

## Development of a Scale to Assess Avoidance Behavior Due to a Fear of Falling: The Fear of Falling Avoidance Behavior Questionnaire

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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 deconditioning 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 2 parts: questionnaire development and psychometric testing. Questionnaire development involved an expert panel and 39 residents of an assisted living facility. Sixty-three community-dwelling individuals with various health conditions participated in psychometric testing.

**Method.** 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 psychometric properties, reliability and construct validity were assessed through administration of the FFABQ to participants twice, 1 week apart, and comparison of the FFABQ with other questionnaires related to fear of falling, functional measures of balance and mobility, and daily activity levels using an activity monitor.

**Results.** The FFABQ had good overall test-retest reliability (intraclass correlation coefficient=.812) and was found to differentiate between participants who were considered "fallers" (ie, at least one fall in the previous year) and those who were considered "nonfallers." The FFABQ predicted time spent sitting or lying and endurance.

**Limitations.** A relatively small number of people 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 measures avoidance behavior rather than balance confidence, self-efficacy, or fear.

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It has been reported that 28% to 35% of individuals 65 years of age and older will fall within a year's time, exposing them to serious potential injury.<sup>1</sup> Although injuries as a result of a fall can be significant,<sup>2-7</sup> a fear of falling may be a more serious problem, as it may lead to restricted activity and mobility in elderly people.<sup>2,5,8</sup> Research indicates 50% of the elderly population have a fear of falling after experiencing just one fall, and a quarter of these individuals describe avoiding some activity due to their fear.<sup>6</sup> A fall, however, is not a prerequisite to the fear of falling or subsequent activity restriction.<sup>2,9</sup> Howland et al<sup>2</sup> reported 20% of individuals who had not recently experienced a fall were still somewhat or very afraid of falling. Therefore, "fallers" and "non-fallers" alike may have a fear of falling that may lead to inactivity and social isolation, which in turn could stimulate deconditioning, functional decline, and decreased quality of life.<sup>2,10-14</sup>

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 *activity* and *participation*, as defined by the *International Classification of Functioning, Disability and Health* (ICF).<sup>15</sup> The most commonly used self-perceived balance confidence and efficacy questionnaires—the Activities-specific Balance Confidence (ABC) Scale<sup>16</sup> and the Falls Efficacy Scale (FES)<sup>17</sup>—appear to be adequate at measuring "confidence" and "self-efficacy," respectively, with activities of daily living (ADL); however, both questionnaires fail to capture the downstream consequence (ie, activity limitation and participation restriction) that a lack of confidence or decreased self-efficacy has on performing functional tasks. Further-

more, the ABC Scale and the 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. Research has indicated these fall-related instruments often are used beyond the scope of their original design to measure fear of falling.<sup>18</sup> Although performance-based measures of balance, gait, and fall risk (ie, Berg Balance Scale [BBS],<sup>19-22</sup> Dynamic Gait Index [DGI],<sup>7,23-25</sup> Timed "Up & Go" Test [TUG],<sup>7,22</sup> Functional Reach Test [FRT],<sup>26-28</sup> and dynamic posturography<sup>29,30</sup>) 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.<sup>8</sup>

There are few survey instruments 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 instrument intended to differentiate individuals who restrict their activity because of fear of falling from those who do not restrict their activity but still have a fear of falling.<sup>31</sup> Although no test-retest reliability was published for the original SAFFE measure, the authors did provide evidence for convergent validity of the SAFFE.<sup>31,32</sup> Evidence for reliability and validity of the SAFFE has been found recently for individuals with Parkinson disease (PD).<sup>33</sup> Deshpande et al<sup>34</sup> found SAFFE scores indicating severe and moderate activity restriction due to a fear of falling to be an independent predictor of increasing independent ADL disability. On the other hand, Hotchkiss et al<sup>35</sup> found that the SAFFE was unable to accurately pre-

dict frequency of falls, activity limitation, and frequency of leaving home. The FES was a better predictor of people who exhibited activity restriction compared with the SAFFE, even though the FES is not intended to measure activity restriction.<sup>34</sup> Although the SAFFE instrument has items consistent with the ICF levels of activity and participation, it is a 6-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.<sup>18,36</sup>

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.<sup>37</sup> 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.<sup>37</sup> Moore and Ellis<sup>18</sup> 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 they concluded that more research is needed to support the measure prior to its use.

