

Validity and Reliability of the Turkish Version of the Modified Falls Efficacy Scale of in Older Adults

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Abstract

Falling is a common problem in the older adults, which can lead to serious injuries and deaths. This study was conducted to determine the validity and reliability of the Turkish version of the Modified Falls Efficacy Scale (MFES) developed to diagnose the fear of falling of older adult individuals. This methodological study was conducted with 141 older adults who are 65-years-old and above who are independent in their activities of daily living. The internal consistency coefficient of the Turkish Form of MFES is 0.98, the split half test consistency coefficient is 0.97 and, test-retest stability coefficient of the items is between 0.73-0.99. The Turkish Form of MFES was found to correlate positively with the Barthell Index and the rivermead mobility index, while it negatively correlated with the falls behavioral scale for the Older Person. The MFES Turkish form is a valid and reliable instrument that can be used to determine the potential fears of falling, and practice regarding the fear of falling in older adults.

Keywords: Fear; Falling; Elderly; Reliability and validation; Turkey

Introduction

Falling is a common problem in the older adults, which can lead to serious injuries and deaths. The frequency of falls ranges between, 30-50% of adults over 65 years of age and at least 40% of adults aged 80 years and older fall annually [1]. Old age affects the severity of falls and the need for health care [2,3]. One of the major problems created by falling in the older adults is the fear of falling, which refers to the perception that an individual cannot resist falling during activities of daily living (ADL) [4]. The fear of falling, which manifests itself as walking anxiety or worry about falling, is both a consequence and a predictor of falls or ongoing balance disorder. Although the fear of falling can be a psychological consequence arising from previous falls, it can also be observed in many older individuals who have not experienced a serious fall before [2]. Moreover, it can result in the restriction of all or some types of activities, loss of function, and institutional care needs [4].

We need a tool that makes it easier for our country to diagnose the falls efficacy in the older adults in order to evaluate the effectiveness of the initiatives undertaken for this purpose and to use them in research. For this reason, this study was conducted to determine the validity and reliability of the Turkish version of MFES.

Methods

Design and sample

This methodological study was carried out as cross-sectional in 2016 with the participation of the older adult people living in the city of Ankara. The aim of the study was to assess the validity and reliability of the MFES- Turkish. It was planned that the sample size to be 10 times (120) the number of items in the scale [5,6], taking into account possible data loss, 150 people were chosen as the subjects by using a probability sampling method. A total of 141 older adults aged 65 years and over (24 points and over from the mini mental test, and individuals who agree to participate in the study), who were independent in their ADL, were able to communicate, volunteered to participate in the study, and were reached through random sampling method. People using any walking aids were not included in the study. After assessing that whether the individuals over 65 years meet inclusion criteria for study, individuals who meet the criteria were invited to research study. Interviews and data collection were held at the homes of the people. The mean age of the participants was 71.46 ± 6.02 years; 64.5% were

female; 22.7% retired; 41.8% were graduates of a primary school, 73.8% were married and 57.4 were no fall.

Instruments

Data collection forms

The data in this study were collected by using MFES-Turkish form and the following indeces to assess the scale-dependent validity of MFES; Barthel Index (BI), Rivermead Mobility Index (RMI) and The Falls Behavioural Scale for the Older Person (FaB).

Modified Falls Efficacy Scale (MFES): MFES was developed in 1990 by Tinetti [7] and revised by Hill et al. in 1996 [8]. The scale is a ten-point visual analogue scale consisting of 14 questions ("never safe"=0, "totally safe=10") evaluating the sense of security about ADL (such as dressing, bathing, crossing over). The scale score is calculated by dividing the sum of the scores per question by the number of questions. High score means that the sense of safety and competence against falling are high. Cronbach's alpha internal consistency coefficient (ICC) of the scale was found to be 0.93.

