrovascular accident, PD) was good, ICC (3,1)=.751 (95% CI: .524 to .878). Likewise, good reliability was also noted for those reporting no health conditions, ICC (3,1)=.798 (95% CI: .593 to .905). Reliability was not analyzed for the other health conditions as there were not enough subjects for each of the diagnostic categories. The individual MDC_{95} was 14.69 scale points for the overall sample (95% CI: 11.61 to 17.77).

Known-groups validity analysis

There was a statistically significant difference between fallers (mean=17.48, SD=15.20, 95% CI: 11.20 to 23.76) and non-fallers (mean=7.97, SD=8.28, 95% CI: 5.25 to 10.70) on FFABQ scores, t(61)=2.860, p=.007 (homogeneity violation, p=.005) (Figure 1). The number of falls in the last year also correlated significantly with the FFABQ, r=.408 (r^2=.166). Likewise, there was a statistically significant difference between the frequent fallers (mean=23.83, SD=17.54, 95% CI: 12.69 to 34.98) and non-frequent fallers (mean=8.90, SD=8.83, 95% CI: 6.42 to 11.38) on the FFABQ, t(61)=2.864, p=.014 (homogeneity violation, p=.013) (Figure 1).

There was also a statistically significant difference between recent fallers (mean=24.55, SD=17.52, 95% CI: 12.78 to 36.31) and non-recent fallers (mean=9.04, SD=9.07, 95% CI: 6.51 to 11.56), t(61)=2.856, p=.015 (homogeneity violation, p=.008)

(Figure 1). However, there was not a statistically significant difference between the

injured fallers (mean=19.00, SD=17.70, 95% CI: 7.11 to 30.89) and the non-injured

fallers (mean=10.21, SD=10.49, 95% CI: 7.29 to 13.13), t(61)=1.589, p=.139 (due to a

violation of homogeneity, p= .001), power = 10.8%.

<div align="center">Convergent validity analysis</div>

Table 6 contains the correlational statistics for the relationships of the FFABQ to

self-perceived balance/fall confidence questionnaires (i.e., ABC, FES), performance-

based balance assessment tools (i.e., BBS, DGI, self-selected gait velocity (SSGV),

TUGT, sensory organization test (SOT), limits of stability (LOS)) and endurance and

activity level measures (i.e., 6MWT, activity monitor results).

Multiple linear regression analyses were used to compare the predictive validity

of the variables with the most similar theoretical concepts (i.e., FFABQ, ABC, FES) on

measures of endurance (i.e., 6MWT) and daily physical activity (i.e., sitting and/or lying,

stepping, up/down transitions, daily metabolic equivalents). The only variable that

correlated significantly with sitting and/or lying was the FFABQ [b=.055, β=.326,

t=2.692, p=.009]. The FFABQ explained 9.2% of the variance of time spent sitting

and/or lying (adjusted r^2=.092). None of the variables entered into the regression

predicted time spent standing. However, the ABC did significantly predict stepping

[b=.016, β=.476, t=4.229, p< .0005], explaining 21.4% of the variance (adjusted r^2=.214).

Likewise, the ABC was the only variable that made it into the final model for prediction

of up/down transitions [b=.262, β=.340, t=2.828, p=.006] and daily metabolic equivalents

[b=.030, β=.435, t=3.773, p< .0005], explaining 10.1% (adjusted r^2=.101) and 17.6%

(adjusted r^2=.176) of the variance, respectively. Both the ABC [b=2.209, β=.345,

t=2.413, p=.019] and the FFABQ [b=-3.194, β=-.290, t=2.030, p=.047] were found to be correlated significantly with distance on the 6MWT. The full model explained approximately 31.6% of the variance (adjusted r^2=.316) with the ABC explaining 28.1% (adjusted r^2=.281) and the FFABQ explaining an additional 3.5% of the variance over and above the ABC. Without the ABC scale entered into the analysis, the FFABQ explained 26.2% (adjusted r^2=.262) of the variance in the 6MWT.

Discussion

The primary purpose of this study was to develop a questionnaire that would be a practical, self-assessment tool with sound psychometric properties for measuring avoidance-behavior due to a fear of falling. Our results offer preliminary evidence for the reliability and validity of the FFABQ for the assessment of activity limitation and participation restriction due to a fear of falling in community ambulating seniors. In addition, these results suggest that the FFABQ may have utility as a complementary assessment tool with other balance assessment tools to help create a more complete picture of the influence that balance impairment and falling have on a patient's life.

