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VALIDATION OF EDMONTON FRAIL SCALE INTO ELDERLY TURKISH POPULATION

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ABSTRACT

Purpose: The purpose of this methodological study was to assess the validity and reliability of Turkish version of the "**Edmonton Frail Scale"** (EFS).

Method: 130 individuals aged 65 and over residing at the Izmir Narlıdere Nursing Home between September 2011 − April 2012 who agreed to participate in the study constituted the sample for the research. Individuals with communication problems (deafness, blindness or language barriers) and problems with manual dexterity were not included in the study. The EFS is composed of 11 items, with a minimum score of zero and a maximum score of 17. Initially, the scale was translated into Turkish and then back translated in order to ensure language equivalence. Six experts were consulted with regard to content validity and agreement among the experts was assessed using Kendall's W. When testing the reliability of the EFS, the scale was re-administered to 30 participants two-three weeks after the initial administration in order to determine its consistency over time and agreement between the first and second administration was analysed using the kappa statistic. Pearson's Moment Correlation Coefficient and Cronbach's Alpha were also used to establish reliability.

Findings: The overall Cronbach's alpha value for the scale was 0.75. An "item analysis" calculated item-total correlation coefficients of between 0.12-0.65 for scale items, and the item-total correlation for item six was found to be less than 0.20. This item solicits the number of medications used by the subject, and since the number of medications used is significant in the determination of frailty it was not removed from the scale. The scale was found to be highly consistent over time (Kappa (κ) = Min: 0.95, Max: 1.00)

Conclusion: EFS indicators were found to be sufficiently reliable and valid for the Turkish population. Accordingly, it is recommended that this scale be used in determining the frailty of older individuals.

1. Introduction

Frailty is a dynamic process in which a loss in one or more areas of physical, psychological and social functioning has an undesirable impact on the health of an elderly individual (Buckinx, Rolland, Reginster, Ricour, & Petermans Bruyère, 2015). Frailty increases the unwanted impacts of stressful events, such as weakened haemostasis, increased sensitivity, falls, delirium, and disability (Clegg, Young, Iliffe, Rikkert, & Rockwood, 2013). Frailty is not an inevitable part of aging; like diabetes or Alzheimer's, it is comorbidity. (British Geriatrics Society, 2014)In relation to reductions in homeostatic reserves, the frailty process may be defined as having three stages; the pre-frail stage, the frail stage and the stage in which complications of frailty are experienced (Lang, Michel, & Zekry, 2009). Once begun, the stage of frailty complications may turn into a self-perpetuating vicious circle ultimately leading to death (Lang et al., 2009; Kinney, 2004). The frailty cycle can potentially start from various points. Any stress can accelerate the transition from the pre-frail stage to the frail stage and subsequently to the frailty complications stage (Lang et al., 2009; Kinney, 2004). Frailty can be measured in various ways, including rules-based scales and algorithms derived from clinical judgement. However many of these scales are not practical for bedside implementation by primary healthcare practitioners. This is because they require multidimensional clinical data provided by comprehensive geriatric assessments, which require specialist knowledge of the subject. Other negative aspects of these scales are that they are time-consuming and not universally applicable. Taking these facts into consideration, the user-friendly Edmonton Frail Scale (EFS), which can be easily administered in a short time to either hospitalised and out-patient subjects, was developed at Alberta University in the Canadian city of Edmonton by Rolfson et al. in

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2006 (Appendix A) (Rolfson, Majumdar, Tsuyuki, Tahir, & Rockwood, 2006). Existing frailty scales generally do not include social and psychological indicators. Only the physical domain of frailty is used in making an assessment (Steverink, Slaets, Schuurmans, & Lis van, 2001). Another purpose in selecting the EFS is that it is an easy-to-use screening tool that includes psycho-social components. There is no tool used to evaluate frailty in old age in Turkey. The EFS is a measurement tool that aims to measure frailty in the elderly and helps to identify frail individuals. The purpose of this study is to assess the validity and reliability of Turkish version of the EFS.

METHOD

1.1. Type and place of research

This study was planned as a methodological research with the aim of determining the validity and reliability of the Turkish version of the EFS. It was carried out the Elderly residing at the İzmir Narlıdere Nursing Home.