MFES translation process: For the adaptations of the items and instructions in MFES, original form group translations and expert opinion methods were used. Firstly, they were translated into Turkish independently by three researchers who were competent in the field of english. Then a consensus was reached on the materials to form a joint text. The scale was presented to 10 experts who were well versed in english to assess language validity, cultural appropriateness, clarity, and suitability. The experts were asked to score each scale item between 1 and 4 points. The experts were asked to make scoring between 1 and 4 for each item (not appropriate=1, somewhat appropriate=2,

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Received August 22, 2018; **Accepted** December 11, 2018; **Published** December 22, 2018

Citation: Okuyan CB, Bilgili N, Kitis Y (2018) Validity and Reliability of the Turkish Version of the Modified Falls Efficacy Scale of in Older Adults. J Gerontol Geriatr Res 7: 494. doi:10.4172/2167-7182.1000494

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appropriate=3, very appropriate=4) and make a suggestion about the item translations that were not fully agreed upon. In the calculation of the scope validity index, there was no item ranked below 2 points. In the direction of the suggestions received, the final state was given to the items [5,6].

Barthel Index (BI)

BI, developed by Mahoney and Barthel in 1965, examines the level of independence of patients in their ADL [9]. Turkish validity and reliability was tested by Küçükdeveci [10] with neurology patients, internal consistency was 0.93, Kappa proficiency level was >0.5, intraclass correlation coefficient was 0.99, and Cronbach's alpha value was 0.93. The scores of Barthel index ranged from 0 to 100. 0-20-point range means fully dependent, 21-61-point range means dependent on advanced level, 62-90-point range means moderately dependent, 91-99-point range means slightly dependent, and 100 points means independence [9,10].

Rivermead Mobility Index (RMI)

RMI is a unidimensional index that focuses on measuring the motion state at various levels from turning in the bed to running. It

Kaiser-Meyer-Olkin			0.92
Barlett Scherity	X ² =3414	Degrees of freedom=78	p=0.000

Table 1: Eligibility values of factors for factor analysis.

Items	Indicators	Rotated Factor Load Values		Total Item Correlations
		Factor 1	Factor 2	
1	Get dressed and undressed	0.69	0.4	0.57
2	Prepare a simple meal	0.91	0.18	0.89
3	Take a bath or shower	0.44	0.66	0.6
4	Get in/ out of chair	0.91	0.25	0.85
5	Get in/out of bed	0.89	0.27	0.84
6	Answer the door or telephone	0.96	0.16	0.94
7	Walk around the inside of your house	0.96	0.16	0.94
8	Reach the cabinets or closets	-0.06	0.91	0.8
9	Light house keeping	0.94	0.23	0.97
10	Simple shopping	0.92	0.29	0.89
11	Using public transportation	0.96	0.02	0.9
12	Crossing roads	0.93	0.03	0.86
13	Light gardening or hanging out the wash*	0.93	0.09	0.97
14	Using front or rear steps at home	0.844	0.154	0.71
Eigenvalue		10.583	1.271	
Variance percentage		75.59	9.08	
Eigen-value sum 11.853				
Total variance explained 84.67				
Varimax rotation with Kaiser normalization.				

Table 2: Factor analysis results of mFES-Turkish*.

was developed by Collen [11]. The test-retest reliability coefficient of original scale was ($r=0.98$) and the KR₂₀ reliability coefficient was found to be ($r=0.91$). The index consists of 14 questions and an observation and can be used in hospital, outpatient clinic or home environments. The questions are answered by the individual, but only the fifth item (standing without support) is observed and evaluated by the interviewer. "1" point is given for every "yes" response and the score varies between 0-15 points. Fifteen points indicate that there is no problem with mobility while 14 points and below indicates a problem. It was adapted to Turkish by Akin and Emiroğlu [12]. The test-retest reliability coefficient ($r=0.98$) and the KR₂₀ reliability coefficient ($r=0.91$) of the Turkish version of the scale were found to correlate with RMI scores and brief disability questionnaire scores ($r=0.66$).

The Falls Behavioural Scale for the older person (FaB)

FaB was developed by Clemson, Cuming, and Heard and

Variables	MFES-Turkish Score	
	r	p
RMI	0.66	<0.01
BI	0.69	<0.01
FaB Scale	-0.74	<0.01
Cognitive adaptation	-0.54	<0.01
Mobility	-0.89	<0.01
Avoidance	-0.37	<0.01
Awareness	-0.43	<0.01
Practicality	-0.24	<0.01
Hastiness	-0.117	>0.05
Level change	-0.525	<0.01
Cautiousness	-0.363	<0.01
Answering the telephone	0.586	<0.01

r: Pearson correlation

Table 3: Correlation between MFES-Turkish and BI, RMI and FaB Scales.

