Validation of the Iconographical Falls Efficacy Scale in Cognitively Impaired Older People

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Background. This study evaluated psychometric properties of the Iconographical Falls Efficacy Scale (Icon-FES) to measure fear of falling in cognitively impaired older people. Icon-FES uses pictures as visual cues to prompt responses.

Methods. A total of 50 community-dwelling older people with moderate cognitive impairment were assessed on Icon-FES, Falls Efficacy Scale-International, and various physical and cognitive measures.

Results. Overall structure and measurement properties of Icon-FES, as evaluated with item response theory, were good. Internal consistency was high (Cronbach’s alpha = 0.97). Distribution was near normal, indicating absence of floor and ceiling effects. Icon-FES construct validity was supported by its relation with Falls Efficacy Scale-International (r = .68, p < .001) and its ability to discriminate between groups relating to fall risk factors (gender, balance, falls). Scores were not affected by different levels of cognitive functioning, as assessed with the Mini-Mental State Examination and Trail Making Test.

Conclusions. Icon-FES is the first measure of fear of falling that compensates for reduced abstract abilities by using pictures to match the verbal descriptions. This study supports its feasibility, reliability, and validity to assess fear of falling in people with moderate cognitive impairment or dementia living in the community. Compared with Falls Efficacy Scale-International, Icon-FES was better at identifying participants with higher fall risk and did not show a floor effect likely due to a greater range of physically challenging activities.

Key Words: Falls—Geriatric assessment—Alzheimer’s disease—Fear of falling—Dementia.

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FEAR of falling is common in community-dwelling older adults, with higher prevalence in people who are frail and in those who have a history of falling (1–3). The few studies that have investigated fear of falling in older people with cognitive impairment have reported inconsistent findings. Two studies have found that older people with cognitive impairment report high levels of fear of falling and that this is related to concomitant physical impairments and frailty (4,5). In contrast, it has been suggested that people with Alzheimer’s disease report lower levels of fear of falling (6), that they are less likely to restrict activities as a result of falling (7), and that their fear of falling may be unrelated to fall frequency in this group (4). It is possible that a lack of awareness of risk of falls might result in an inappropriately low level of fear relative to physical ability. Accuracy of the reported level of fear of falling in people with cognitive impairment may be strongly influenced by difficulty in comprehending questions or reporting on subjective states. The Iconographical Falls Efficacy Scale (Icon-FES) is a fear of falling questionnaire using pictures as visual cues to provide more complete environmental contexts (1). Both full (30-item) and shortened (10-item) versions of the Icon-FES previously demonstrated strong psychometric properties in cognitively intact older people, including its normal distribution and its ability to assess fear of falling in high functioning older people (1). This study evaluated the Icon-FES in people with cognitive impairment. The use of pictures might compensate for reduced abstract abilities in people with cognitive impairment and therefore be a more feasible assessment in this population.
**Methods**

A total of 50 participants were randomly recruited from a cohort of 177 community-dwelling people aged 65 years or older and participating in a study on understanding fall risk factors in cognitively impaired older adults (8). The main inclusion criterion for cognitive impairment was defined as an Addenbrooke’s Cognitive Examination-Revised score of 82 or lower (9), or a Mini-Mental State Examination score of 23 or lower (10), or where a specialist clinician had made a diagnosis of cognitive impairment or dementia. Exclusion criteria were presence of Parkinson’s disease, recent stroke (within 18 months), other neurodegenerative disorders, known as end-stage illness, or insufficient knowledge of the English language to complete the tasks. All participants had an identified and willing “person responsible” with at least 3.5 hours of weekly face-to-face contact. All participants and their person responsible consented to participate in the study prior to interview. Study approval was obtained from the University of New South Wales Human Studies Ethics Committee.

Icon-FES is an interview-based questionnaire using a combination of pictures and matching short phrases. Icon-FES provides information on level of concern about falls for a range of activities of daily living (Figure 1). The long Icon-FES version contains 30 items scored on a 4-point scale (1 = not at all concerned to 4 = very concerned); the shortened Icon-FES version contains 10 items (1). Concern about falling during seven activities of daily living was also assessed by interview using the shortened Falls Efficacy Scale-International (FES-I; total score range = 7–28 [11]). Postural sway was assessed by recording body displacements at waist level (mm) while standing on a foam mat with eyes open and feet hip width apart (12). The Physiological Profile Assessment was used to gain an estimate of physiological fall risk (12). Trail Making Test (Trails A) was performed as a measure of visual search and processing speed. Participants were asked to connect consecutively numbered circles as fast as possible (13). Information pertaining to falls in the previous year and during a 12-month follow-up period using falls diaries was also obtained from participants or carers (8).