1.2. Research sample

The research sample was composed, using the simple random sampling method, of individuals aged 65 and over who agreed to take part in the study. The domains of cognition tested using performance-based item; the 'clock test' .Therefore exclusion criteria for the study were determined as illiteracy, lack of manual dexterity, a hearing-visual disability and communication problems. In determining the sample size, taking the number of items in the scale as a basis, it was aimed to recruit at least ten times the number of items (İltuş, 2007; Wood & Haber, 2002;; Yıldırım, 2007). Accordingly, since there are 11 items in the scale, it was planned to administer it to at least 110 subjects. By the end of the study, the scale had been administered to 130 people who had provided their verbal agreement to participate in the study between September 2011 and April 2012. Given the prospect that at the end of the survey process it might be impossible for various reasons to include some forms in the assessment, and that an increased sample size would contribute to the validity and reliability level, the sample size was increased.

1.3. Data collection tools

Geriatric Information Form; The information form prepared by the investigator included 22 introductory questions containing assessments aimed at defining the socio-demographic characteristics and frailty-related variables of the elderly subjects.

Socio-demographic data on elderly subjects; consisted of questions including information such as the gender, age, educational status, social security, income status, sources of revenue and number of children of the elderly subjects.

Frailty-related variables; this form was prepared in the light of information in the literature and consists of questions regarding the presence of chronic illness, number of medications, frequency of falls, duration of hospitalisation, perception of old age etc.

The Edmonton Frail Scale (EFS) was developed by Rolfson et al. (2006) at Alberta University, Canada (Appendix A) (Rolfson et al., 2006; Fabrício-Wehbe et al., 2009) It was developed for routine use by healthcare practitioners with no specialist training in geriatrics and gerontology in order to measure frailty in older persons. The scale consists of the nine frailty domains that are included in a Comprehensive Geriatric Assessment and are considered to be determinants of frailty. Of these frailty domains, general health status and medication use are assessed with two questions while the other domains are assessed with a single question. The scale consists of a total of 11 items. The two domains of cognition and functional performance are tested using performance-based items; the 'clock test' for cognitive status and the 'Timed Get Up and Go' test for functional performance (Rolfson et al., 2006; Fabrício-Wehbe et al., 2009; Brodaty & Moore, 1997;; Podsiadlo & Richardson, 1991;; Strandberg, Pitkala, & Tilvis, 2011). Furthermore, the content validity of the original scale was tested with a 70-question frailty scale called the Geriatrician's Clinical Impression of Frailty (GCIF). It was found that the EFS displayed a high correlation with the GCIF (r: 0.64 $p < 0.0001$). Cronbach's alpha for the original scale was 0.62 and it was found to be a valid and reliable tool (Ercan & Kan, 2004). It takes less than five minutes to administer the EFS. It has a minimum total score of zero and a maximum score of 17. An increase in the total score obtained from the scale indicates an increase in the severity of frailty. The EFS frailty level scoring consists of five levels; not frail, vulnerable, mild frailty, moderate frailty and severe frailty (Fabrício-Wehbe et al., 2009; Rolfson et al., 2006).

1.4. Research ethics

Permission to perform the study was obtained from the Scientific Ethics Committee of Ege University's Faculty of Nursing (Permission no: 2011) and in writing from the Management of Izmir Narlıdere Rest and Nursing Home. Both verbal and written information regarding the study and the fact that their names would be kept confidential was provided to the individuals whom it was planned to recruit to the study, and the written approval of the informed individuals was obtained on a voluntary basis.

1.5. Procedure

The first stage of the study was to test language validity. The translation method was used to minimise conceptualisation and differences of expression in the adaptation of the scale's language. According to Aksayan and Gözüm, at least two independent translators are necessary under this method (Aksayan & Gözüm, 2002). Accordingly, the translation of the scale from its English original into Turkish was performed by an English language instructor familiar with both languages and six specialist faculty members, one a nurse and the other doctors. After these translations were arranged by the investigator, a back translation into English of the prepared form was made by a translator fluent in both languages (Turkish-English) employed by the UK-based Turkish translation company TTC wetranslate Ltd. After comparing the expressions in this back translation with the original English expressions, the Turkish translation was revised (Appendix B). The content validity of the EFS was tested by six experts. The experts were asked to score the measurement level of each item in the scale out of ten. After recommendations were received and modifications made, 15 individuals who were not included in the scope of the study were recruited for pretesting. They were asked to assess the survey with regard to items that were hard to comprehend and hard to read and the format of items, and the scale was finalised based on their suggestions. In order to assess the scale's consistency over time the EFS was administered twice to 30 same subjects of 65 years and over resident. Finally EFS were given to 130 elderly and a validity technique to determine the validity of the tool (criterion-related validity), a reliability technique to determine the internal consistency (item-total score correlation) and Cronbach's alpha were calculated.