Items	Scale average when item is deleted	Alpha value when item is deleted	Corrected item total correlation (r)	Test retest stability coefficient (r)*
Get dressed and undressed	78.6	0.97	0.73	0.82
Prepare a simple meal	79.6	0.92	0.90	0.93
Take a bath or shower	83.1	0.97	0.57	0.73
Get in/ out of chair	79.7	0.96	0.92	0.99
Get in/out of bed	79.9	0.96	0.91	0.92
Answer the door or telephone	79.6	0.96	0.96	0.96
Walk around the inside of your house	79.6	0.96	0.96	0.96
Reach the cabinets or closets	84.3	0.98	0.15 ^a	0.78
Light house keeping	79.9	0.96	0.95	0.96
Simple shopping	80.2	0.96	0.95	0.91
Using public transportation	81.6	0.96	0.91	0.92
Crossing roads	81.7	0.96	0.89	0.94
Light gardening or hanging out the wash*	79.8	0.96	0.89	0.57
Using front or rear steps at home	82.5	0.96	0.84	0.89
Cronbach's alpha (α): 0.97				
Split half test consistency (r): 0.97				
Test re-test correlation (r): 0.95				
Total item correlation (r): 0.15- 0.96				
*Correlations (p<0.01) were found to be significant.				
^a p<0.05				

Table 4: Findings related to the internal consistency of the MFES-Turkish.

designed to help older people, to understand their behaviors, to protect themselves from potential falls, and for their self-perception. The scale consists of 30 items (seven of which are reversely coded) designed in accordance with self-report and interview method, and 10 sub-dimensions. The score of the scale and subscales are determined by dividing the raw score, obtained by summing the item scores, by the item count. A high score indicates the individual's safe/protective behaviors for falling, while a low score indicates risky behaviors. The lowest and highest possible scores for all sub-dimensions are between 1 and 4 [13]. The reliability and validity of the Turkish version were tested by Uymaz and Nahcivan [14], Cronbach's alpha coefficient was obtained as $\alpha=0.90$ [14].

Ethical considerations

The permission has been obtained from University Ethics Committee (No:77082166-604.01.02) in order to conduct the research. The participants were informed about the research and their written consent was received.

Data collection

The scales were filled in by the participants in company with the researcher. The order of the scales was arranged to be systematically different in order to remove the order effect during filling the scales. It took an average of 30 minutes to complete all of the scales that were answered based on self-report. It is provided that MFES-Turkish forms to be filled out via reaching 60 subjects again, 2-4 weeks after the first test.

Data analysis

The study data were analyzed using Statistical Package for the Social Sciences (SPSS) 20. The adequacy of the sample was assessed by the structural validity of the Kaiser-Meyer-Olkin and the distribution of the MFES-Turkish determined by Barlett's Scherity test. Consistency of test data and data size were found to be suitable for factor analysis (Table 1).

For the criterion related validity, the correlation of the MFES-Turkish with parallel scales was examined. Internal consistency analysis split half-test consistency and test re-test consistency (correlation)

were used to assess the reliability of the scale [5,15,16]. For correlation analysis, $p<0.01$ was considered as statistically significant. Validity of MFES Turkish was assessed with principal component analysis using varimax with Kaiser normalization.

Results

Findings related to validity of MFES-Turkish

To test the construct validity of the scale, the principal components analysis was used. The analysis of the non-reverse principal components showed that the items of the measuring tool were loaded on two factors. Graph 1 shows the (probable) factor structure of the scale's eigenvalue is greater than 1 was observed that the first curve in the graph of the line was in the second factor (Graph 1).

As shown in Table 2, the first factor has an eigenvalue of 10.58 and the variance explained is 75.59%; the second factor has an eigenvalue of 1.27 and the variance explained is 9.08%. The total variance explained by two factors on the scale is 84.67%. The factor loads under the first factor of 12 items ranging from 0.69 to 0.96 and there are two items with factor loadings of 0.67 and 0.91 in the second factor. Correlations of the items with the total scale vary between 0.57 and 0.97.