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.<sup>38</sup> It comprises 3 subscales (psychosomatic symptoms, risk prevention, modifying behavior), with a total score of 15 points, that are intended to measure activity restriction.<sup>38</sup> The GFFM has good test-retest reliability

( $r=.88$ ) but poor validity ( $r=.29$ ) compared with the FES.<sup>38</sup> However, generalizability also is an issue for the GFFM, as the authors acknowledged the data are limited to Taiwanese older adults and suggested reliability and validity should be investigated further.<sup>18,38</sup> 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 heterogeneous 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). The FFABQ quantifies avoidance behavior (activity limitation and participation restriction) related to the fear of falling. It was based on the fear-avoidance model of exaggerated pain perception presented by Lethem et al<sup>39</sup> and Troup et al.<sup>40</sup> This model is used to understand the psychogenic component of an individual's condition that may cause avoidance of certain activities.<sup>41</sup> 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 these stimuli.<sup>41</sup> 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 a tool that would aid the researcher and the clinician alike in quickly, quantitatively, and reli-

ably assessing avoidance behavior (activity limitation and participation restriction) due to a fear of falling. The FFABQ was not intended to be used in isolation but as a complement to other balance assessment tools in creating a more complete picture of the effects that balance impairment and falls have on a patient's life. The purposes of this study were 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 people with a history of falling would report more fear-avoidance behavior. In addition, because we believe that the FFABQ measures a different but tangentially related construct compared with other commonly used clinical balance tests, we hypothesized that there would be moderate correlations with these other tests. Lastly, we expected the FFABQ to contribute a unique amount of the variation beyond what is accounted for by other scales with a similar construct.

## Method

The overall design of the study involved 2 main components: (1) questionnaire development and (2) 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 history of falling. In addition, other questions or items that were not present in the questionnaire would be added if the item domain was missing or underrepresented. 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 then would 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. All participants provided written informed consent prior to the study.

## Questionnaire Development: Face Validity, Content Validity, and Pilot Study Analysis

Face and content validity of the original 21-item questionnaire, as conceptualized by its developers, were determined by a panel of 13 experts: 7 physical therapy educators (including 4 who have published research related to balance or falls), 1 physical therapist who was a generalist, 3 physical therapists whose specialty was balance, and 2 patients with a history of falling. 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 people with PD and 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, 5-point ordinal scale (0=completely disagree to 4=completely agree), resulting in a total possible score of 84 points. A higher score indicates

## Fear of Falling Avoidance Behavior Questionnaire

**Table 1.**

*International Classification of Functioning, Disability and Health (ICF) Information Matrix Domain Codes for Each of the Fear of Falling Avoidance Behavior Questionnaire Items*

Item No.	Due to My Fear of Falling, I Avoid:	ICF Information Matrix Domain Codes
1	Walking	Walking (d450)
2	Lifting and carrying objects (eg, 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 (eg, grass, uneven ground)	Walking (d450)
5	Walking in crowded places	Walking (d450) Moving around in different locations (d460)
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 or bathing	Washing oneself (d510)
10	Exercise	Looking after one's health (d570)
11	Preparing meals (eg, planning, cooking, serving)	Preparing meals (d630)
12	Doing housework (eg, cleaning, washing clothes)	Doing housework (d640)
13	Work or volunteer work	Remunerative employment (d850) Nonremunerative employment (d855)
14	Recreational and leisure activities (eg, play, sports, arts and culture, crafts, hobbies, socializing, traveling)	Recreation and leisure (d920)

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 of an assisted living facility (mean age=85.03 years, SD=5.1; 16 fallers, 23 nonfallers; 11 male, 28 female) to assess each of the items of the questionnaire with factor analysis. These individuals were recruited using convenience sampling and consented to participate in the study with institutional review board 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 domains of the ICF model of activity limitation and participation restriction (Tab. 1). Those items that were not consistent with ICF model domains were dropped from the questionnaire. The final version of the questionnaire (ie, the FFABQ) consisted of 14 items (Appendix) ranked using the same Likert-style, 5-point ordinal scale as described above, resulting in a total possible score of 56 points. A high score indicates greater activity limitation and participation restriction as a result of the fear of the falling.