Questionnaire structure was evaluated by using item response theory, that is, Rasch modelling (Winsteps, JM Linacre). Further reliability analyses were performed using SPSS for Windows (Version 20, SPSS, Inc., Chicago, IL). Construct and discriminant validity of Icon-FES was assessed by using independent t tests to examine between-group differences in total scores according to age, gender, various fall risk factors, and cognitive performance (cutoff: median). Effect sizes for group differences of Icon-FES and FES-I scores were calculated (1).

**Results**

Mean age of participants was 82.1 years (SD = 5.9) and 26 (52%) were women. Seventy-two percent (n = 36) of participants reported one or more falls in the previous year, of which half (n = 18) fell twice or more. Mean Physiological Profile Assessment fall risk score was 2.2 (SD = 1.8), mean Mini-Mental State Examination score was 22.4 (SD = 4.4), and on average, participants took 116.5 seconds (SD = 85.8) to complete Trails A.

Rasch analyses indicated that most items fitted well within the unidimensional fear of falling scale, suggesting

![Figure 1. Bubble chart for Iconographical Falls Efficacy Scale (Icon-FES) as a graphical representation of measures and fit values. Bubbles are named after the activity.](https://academic.oup.com/biomedgerontology/article-abstract/68/9/1098/596011)
Table 1. Scoring and Reliability Estimates of 30-Item Iconographical Falls Efficacy Scale (Icon-FES; range = 30-120), 10-Item Icon-FES (range = 10-40), and Shortened Falls Efficacy Scale-International (FES-I; range = 4-28) for 50 Cognitively Impaired Older Adults Living in the Community

<table>
<thead>
<tr>
<th></th>
<th>30-Item Icon-FES</th>
<th>10-Item Icon-FES</th>
<th>FES-I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean score (SD)</td>
<td>55.3 (21.8)</td>
<td>18.9 (7.4)</td>
<td>11.1 (5.4)</td>
</tr>
<tr>
<td>Median (range)</td>
<td>52 (30–117)</td>
<td>17 (10–39)</td>
<td>9 (7–26)</td>
</tr>
<tr>
<td>Minimum score (floor effect), n (%)</td>
<td>4 (8.0)</td>
<td>8 (16.0)</td>
<td>20 (40.0)</td>
</tr>
<tr>
<td>Maximum score (ceiling effect), n (%)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Cronbach’s alpha</td>
<td>0.97</td>
<td>0.91</td>
<td>0.93</td>
</tr>
<tr>
<td>Mean (minimum-maximum) inter-item correlations</td>
<td>0.53 (0.18–0.84)</td>
<td>0.50 (0.25–0.81)</td>
<td>0.65 (0.48–0.85)</td>
</tr>
<tr>
<td>Skewness (SEM)</td>
<td>0.87 (0.34)</td>
<td>0.66 (0.34)</td>
<td>1.32 (0.34)</td>
</tr>
<tr>
<td>Kurtosis (SEM)</td>
<td>0.21 (0.66)</td>
<td>0.23 (0.66)</td>
<td>0.50 (0.66)</td>
</tr>
</tbody>
</table>

Notes: SD = standard deviation; SEM = standard error of the mean.

Table 2. Mean and Standard Deviation (SD) of 30-Item Iconographical Falls Efficacy Scale (Icon-FES; range = 30–120), 10-Item Icon-FES (range = 10–40), and Shortened Falls Efficacy Scale-International (FES-I; range = 4–28) Scores for Subgroups Based on Demographic Characteristics, Fall Risk Factors, and Cognitive Performance