The FFABQ was reliable for community ambulating seniors with different diagnoses. Therefore, we feel that it can be reasonably used with all patients who have normal cognition or only mild cognitive deficits and suspected avoidance behavior due to a fear of falling. Because of its good reliability and ease of use as evidenced by the short average time of completion (approximating 1.5 minutes) it offers the clinician a quick, consistent, and standardized assessment tool. In addition, with a MDC of 15 scale points,

the therapist can be confident that a change in score beyond this value would be indicative of a significant increase or decrease in activity and participation.

The validity of the FFABQ was supported by results from the known-groups analysis of this study. Subjects who were classified as fallers reported a greater amount of avoidance behavior, as measured by the FFABQ, compared to non-fallers. As past research has indicated, those who have experienced a fall may restrict activities or situations that would put them at risk for falling.[2,6,12] Frequent fallers (two or more falls in the last year) also reported more avoidance behavior than non-frequent fallers (one fall or less in the last year). This result is consistent with findings by Delbaere et al.[48] In addition, the more one fell, the more fear-avoidance behavior was exhibited. While the correlation between the number of falls and the FFABQ was in the low-moderate range (r=.408), these results suggest that there may be a dose dependent relationship between falling and fear-avoidance behavior. Recent fallers, presumably because of a fresh memory from the proximity of the incident, also exhibited more avoidance behavior as measured by the FFABQ.

We had hypothesized that those who had sustained an injury due to a fall would be more likely to restrict their activity. Despite the mean difference of 8.79 scale points on the FFABQ, this was not the case in the present study. In relation to current evidence, our findings add little to the inconsistent data from other studies on fall injuries and avoidance behavior. One study found that individuals who restricted their activity were more likely to have a history of an injurious fall within one year,[49] while other studies found there was no association between activity restriction and a fall causing an

injury.[50,51] However, we cannot rule out the possibility of a Type II error since this comparison was clearly underpowered at 10.8%.

Self-perceived balance questionnaires (i.e., ABC, FES) were most strongly correlated with the FFABQ. These moderate correlations may be due to the possible contributing roles of confidence and self-efficacy on performing activities.[52,53] That is, if one feels more confident and capable in completing an activity, they will perform that activity more. While the constructs of confidence and self-efficacy are different constructs from fear-avoidance behavior, the correlations noted in our study suggest these constructs are similar or closely related. If the FFABQ was truly measuring the same construct as either the FES or the ABC, we would have logically observed higher intercorrelations. Therefore, these results are in support of the notion that the FFABQ is measuring avoidance behavior rather than balance confidence, self-efficacy or fear.

The FFABQ was also moderately correlated with many performance-based measures of balance, which supports previous research that associates activity limitation with decreased physical capacity.[50,54,55] This is reasonable since those with high avoidance behavior due to a fear of falls would logically have had some balance dysfunction.[56] The performance-based measures that had a greater dynamic component (i.e., BBS, DGI, SSGV, TUGT) were most strongly correlated with FFABQ scores. The most logical explanation is that those with more avoidance behavior (i.e., high FFABQ scores) had poorer dynamic balance capabilities. This may also be a result of decreased dynamic activity caused by avoidance-behavior that has been shown to cause slower times on physical performance tests (e.g., walking rapidly for 20 feet, turning a circle, rising from a chair three times).[49]

Performance-based measures of balance with a more static component (i.e., SOT, LOS) were also correlated with the FFABQ, but these correlations were considerably lower than the dynamic measure correlations. Delbaere et al. found that fear of falling and avoidance-behavior measured by the mSAFFE was related to a reduced forward displacement measured by the LOS.[48] However, these findings may be induced by the negative impact that fear may have on postural performance as opposed to actual deterioration of the postural control systems.[57] The smaller correlations between the FFABQ and more static performance-based measures suggests the FFABQ may be better able to capture avoidance of more dynamic activities.

