Content Analysis of Four Fear of Falling Rating Scales by Linking to the International Classification of Functioning, Disability and Health.

Jonasson, Stina; Nilsson, Maria H; Carlsson, Gunilla; Lexell, Jan

Published in: PM&R

DOI: 10.1016/j.pmrj.2013.01.006

2013

Citation for published version (APA):

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

• Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
• You may not further distribute the material or use it for any profit-making activity or commercial gain
• You may freely distribute the URL identifying the publication in the public portal

Take down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.
Content Analysis of Four Fear of Falling Rating Scales by Linking to the International Classification of Functioning, Disability and Health

Stina Bladh, RPT, MSc\textsuperscript{1,2}, Maria H Nilsson, RPT, PhD\textsuperscript{1}, Gunilla Carlsson, ROT, PhD\textsuperscript{1}, Jan Lexell, MD, PhD\textsuperscript{1,2}

\textsuperscript{1} Department of Health Sciences, Lund University, Lund, Sweden
\textsuperscript{3} Department of Rehabilitation Medicine, Skåne University Hospital, Lund, Sweden

\textbf{Funding sources:} This study was funded by the Faculty of Medicine at Lund University, Lund, Sweden, and the Swedish Council for Working Life and Social Research.

\textbf{Key words:} Disability Evaluation; Outcome Assessment; Rehabilitation; Research Design; Self Efficacy

\textbf{Corresponding author:}
Stina Bladh
Department of Health Sciences
PO Box 157
Lund University
SE-221 00 Lund
Sweden
\textit{Phone:} +46 46 222 1817
\textit{Fax:} +46 46 222 1959
\textit{E-mail:} Stina.Bladh@med.lu.se
ABSTRACT

Objective: To gain a deeper understanding of the content of 4 fear of falling (FOF) rating scales by linking them to the International Classification of Functioning, Disability and Health (ICF).

Design: Linking study according to the ICF linking rules.

Setting: Not applicable.

Patients: Not applicable.

Methods: The rating scales were the Falls Efficacy Scale-International (FES-I), the Swedish version of the Falls Efficacy Scale (FES[S]), the Activities-specific Balance Confidence Scale (ABC), and the modified Survey of Activities and Fear of Falling in the Elderly (SAFFE). The process followed the established and updated linking rules. Three linkers independently identified all meaningful concepts in the rating scales and linked them to the most precise ICF categories. The linkers then discussed their results in order to reach consensus. If consensus was not attained, the linkers pursued the discussions with a fourth person to reach consensus.

Main outcome measurements: Not applicable.

Results: Most meaningful concepts from the overall questions were linked to the ICF component of body functions. Of the 62 items, all but one meaningful concept were linked to the component of activities and participation. All 4 rating scales covered the chapters of mobility and domestic life and had most linkages to the mobility chapter.

Conclusions: The linking process revealed similarities and differences between the 4 FOF rating scales, as well as methodological challenges in linking instruments to the ICF. By providing a content description that allows for a direct comparison of the rating scales, the results may be helpful when choosing an appropriate rating scale assessing FOF in clinical practice and research. A further head-to-head comparison through psychometric analyses is required to recommend appropriate FOF rating scales. Studies are also needed to investigate how the overall question and response categories of a rating scale affect respondents’ answers.
INTRODUCTION

Fear of falling (FOF) is common among older people and in people with mobility difficulties [1-6]. Many older people are afraid of falling and hurting themselves, and this fear is more common than the fear of being robbed or of experiencing financial problems [7]. The consequences of FOF include increased risk of falls, loss of functional independence, depression, and decreased quality of life [1]. The authors of a recent study found that balance confidence was independently associated with activity and participation after stroke, unlike the capacity to walk [8]. Taken together, FOF is an important target in rehabilitation.

FOF can be conceptualized as either decreased balance confidence, activity avoidance because of the risk of falling, low fall-related self-efficacy, or a lasting concern about falling [6,9-11]. A variety of rating scales assess different aspects of FOF, such as the Falls Efficacy Scale (FES) [10], Falls Efficacy Scale-International (FES-I) [12], the Swedish version of the Falls Efficacy Scale (FES[S]) [13], the Activities-specific Balance Confidence Scale (ABC) [9] and the modified Survey of Activities and Fear of Falling in the Elderly (SAFFE) [6]. Although these rating scales may seem similar, it has been argued that they do not assess the same aspect of FOF [2,14]. One way to increase the conceptual understanding of rating scales is by linking them to the International Classification of Functioning, Disability and Health (ICF) [15-17]. Linking is a way of mapping the content covered by a scale and results in a structured description of the scale [17-20].

The ICF offers detailed definitions of different aspects of functioning, disability, and health that are described in a large number of categories [15]. It offers a structure and a common language for describing disability and health that enable a better understanding across different professions and facilitates international and cross-cultural comparisons of health and health-related states [15].

Rules have been developed and updated to enable and standardize linking of rating scales to the ICF [16,17]. Linking is a rigorous method of analyzing rating scales and should be considered a complement to psychometric evaluations. It provides a way of exploring content validity of a rating scale [17,18]. A head-to-head comparison of several linked FOF rating scales may facilitate a direct comparison of contents covered by each scale in the overall questions, items and response categories [17-19]. Together with psychometric studies, this comparison may facilitate the process of choosing appropriate rating scales for assessing FOF in clinical practice and research [17,18]. To the best of our knowledge, no study has rigorously linked commonly used FOF rating scales to the most precise ICF categories. The
aim of this study was to gain a deeper understanding of the content of 4 FOF rating scales by linking them to the ICF.