### Questionnaire Psychometrics: Reliability and Construct Validity

**Participants.** The goal of participant 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 rel-

atively equivalent populations of those with and without fear of falling was needed. In order to obtain this desired sample, individuals who were healthy (presumably without balance problems) as well as those with pathologies known to have a high prevalence of balance problems (eg, cerebrovascular accident [CVA], PD) were the target populations for recruitment. Subsequently, 63 individuals (23 men and 40 women) with a mean age of 72.2 years (SD=7.2, range=60-88) were recruited as a convenience sample through snowball sampling at local senior centers, physical therapy balance clinics, and various support groups (eg, PD support group, stroke support group) in Las Vegas, Nevada. The participants were English-speaking and community-dwelling individuals of 60 years of age or older. The Mini-Mental State Examination (MMSE) was used to



**Table 2.**  
Primary Fall Categories and Their Respective Health Conditions

Fall Category	Total No. of Participants (%)	Healthy	Parkinson Disease	Cerebrovascular Accident	Diabetes	Cardiovascular Diagnosis
Faller	25 (39.7%)	8	7	8	1	1
Frequent faller	12 (19.0%)	3	3	5	0	1
Recent faller	11 (17.5%)	2	3	5	0	1
Injured faller	11 (17.5%)	5	3	2	0	1

**Table 3.**  
Self-Perceived Balance Confidence and Self-Efficacy Questionnaires

Standardized Scale	Construct	No. of Items	Evidence for Reliability	Evidence for Validity
Activities-specific Balance Confidence Scale <sup>16</sup>	Self-administered assessment of confidence with balance during various activities of daily living	16 items, scores ranging from 0% (not confident) to 100% (very confident)	$r = .92^{16}$	Correlated with age, balance score, gait scores, mobility scores, and falls in the previous year <sup>63</sup>
Falls Efficacy Scale <sup>17</sup>	Self-administered assessment of self-efficacy in completing activities of daily living without falling	10 items, total scores ranging from 10 (very confident) to 100 (not confident)	$r = .71^{17}$	Correlated with age, balance score, gait scores, mobility scores, and falls in the previous year <sup>63</sup>

determine the level of cognition of the participants. Those with moderate cognitive impairment (<21 on the MMSE) were excluded.<sup>42,43</sup> The participants' primary health conditions were as follows: 25 were healthy, 16 had PD, 11 had a history of CVA, 6 had diabetes, and 5 had a cardiovascular diagnosis (eg, coronary artery bypass, angina). Nine individuals had secondary diagnoses (eg, diabetes), but had a primary diagnosis that was more pronounced (eg, CVA).

Participants also were classified using their recollection of their fall history. Twenty-five individuals were classified as a *faller*, defined as an individual who had at least one unexplained event where he or she descended to the floor in the previous year (Tab. 2). Twelve individuals were classified as *frequent fallers*, defined as having had 2 or more falls in the previous year. Eleven individuals were classified as *recent fallers*, defined as having had a fall in the previous month. An *injured faller* was defined as an individual who sustained an injury from a fall that

required medical assistance in the previous year. Eleven individuals were classified as injured fallers. These categories of classification were not mutually exclusive; as a result, a participant may have been placed in more than one category (Tab. 2).

**Reliability.** In order to determine test-retest reliability, the FFABQ was administered to 63 participants twice, approximately 1 week apart. The first administration of the FFABQ was timed to determine the average length for completion. Two individuals were not included in the reliability analysis because they experienced a fall during the test-retest period. Minimal detectable change (MDC) was calculated based on the standard error of measurement (SEM) using the test-retest reliability statistic, where  $r_{xx}$  = test-retest reliability<sup>44-46</sup>:  $SEM = \text{baseline standard deviation} \times \sqrt{1 - r_{xx}}$ . Once the 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 2 data sets [ie, test and retest]).<sup>44</sup>

**Construct and convergent 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 (ie, FFABQ). For this study, our known-groups characteristic was the dichotomous response ("yes" or "no") of the participants regarding their fall history (ie, faller, frequent faller, recent faller, or injured faller) (Tab. 2). Independent-samples *t* tests were utilized to determine whether there was a difference between participants with a history of falling and those without a history of falling based on their FFABQ scores. It was presumed that those with a history of falling would have more avoidance behavior than those without a fall history.