Perhaps the most important finding of the present study is the correlation between the FFABQ and measures of daily physical activity measured by the activity monitors. Our claim that the FFABQ quantifies avoidance behavior in terms of activity limitation and participation restriction should be reflected by a decrease in daily physical activities. In addition, a decrease in physical activity can, logically, result in the downstream consequence of physical de-conditioning and decreased endurance. The 6MWT was used in this study with this in mind. A positive correlation of the FFABQ with hours spent sitting/laying and negative correlations of the FFABQ with hours stepping, METs and the 6MWT in the present study support the notion that those with high FFABQ scores (i.e., high avoidance-behavior) are less physically active (as measured by the activity monitor) and have decreased physical endurance (as measured by the 6MWT). This may be the result of avoidance of mobility tasks, such as walking, which has been found to be more frequently avoided by elderly persons with a fear of falling.[48] However, hours spent standing as measured by the activity monitor was not correlated with the FFABQ.

Because standing is a static and somewhat less mobile task this would presumably not be considered a "risky" behavior. Therefore, static standing is not avoided as much as dynamic movements. This is consistent with the higher correlations of the FFABQ with dynamic balance measures compared to static balance measures. In addition, the transition from sitting to standing was not correlated with the FFABQ. This may be due to the requirement of this transition in unavoidable ADLs (e.g., toileting, dressing, bathing) that often must be performed on a regular basis despite the presence of a fear of falling.

Predictive validity was best represented by the FFABQ and ABC. The FFABQ was the only variable that predicted hours spent sitting, a sedentary activity. The ability to predict this sedentary activity further supports the FFABQ's capacity to measure activity limitation as those with a high FFABQ score could reasonably be expected to engage in increased hours of sitting (i.e., avoidance-behavior). The ABC was found to be a better predictor of activity levels when compared to the FFABQ and FES. Previous research has also found the ABC to be superior to the FES at differentiating between those who had a fear of falling and limited activity and those who did not.[58] The FFABQ and ABC both predicted endurance as measured by the distance walked on the 6MWT indicating both may have the ability to predict the de-conditioning that can occur after a substantial period of activity limitation. While the ABC predicted more of the variance of endurance, the FFABQ predicted an additional unique contribution over and above the ABC, supporting the notion that the measurement constructs are related but different.

Recruitment of community ambulating elderly individuals that exhibited high fear-avoidance behavior was challenging. Those with high fear-avoidance beliefs were

not likely to participate in a study that required them to travel and be physically active, both prerequisites to participation in our study. Subsequently, a sample of convenience was used and because of the difficulty in recruiting subjects with high fear of falling we tended to have subjects at the lower end of the scale. Future research targeting homebound seniors may yield a subject pool with a higher level of fear-avoidance behavior. Another limitation of this study was the activPAL activity monitors. They could not be worn while swimming and a couple of our subjects participated in swimming during the week they wore the activity monitor. In addition, the combination of the activity monitor applied to the mid-thigh with adhesive backing resulted in frequent need for re-adherence and compliance issues in a few cases. It has been reported that activity monitors are not sensitive to those who have a bradykinetic gait (i.e., individuals with PD).[59] For this reason, the activity monitor is not recommended for those with a SSGV below 0.67 meters/second.[60] However, in our study, the average gait velocity of those with PD was 1.23 meters/second making it unlikely that this was an issue.

Conclusion

The results from this study provide evidence for the reliability and validity of the FFABQ for different populations, from the healthy elderly to those with PD and CVA. Furthermore, our results support the notion that the FFABQ is measuring avoidance behavior rather than balance confidence, self-efficacy, or fear. The results of this study also illustrate that the FFABQ has the potential to offer the clinician an efficient way to assess the effectiveness of balance treatment on the patient whose fear of falling has

triggered a reduction in their daily activity and participation. Currently, there are no

other assessment tools that measure these sequelae of balance impairment and falls in a

clinically useful and practical manner.

