

Adaptation of Diabetic Empowerment Scale-Short Form to Older Individuals and to Turkish Language: Validity and Reliability Study

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ABSTRACT

Objective: The empowerment of old people is important in order for them to gain control over their own lives and to raise their quality of life. The purpose of this study was to adapt the Diabetes Empowerment Scale-Short Form (DES-SF) to old people and to the Turkish language, and to determine its validity and reliability.

Materials and Methods: This methodological type study was conducted between 1 January and 30 March 2017 with 106 old people fitting the criteria of acceptance in the study who attended the geriatrics clinic of a university hospital. In determining validity, language equivalence, content, and predictive validity were used, while reliability was tested with temporal invariance, Cronbach's alpha coefficient, and item total correlation. We examined its reliability and validity via item analyses, content validity (expert panel), confirmatory factor analyses, and construct validity (exploratory factor analyses).

Results: The Cronbach's alpha of the scale was 0.883. The scale items were grouped under a single factor in accordance with the original. Confirmatory and exploratory factor analysis showed good fit signs.

Conclusion: After conducting validity and reliability testing on the adaptation of the Diabetic Empowerment Scale-Short Form to old people and the Turkish language, it was concluded that it is a reliable scale to determine the empowerment levels of old people. Based on the statistical analyses applied to evaluate the validity and reliability of the scale obtained by adapting the DES-SF to old people, it was inferred that it is an instrument with high validity and reliability. The scale is a short and practical instrument to evaluate the empowerment levels of old people. The new name of the scale is the elderly empowerment scale.

Keywords: Empowerment, nursing, old person, validity-reliability.

Introduction

Aging is a complex process. Biologically, it is characterized by progressive molecular and cellular damage at various levels. Over time, these changes lead to an increase in a person's health risk and a decrease in their general capacity [1]. In this process, it is important to empower a person in order to enliven their old age, and to ensure their conformity to active participation in treatment and care. Empowerment is a healthcare model which is beginning to find a place in current healthcare. It is a process which develops patients' autonomous and conscious decision-making skills, enabling them to have knowledge of their own condition and control over it [2].

Diabetes Empowerment Scale was designed to initiate the behavioral changes necessary for a person's health [3], and is based on the strengths, rights, and abilities of the patients. It concentrates on the idea that patients are not passive healthcare recipients, but have a say in the management of their health, and have the right to express their views on their care. This is closely correlated with the state of a person's health, and takes the patient as the center of care [4].

This model is particularly important for those who need constant treatment and care such as those with a chronic illness, and it helps them to cope with their problems by increasing their self-confidence. It is thought that empowerment has a key role particularly in improving the quality of life of the chronically ill [5]. The aim of empowering those in need of long-term care is to enable them to have control over their own lives and over their interactions with health-

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care and other professionals. Experts have found that although people have illness-specific needs, all these needs have a common basic point. Empowerment is an inescapable part of all human relations and is basic to relations with those who provide care. Sharing power in a systematic and meaningful way is the basis to the development of therapeutic relations. Power sharing leads to an improvement in the quality of life and the development of a feeling of control [2, 6]. It is thought that the empowerment of old people will enable self-management and enhance their quality of life. However, no scale reported in the existing literature could determine the extent to which old people needed support.

Purpose

The aim of this study was to adapt the Diabetes Empowerment Scale-Short Form (DES-SF) to old people and to the Turkish language, and to determine its validity and reliability.

Materials and Methods

Design

This was a methodological study.

Location and Time of the Study

The study was conducted between 1 January and 30 March 2017 in the geriatrics clinic of a university hospital.

Sample

The research sample consisted of individuals aged 65 and above who attended the geriatrics clinic between 1 January and 30 March 2017 and who were suffering from a chronic illness. It is stated in the literature that when determining the sample size in a scale study, a sample which is five to ten times the number of items [7] should be taken. The DES-SF had eight items, and hence a target of ten times the number of old people was chosen, and the sample consisted 106 old people who could speak Turkish, who had no communication or mental problems, and who voluntarily agreed to take part in the study. Sixteen individuals refused to participate in the study.

Main Points

- The Turkish version of the scale is valid and reliable.
- The Elderly Empowerment Scale (EES), will allow assessing empowerment in the senior Turkish population.
- The scale is a short and functional mean to evaluate the empowerment levels of old people.

Data Collection and Instruments

The scale was applied to the old people by two researchers via face-to-face interviews in a hospital.