## Fear of Falling Avoidance Behavior Questionnaire

**Table 4.**  
Performance-Based Balance Assessment Tools<sup>a</sup>

Standardized Scale	Construct	No. of Items	Evidence for Reliability	Evidence for Validity
Berg Balance Scale <sup>19</sup>	Clinician-rated assessment of balance tasks	14 tasks, total score 0 (greatest fall risk) to 56 (least fall risk)	ICC=.98 <sup>19,20</sup>	Validated for populations that had a cerebrovascular accident or Parkinson disease <sup>20,64</sup> and to predict future falls <sup>65</sup>
Dynamic Gait Index <sup>25</sup>	Clinician-rated assessment of ability to modify gait under various conditions	Eight tasks, total score ranging from 0 (greatest fall risk) to 24 (least fall risk)	ICC≥.98 <sup>24,66</sup>	Correlated with Berg Balance Scale, timed walking test, Timed "Up & Go" Test, and Activities-specific Balance Confidence Scale in chronic stroke (range=.68-.83) <sup>67</sup> and to predict fall risk <sup>68</sup>
Sensory Organization Test	Computerized posturography used to challenge the 3 sensory components of balance	Composite score of 6 scenarios, ranging from 0 to 100 based on age and height-adjusted averages	ICC=.66 <sup>66</sup>	Able to predict individuals with 2 or more falls in the previous 6 mo with cutoff score of 38 <sup>69</sup>
Limits of stability	Computerized posturography used to assess how far individual can purposefully displace center of gravity for 8 seconds	Five scores (reaction time, movement velocity, endpoint excursion, maximum excursion, and directional control) based on age and height-adjusted averages	Movement time ICC (2,1)=.825 Path sway ICC (2,1)=.846 Distance error ICC (2,1)=.632 <sup>70</sup>	Anterior displacement was correlated to the Sensory Organization Test composite score for fallers ( $r=.79$ , $P=.006$ ) <sup>30</sup>
Timed "Up & Go" Test <sup>72</sup>	A timed test of functional mobility	Three components (standing up, walking, and sitting down) where longer than 30 seconds indicated dependence in mobility	Intrarater and interrater $r$ values ranging from .93 to .99 <sup>71</sup>	Correlated with Functional Independence Measure ( $-.59$ at $P<.001$ ) in older individuals, <sup>72</sup> Tinetti balance measure scores $r=-.55$ , Tinetti gait measure scores ( $r=-.53$ ), and walking speed ( $r=.66$ ) where longer performance times predicted fall occurrence and decline in performance of activities of daily living in community-dwelling older people <sup>71</sup>
Self-selected gait speed <sup>73</sup>	Timed comfortable walking pace over 10 m	N/A	ICC=.95 <sup>74</sup>	Slow walking speed associated with a fear of falling <sup>75</sup>

<sup>a</sup> ICC=intraclass correlation coefficient, N/A=not applicable.

Convergent validity was evaluated by comparing the FFABQ with 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 with the following 3 categories of assessment tools: self-perceived balance confidence and

self-efficacy questionnaires (Tab. 3), performance-based balance assessment tools (Tab. 4), and endurance and activity level measures (Tab. 5).

Activity levels were measured using activPAL monitors,\* which measured the number of hours each day a par-

\* PAL Technologies Ltd. 141 St James Rd. Glasgow G4 0LT, United Kingdom.

ticipant spent sitting or lying down, standing upright, and stepping. The monitors also measured the number of times the individual transitioned from sitting to standing or vice versa (up/down transitions) and metabolic equivalent of tasks (METs) performed each day. The activPAL software estimates METs by taking commonly accepted MET values for the aforementioned tasks and