**METHODS**

**Choice of FOF Rating Scales**

The included FOF rating scales were the FES-I, FES(S), ABC and SAFFE. We had several reasons for choosing these rating scales. FES-I was included because it is developed and recommended by the Prevention of Falls Network Europe [12]. It was developed by combining and modifying items from the FES, the ABC and the Survey of Activities and Fear of Falling in the Elderly (SAFE) [12], and we therefore also wanted to include these scales. However, FES [10] is not available in Swedish; therefore, the FES(S) [13] (modification of FES) was instead included. Because SAFE [21] is extensive and complicated, we instead included the modified version (SAFFE) [6]. Our aim was also to include rating scales that assesses various FOF aspects. FES-I and FES(S) relate to concern and confidence in relation to falls, respectively, whereas ABC relates to losing balance and becoming unsteady, and SAFFE to activity avoidance because of the risk of falling [6,9,12,13].

For each of the 4 FOF rating scales, Swedish-translated and Swedish-adapted versions were used. Because of linguistic and cultural differences between the English and the Swedish language, the versions used are not literal translations and have minor differences.

**Descriptions of the 4 FOF Rating Scales**

FES-I assesses concerns about falling [12]. The respondents answer the overall question of how concerned they are about the possibility of falling in relation to 16 activities (items). The response categories are “not at all”, “somewhat”, “fairly”, or “very concerned”. The total score ranges from 16 to 64 (higher = worse). FES-I is intended to be applicable internationally and in different cultural settings [12]. FES-I has been used in studies, for instance, with older people, people who have had a stroke, and older people after they sustain a hip fracture [22-25]. It has been translated to Swedish by Nordell et al [26].

FES(S) assesses fall-related self-efficacy [13]. Respondents answer the overall question of how confident they are in performing 13 different activities (items) without falling. Response categories range from 0 (not confident at all) to 10 (completely confident), and the total score ranges from 0 to 130 (higher = better) [13]. FES(S) was originally
developed for people who have had a stroke, but it also has been used for people with Parkinson disease and late effects of polio [2,27,28].

ABC assesses balance confidence [9]. Respondents answer the overall question of how confident they are in performing 16 different activities (items) without losing their balance or becoming unsteady. Response categories range from 0% (no confidence) to 100% (completely confident). The total score is the mean value of the 16 items; that is, it ranges from 0% to 100% (higher = better) [9]. ABC has been used in studies with older people, people who have had a stroke, and people with hip osteoarthritis [8,29,30]. The Swedish-translated version of ABC has been culturally adapted, and items related to “stepping onto or off escalators” are changed into “travel by bus” (L. Lundin-Olsson, written personal communication, June 20, 2012).

SAFFE assesses activity avoidance as a result of the risk of falling [6]. Respondents answer the overall question of whether they avoid 17 different activities (items) because of a risk of falling. The response categories are “never”, “sometimes”, or “always” avoid. The total score ranges from 17 to 51 (higher = worse) [6]. SAFFE has been used in studies with older people, older people after sustaining a hip fracture, and in people with Parkinson disease [2,23,25,31]. It has been translated to Swedish by L. Lundin-Olsson (written personal communication, June 20, 2012).

**International Classification of Functioning, Disability and Health (ICF)**
The ICF is a hierarchically structured classification of functioning, disability and health. The 4 ICF components (body functions, body structures, activity and participation, and environmental factors) consist of 1454 categories that are hierarchically organized in chapters and levels. All categories are defined and assigned a unique code consisting of a letter followed by digits. The letter represents the ICF component (b, body function; s, body structure; d, activity and participation; and e, environmental factor). The first digit represents the chapter level, the following 2 digits represent the second level and the fourth digit represents the third ICF level [15]. The following example illustrates the branched structure of the ICF:

“d Activities and participation” (component level)
“d4 Mobility” (first/chapter level)
“d450 Walking” (second level)
“d4502 Walking on different surfaces” (third level)
Linking Process
The linking process followed the updated linking rules [17] and was performed by 2 researchers (M.H.N., a physiotherapist and G.C., an occupational therapist) and 1 PhD student (S.B., a physiotherapist). All linkers had 5 to 10 years’ experience with the ICF, and the 2 researchers had previously linked rating scales to the ICF [32]. Before linking, all 3 linkers renewed their knowledge by studying the ICF and the updated linking rules [15,17].

According to the linking rules, one item may consist of multiple meaningful concepts, and all concepts are to be linked to the most precise ICF category. The same ICF category may be used several times for linking multiple meaningful concepts within an item. Content of a meaningful concept that is not explicitly named in the corresponding ICF category is documented as “additional information” [17].

Initially, all meaningful concepts of the overall questions, items, and response categories in the 4 FOF rating scales (FES-I, FES(S), ABC, and SAFFE) were identified and linked to the most precise ICF categories [17]. This task was performed individually and independently by the 3 linkers, who thereafter discussed their results to reach a consensus [18,19]. The first consensus meeting covered the items of FES-I and FES(S), and the second meeting covered the items of ABC and SAFFE. A third meeting included discussions regarding environmental factors, although this aspect is not covered in the present study. A fourth meeting covered all overall questions and response categories. A fifth and final meeting covered meaningful concepts in which consensus was not previously reached because of different opinions between the 3 linkers. During this meeting, the linkers pursued the discussions with a fourth person (J.L., a rehabilitation medicine specialist with previous experience of linking rating scales to the ICF [33]) to reach consensus. This process was in agreement with previous linking studies [18,19]. The discussions during all consensus meetings were tape recorded for possible use at a later point.