Questionnaire on Socio-demographic Characteristics

A form consisting of 13 questions on the socio-demographic characteristics of the participants and their health was used to collect data.

DES (SF)

The DES-SF, developed by Anderson [8] was designed to evaluate the empowerment levels of individuals in relation to their state of health. The scale has eight five-way Likert-type items, from "Strongly disagree" = 1 to "Strongly agree" = 5. The scoring of the DES-SF is based on the total of items. An item checked "strongly agree" receives 5 points, "agree" 4 points, "neutral" 3 points, "disagree" 2 points, and "strongly disagree" 1 point. The scale has no cutoff score value; it is scored by averaging the scores of all completed items, and a high score means a high level of empowerment [9].

The Cronbach alpha coefficient of the original scale was 0.96 (8), that of the Turkish adaptation of the long form was 0.88, and that of the adaptation of the long form for heart failure patients was 0.932 [10, 11].

Statistical Analysis

Statistical analysis of data was performed using the programs Statistical Package for the Social Sciences 23.0 (IBM SPSS Corp.; Armonk, NY, USA) and Statistical Package for the Social Sciences AMOS. In adapting the DES-SF to seniors and the Turkish language, the data was presented under two headings: an examination of psychometric data and validity and reliability testing.

In the validity analysis, language validity, content validity, and structural validity were evaluated. In the language validity testing, we translated the original DES-SF into Turkish and adapted it to old people. After that, it was translated back into English (original language) by an independent translator. The original DES-SF and back-translation were then cross-checked by the researchers. For content validity, the expert views of a geriatric specialist, a teacher of geriatrics, and five teachers of internal medicine nursing were sought. The mean of the scores of the evaluation by these experts was used to calculate the Kendall Coefficient of Concordance (W). After we finalized that the items of both versions had similar meaning, we accepted this translation as acceptable. We then conducted a pilot study with 10 old people who were

receiving care from the geriatrics department of the study hospital to determine whether any of the items were not understood by the elderly people. The pilot study showed that some of the items were not understood by the elderly people. Researchers revised these items accordingly, and after that we began collecting data with the DES-SF.

The construct validity was assessed by means of confirmatory factor analysis (CFA) and exploratory factor analyses (EFA). We conducted an item analysis before the factor analysis. The Kaiser-Meyer-Olkin measure of sampling adequacy, Bartlett's test of sphericity, and the determinant of the correlation matrix were used to investigate the factorability of the scale.

Evaluation of reliability was performed using item-total score correlations and Cronbach's alpha internal consistency coefficient. The test-retest method was used to test the temporal invariance. When deleting items, the mean score and standard deviation were calculated for each item on the scale, and an evaluation was made of the increase in the Cronbach's alpha coefficient and of whether or not an item was to be deleted [12, 13].

Cronbach's alpha and the split half-reliability method were used to identify the reliability of the DES-SF. In addition, the intraclass correlation coefficients (ICC) value was calculated with the help of Cronbach's alpha, item-total score correlation, Gutmann split-half, and Spearman-Brown reliability coefficients. To check the conformity to normal distribution for test-retest, Wilcoxon analysis was performed for dependent group comparison.

In all tests, a value of less than 0.05 was taken as significant in statistical analyses, and results were evaluated at an alpha 95% reliability level.

Ethics of the Study

Written permission was obtained by email from the corresponding author, Dr. Anderson, for the adaptation to old people and Turkish language and for validity and reliability testing of the DES-SF. We obtained informed consent from all those who participated in the questionnaire. The study was approved by the ethical commission of the Ege University that conducted the study (Approval no. 89-2016).

Results

The mean age of the old people included in the study was 74.6 ± 8.5 years; 57.5% of them were female, 68.8% were educated to primary level or below (Table 1).

Table 1. Socio-demographic characteristics of the old people

Characteristics	n	%
Gender		
Female	61	57.5
Male	45	42.5
Educational level		
Illiterate	10	9.4
Literate	12	11.3
Primary school	37	34.9
Middle school	14	13.2
High school	21	19.8
University	12	11.3
Marital status		
Married	72	67.9
Single	34	32.1
Number of children		
2 or less	48	45.3
3 or more	58	54.7
Profession		
Housewife	35	33.0
Manual worker	1	0.9
Office worker	1	0.9
Self-employed	2	1.9
Retired	67	63.2
Monthly income		
Income>expense	18	17.0
Income=expense	70	66.0
Income<expense	18	17.0
Place of long-term residence		
Village	23	21.7
Urban area	83	78.3
Smoking		
Yes	7	6.6
No	72	67.9
Quit	27	25.5
Alcohol		
Yes	10	9.4
No	80	75.5
Quit	16	15.1