**Table 5.**  
Endurance and Activity Level Measures<sup>a</sup>

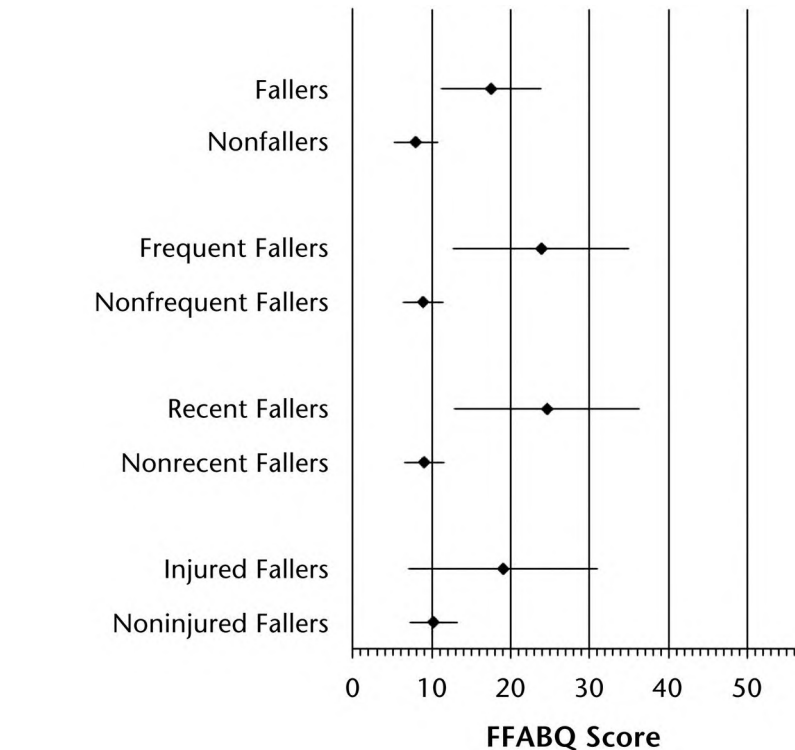
Standardized Scale	Construct	No. of Items	Evidence for Reliability	Evidence for Validity
Six-Minute Walk Test	A functional walking endurance test where the individual walks as far as possible in 6 min	N/A	High intraclass correlation between trials for adults older than 60 years of age: trials 1 and 2 (.88 < <i>r</i> < .94), trials 2 and 3 (.91 < <i>r</i> < .97) <sup>76</sup>	Correlated with treadmill scores ( <i>r</i> = .78) and functional ability <sup>76</sup>
Activity monitor <sup>61</sup>	A device that measures activity levels for a 1-wk period	Five components: hours sitting or lying, hours standing, hours stepping, up/down transitions, and metabolic equivalent of tasks	Interdevice reliability of step number and cadence: ICC (2,1) ≥ .99 <sup>61</sup>	Absolute percentage of error < 1% for outdoor ambulation, ≤ 2% for walking speeds of ≤ 0.67 m/s <sup>62</sup>

<sup>a</sup> ICC=intraclass correlation coefficient, N/A=not applicable.

applying them to the individual's daily activity. These types of activity monitors have been used in the past as a measure of walking activity in patients with spinal cord injury and cerebral palsy.<sup>47,48</sup> 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 were active (eg, walking). In a general sense, this measurement would allow some logical inferences about whether someone was active (ie, low FFABQ scores) or not (ie, high FFABQ scores). Someone who has significant activity limitation or participation restriction may not be moving around very much and would logically register low activity levels on activity monitors. On the other hand, someone who is engaged in activities and participation may register high activity levels on the activity monitors. Participants were asked to wear the activity monitors for 7 days; however, only data from days 2 through 6 were included and averaged for use in analysis because on days 1 and 7 participants did not have the monitor for a full day.

**Results**  
**Reliability**

Overall test-retest reliability was .812 (95% confidence interval (CI)=



**Figure.** Confidence interval distribution among varied fall history groups. FFABQ=Fear of Falling Avoidance Behavior Questionnaire.

.706-.883), with 90.9 seconds as the average time of completion for the FFABQ (mean=90.9 seconds, SD=49.5). The test-retest reliability for participants with neurological involvement (ie, cerebrovascular accident, PD) was good (intraclass correlation coefficient [ICC] (3,1)= .751, 95% CI=.524-.878). Likewise, good reliability was noted for those

reporting no health conditions (ICC [3,1]=.798, 95% CI=.593-.905). Reliability was not analyzed for the other health conditions, as there were not enough participants for each of the diagnostic categories. The individual MDC<sub>95</sub> was 14.69 scale points for the overall sample (95% CI=11.61-17.77).