Analyses
Following the example of Geyh et al [19], content density, content diversity, and bandwidth of content coverage for each linked FOF rating scale are reported to enable a quantitative comparison. Content density is the number of identified meaningful concepts divided by the number of items. A higher value reflects more meaningful concepts per item. Content diversity is the number of unique ICF categories linked divided by the number of identified meaningful concepts. A value of 1 means that each meaningful concept is linked to different
categories, which implies that the content of the rating scale is highly diverse. Bandwidth of content coverage is the percentage used ICF categories of the total number of plausible categories (ie, 1454) and reflects the spread of the content of the rating scale [19]. Depending on the nature of the rating scale and the aim of the assessment, high content density, content diversity, and bandwidth of content coverage of a scale can be either positive or negative [34] (note the second paragraph of the Discussion section). The linking of the overall questions and the response categories in the 4 rating scales is not included in the quantitative comparison but is reported separately (see Table 1).

RESULTS
A total of 13 meaningful concepts from the overall questions and response categories and 101 meaningful concepts from the 62 items of the 4 FOF rating scales were identified. Nine of a total of 114 meaningful concepts (8%) required further discussions with the fourth person to decide on the appropriate corresponding ICF category. Five of these meaningful concepts were in ABC, 3 were in FES(S) and 1 was in FES-I. Four of these concepts contained the word “confident/confidence”. Discussions focused whether this should be linked to a personal factor or body function. The remaining 5 disagreements were spread among items in FES-I, FES(S), and ABC. These items dealt with aspects of walking and moving around in different locations. All but 3 of the total number of meaningful concepts could be linked to the ICF.

Table 1 presents the linking results of the overall questions and response categories of the 4 rating scales. Eight meaningful concepts were linked to the component of body functions and 2 concepts were linked to the component of activities and participation. The overall question in FES-I, FES(S), and SAFFE contained the meaningful concept “falling”. Because falling cannot be linked to an ICF category, these 3 meaningful concepts were assigned the code “nd”, that is, not definable.

Table 2 illustrates the spread of item contents of the 4 FOF rating scales. All but one meaningful concept of the 62 items were linked to the component of activities and participation. One single meaningful concept (from ABC) was linked to the environmental component. Three of 9 chapters of the component of activity and participation were not covered by any rating scale. Two chapters were covered by all 4 rating scales: the chapters of mobility and domestic life. All 4 rating scales, particularly ABC, revealed strongest connections to the chapter of mobility. (See Supplementary Table 1 for a detailed content comparison of items of the 4 FOF rating scales.)
Table 3 presents the quantitative summary of the linking of items and reveals general similarities between the 4 rating scales. Content density was somewhat higher for FES-I (2.1 compared with 1.3 to 1.7 for the other rating scales), which implies that FES-I contained the most meaningful concepts per item. Content diversity was equally low (0.5) for FES-I and ABC, although because of different reasons. In FES-I, multiple meaningful concepts within items were often (in 50% of items) linked to the same ICF category. This occurred in 19% of items in ABC. However, meaningful concepts in different ABC items were often linked to the same ICF category; for example, 4 items were linked to the category “Reaching”. Table 3 further reveals that SAFFE had the lowest content density (1.3) but the highest content diversity (0.8). This finding mirrors its shortly phrased items that cover diverse aspects of activities and participation. Bandwidth of content coverage ranged from 0.9% (ABC) to 1.2% (FES-I and SAFFE), which means that about 1% of all ICF categories were used to link the items in each FOF rating scale. Tables 4-7 address the actual results of the linking of the 62 items of the 4 rating scales.

**DISCUSSION**

Linking rating scales to the ICF is a rigorous and established method for analyzing and comparing contents [17-20]. Together with psychometric studies, the linking results may facilitate the selection of appropriate rating scales for assessing FOF in clinical practice and research [17]. To the best of our knowledge, this study is the first that simultaneously links several FOF rating scales to the ICF, which allows for a head-to-head comparison. ABC is the only FOF rating scale that has previously been linked to the ICF [35]. Meaningful concepts were then linked to the second level ICF categories instead of to the most precise categories [17]. In this study, we have linked 4 FOF rating scales to the most precise ICF categories. Most meaningful concepts from the overall questions and response categories were linked to the ICF component of body functions. Of the 62 items, all but one meaningful concept were linked to the component of activities and participation. All 4 rating scales covered the chapters of mobility and domestic life and had most linkages to the chapter of mobility.
**Interpretation of Quantitative Measures of the Linking Process**

Quantitative measures (eg, content density) were used in accordance with Geyh et al [19], but information on how to interpret such results is limited. Our understanding is that the interpretation depends on the nature of the rating scales. As stated by Gradinger et al [34], a high content density of a rating scale can be both positive and negative. Scales with low content density are suggested to be suitable for clinical settings because their items are less complex [34]. High content density indicates that single items contain multiple meaningful concepts (in the present study: multiple activities). This situation could cause difficulties when interpreting a response because we do not know whether it refers to one or all activities within an item. For example, FES(S) and ABC contain the item “Walk up or down stairs”. However, it has been shown that confidence may be rated differently for walking up stairs compared with down stairs [9]. On the other hand, having multiple meaningful concepts per item may be valuable because it could provide a more detailed and precise instruction to the respondent. For example, the item “Stand on your tiptoes and reach for something above your head” (ABC) illustrates a well-defined and complex situation. Taken together, these examples suggest that there is no rule of thumb for interpretation of content density, which requires careful considerations. Gradinger et al [34] suggest that rating scales with high content density can be combined with scales with low content density to provide a broader spread of assessment.