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th></th>
<th>Group 2</th>
<th></th>
<th>Effect Size*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>30-Item Icon-FES</td>
<td>10-Item Icon-FES</td>
<td>FES-I</td>
<td>30-Item Icon-FES</td>
</tr>
<tr>
<td>Age (y)</td>
<td>&lt;82^</td>
<td>24</td>
<td>57.6±21.9</td>
<td>19.4±7.4</td>
<td>11.4±5.7</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>24</td>
<td>48.7±16.9</td>
<td>16.2±5.4</td>
<td>10.0±4.5</td>
</tr>
<tr>
<td>Previous falls</td>
<td>&lt;1</td>
<td>32</td>
<td>50.6±20.4</td>
<td>17.4±7.4</td>
<td>9.9±5.0</td>
</tr>
<tr>
<td>Future falls</td>
<td>&lt;1</td>
<td>28</td>
<td>49.4±17.9</td>
<td>17.1±6.3</td>
<td>9.5±4.1</td>
</tr>
<tr>
<td>PPA score</td>
<td>&lt;2.2^</td>
<td>25</td>
<td>49.8±21.2</td>
<td>16.9±7.1</td>
<td>10.6±5.5</td>
</tr>
<tr>
<td>Postural sway (mm²)</td>
<td>&lt;1991^</td>
<td>25</td>
<td>45.1±16.3</td>
<td>15.4±5.5</td>
<td>9.9±4.8</td>
</tr>
<tr>
<td>Trails A</td>
<td>&lt;4^</td>
<td>26</td>
<td>57.3±22.4</td>
<td>11.3±5.5</td>
<td>11.3±5.5</td>
</tr>
<tr>
<td>MMSE score</td>
<td>&gt;23^</td>
<td>20</td>
<td>56.9±25.9</td>
<td>19.4±8.7</td>
<td>11.8±6.1</td>
</tr>
</tbody>
</table>

Notes: MMSE = Mini-Mental State Examination; PPA = Physiological Profile Assessment.
*Effect sizes for group differences on FES-I, 30-item Icon-FES, and 10-item Icon-FES.
^Median of total sample.
^p ≤ .050.
^p ≤ .001.
ICONOGRAPHICAL FALLS EFFICACY SCALE

**Discussion**

Icon-FES is the first fear of falling scale to combine words with pictures and also includes a greater range of physically challenging activities. This study supports feasibility, reliability, and validity of Icon-FES to assess fear of falling in people with moderate cognitive impairment or dementia living in the community. Compared with FES-I, Icon-FES scales were better at identifying participants with higher fall risk and its data distributions were near normal. The poor fit of the item asking about concern when taking a shower according to Rasch analyses could be due to our relatively small sample size. Overall, Icon-FES has excellent psychometric properties and can be used to assess fear of falling in people with moderate cognitive impairment. This was further confirmed by similar scores obtained in people with different levels of cognitive functioning.

One of the challenges of assessing an abstract concept as fear of falling in older people with cognitive impairment is to establish with the person that the topic being considered is their fear of falling. The use of interview-based questionnaires has therefore been recommended (4). Impaired recognition memory, especially for recent events, also makes it difficult to assess people with cognitive impairment using self-assessment methods. The main advantage of Icon-FES over more traditional fear of falling scales is its use of pictures providing clear, unambiguous contexts. Previous research has suggested that pictures allow patients with cognitive impairment to better recognize and identify a situation compared with using just words, by enhancing familiarity (14,15). Therefore, using pictures in combination with words is likely to assist with correct interpretation of the contextual meaning. Furthermore, expressive and receptive disorders of language are common in cognitive impairment and can limit full participation in discussions about fear of falling. Use of facial expressions as line drawings, such as those used in Icon-FES response categories, can facilitate completion of the scale and has been used successfully in people with dementia to assess mood (16).

To get a complete picture of fear of falling in people with cognitive impairment, inclusion of at least one high risk activity is crucial. This helps determine whether low levels of fear are due to poor insight or are a true reflection of a low fall risk. Older people with poor insight as a consequence of conditions such as Alzheimer’s disease might take undue risks relative to their physical ability. Icon-FES, both long and shortened version, is the only fear of falling scale that includes high-risk activities such as climbing on chairs or ladders to reach high places. Therefore, Icon-FES may also have potential to identify risk-taking behaviors that might result in increased fall risk through exposure to dangerous situations. Discussions around modifying such risk behaviors could have significant positive outcomes for this population.

We acknowledge that this study has certain limitations. First, the sample size is relatively small. Second, Icon-FES was assessed in community-dwelling older adults with moderate cognitive impairment. Future research should confirm feasibility and psychometric properties of Icon-FES in alternate settings and older people with severe cognitive impairment. In addition, future research should explore appropriateness of the chosen cartoons across cultures and environmental circumstances.

In conclusion, both long and shortened Icon-FES are reliable and valid measures of concern about falling in community-dwelling older adults with cognitive impairment. The Icon-FES is the first measure of fear of falling that compensates for reduced abstract abilities by using pictures to match the verbal descriptions. Future studies should use larger samples and explore the Icon-FES’s test–retest reliability and sensitivity to change following interventions.

**Acknowledgments**

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**References**