Criterion-related validity results of the MFES-Turkish

There was a statistically significant correlation between MFES-Turkish and RMI ($r_{(14)}=0.664$; $p<0.01$) and between MFES-Turkish and BI ($r_{(14)}=0.689$; $p<0.01$) a positive significant correlation was found (Table 3). There was a negative significant correlation between MFES-Turkish and FaB scale values ($r_{(14)}=-0.743$; $p<0.01$). There was no significant correlation between with hastiness subdimension of FaB Scale, positive correlations were found between with answering telephone subdimention of FaB Scale and negative correlations among/ between other subdimentions of FaB Scale ($p<0.01$).

Reliability findings of MFES-Turkish

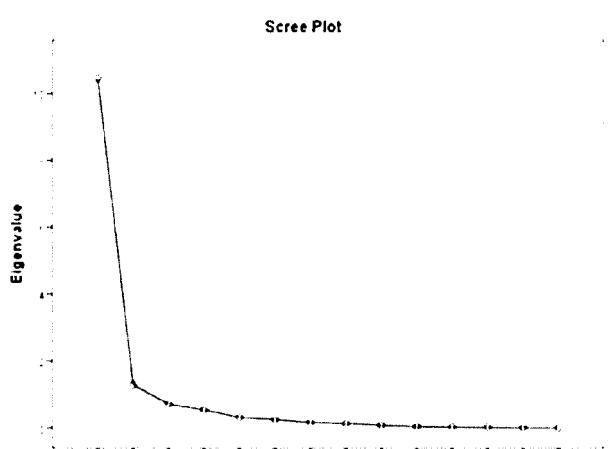
The internal consistency coefficient of the MFES-Turkish was 0.97. The test retest consistency coefficients for the measured items ranged from 0.73 to 0.99 and it was 0.95 for all of the scale (Table 4). The split half test correlations of the scale were found to be 0.97. The correlations between scale and items were found between 0.15 and 0.96.

Discussion

The basic psychometric studies are the ones with reliability and validity studies when a scale is developed or adapted to the target language. It is not appropriate to use a measuring instrument that cannot make accurate and reliable measurements, or that does not serve the purpose of making accurate measurements. This requires that the reliability and validity of the measurement tools to be handled together. Although validity of a measurement tool depends on its reliability, a reliable but not valid measuring tool does not have much of a proposition in practice [15]. This study was conducted to evaluate the validity and reliability of MFES-Turkish. Although it has an important role in carrying out ADL, especially in the older adults, the fear of falling has a limited number of measurement tools in the Turkish society. MFES-Turkish has been developed for the purpose of diagnosing the fear of falling in the older adults.

Discussion of the findings regarding the validity of the scale

The distribution of the items of the MFES-Turkish according to the dimensions, the returned factor load values, and the item total correlation values are given in Table 2. In the analysis of the principal



Graph 1: Scree plot graph of the scale.

Note: The graph shows the (probable) factor structure of the scale's Eigen-value is greater than 1. It was observed that the first curve in the graph of the line was in the second factor.

