BRIEF REPORT

Convergent and Predictive Validity of Three Scales Related to Falls in the Elderly

Anita Hotchkiss, Andrea Fisher, Randi Robertson, Amy Ruttencutter, Julie Schuffert, David Bruce Barker

The purpose of this study was to determine if the Activities-specific Balance Confidence (ABC) Scale, Falls Efficacy Scale (FES), and Survey of Activities and Fear of Falling in the Elderly (SAFE) assessments measured fear of falling in the same manner (convergent validity) and to determine if they predicted those individuals who, based upon a previous history of falls, limitation of activity, and not leaving home, had an increased potential for falling (predictive validity). One hundred and eighteen individuals, 60 years of age and older, completed each of the assessments. They self-reported activity restriction, fall history, and the number of times they left the home each week. The convergent validity of each assessment was established by correlating each assessment tool with each of the others. Findings indicated the ABC and FES were highly correlated with each other, indicating they measured similar constructs, and both were moderately correlated with the SAFE, suggesting these assessments measured different constructs. The predictive validity of each instrument in relation to the frequency of falls, limitation of activity, and frequency of leaving the home revealed no individual tool could accurately predict any of these characteristics of the sample. As a result, no one test by itself was able to identify individuals who may be at risk and a candidate for an intervention program.


Falls have been identified as a serious concern among people who are elderly. Each year 30%–50% of adults over the age of 65 experience falls (Powell & Myers, 1995). Walker and Howland (1991) concluded that each year one third of the elderly population more than 65 years of age would suffer at least one fall. While many falls do not produce a serious injury, falls are the sixth leading cause of death in the elderly population.

Fear of falling has been identified as a related consequence of falls that may limit function beyond what might be expected from the effects of injury or underlying physical competence alone (Tinetti, Mendes de Leon, Doucette, & Baker, 1994). Although fear alone may not be detrimental to one's quality of life, it could have greater repercussions if it leads to the restriction of activity and a sedentary lifestyle (Lachman et al., 1998). Activity restriction may lead to deconditioning, including decreased endurance and coordination, muscle atrophy, and decreased flexibility of the body. Ultimately, activity restriction could contribute to a person's risk of future falls (Petrilla, Payne, Myers, Overend, & Chesworth, 2000).

Humans have been described as occupational beings. The word occupation has been used to describe what humans do or “human doing” (Hocking, 2000). Rudman, Cook, and Polatajko (1997) found elder participants felt activity contributes to well-being in that it fulfills a need necessary to continued existence and quality of life. For participants in this study, completing activities also created positive feelings such as competence, mastery, belonging, and feeling needed.

Several assessment tools have been developed to evaluate a person's level of fear or lack of confidence in relation to falling. The purposes of this study were to (a) determine the convergent validity of the

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Activities-specific Balance Confidence (ABC) scale, Falls Efficacy Scale (FES), and the Survey and Fear of Falling in the Elderly (SAFE) assessment to determine if these tests measured similar constructs; (b) identify which of these tools best identified level of activity restriction; (c) determine which tool best identified frequency of falls; and (d) determine which tool best identified frequency of leaving the home. We currently don’t know which of these tools is most valid in measuring fear of falling and which can best predict activity restriction or potential for falling. This information would be helpful in identifying people at risk in the elderly population.

Method

Experimental Design and Data Analysis

The research was a methodological study; it examined the convergent validity of the Activities-specific Balance Confidence Scale, Falls Efficacy Scale, and the Survey of Activities and Fear of Falling in the Elderly. Portney and Watkins (2000) state that convergent validity “indicates that two measures believed to reflect the same underlying phenomenon will yield similar results or will correlate highly” (p. 90). Pearson Product Moment Correlation Coefficients were used to determine the association between the ABC, FES, and SAFE (Marascuilo & Serlin, 1988).

This study also examined the predictive validity of the three assessments. This was measured by correlating each of the assessment scores with the number of times the individual fell over the past year, the number of activities the individual no longer participated in, and the average number of times individuals left their home per week. The questionnaire at the beginning of the interviews was used to gather these data. Predictive validity “attempts to establish that a measure will be a valid predictor of some future criterion score” (Portney & Watkins, 2000, p. 86). The square of the Pearson Product Moment Correlation Coefficient was used to determine predictive validity. It provides a value that determines what knowledge of one score allows one to predict about another. For example, if \( r = 1.00 \), then knowledge of one score on one test would allow prediction of the exact score on the other test with 100% accuracy.