1.6. Statistical analysis

A statistician conducted the statistical analysis. The data obtained in the research were analysed using the SPSS (Statistical Package for Social Sciences for Windows), Version 16.0. The patients' descriptive information was calculated as a distribution in number and percentage. Frailty-related variables Man-Whitney *U* test and Chi-Square were used in relation to frailty level and some variables. The Kendall's W correlation coefficient was calculated with regard to content validity. Spearman Correlation Test and Kappa statistic was calculated to determine test-retest reliability. To determine the internal consistency of

Table 1
Distribution of individuals according to sociodemographic variables.

FEATURES	N	%
Gender		
Female	75	57,7
Male	55	42,3
Age Groups		
65–74	25	19,1
75–84	83	56,2
85 and over	22	24,7
Marital status		
Married	41	31,5
Single	5	3,8
Widow	84	64,6
Education Status		
Literate	4	3,0
Primary school	23	17,7
Middle school	27	20,8
High school	47	36,2
College	29	22,3
Toplam	130	100

the EFS the Cronbach's alpha coefficient and the item-total score correlations were calculated. For all analyses a p value less than 0.05 was accepted as statistically significant.

2. Findings

2.1. Socio-demographic characteristics

57.7% of the 130 subjects aged 65 and over who were recruited to the study were women and 42.3% were men, with a mean age of 79.68 (± 6.5) (Table 1). 92.3% of the subjects had a chronic illness and the average number of chronic illnesses was found to be 3.37 ± 2.03, with the average number of medications taken calculated as 4.97 ± 3.05. 73.8% of the subjects suffered from hypertension, 30.8% from coronary artery disease, 26.9% from hyperlipidemia, 21.5% from diabetes and 22.3% from osteoporosis.

Frailty Level and Frailty-related variables of The Elderly

The elderly individuals were examined according to their frailty status;

39.2% were not frailty, 24.6% were apparently vulnerable, 13.1% were mild frailty, 10.0% were moderate frailty, and 13.1% were severe frailty. When the level of frailty according to sex and educational status was examined, the difference was statistically insignificant. It has been determined that the levels of frailty according to age was different and the level of frailty increases with old age. It was determined that the frailty levels according to marital status were different and this difference was caused by the widow group. Individuals with chronic illness, drug use and comorbidities were found to be more frail (Table 2).

2.2. Validity

It was determined during content validation, performed after language validation, that expert opinion was in agreement (Kendall W = 0.14, p = .54). In order to evaluate whether the sample size was sufficient, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO-sampling adequacy) was applied and it was found to be statistically sufficient (KMO: 0.74 pnull < .01).

2.3. Reliability

Pearson's Moment Correlation Coefficient was calculated for the EFS items used in the study and the internal consistency of each item with the scale as a whole was determined (Table 3). In this study the correlation between item 6 and total score was found to be under 0.20 (Table 3). Since Cronbach's alpha would remain unchanged if this item

Table 2
The Frailty Of Individuals According to Some Variabilities.

Features	N	Z	U	P
Gender				
Female	75	-,29	1999,50	,76
Male	55			
Chronic Illness				
Yes	120	−2,00	371,000	,04
No	10			
Comorbidity				
Yes	109	−2,39	7.68,000	,01
No	21			
Medication Use				
Yes	118	−1,88	4,74,000	,05
No	12			
Features	N	SD		P
Age Groups				
65–74	25	2	13,34	,001
75–84	73			
85 and over	32			
Marital status				
Married	41	2	12,29	,002
Single	5			
Widow	84			
Education Status				
Literate	4	4	3,94	,41
Primary school	23			
Middle school	27			
High school	47			
University	29			

Table 3
Results of Individual Item Analysis for the Edmonton Frail Scale.