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Table 1. ICF information matrix for FFABQ items

Item #	Due to my fear of falling, I avoid:	ICF information matrix
1	Walking	Walking (d450)
2	Lifting and carrying objects (e.g., cup, child)	Lifting and carrying objects (d430)
3	Going up and downstairs	Walking (d450) Moving around(d455) Moving around in different locations (d460)
4	Walking on different surfaces (e.g., grass, uneven ground)	Walking (d450)
5	Walking in crowded places	Walking (d450) Moving around in different locations (460)
6	Walking in dimly lit, unfamiliar places	Walking (d450) Products and technology for personal use in daily living (e115)
7	Leaving home	Moving around in different locations (d460)
8	Getting in and out of a chair	Changing basic body position (d410)
9	Showering and/or bathing	Washing oneself (d510)
10	Exercise	Looking after one's health (d570)
11	Preparing meals (e.g., planning, cooking, serving)	Preparing meals (d630)
12	Doing housework (e.g., cleaning, washing clothes)	Doing housework (d640)
13	Work and/or volunteer work	Remunerative employment (d850) Non-remunerative employment (d855)
14	Recreational and leisure activities (e.g., play, sports, arts and culture, crafts, hobbies, socializing, travelling)	Recreation and leisure (d920)

Table 2. Primary fall categories and their respective health conditions

	Total subjects	Healthy	PD	CVA	Diabetes	Cardiovascular Diagnosis
Faller	25	8	7	8	1	1
Frequent Faller	12	3	3	5	0	1
Recent Faller	11	2	3	5	0	1
Injured Faller	11	5	3	2	0	1

Table 3. Self-perceived balance confidence and self-efficacy questionnaires

Standardized scale	Construct	Number of items	Evidence for reliability	Evidence for validity
Activities-Specific Balance Confidence Scale (ABC)[15]	Self-administered assessment of confidence with balance during various ADLs	16 items, scores ranging from 0 (not confident) to100% (very confident)	r=.92[15]	Correlated with age, balance score, gait scores, mobility scores and falls in the previous year[61]
Falls Efficacy Scale (FES)[16]	Self-administered assessment of self-efficacy in completing ADLs without falling	10 items, total scores range from 10 (very confident) to 100 (not confident)	r=.71[16]	Correlated with age, balance score, gait scores, mobility scores and falls in the previous year[61]

Table 4. Performance-based balance assessment tools

Standardized scale	Construct	Number of items	Evidence for reliability	Evidence for validity
Berg Balance Scale (BBS)[18]	Clinician rated assessment of balance tasks	14 tasks, total score 0 (greatest fall risk)- 56 (least fall risk)	ICC=.98[19,18]	Validated for populations who had a CVA or PD[19,62] and to predict future falls[63]
Dynamic Gait Index (DGI)[24]	Clinician rated assessment of ability to modify gait under various conditions	Eight tasks, total score ranging 0 (greatest fall risk) to 24 (least fall risk)	ICCs$\geq$.983[23,64]	Correlated with BBS, timed walking test, TUGT and ABC in chronic stroke (range .68- .83)[65] and to predict fall risk[66]
Sensory Organization Test (SOT)	Computerized posturography used to challenge the three sensory components of balance	Composite score of six scenarios ranges from 0-100 based off age and height adjusted averages	ICC=.66[64]	Able to predict individuals with two or more falls in the past six months with cut-off score of 38[67]
Limits of Stability (LOS)	Computerized posturography used to assess how far individual can purposefully displace center of gravity for eight seconds	Five scores (reaction time, movement velocity, end point excursion, max excursion, directional control) based off age and height adjusted averages	Movement time ICC (2,1)=.825 Path sway ICC (2,1)=.846 Distance error ICC (2,1)=.632[68]	Anterior displacement was correlated to the SOT composite score for fallers (r=.79, p=.006)[29]

Timed Up and Go Test (TUGT)[7,21]	A timed test of functional mobility	Three components (standing up, walking, sitting down) where greater than 30 seconds indicated dependence in mobility	Intra- and interrater r values ranging from .93 to .99[69]	Correlated with Functional Independence Measure (FIM) (-.59 at p<.001) in older subjects,[70] Tinetti Balance scores r=-.55, Tinetti gait (r=-.53), and walking speed (r=.66) where longer performance times predicted fall occurrence and ADL decline in community dwelling older people[69]
Self Selected Gait Velocity (SSGV)[71]	Timed comfortable walking pace over 10 meters	N/A	ICC= .95[72]	Slow walking speed associated with a fear of falling[73]