## Fear of Falling Avoidance Behavior Questionnaire

**Table 6.**

Correlation Statistics of the Fear of Falling Avoidance Behavior Questionnaire With Other Measures of Balance and Activity

Measure	<i>r</i>	<i>r</i> <sup>2</sup>
Self-perceived balance/fall confidence questionnaires		
Activities-specific Balance Confidence Scale	-.678 <sup>a</sup>	.460
Falls Efficacy Scale	.558 <sup>a</sup>	.311
Performance-based balance assessment tools		
Berg Balance Scale	-.498 <sup>a</sup>	.248
Dynamic Gait Index	-.585 <sup>a</sup>	.342
Self-selected gait speed	-.475 <sup>a</sup>	.226
Timed "Up & Go" Test	.528 <sup>a</sup>	.279
Sensory Organization Test composite score	-.385 <sup>a</sup>	.148
Limits of stability		
Reaction time	.280 <sup>b</sup>	.078
Movement velocity	-.295 <sup>b</sup>	.087
Maximum excursion	-.285 <sup>b</sup>	.081
Endpoint excursion	-.238	.057
Directional control	-.200	.040
Endurance and activity level measures		
Six-Minute Walk Test	-.523 <sup>a</sup>	.274
Hours sitting or lying	.326 <sup>a</sup>	.106
Hours standing	-.214	.046
Hours stepping	-.420 <sup>a</sup>	.176
Steps per day	-.416 <sup>a</sup>	.173
Up/down	-.227	.052
Metabolic equivalent of task	-.431 <sup>a</sup>	.186

<sup>a</sup> Correlation is significant at  $P \leq .01$  (2-tailed).

<sup>b</sup> Correlation is significant at  $P \leq .05$  (2-tailed).

### Known-Groups Validity Analysis

There was a statistically significant difference between fallers (mean=17.48, SD=15.20, 95% CI=11.20-23.76) and nonfallers (mean=7.97, SD=8.28, 95% CI=5.25-10.70) on FFABQ scores ( $t[61]=2.860$ ,  $P=.007$ ; homogeneity violation,  $P=.005$ ) (Figure). The number of falls in the previous year also correlated significantly with the FFABQ scores ( $r=.408$ ,  $r^2=.166$ ). Likewise, there was a statistically significant difference between the frequent fallers (mean=23.83, SD=17.54, 95% CI=12.69-34.98) and nonfrequent fallers (mean=8.90, SD=8.83, 95% CI=6.42-11.38) on the FFABQ

( $t[61]=2.864$ ,  $P=.014$ ; homogeneity violation,  $P=.013$ ) (Figure).

There also was a statistically significant difference between recent fallers (mean=24.55, SD=17.52, 95% CI=12.78-36.31) and nonrecent fallers (mean=9.04, SD=9.07, 95% CI=6.51-11.56) ( $t[61]=2.856$ ,  $P=.015$ ; homogeneity violation,  $P=.008$ ) (Figure). However, there was not a statistically significant difference between the injured fallers (mean=19.00, SD=17.70, 95% CI=7.11-30.89) and the noninjured fallers (mean=10.21, SD=10.49, 95% CI=7.29-13.13) ( $t[61]=1.589$ ,  $P=$

.139; homogeneity violation,  $P=.001$ ; power=10.8%).

### Convergent Validity Analysis

Table 6 contains the correlational statistics for the relationships of the FFABQ to self-perceived balance and fall confidence questionnaires (ie, ABC Scale and FES), performance-based balance assessment measures (ie, BBS, DGI, self-selected gait speed, TUG, Sensory Organization Test [SOT]), and limits of stability [LOS]), and endurance and activity level measures (ie, Six-Minute Walk Test [6MWT] and activity monitor results). The FFABQ scores correlated moderately with the ABC Scale, FES, BBS, DGI, TUG, and 6MWT scores. No significant correlations were noted between the FFABQ and the LOS endpoint excursion, LOS directional control, daily hours standing, and daily up/down transitions.