The bandwidth of content coverage was rather low for all 4 FOF rating scales. All but one meaningful concept of the 62 items were linked to the component of activities and participation, and all rating scales had the majority of linkages to the chapter of mobility. In previous studies, authors have identified walking difficulties as an important contributing factor to FOF [27,36], and walking difficulties increase the risk of restricting outdoor activities because of FOF [37]. Furthermore, FOF is associated with falls [2,5,7,12,21,27], and falls among older people commonly occur during walking (44-57%) [38-40]. Seven of 16 items in ABC, 6 of 17 items in SAFFE, and 5 of 16 items in FES-I are in fact walking related (ie, contain the word “walk/walking” and/or were linked to the ICF category “d450: Walking” or any of its subcategories). In FES(S), 1 of 13 items is walking related.

In all 4 FOF rating scales, there was only a single linkage to the ICF component of environmental factors (see Tables 1-2). Although several items related to the surrounding environment, this did not constitute a meaningful concept by itself. Therefore environmental
factors ended up as “additional information” (see Tables 4-7). This finding highlights the need for taking additional information into account when interpreting linking results.

**Does the Linking Capture the Meaning of a Person’s Response to a Rating Scale?**

A reasonable assumption is that a person’s response to a rating scale is a function of the overall question, the item, and the response categories, which implies that there may be a difference in the meaning of a person’s responses to 2 identical items if the overall questions differ. Previous studies underline that FOF rating scales do not assess the same aspects of FOF [2,14]. For example, there is a difference in being “concerned about the possibility of falling” (FES-I) compared with “activity avoidance due to the risk of falling” (SAFFE). “Being concerned” expresses a feeling, whereas “avoiding” is a consequence of a perceived risk. In this study, the overall questions in FES-I and SAFFE were in fact linked to different ICF components (b: body functions and d: activities and participation, respectively). In addition, the overall questions differ in that FES-I, FES(S), and SAFFE relate to actual falling, whereas ABC relates to loosing balance and becoming unsteady. “Losing balance” and “becoming unsteady” were linked to the component of body functions, whereas “falling” is not included in the ICF.

Difficulties in capturing the meaning of a person’s response also can be a consequence of how the item is phrased. The linkages reflect activities explicitly expressed, even though respondents may interpret the items differently. If a respondent answers that he/she sometimes avoids taking a bath because of a risk of falling (SAFFE), the perceived risk of falling is probably not when sitting in the bathtub but rather when stepping in or out of the tub. The present linking rules do not take into account the intertwined complexity of a rating scale’s overall question, items, and response categories.

**Is the Complexity of Items Reflected in the Linking?**

The level of difficulty of items is sometimes expressed in terms of positions and directions, such as “Stand on a chair and reach for something” (ABC). This item contains 2 meaningful concepts that were linked to the ICF categories “Maintaining a standing position” and “Reaching”. The words “on a chair” greatly affect the difficulty level but are only reported as “additional information”. This example further highlights the need to take additional information into account when interpreting linking results.
The complexity within an item also may be the combination of two meaningful concepts, for example, “Hurrying up to answer the telephone” (FES[S]). Simply answering the telephone might not be that difficult, whereas hurrying up can be hazardous. For example, people with Parkinson disease often experience freezing of gait in stressful situations that may provoke a fall [41]. If all meaningful concepts within an item (including “additional information”) are not considered simultaneously, item complexity may be lost.

Choosing an FOF Rating Scale

Which FOF rating scale is the most suitable depends on the situation and the target population. The choice must also depend on the rating scales’ psychometric properties such as validity and reliability, which are sample-dependent issues [42]. FES-I, FES(S), ABC, and SAFFE have undergone psychometric evaluation [2,6,9,12-14,23,26], but a head-to-head comparison of all 4 rating scales has not been conducted.

When choosing an FOF rating scale, it is important to consider what aspect one wishes to address or whether one wants to capture the diversity. In this study, all 4 rating scales predominately focused on mobility (d4) and included domestic life (d6), but some differences were found. That is, if one aims at targeting FOF in relation to activities concerning community, social, or civic life (d9), our results clearly favor FES-I or SAFFE. On the other hand, if one wants to have a very strong focus on mobility (d4), ABC might be the choice, because 21 of 24 linkings were within the mobility chapter. However, ABC did not at all include self-care (d5), which was covered by the other 3 rating scales. To evaluate rehabilitation programs that target gait problems to reduce FOF, either FES-I, SAFFE, or ABC is preferred, because these rating scales contain 5 to 7 walking-related items each.

Other considerations must be taken into account beyond coverage and psychometric properties. Although FES-I covers a range of different aspects of activities and participation, several items contain multiple activities, which causes problems when interpreting the respondents’ answers. SAFFE offers items with a good range of diverse content but contains less detailed descriptions of the activities compared with ABC. It needs to be emphasized that the overall question in SAFFE differs from the other rating scales because it asks about activity avoidance rather than confidence or concerns. This difference might limit a head-to-head comparison because these scales assess similar but not interchangeable aspects of FOF [2,14]. Further studies are needed to investigate how the overall question and response categories affect respondents’ answers.
Challenges and Future Perspectives

A great variety of FOF rating scales exist [14]. We have linked only 4 of them, and thus this study is not fully comprehensive. Use of the Swedish translations of the rating scales naturally implies that some linguistic and cultural adaptations have been made. Consequently, linking the English FOF rating scales would not yield the exact results as in this study. However, for the most part the linking would probably be similar, and we therefore believe that our results are applicable to the corresponding English versions.