Item	Scale Mean if Item is Deleted	Scale Variance if Item is Deleted	Item-Scale Total Correlation	Scale Alpha if Item is Deleted
1	5.13	11.08	0.47	0.72
2	5.44	12.79	0.34	0.74
3	5.26	12.50	0.39	0.73
4	5.08	10.63	0.65	0.69
5	5.30	11.87	0.36	0.74
6	5.36	13.87	0.12	0.76
7	5.46	12.62	0.48	0.72
8	5.63	13.64	0.23	0.75
9	5.50	12.54	0.52	0.72
10	5.5462	13.490	0.249	0.75
11	5.100	10.78	0.56	0.70
N: 130 No. of Items:11 Cronbach's Alpha = 0.75				

was to be removed, it was decided not to remove the item from the scale. Furthermore, this item solicits the number of medications used by the subject, and since the number of medications used is significant in the determination of frailty it was not removed from the scale. The Cronbach's alpha value for internal consistency of the scale was 0.75. In order to assess the scale's consistency over time Spearman Correlation Test was calculated to determine test-retest reliability. The correlation between frailty scores in the first and last test was r:0.98, which was highly significant ($p < 0.001$) statistically. The scale was found to be highly consistent over time (Kappa (κ) = Min: 0.95, Max: 1.00). In line with this result, the EFS was found to have strong consistency over time and its stability over time was determined to be sufficient.

3. Discussion

Validity is the degree to which a particular measurement tool measures the construct or variable that it was designed to measure. It is a concept related to “what” and to what degree of “accuracy/correctness” a scale measures. (Erefe, 2004; Gözüm & Aksayan, 2003;; Polit & Beck, 2003;; Portney & Watkins, 2000). The aim of construct validity is

to have a group of experts examine whether the items in a measurement tool represent the domain to be measured and thereby to create a comprehensive tool composed of meaningful items. The scale is restructured in line with the recommendations and criticisms of the experts (Ercan & Kan, 2004;; Erefe, 2004; Dağ İ., 2005). The number of experts to be consulted, according to the literature, should be at least 2 persons and where necessary this can be increased up to 20, so the investigator should obtain a suitable number of opinions within this range (Yıldırım, 2007; Erefe, 2004; Gözüm & Aksayan, 2003). For this study, the opinions of 6 specialists were considered sufficient, and the Turkish form that comprised the scale was submitted for expert review of its construct validity, and they were requested to assign items scores of zero-ten with respect to validity. These results showed item averages to be adequate and it was not considered necessary to delete any item from the scale. Sometimes, even though a form does not give rise to a difference of opinion the translation might not be fully culture-appropriate and there may be difficulties in administering it. This is why a pretest is required (Yıldırım, 2007; Aksayan & Gözüm, 2002;; Aktürk & Acemoğlu, 2012;; Carlson, 2000). After receiving recommendations based on this information and making modifications, the pretest was conducted with 15 subjects who were not included in the scope of the study, and they were asked to assess the scale with regard to questions which were hard to comprehend. At the end of this process, the scale attained its final form. It is believed that sample size in validity and reliability studies should be at least five times, and ideally ten times, the number of items (Wood & Haber, 2002;; Yıldırım, 2007). In Yıldırım's 22-item study (2007) titled “An Elderly Diabetes Burden Scale”, it was aimed to reach the ideal sample size of 220 subjects, and the study was administered to 230 elderly patients with diabetes (Yıldırım, 2007). A 15-item study by İltuş (2007) on the 24-h Migraine-specific Quality of Life Questionnaire was administered to 85 subjects (İltuş, 2007). A sufficient sample size has a positive impact on the validity and reliability of the scale. Therefore, the validity and reliability of the EFS was analysed using the data of 130 subjects.