Multiple linear regression analyses were used to compare the predictive validity of the variables with the most similar theoretical concepts (ie, FFABQ, ABC Scale, and FES) on measures of endurance (ie, 6MWT) and daily physical activity (ie, sitting or lying, stepping, up/down transitions, and daily METs). The only variable that correlated significantly with sitting or lying was the FFABQ ( $b=.055$ ,  $\beta=.326$ ,  $t=2.692$ ,  $P=.009$ ). The FFABQ explained 9.2% of the variance of time spent sitting or lying (adjusted  $r^2=.092$ ). None of the variables entered into the regression predicted time spent standing. However, the ABC Scale did significantly predict stepping ( $b=.016$ ,  $\beta=.476$ ,  $t=4.229$ ,  $P<.0005$ ), explaining 21.4% of the variance (adjusted  $r^2=.214$ ). Likewise, the ABC Scale was the only variable that was entered into the final model for prediction of up/down transitions ( $b=.262$ ,  $\beta=.340$ ,  $t=2.828$ ,  $P=.006$ ) and daily METs ( $b=.030$ ,  $\beta=.435$ ,  $t=3.773$ ,  $P<.0005$ ), explaining 10.1% (adjusted



$r^2=.101$ ) and 17.6% (adjusted  $r^2=.176$ ) of the variance, respectively. Both the ABC Scale ( $b=2.209$ ,  $\beta=.345$ ,  $t=2.413$ ,  $P=.019$ ) and the FFABQ ( $b=-3.194$ ,  $\beta=-.290$ ,  $t=2.030$ ,  $P=.047$ ) 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 Scale explaining 28.1% (adjusted  $r^2=.281$ ) and the FFABQ explaining an additional 3.5% of the variance over and above the ABC Scale. Without the ABC Scale entered into the analysis, the FFABQ explained 26.2% (adjusted  $r^2=.262$ ) of the variance in the 6MWT scores.

## 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 elderly people. 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 elderly people 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 an 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. Participants who were classified as fallers reported a greater amount of avoidance behavior, as measured by the FFABQ, compared with nonfallers. As previous research has indicated, people who have experienced a fall may restrict activities or situations that would put them at risk for falling.<sup>2,6,12</sup> Frequent fallers (2 or more falls in the previous year) also reported more avoidance behavior than nonfrequent fallers (one fall or fewer in the previous year). This result is consistent with findings by Delbaere et al.<sup>49</sup> In addition, the more often a person fell, the more fear-avoidance behavior was exhibited. Although the correlation between the number of falls and the FFABQ scores 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. In addition, individuals classified as fallers, frequent fallers, or injured fallers may have increased anxiety from the fall or anxiety related to their unsteadiness. This anxiety may contribute to a vicious cycle involving fear of falling, activity and participation restriction, and vulnerability to future falls.<sup>50</sup>

We had hypothesized that individuals 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 hypothesized outcome 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 showed that individuals who restricted their activity were more likely to have a history of an injurious fall in the previous year,<sup>51</sup> whereas other studies showed there was no association between activity restriction and a fall causing an injury.<sup>52,53</sup> However, we cannot rule out the possibility of a type II error because this comparison was clearly underpowered at 10.8%.

Self-perceived balance confidence and self-efficacy questionnaires (ie, ABC Scale and FES) were most strongly correlated with the FFABQ. These moderate correlations may have been due to the possible contributing roles of confidence and self-efficacy on performing activities.<sup>54,55</sup> That is, if a person feels more confident and capable in completing an activity, he or she will perform that activity more often. Although the constructs of confidence and self-efficacy differ from that of 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 Scale, we would have observed higher intercorrelations. Therefore, these results support the notion that the FFABQ measures avoidance behavior rather than balance confidence, self-efficacy, or fear.

The FFABQ also was moderately correlated with many performance-based measures of balance, which supports previous research that associates activity limitation with decreased physical capacity.<sup>52,56,57</sup>

This association is reasonable because people with high avoidance behavior due to a fear of falls would logically have had some balance dysfunction.<sup>58</sup> The performance-based measures that had a greater dynamic component (ie, BBS, DGI, self-selected gait speed, and TUG) were most strongly correlated with FFABQ scores. The most logical explanation is that participants with more avoidance behavior (ie, high FFABQ scores) had poorer dynamic balance capabilities. This finding also may be a result of decreased dynamic activity caused by avoidance behavior that has been shown to cause slower times on physical performance tests (eg, walking rapidly for 6.096 m [20 ft], turning a circle, rising from a chair 3 times).<sup>51</sup>