Future methodological studies are needed that address whether and how the linking rules can take into account the complexity of an item, as well as how the linking results should be presented and interpreted. Furthermore, the ICF does not fully capture all meaningful concepts. Although balance is multifactorial by nature [43], it is only reflected in relation to vestibular function of balance (b2351) and involuntary movement reaction functions (b755) in the ICF. Sensation of falling is classified (b2402), whereas actual falling is not classified [15]. Future revisions of the ICF may benefit from including a more thorough classification of balance and falls.

The predefined activities in the 4 FOF rating scales may not reflect all activities of importance to FOF. The development of ABC included older people, who were asked to name daily activities in which they experienced FOF [9]. Only clinicians and researchers were included in the development of FES and SAFE [10,21]. The end user perspective is important in relation to outcome measures [44], yet few qualitative studies do in fact target FOF in older people. Faes et al [45] interviewed 10 older persons, who all described a fear of being alone in case they might fall, which is an example of an aspect that is not included in any of the 4 rating scales. Another qualitative study [46] reports FOF and activity avoidance in relation to exercising and overall leaving the home. All 4 FOF rating scales include activities that require leaving home, whereas exercising is not contained in any of the rating scales. Further in-depth studies that target FOF are warranted to gain an increased knowledge about how FOF is expressed and perceived but also to explore important activities and aspects, including environmental factors.

CONCLUSION

The choice of rating scale depends on several factors, such as the aim of the assessment, the target population, and the psychometric properties of the scale. The linking process solely provides information about scale content in relation to the ICF, and it revealed advantages and
disadvantages in each of the 4 FOF rating scales. Our results facilitate an increased conceptual understanding of these 4 FOF rating scales, which may assist in the process of choosing an appropriate scale in clinical practice and research. Taken together, the knowledge gained from the linking analysis presented here may be useful when interpreting results of other linking studies and for future revision of the linking rules. Furthermore, the findings may prove useful when revising and developing FOF rating scales, as well as for increasing the understanding of barriers when linking rating scales to the ICF. Finally, the linking revealed some shortages in the ICF. Future revisions of the ICF may benefit from including a more thorough classification of balance and falls.
ACKNOWLEDGEMENTS

The study was accomplished within the Strategic Research Area MultiPark and the Centre for Ageing and Supportive Environments (CASE) at Lund University, Lund, Sweden. M.H. Nilsson is affiliated to the Swedish Parkinson Academy.
REFERENCES


**Table 1. Detailed information of the linking of overall questions and response categories of 4 fear of falling rating scales to the International Classification of Functioning, Disability and Health**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Overall Question and Response Categories</th>
<th>ICF Category</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>FES-I</td>
<td>Q: Now we would like to ask some questions about how concerned you are about the possibility of falling RC: Not at all/somewhat/fairly/very concerned</td>
<td>b152 Emotional functions nd: not definable</td>
<td>Concerned Falling</td>
</tr>
<tr>
<td>FES(S)</td>
<td>Q: How confident are you that you can … without falling? RC: Not confident at all/fairly confident/ completely confident</td>
<td>b1266 Confidence * nd: not definable</td>
<td>Not at all/fairly/ completely</td>
</tr>
<tr>
<td>ABC</td>
<td>Q: How confident are you that you will not lose your balance or become unsteady when you…? RC: No confidence/completely confident</td>
<td>b1266 Confidence * b755 Involuntary movement reaction functions</td>
<td>Lose your balance Become unsteady</td>
</tr>
<tr>
<td>SAFFE</td>
<td>Q: Do you avoid doing certain things because of a risk of falling? RC: Would never/sometimes/always avoid</td>
<td>d Activities and participation nd: not definable</td>
<td>Avoid doing Falling</td>
</tr>
</tbody>
</table>

ICF = International Classification of Functioning, Disability and Health; FES-I = Falls Efficacy Scale-International; FES(S) = Swedish version of the Falls Efficacy Scale; ABC = Activities-specific Balance Confidence scale; SAFFE = modified Survey of Activities and Fear of Falling in the Elderly; Q = overall question; RC = response category; b = ICF component of body functions; d = ICF component of activities and participation.

The overall questions and the response categories refer to the items shown in Tables 4-7.

*The ICF category was decided in consensus after discussions between all 4 authors, as opposed to the other ICF categories, which were decided by the 3 linkers.
Table 2. Content comparison of the 62 items of fear of falling rating scales, using the International Classification of Functioning, Disability and Health as a reference

<table>
<thead>
<tr>
<th>ICF Category</th>
<th>FES-I</th>
<th>FES(S)</th>
<th>ABC</th>
<th>SAFFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>b Body functions</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>s Body structures</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d Activities and participation</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d1 Learning and applying knowledge</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d2 General tasks and demands</td>
<td>–</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d3 Communication</td>
<td>1</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d4 Mobility</td>
<td>15</td>
<td>9</td>
<td>21</td>
<td>11</td>
</tr>
<tr>
<td>d5 Self-care</td>
<td>4</td>
<td>6</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>d6 Domestic life</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>d7 Interpersonal interactions and relationships</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d8 Major life areas</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d9 Community, social and civic life</td>
<td>7</td>
<td>–</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>e Environmental factors</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>–</td>
</tr>
</tbody>
</table>

ICF = International Classification of Functioning, Disability and Health; FES-I = Falls Efficacy Scale-International; FES(S) = Swedish version of the Falls Efficacy Scale; ABC = Activities-specific Balance Confidence scale; SAFFE = modified Survey of Activities and Fear of Falling in the Elderly.