Validity Findings of the DES-SF Adapted to Old People

Content Validity

The views of seven experts were sought on the topic of old age concerning the content validity of the Turkish form of the scale adapted to old people. Each of the items on the scale was evaluated by the experts on a scale of 0 to 100 for comprehensibility, discriminative ability, suitability to purpose, and cultural suitability. For eight items on the scale, the content validity index (CVI) was calculated. In order for the scale to have adequate content validity, it must have a CVI of over 0.80 [14, 15]. The CVI in our study was calculated as 0.89, indicating that content validity was adequate.

Table 2. Goodness of fit index

Goodness of Fit Index	Acceptable Fit	Model
χ^2/df (CMIN/df)	<3 good, <5 sometimes permissible	2.186
p value	0.05<p≤1.00 good fit - 0.01≤p≤0.05 acceptable fit	0.088
RMSEA	≤0.05 good, 0.05-0.10 moderate, >0.10 bad	0.079
CFI	≥0.95 great, ≥0.90 traditional, ≥0.80 sometimes permissible	0.971
GFI	≥0.90 good fit	0.942
AGFI	≥0.80 good fit	0.870
NFI	≥0.90 good fit	0.950

Df: degrees of freedom; CMIN: minimum discrepancy function; RMSEA: root mean square error of approximation; CFI: comparative fit index; AGFI: adjusted goodness of fit index; GFI: goodness of fit index; NFI: normed fit index

Table 3. Total Variance Explanation Rates of Scale Items and Factors

Components	Starting eigenvalues			Totals of squares of loads after rotation		
	Total	% Variance	Cumulative %	Total	% Variance	Cumulative %
1	4.431	55.386	55.386	4.431	55.386	55.386
2	0.962	12.022	67.408			
3	0.777	9.707	77.115			
4	0.531	6.635	83.750			
5	0.503	6.289	90.039			
6	0.323	4.040	94.079			
7	0.248	3.098	97.176			
8	0.226	2.824	100.000			

Table 4. Comparison of test-retest mean scores of the scale

Scales	n	Mean±SD	Med±IR	p
Test	41	19.36±7.12	17±10.5	0.09
Retest	41	18.92±6.91	17±10.5	

Structural Validity

To evaluate the structural validity, the value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy performed was 0.847. This value indicated that the sample was suitable for factor analysis. We evaluated the factorability of the sample: Bartlett's test of sphericity was significant, and conducting the factor analyses ($X^2=419.786$ p<0.001).

In the confirmatory factor analysis, the X^2/df value of the study was found to be 2.186, the root mean square error of approximation (RMSEA) value was 0.079, and the standardized root mean square residual (SRMR) value was 0.05. The goodness to fit index (GFI) was calculated as 0.942, and the comparative fit index (CFI) was calculated as 0.971 (Table 2).

Bartlett's test of sphericity was performed with basic component factor analysis using the varimax

rotation method conducted in the exploratory factor analysis and afterwards ($X^2=419.786$ p<0.001). It was seen that the scale items grouped under a single factor; and the eigenvalue of the single factor was 4.431. This single factor forming the scale explained 55.386% of the total variance (Table 3, Figure 1).

Reliability Findings of the DES-SF Adapted to Old People

Temporal Invariance (test-retest)

In order to test the scale for temporal invariance, the researchers applied it again to 41 old people, and compared the results of the first and last applications (Tables 4 and 5). Table 6 shows the ICC values of the test-retest application, and it is seen that the correlation values are between 0.443 and 0.97. According to the result of the Hotelling T^2 test, mean responses were not found to be different (Hotelling $T^2=0.248$, p=0.622). The Pearson correlation coefficient

Table 5. Correlation coefficient for test-retest

	Intraclass Correlation ^b	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	0.500 ^a	0.422	0.584	9.006	105	735	p<0.001
Average Measures	0.889 ^c	0.854	0.918	9.006	105	735	p<0.001

df: degrees of freedom

Table 6. Scale Total Score Correlation Distribution by Scale Items

Items	ICC	p
Question 1	0.764	<0.001
Question 2	0.806	<0.001
Question 3	0.795	<0.001
Question 4	0.815	<0.001
Question 5	0.773	<0.001
Question 6	0.509	<0.001
Question 7	0.748	<0.001
Question 8	0.693	<0.001