Performance-based measures of balance with a more static component (ie, SOT and LOS) also were correlated with the FFABQ, but these correlations were considerably lower than the dynamic measure correlations. Delbaere et al<sup>49</sup> found that fear of falling and avoidance behavior measured by the mSAFFE were related to a reduced forward displacement as measured by the LOS. 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.<sup>59</sup> The smaller correlations between the FFABQ and more static performance-based measures suggest 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 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 activity. In addition, a decrease in physical activity, logically, can result in the downstream consequence of physical deconditioning and decreased endurance. The 6MWT was used in this study with this in mind. A positive correlation of the FFABQ with hours spent sitting or lying and negative correlations of the FFABQ with hours stepping, METs, and the 6MWT in the present study support the notion that individuals with high FFABQ scores (ie, high avoidance behavior) are less physically active (as measured by the activity monitor) and have decreased physical endurance (as measured by the 6MWT). This decrease in physical endurance may be the result of avoidance of mobility tasks, such as walking, which has been found to be more frequently avoided by elderly people with a fear of falling.<sup>49</sup> 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 finding is consistent with the higher correlations of the FFABQ with dynamic balance measures compared with static balance measures. In addition, the transition from sitting to standing was not correlated with the FFABQ. This finding may be due to the requirement of this transition in unavoidable ADL tasks (eg, 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 Scale. 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 indi-

viduals with a high FFABQ score could reasonably be expected to engage in increased hours of sitting (ie, avoidance behavior). The ABC Scale was found to be a better predictor of activity levels compared with the FFABQ and FES. Previous research has shown the ABC Scale to be superior to the FES at differentiating between individuals who had a fear of falling and limited activity and those who did not.<sup>60</sup> The FFABQ and ABC Scale both predicted endurance as measured by the distance walked on the 6MWT, indicating both tests may have the ability to predict the deconditioning that can occur after a substantial period of activity limitation. Although the ABC Scale predicted more of the variance of endurance, the FFABQ predicted an additional unique contribution over and above the ABC Scale, supporting the notion that the measurement constructs are related but different.

Recruitment of community-ambulating elderly individuals who exhibited high fear-avoidance behavior was challenging. Those with high fear-avoidance behavior 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 individuals with high fear of falling, we tended to have participants at the lower end of the scale. Future research targeting homebound elderly people may yield a participant 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 individuals 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 back-

ing resulted in frequent need for reapplication of the adhesive backing and in a lack of adherence to use of the activity monitor in a few cases. It has been reported that activity monitors are not sensitive to people who have a bradykinetic gait (ie, individuals with PD).<sup>61</sup> For this reason, the activity monitor is not recommended for those with a self-selected gait speed below 0.67 m/s.<sup>62</sup> However, in our study, the average gait speed of participants with PD was 1.23 m/s, 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, including elderly people who are healthy and people with PD and CVA. Furthermore, our results support the notion that the FFABQ measures 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 a patient whose fear of falling has triggered a reduction in his or her 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.

All authors provided concept/idea/research design and writing. Dr Landers, Dr Durand, and Dr Powell provided data collection and analysis. Dr Landers provided project management, facilities/equipment, and institutional liaisons. Dr Powell provided participants. Dr Durand, Dr Powell, Dr Dibble, and Dr Young provided consultation (including review of manuscript before submission).

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## Fear of Falling Avoidance Behavior Questionnaire

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### Appendix.

Fear of Falling Avoidance-Behavior Questionnaire<sup>a</sup>

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Name:

Date:

Please answer the following questions that are related to your balance. For each statement, please check one box 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 on to 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.

	Please check <u>one box</u> for each question				
Due to my fear of falling, I avoid . . .	Completely disagree (0)	Disagree (1)	Unsure (2)	Agree (3)	Completely agree (4)
1. Walking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Lifting and carrying objects (eg, cup, child)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Going up and downstairs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Walking on different surfaces (eg, grass, uneven ground)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Walking in crowded places	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Walking in dimly lit, unfamiliar places	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Leaving home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Getting in and out of a chair	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Showering or bathing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Exercise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Preparing meals (eg, planning, cooking, serving)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Doing housework (eg, cleaning, washing clothes)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Work or volunteer work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Recreational and leisure activities (eg, play, sports, arts and culture, crafts, hobbies, socializing, traveling)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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Please make sure you have checked one box for each question. Thank you!

Total:     /56

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<sup>a</sup> The Fear of Falling Avoidance-Behavior Questionnaire may not be used or reproduced without written permission from the authors.