The values represent the number of linkages, presented on ICF component and chapter levels.

Please note: Data do not include linking of the overall questions and the response categories (see Table 1).
Table 3. Quantitative summary of the linking of the 62 items of 4 fear of falling rating scales to the International Classification of Functioning, Disability and Health

<table>
<thead>
<tr>
<th></th>
<th>FES-I</th>
<th>FES(S)</th>
<th>ABC</th>
<th>SAFFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of items</td>
<td>16</td>
<td>13</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>No. of meaningful concepts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>22</td>
<td>24</td>
<td>22</td>
</tr>
<tr>
<td>Per item (content density)</td>
<td>2.1</td>
<td>1.7</td>
<td>1.5</td>
<td>1.3</td>
</tr>
<tr>
<td>Unique ICF categories used for linkage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total, n</td>
<td>18</td>
<td>15</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>Per meaningful concept (content diversity)</td>
<td>0.5</td>
<td>0.7</td>
<td>0.5</td>
<td>0.8</td>
</tr>
<tr>
<td>Bandwidth of content coverage, %*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2</td>
<td>1.0</td>
<td>0.9</td>
<td>1.2</td>
</tr>
</tbody>
</table>

ICF = International Classification of Functioning, Disability and Health; FES-I = Falls Efficacy Scale-International; FES(S) = Swedish version of the Falls Efficacy Scale; ABC = Activities-specific Balance Confidence scale; SAFFE = modified Survey of Activities and Fear of Falling in the Elderly.

*% used ICF categories of the total number of ICF categories, ie, 1454.

Please note: High content density, content diversity and bandwidth of content coverage can be both positive and negative (see discussion “Interpretation of Quantitative Measures of the Linking Process”).

Data do not include linking of the overall questions and the response categories (see Table 1).
### Table 4. Detailed information of the linking of the Falls Efficacy Scale-International (FES-I) items to the International Classification of Functioning, Disability and Health

<table>
<thead>
<tr>
<th>Item</th>
<th>ICF Category</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cleaning the house (e.g., sweep the floor, vacuum or dust)</td>
<td>d6402 Cleaning living area (d6402) Cleaning living area (d6403) Using household appliances (d6402) Cleaning living area</td>
<td></td>
</tr>
<tr>
<td>2. Getting dressed or undressed</td>
<td>d540 Dressing d540 Dressing</td>
<td></td>
</tr>
<tr>
<td>3. Preparing simple meals</td>
<td>d6300 Preparing simple meals</td>
<td></td>
</tr>
<tr>
<td>4. Taking a bath or shower</td>
<td>d5101 Washing whole body d5101 Washing whole body</td>
<td></td>
</tr>
<tr>
<td>5. Buying some groceries</td>
<td>d6200 Shopping</td>
<td>Some groceries</td>
</tr>
<tr>
<td>6. Getting in or out of a chair</td>
<td>d4103 Sitting d4103 Sitting</td>
<td>In a chair Out of a chair</td>
</tr>
<tr>
<td>7. Climbing stairs</td>
<td>d4551 Climbing</td>
<td></td>
</tr>
<tr>
<td>8. Walking around in the neighbourhood</td>
<td>d4602 Moving around outside the home and other buildings *</td>
<td></td>
</tr>
<tr>
<td>9. Reaching for something above your head or on the ground</td>
<td>d4452 Reaching d4105 Bending</td>
<td>Above your head On the ground</td>
</tr>
<tr>
<td>10. Answering the telephone before it stops ringing</td>
<td>d3600 Using telecommunication devices</td>
<td>Answering the telephone</td>
</tr>
<tr>
<td>11. Walking on a slippery surface (e.g., wet or icy)</td>
<td>d4502 Walking on different surfaces (d4502) Walking on different surfaces (d4502) Walking on different surfaces</td>
<td>Slippery Wet</td>
</tr>
<tr>
<td>12. Visiting acquaintances, friends or relatives</td>
<td>d9205 Socializing d9205 Socializing d9205 Socializing</td>
<td>Acquaintances</td>
</tr>
<tr>
<td>13. Walking in crowds</td>
<td>d4503 Walking around obstacles</td>
<td></td>
</tr>
<tr>
<td>14. Walking on an uneven surface (e.g., rocky ground, poorly maintained pavement)</td>
<td>d4502 Walking on different surfaces (d4502) Walking on different surfaces (d4502) Walking on different surfaces</td>
<td>Rocky ground Poorly maintained pavement</td>
</tr>
<tr>
<td>15. Walking up or down a slope</td>
<td>d4502 Walking on different surfaces d4502 Walking on different surfaces</td>
<td></td>
</tr>
<tr>
<td>16. Participating in a social event (e.g., family gathering, club meeting or religious service)</td>
<td>d9 Community, social and civic life (d9205) Socializing (d910) Community life (d9300) Organized religion</td>
<td>Participating in a social event Club meeting Religious service</td>
</tr>
</tbody>
</table>

ICF = International Classification of Functioning, Disability and Health.