Participants

A university Institutional Review Board for the protection of human participants approved this study. All participants gave informed consent prior to participation. One hundred and eighteen community dwelling individuals, 60 years of age and older participated in the study. The age range of participants in the study was 60–99 years with the mean age of 75.8. These individuals were primarily recruited from senior centers or senior housing centers or both with additional participants obtained from private residences. Individuals who lived in a nursing home or a restricted environment, or used a wheelchair as their major form of locomotion were not used as participants for this study. For inclusion individuals had to be able to read the questionnaire and respond appropriately to the questions posed to them.

Instrumentation

Prior to administering the assessments, the investigators required each participant to complete a brief questionnaire with the following questions: How many falls have you had in the past year? How often did you leave your home in the past week? How many of the following places do you not go because you are afraid of falling? (i.e., church, mall, movie theater, restaurant, etc.). Regarding psychometric testing of the three assessments, Powell and Myers (1995) concluded that the ABC had highly stable test–retest reliability over a 2-week period \( r = .92, p < .001 \) and demonstrated high internal consistency, Cronbach’s alpha equal to .96. The FES has well-established psychometric properties, with a test–retest reliability of \( r = .71 \), an internal consistency of alpha equal to .90 and established construct validity (Cumming, Salkeld, Thomas, & Szonyi, 2000; Powell & Myers, 1995). The SAFE demonstrated acceptable psychometric characteristics including high test–retest reliability, coefficient alpha .95 (Lachman et al., 1998). Internal consistency for the 11-item activity scale was .91.

Assessment Tools. The ABC required each participant to rate how confident he or she would be in maintaining balance if asked to perform a variety of activities, expressed as 0% = no confidence; 100% = total confidence. Confidence was ranked for 16 different activities such as getting into or out of a car, bending over to pick up a slipper, and walking in a crowded mall. To score the ABC, the sum of the ratings (possible range = 0 to 1,600) was divided by 16 to get each participant’s ABC score (Powell & Myers, 1995).

The FES required each participant to consider questions about 10 common daily activities and rate his or her efficacy or self-confidence about avoiding a fall during each activity on a 10-point continuum; the lower the rating, the lower the level of confidence. A variety of tasks were assessed including taking a bath or shower, getting dressed or undressed, and walking around the neighborhood. The individual’s FES score was a sum of the scores on each of the 10 activities with a possible range of 10 to 100 (Powell & Myers, 1995).

The SAFE was used to assess the fear of falling and how this fear had limited each participant’s activity over the past 5 years. The instrument required each individual to report if they currently participated in 11 daily living and social activities such as preparing simple meals and visiting a friend or relative and how “worried” they were when performing that activity. Scoring procedures required the item responses to the “worried” questions to be quantified according to the SAFE (possible range: 0 = not at all worried to 3 = very worried, with higher scores indicating more fear). The scores were then compiled, divided by 11 (the total number of questions) and subtracted from 1 to make them comparable to the ABC and FES scores for the correlation analyses.

Procedure

Each participant completed the brief paper and pencil questionnaire. One of the investigators then sat with the participant and assisted each individual in completing the three assessments. The ABC, FES, and SAFE were administered in that order, with questions and responses given orally;
another investigator recorded the participant’s responses. The average length of time to administer all assessments was approximately 30 minutes.

Results

Descriptive Statistics

Forty-five of the 118 study participants reported they had experienced a fall within the last year; 73 had not. Eighty-five of the participants did not restrict activity, leaving 33 who did restrict activity due to a lack of confidence or fear of falling. On average, participants left their homes 5.7 times per week and exhibited one activity restriction in their daily routine.

Convergent Validity

Findings indicated there was a high correlation between the ABC and FES ($r = .86$), suggesting these assessments measured similar constructs. The FES and SAFE and the ABC and SAFE were moderately correlated ($r = .67$ and $r = .66$ respectively), indicating these measures, although related, measured more variable constructs.

Predictive Validity

Pearson correlations were calculated to determine which of the three assessment tools could best distinguish a sample of individuals who restricted activities, who had previously fallen and who leave their home on a regular basis. The square of the correlation coefficient provided the percentage of explained variance (Marascuilo & Serlin, 1988). The percent explained variance is a measure that provides information about how well knowledge of one score can be used to predict another score on another test.

The FES was the best predictor of individuals who restricted their activity. Scores on the FES explained 28% of the variance. The SAFE explained 26% of the variance, while the ABC only explained 22% of the variance. No one test could accurately predict activity restriction, since at least 72% of the variance was unexplained. See Table 1 for correlations of the ABC, FES, and SAFE with activity restriction in addition to the other two dependent variables. Activity restriction can not be predicted based upon scores on any of the three assessments.

The ability of the tests to identify individuals who had a history of falling was low. ABC explained 1% of the variance in fall history, FES explained only 4% of the variance, and 5% of the variance was accounted for by using the SAFE (see Table 1). None of the tests could predict individuals who had a history of falling.