components applied to determine the factor structure of the scale, eigenvalues of 0.60 and above are defined as high, and values between 0.30 and 0.59 are defined as intermediate in the selection of scale items [6]. In Varimax rotation, the materials with a factor load of 0.30 are generally processed as the lower cut-off point of factor loads. The factor load values for each item according to Field (2005) must be above the limit value of 0.30 or 0.40 [17]. While examining the factor analysis values, the following criteria were paid attention; the scale items have a high load value in a single factor, the load value difference in two or more factors is at least 0.1 and the load values of the items in the factor are 0.40 or higher [6] were paid attention. There was no item with a factor load score lower than 0.44 on the study scale. These findings show that the factor load values for each item are above the acceptable limit values. So, all items remained in the scale. Accordingly, the eigenvalue of all scale materials is sufficiently large and must hold on the scale. In the two-factor structure obtained, the total variance explained by the factors on the scale is approximately 85%. This variance is very sufficient and higher than the one found in Serbian version [18]. According to Alpar, this value of the total variance is at a quite good level [16]. The item-total correlation explains the relationship between the scores obtained from the scale items and the total score of the scale. According to Büyüköztürk, positive and high item total correlations indicate similar behaviors and have high internal consistency. Total item correlations indicate that items with a value of 0.30 or higher distinguish individuals well [15]. Correlations of MFES-Turkish with the items (0.57 to 0.97) were high (Table 2). According to these values, each item on the scale has a scale-compatible and sufficient measuring power. BI [9] FaB Scale [14] and RMI [12] values selected for comparison with the MFES-Turkish, measure the factors affecting the fear of falling more differently than MFES-Turkish. While these measures relate to the factors that affect the fear of falling, MFES-Turkish is intended to determine the fear of falling directly. There was a significant correlation positively between MFES-Turkish and the RMI and between MFES-Turkish and the BI in the study ($p<0.01$), while there was a significant correlation between MFES-Turkish and FaB Scale values in the negative direction ($p<0.01$) (Table 3). While the score obtained from BI increases, the dependency decreases. In this case, the positive correlation of with MFES-Turkish shows that as the dependency decreases, the competence against falling (safety sense) increases. This indicates that as the level of dependence increases in ADL, the sense of security against falling decreases. This relationship with another criterion is another evidence of the fact that MFES-Turkish measures the fear of falling. Higher scores on measures made with RMI indicate improved mobility. A positive correlation of with the MFES-Turkish means an increase in the mobility of the people and an increase in the sense of safety against the falls, which is an expected outcome. This finding suggests that those individuals with mobility impairment are more likely to fall. It was also found that fear of falling limits the individual's level of mobility [12]. Having mobility impairment may cause progression of mobility disability as the older adults fall or limit their movements after falling [19]. This finding should be considered as a proof of validity indicating that MFES-Turkish measures the sense of safety against the possible fall.

Discussion of reliability findings of MFES-Turkish

Cronbach's alpha reliability coefficient, item-total correlation and test-re test consistency were performed to test the reliability of MFES-Turkish. The reliability coefficient values of the scale are given in Graph 1. Since the coefficients are calculated one by one for each item, the coefficient that best reflects the reliability structure of the scale was chosen among other coefficients. A coefficient is highly reliable

between $0.80 < \alpha < 1.00$; quite reliable between $0.60 < \alpha < 0.80$; thought to have low reliability between $0.40 < \alpha < 0.60$ and not reliable between $0.00 < \alpha < 0.40$ [6,15].

The Cronbach Alpha internal consistency coefficient of the original MFES form, developed by Tinetti in 1990 and revised by Hill in 1996, was 0.93 and reliability coefficient was found to be 0.95 [7,8]. In this study, the internal consistency coefficient of the MFES-Turkish Cronbach Alpha (with consistency of $\alpha=0.97$) was found to be quite reliable. The fact that, the test-retest correlation coefficient was significantly higher in all items ($r=0.95$) and the correlation between the two half tests ($r=0.97$) was found to be quite high, suggests that MFES-Turkish is not affected by external changes in repetitive measures and supports its reliability. This ICC higher than Persian version [20] was similar to original MFES [8].

Correlations of the items in the scale were quite high, and the correlation of item 8 was found to be low compared to other items. Nonetheless, it was decided for the item to remain on the scale due to the high internal consistency of the scale and the fact that the increase in scale reliability was not significant (an increase of 0.6 in Cronbach's alpha value) in case of the removal of item 8.

Conclusion

In conclusion, the findings obtained from the validity and reliability study show that the MFES-Turkish scale is a valid and reliable measurement tool. It is also an important tool for measuring data that can be used to assess the effectiveness of attempts to identify and prevent falls in older adults. This scale can be effectively used in scientific research and practical applications in order to determine the falls efficacy in the older adults in Turkish society. The limitation of this study was the inclusion of only community-dwelling older adults as test subjects. The MFES Turkish form should also be studied in different older adult groups like the ones living in institutions. Turkish version of MFES is eligible to obtain transculturally comparable data with other versions [20,21].

Conflict of Interest

None.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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