N/A= not applicable

Table 5. Endurance and activity level measures

Standardized scale	Construct	Number of items	Evidence for reliability	Evidence for validity
6 Minute Walk Test (6MWT)	A functional walking endurance test where the individual walks as far as possible in six minutes	N/A	High intraclass correlation between trials for adults over 60 years: Trials one and two (.88<R<.94); Trials two and three (.91<R<.97)[74]	Correlated with treadmill scores (r=.78) and functional ability[74]
Activity monitor[59]	A device that measures activity levels for a one week period	Five components: hours (hrs) sitting or lying, hrs standing, hrs stepping, up/down transitions, metabolic equivalent of tasks (METs)	Inter-device reliability of step number and cadence: ICC (2,1) $\geq$.99[59]	Absolute percentage error <1% for outdoor ambulation, $\leq$ 2% for walking speeds $\leq$ 0.67 m/s[60]

N/A= not applicable

Table 6. Correlation Statistics of the FFABQ with other measures of balance and activity

	r	r^2
Self-perceived balance/fall confidence questionnaires		
ABC	-0.678**	0.460
FES	0.558**	0.311
Performance-based balance assessment tools		
BBS	-0.498**	0.248
DGI	-0.585**	0.342
SSGV	-0.475**	0.226
TUGT	0.528**	0.279
SOT composite	-0.385**	0.148
LOS reaction time	0.280*	0.078
LOS movement velocity	-0.295*	0.087
LOS max excursion	-0.285*	0.081
LOS end point excursion	-0.238	0.057
LOS directional control	-0.200	0.040
Endurance and activity level measures		
6 MWT	-0.523**	0.274
Hrs sitting/laying	0.326**	0.106
Hrs standing	-0.214	0.046
Hrs stepping	-0.420**	0.176
Steps/day	-0.416**	0.173
Up/down	-0.227	0.052
METs	-0.431**	0.186

** Correlation is significant at $p \leq 0.01$ (2-tailed)
* Correlation is significant at $p \leq 0.05$ (2-tailed)

Figure 1. Confidence interval distribution between varied fall history groups
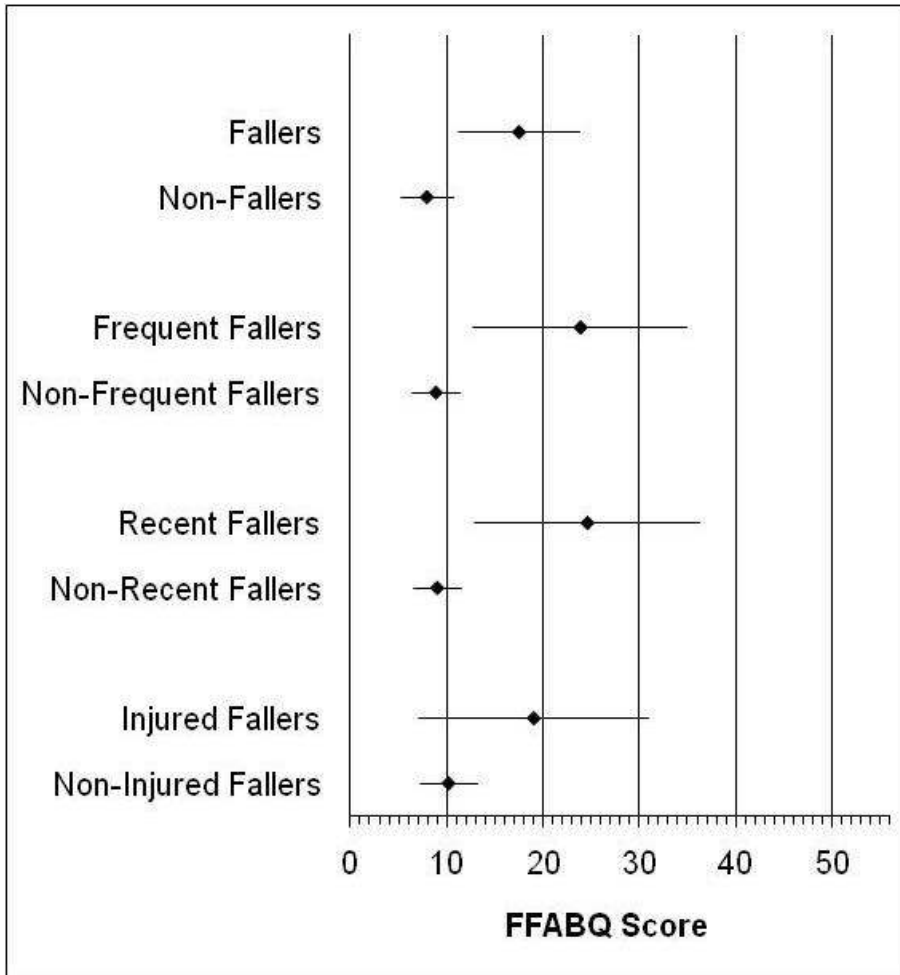
APPENDICES