*The ICF category was decided in consensus after discussions between all 4 authors, as opposed to the other ICF categories, which were decided by the 3 linkers.*
<table>
<thead>
<tr>
<th>Item</th>
<th>ICF Category</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Get in and out of bed</td>
<td>d4100 Lying down</td>
<td>In bed</td>
</tr>
<tr>
<td>2. Go to the toilet</td>
<td>d530 Toileting</td>
<td></td>
</tr>
<tr>
<td>3. Wash yourself</td>
<td>d510 Washing oneself</td>
<td></td>
</tr>
<tr>
<td>4. Get in and out of a chair</td>
<td>d4103 Sitting</td>
<td>In a chair</td>
</tr>
<tr>
<td>5. Get dressed and undressed</td>
<td>d540 Dressing</td>
<td></td>
</tr>
<tr>
<td>6. Take a bath or a shower</td>
<td>d5101 Washing whole body</td>
<td></td>
</tr>
<tr>
<td>7. Go up and down stairs</td>
<td>d4551 Climbing</td>
<td></td>
</tr>
<tr>
<td>8. Walk around the neighbourhood</td>
<td>d4602 Moving around outside the home</td>
<td></td>
</tr>
<tr>
<td>9. Reach into cupboards/closets</td>
<td>d4452 Reaching</td>
<td>Into cupboards/closets</td>
</tr>
<tr>
<td>10. Clean the apartment (ie, sweep or dust)</td>
<td>d6402 Cleaning living area</td>
<td></td>
</tr>
<tr>
<td>11. Prepare a meal that does not require carrying hot or heavy objects</td>
<td>d630 Preparing meals</td>
<td>Hot or heavy objects</td>
</tr>
<tr>
<td>12. Hurrying up to answer the telephone</td>
<td>d2401 Handling stress</td>
<td>Hurrying up</td>
</tr>
<tr>
<td>13. Simple shopping</td>
<td>d6200 Shopping</td>
<td>Simple shopping</td>
</tr>
</tbody>
</table>

ICF = International Classification of Functioning, Disability and Health.

*The ICF category was decided in consensus after discussions between all 4 authors, as opposed to the other ICF categories, which were decided by the 3 linkers.*
<table>
<thead>
<tr>
<th>Item</th>
<th>ICF Category</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk around the house</td>
<td>d4600 Moving around within the home</td>
<td></td>
</tr>
<tr>
<td>Walk up or down stairs</td>
<td>d4551 Climbing</td>
<td></td>
</tr>
<tr>
<td>Bend over and pick up a shoe from the floor</td>
<td>d4105 Bending</td>
<td>Shoe from the floor</td>
</tr>
<tr>
<td>Reach for a small can off a shelf at eye level</td>
<td>d4452 Reaching</td>
<td>Small can off a shelf at eye level</td>
</tr>
<tr>
<td>Stand on your tiptoes and reach for something above your head</td>
<td>d4154 Maintaining a standing position</td>
<td>On your tiptoes</td>
</tr>
<tr>
<td>Stand on a chair and reach for something</td>
<td>d4154 Maintaining a standing position</td>
<td>On a chair</td>
</tr>
<tr>
<td>Sweep or vacuum the floor</td>
<td>d6402 Cleaning living area</td>
<td>The floor</td>
</tr>
<tr>
<td>Walk to a taxi that is waiting by the sidewalk</td>
<td>d4500 Walking short distances</td>
<td>To a taxi</td>
</tr>
<tr>
<td>Get into or out of a car</td>
<td>d410 Changing basic body position</td>
<td>Get into a car</td>
</tr>
<tr>
<td>Cross a street</td>
<td>d4503 Walking around obstacles *</td>
<td>Cross a street</td>
</tr>
<tr>
<td>Step onto or off a curb</td>
<td>d4551 Climbing *</td>
<td>Step onto a curb</td>
</tr>
<tr>
<td>Walk on a street where people are rapidly passing</td>
<td>d4503 Walking around obstacles</td>
<td></td>
</tr>
<tr>
<td>Others bump into you as you walk on the street</td>
<td>e Environmental factors</td>
<td>Others bump into you</td>
</tr>
<tr>
<td>Travel by bus without a bag of groceries</td>
<td>d4702 Using public motorized transportation</td>
<td>Without a bag of groceries</td>
</tr>
<tr>
<td>Travel by bus with a bag of groceries</td>
<td>d4702 Using public motorized transportation</td>
<td>With a bag of groceries</td>
</tr>
<tr>
<td>Walk on icy sidewalks</td>
<td>d4502 Walking on different surfaces</td>
<td>Icy sidewalks</td>
</tr>
</tbody>
</table>

ICF = International Classification of Functioning, Disability and Health.