Reliability is an indicator of the stability of the measured values obtained through repeated applications of a measurement tool under the same conditions (Ercan & Kan, 2004;; Erefe, 2004; Gözüm & Aksayan, 2003;; Polit & Beck, 2003;; Portney & Watkins, 2000). Reliability is a measure of the consistency of measurement (Çakmur, 2012). The “internal consistency” of a measurement tool is a concept based on the assumption that the tool is composed, for a clear and certain purpose, of independent units and that these have known and equal weighting within the whole. Internal consistency shows that a scale measures the same characteristic feature of all subgroups in the scale (Erefe, 2004; Polit & Beck, 2003;; Portney & Watkins, 2000). In order to measure internal consistency firstly item analysis was performed. While there is no fixed standard value for the item-total score correlation coefficient below which reliability is considered insufficient, according to Karasar (1995) the reliability of items with a coefficient of less than 0.50 must be considered suspect, and according to Öner (1987) this coefficient must be greater than 0.30. In practice, most researchers use 0.20 as a minimum value (Gözüm & Aksayan, 2003). For the EFS item-total correlation coefficient, a minimum value of 0.20 was accepted as the reliability level. In this study the item-scale correlation for item six was found to be less than 0.20. If this item were to be deleted, the Cronbach's Alpha value would not be affected, and so it was decided not to remove it. Furthermore, since this item solicits the number of medications used by the subject and this number is significant in the determination of frailty it was not removed from the scale. Cronbach's Alpha is a measurement of the internal consistency or homogeneity of the items included in a scale. A scale composed of items that are closely related to each other will have a high alpha coefficient. The higher a scale's alpha coefficient is, the higher the inter-item consistency of that scale and the more closely the items probe the same construct. Theoretically, a Cronbach's alpha coefficient for internal consistency of close to one is desirable (Gözüm & Aksayan, 2003). The Cronbach's alpha coefficient for internal consistency of the EFS was 0.75, which shows the scale to be quite reliable. These results are also consistent with the values for the original scale. The Cronbach's alpha for the original scale was calculated as 0.62 (Rolfson et al., 2006). After the internal consistency analysis performed on the Edmonton Frail Scale (item analysis, Cronbach's alpha) it can be said that all of the values show that it is a reliable scale with internal consistency. One of the fundamental principles of reliability is a scale's consistency over time. This reliability relates to the ability of a scale to provide similar measurement values for repeated measurements at different times (Ercan & Kan, 2004;; Erefe, 2004; Polit & Beck, 2003;; Portney & Watkins, 2000). The most critical aspect of test-retest reliability is the time interval to be left between the two measurements. Taking potential difficulties into account, the time interval allowed to lapse between administrations should be not less than two weeks and not more than four (Erefe, 2004; Gözüm & Aksayan, 2003;; Portney & Watkins, 2000). The literature states that the second administration should be conducted with at least 30 subjects. Based on this information, the EFS was re-administered in face-to-face interviews to 30 elderly subjects after a two-threeweek interval. The consistency between the first and second administration of the scale for each of the answers provided by the subjects was tested using the kappa coefficient. The kappa statistic can range from zero to one in value, with 0.93-1 defined as excellent, 0.81-0.92 very good, 0.61-0.80 good, 0.41-0.60 average, 0.21-0.40 below average and 0.01-0.20 weak (Aktürk & Acemoğlu, 2012;; Clegg et al., 2013). According to the results of our kappa consistency analysis, questions fourth, fifth, eighth, ninth, tenth. and 11. show excellent consistency over time, while questions first, second, third, sixth, seventh, show very good consistency over time. When the scale was being designed by Rolfson et al. (2006), they had the EFS administered to 18 subjects by two different raters and evaluated inter-rater consistency. They used the kappa coefficient (k) to test inter-rater reliability, and the EFS was found to have good inter-rater reliability ($k = 0.77$, $P = 0.0001$, $n = 18$) (Aktürk & Acemoğlu, 2012). The limitation of this study consists of the less number of sample and healthy elderly people who are only staying in the nursing home and do not have barriers to communication. Because; the majority of older population presents no illiteracy, lack of manual dexterity (loss of ability, functionality and independence), hearing and visual impairment and effective communication problems (often related to psychological conditions).

4. Conclusion

This study concluded that, according to the statistical data gathered, the EFS is a valid and reliable measurement tool for the Turkish population. As a result of this study,

it is recommended that the EFS; should be evaluated with regard to its validity and reliability for different groups (age, gender, educational status, income, place of residence, existence of chronic illness, medications, quality of life, frequency of falls etc). It is also proposed that social awareness should be raised regarding the diagnosis and treatment of frail older persons and educational programmes on frailty should be planned.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.archger.2018.02.003.

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