Appendix 1. Fear of Falling Avoidance-Behavior Questionnaire (FFABQ)

NAME:
DATE:
Please answer the following questions that are related to your balance. For each statement, please check <u>one box</u> to say how the fear of falling has or has not affected you. If you do not currently do the activities in question, try and imagine how your fear of falling would affect your participation in these activities. If you normally use a walking aid to do these activities or hold onto someone, rate how your fear of falling would affect you as if you were not using these supports. If you have questions about answering any of these statements, please ask the questionnaire administrator.

Due to my fear of falling, I avoid…	*Please check one box for each question*				
	Completely disagree	*Disagree*	*Unsure*	*Agree*	*Completely agree*
1. *Walking*	☐	☐	☐	☐	☐
2. *Lifting and carrying objects (e.g., cup, child)*	☐	☐	☐	☐	☐
3. *Going up and downstairs*	☐	☐	☐	☐	☐
4. *Walking on different surfaces (e.g., grass, uneven ground)*	☐	☐	☐	☐	☐
5. *Walking in crowded places*	☐	☐	☐	☐	☐
6. *Walking in dimly lit, unfamiliar places*	☐	☐	☐	☐	☐
7. *Leaving home*	☐	☐	☐	☐	☐
8. *Getting in and out of a chair*	☐	☐	☐	☐	☐
9. *Showering and/or bathing*	☐	☐	☐	☐	☐
10. *Exercise*	☐	☐	☐	☐	☐
11. *Preparing meals (e.g., planning, cooking, serving)*	☐	☐	☐	☐	☐
12. *Doing housework (e.g., cleaning, washing clothes)*	☐	☐	☐	☐	☐
13. *Work and/or volunteer work*	☐	☐	☐	☐	☐
14. *Recreational and leisure activities (e.g., play, sports, arts and culture, crafts, hobbies, socializing, travelling)*	☐	☐	☐	☐	☐

Please make sure you have checked <u>one box for each question</u>. Thank you!

UNLV
UNIVERSITY OF NEVADA LAS VEGAS

Biomedical IRB – Expedited Review
Approval Notice

DATE: June 9, 2009

TO: **Dr. Merrill Landers**, Physical Therapy

FROM: Office for the Protection of Research Subjects

RE: Notification of IRB Action by Dr. John Mercer, Chair
Protocol Title: **Development of a scale to assess fear avoidance behavior due to falling: The fear of falling avoidance-behavior questionnaire (FFABQ)**
Protocol #: 0903-3068

This memorandum is notification that the project referenced above has been reviewed by the UNLV Biomedical Institutional Review Board (IRB) as indicated in regulatory statutes 45 CFR 46. The protocol has been reviewed and approved.

The protocol is approved for a period of one year from the date of IRB approval. The expiration date of this protocol is June 7, 2010. Work on the project may begin as soon as you receive written notification from the Office for the Protection of Research Subjects (OPRS).

PLEASE NOTE:
Attached to this approval notice is the **official Informed Consent/Assent (IC/IA) Form** for this study. The IC/IA contains an official approval stamp. Only copies of this official IC/IA form may be used when obtaining consent. Please keep the original for your records.

Should there be *any* change to the protocol, it will be necessary to submit a **Modification Form** through OPRS. No changes may be made to the existing protocol until modifications have been approved by the IRB.

Should the use of human subjects described in this protocol continue beyond June 7, 2010 it would be necessary to submit a **Continuing Review Request Form** *60 days* before the expiration date.

If you have questions or require any assistance, please contact the Office for the Protection of Research Subjects at OPRSHumanSubjects@unlv.edu or call 895-2794.

VITA

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Dissertation/Thesis Title: Development of a scale to assess avoidance behavior due to fear
      of falling: the fear of falling avoidance behavior questionnaire (FFABQ)

Dissertation/Thesis Examination Committee:
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      Dr. Daniel Young, PT, DPT