*The ICF category was decided in consensus after discussions between all 4 authors, as opposed to the other ICF categories, which were decided by the 3 linkers.*
<table>
<thead>
<tr>
<th>Item</th>
<th>ICF Category</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Walk to the store and shop</td>
<td>d460 Moving around in different locations</td>
<td>d6200 Shopping</td>
</tr>
<tr>
<td>2. Clean your house</td>
<td>d6402 Cleaning living area</td>
<td></td>
</tr>
<tr>
<td>3. Prepare simple meals</td>
<td>d6300 Preparing simple meals</td>
<td></td>
</tr>
<tr>
<td>4. Go to the doctor or dentist</td>
<td>d5702 Maintaining one’s health</td>
<td>Go to the doctor</td>
</tr>
<tr>
<td></td>
<td>d5702 Maintaining one’s health</td>
<td>Go to the dentist</td>
</tr>
<tr>
<td>5. Take a bath</td>
<td>d5101 Washing whole body</td>
<td></td>
</tr>
<tr>
<td>6. Take a shower</td>
<td>d5101 Washing whole body</td>
<td></td>
</tr>
<tr>
<td>7. Go for a walk</td>
<td>d450 Walking</td>
<td></td>
</tr>
<tr>
<td>8. Go out when it is slippery</td>
<td>d4502 Walking on different surfaces</td>
<td>Slippery</td>
</tr>
<tr>
<td>9. Visit a friend or relative</td>
<td>d9205 Socializing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d9205 Socializing</td>
<td></td>
</tr>
<tr>
<td>10. Walk to a place with crowds</td>
<td>d4503 Walking around obstacles</td>
<td></td>
</tr>
<tr>
<td>11. Climb stairs</td>
<td>d4551 Climbing</td>
<td></td>
</tr>
<tr>
<td>12. Walk around indoors</td>
<td>d460 Moving around in different locations</td>
<td></td>
</tr>
<tr>
<td>13. Walk a kilometer</td>
<td>d4500 Walking short distances</td>
<td>A kilometer</td>
</tr>
<tr>
<td>14. Bend down to pick up something</td>
<td>d4105 Bending</td>
<td>d4400 Picking up</td>
</tr>
<tr>
<td>15. Travel by public transport</td>
<td>d4702 Using public motorized</td>
<td></td>
</tr>
<tr>
<td></td>
<td>transportation</td>
<td></td>
</tr>
<tr>
<td>16. Attend a social event or party</td>
<td>d9 Community, social and civic life</td>
<td>Attend a social event</td>
</tr>
<tr>
<td></td>
<td>d9 Community, social and civic life</td>
<td>Attend a party</td>
</tr>
<tr>
<td>17. Reach for something above your head</td>
<td>d4452 Reaching</td>
<td>Above your head</td>
</tr>
</tbody>
</table>

ICF = International Classification of Functioning, Disability and Health.
**Supplementary Table 1. Detailed content comparison of items of four fear of falling rating scales, using the International Classification of Functioning, Disability and Health as a reference**

<table>
<thead>
<tr>
<th>ICF Category</th>
<th>FES-I</th>
<th>FES(S)</th>
<th>ABC</th>
<th>SAFFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>d Activities and participation</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d2 General tasks and demands</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d2401 Handling stress</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>d3 Communication</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d3600 Using telecommunication devices</td>
<td>1</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d4 Mobility</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d410 Changing basic body position</td>
<td>–</td>
<td>–</td>
<td>2</td>
<td>–</td>
</tr>
<tr>
<td>d4100 Lying down</td>
<td>–</td>
<td>2</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d4103 Sitting</td>
<td>2</td>
<td>2</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d4105 Bending</td>
<td>1</td>
<td>–</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>d4154 Maintaining a standing position</td>
<td>–</td>
<td>–</td>
<td>2</td>
<td>–</td>
</tr>
<tr>
<td>d4301 Carrying in the hands</td>
<td>–</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d4400 Picking up</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1</td>
</tr>
<tr>
<td>d4452 Reaching</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>d450 Walking</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1</td>
</tr>
<tr>
<td>d4500 Walking short distances</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>d4502 Walking on different surfaces</td>
<td>8</td>
<td>–</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>d4503 Walking around obstacles</td>
<td>1</td>
<td>–</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>d4551 Climbing</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>d460 Moving around in different locations</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>2</td>
</tr>
<tr>
<td>d4600 Moving around within the home</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>d4602 Moving around outside the home and other buildings</td>
<td>1</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d4702 Using public motorized transportation</td>
<td>–</td>
<td>–</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>d5 Self-care</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d510 Washing oneself</td>
<td>–</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d5101 Washing whole body</td>
<td>2</td>
<td>2</td>
<td>–</td>
<td>2</td>
</tr>
<tr>
<td>d530 Toileting</td>
<td>–</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d540 Dressing</td>
<td>2</td>
<td>2</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d5702 Maintaining one's health</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>2</td>
</tr>
<tr>
<td>d6 Domestic life</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d6200 Shopping</td>
<td>1</td>
<td>1</td>
<td>–</td>
<td>1</td>
</tr>
<tr>
<td>d630 Preparing meals</td>
<td>–</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d6300 Preparing simple meals</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>1</td>
</tr>
<tr>
<td>d6402 Cleaning living area</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>d6403 Using household appliances</td>
<td>1</td>
<td>–</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>d9 Community, social and civic life</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>2</td>
</tr>
<tr>
<td>d910 Community life</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>d9205 Socializing</td>
<td>4</td>
<td>–</td>
<td>–</td>
<td>2</td>
</tr>
<tr>
<td>d9300 Organized religion</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Environmental factors</td>
<td>–</td>
<td>–</td>
<td>1</td>
<td>–</td>
</tr>
</tbody>
</table>

ICF = International Classification of Functioning, Disability and Health; FES-I = Falls Efficacy Scale-International; FES(S) = Swedish version of the Falls Efficacy Scale; ABC = Activities-specific Balance Confidence scale; SAFFE = modified Survey of Activities and Fear of Falling in the Elderly.

The values represent the number of linkages, presented on the most precise ICF levels.

Please note: Data do not include linking of the overall questions and the response categories (see Table 1).