The predictive validity of the ABC, FES, and SAFE was lowest for determining the number of times the individual might leave their home. The FES only explained 8% of the variance. The ABC and SAFE explained 5% and 2% of the variance respectively (see Table 1). None of the tests predicted those individuals who might leave their home more or less frequently.

Discussion

Findings indicated the ABC and FES measured similar constructs, while correlations between the SAFE and FES, and ABC and SAFE demonstrated the assessments were measuring more variable constructs. Results suggested none of the three assessments would be able to correctly and independently identify frequency of falls, level of activity restriction, or frequency of leaving the home.

In comparing this study with the results of previous studies, certain similarities exist. First, Powell and Myers (1995) found the ABC and FES to be highly correlated ($r = .84$), which is comparable to the findings of the present study ($r = .86$). Second, Lachman et al. (1998) reported a statistically significant correlation between the SAFE and FES ($r = .76$): In this study the correlation was $r = .67$. Third, this study supported the findings of Tinetti, Richman, and Powell (1990), which suggested the FES scores were not able to identify individuals who had a fall history. In the present study the FES predicted only 4% of the explained variance for frequency of falls.

Upon comparing past literature with the present study, several differences can be noted. First, Lachman et al. (1998) suggested the SAFE could distinguish between those subjects who restricted activities and those who did not. The present study contradicts this finding, as the SAFE was only able to account for 26% of the explained variance for activity restriction and was not able to clearly identify individuals who would restrict their activities due to fear of falling. Second, Myers, Fletcher, Myers, and Sherk (1998) suggested that knowledge of a participant’s ABC score and five other variables including (a) perceived health; (b) current level of physical activity; (c) age; (d) education; and (e) gender could identify those who considerably restricted their activities compared to those who did not. However, it should be noted that the inclusion of these five other variables in the study by Myers et al. (1998) only accounted for 40% of the variance. This percentage suggests that even with the inclusion of these other variables, 60% of the variance was unexplained. While a 40% variance may be considered good for establishing a moderate association between variables, in this case it would indicate the ABC is inadequate in predicting which individuals restricted their

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<th>Table 1. Correlation Between the ABC, FES, and SAFE and Frequency of Falls, Level of Activity Restriction, and Frequency of Leaving the Home</th>
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Note: Values represent the Pearson $r$ Correlation Coefficient, *$p < .05$; **$p < .01$. $n = 118$. ABC = Activities-specific Balance Confidence Scale. FES = Falls Efficacy Scale. SAFE = Survey of Activities and Fear of Falling in the Elderly.
activities. This was consistent with the findings of this study. Third, Powell and Myers (1995) suggested the ABC could distinguish fallers from nonfallers. This determination was based on the mean ABC scores being lower in a group of subjects who had reported falling in the past year when compared to a group of nonfallers. However, the statistical differences reported were not significant. The findings in this study demonstrated the ABC was not correlated with previous falls and could not predict individuals who had previously fallen.

Several factors regarding this population may have contributed to the discrepancies among studies. In this study the groups used were more representative of the elderly population at large than previous studies. Lachman et al. (1998) recruited participants from public senior housing developments. Myers et al. (1998) examined studies that recruited participants such as home care clients and individuals enrolled in community exercise programs, residents of retirement homes, and patients undergoing hip or knee replacement. The present study better represented the population targeted in the development of the three assessments. This population included those individuals who may be at risk for falling and who were currently living in the community. The use of the ABC, FES, and SAFE on populations of elderly individuals who did not have the freedom to restrict their activity or actively participate in the activities assessed by these tools seems to deviate from the intended purpose of these assessments. Therefore, the use of populations consisting of individuals of low mobility groups may have altered the accuracy of conclusions made in previous research.

The following two limitations of this study should be noted. First, some participants sought further explanation of questions, forcing the administrator to elaborate on the proposed questions in order to clarify confusion. This elaboration might have allowed participants to answer questions differently than if they had simply filled the assessment out independently. Second, many of the surveys were performed in the community areas of various facilities, leaving little room for privacy, thus possibly resulting in peer influenced responses. The results of this study may indicate that more then a fear of falling needs to be taken into consideration by therapists in predicting which individuals might be at risk for falling. If fear of falling consistently fails to correlate with frequency of falls, it may indicate that fear of falling is not the only variable that contributes to activity restriction. An assessment should be developed that will accurately identify individuals who limit their activity, become deconditioned, and have an increased risk for falls. Future research could explore other variables that contribute to falls. Perhaps a multivariate approach needs to be taken in the future.

References