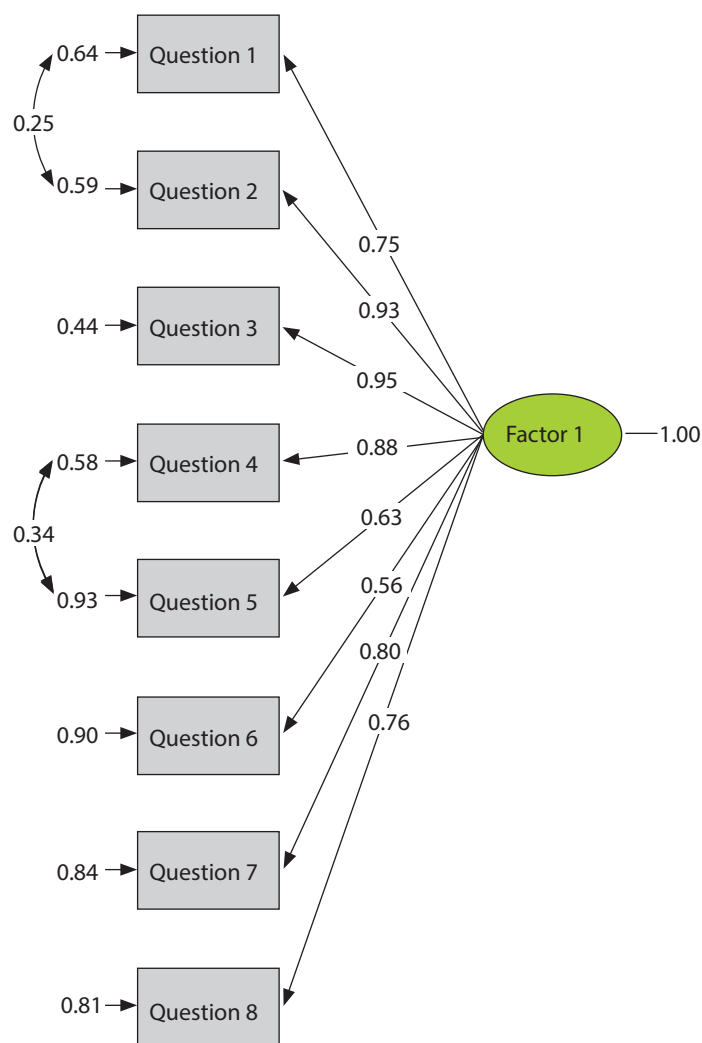
level was seen between each item on the questionnaire and the questionnaire's total mean score ($p<0.05$) (Tables 3 and 6).

Discussion

This study investigated the psychometric properties of the Turkish version of the DES-SF and its adaptation to elderly people. It was established in the study that the DES adapted to old people and to the Turkish language was a valid and reliable measurement instrument.

Validity

The adaptation of the scale to old people and Turkish society with regard to language and culture was evaluated by experts, and no significant differences were found between them. This result shows that the scale achieved reliability of concordance between independent observers with regard to adaptation to Turkish culture and that its language and content were valid. The adequacy of the study sample was performed by comparing the observed size of the correlation coefficients with the size of partial correlation coefficients, and here the KMO test was used. On the form adapted for old people of the DES-SF, the KMO coefficient result was evaluated to be very good (0.865), and it was concluded that the scale was suitable for factor analysis to be performed. Bartlett's test was applied in order to test whether the correlation matrix was a unit matrix. This test showed whether the scale was suitable for the use of a factor model. According to the results of Bartlett's test of this scale, the use of the factor model on the scale was found to be suitable ($p<0.001$). As a result of the exploratory factor analysis of the scale when its factor structure was examined, it was found to group under a single factor, similar to the original (Figure 1). In the confirmatory factor analysis, the χ^2/df value showed conformity. Because chi square statistics are greatly affected by the sample size, χ^2/df is more often used [14, 15]. The RMSEA value is accepted as an indicator of approximate adaptation in the population. In



Chi-Square=34.46, df=18, P-value=0.01106, RMSEA=0.08

Figure 1. DES/SF subdimensions and items
DES/SF: Diabetes Empowerment Scale-Short Form

was found to be 0.979, and no significant difference was found between measurements within a 95% confidence interval ($p=0.926$).

Cronbach's Alpha Coefficient

The Cronbach's alpha coefficient of the Turkish form of the scale adapted to old people was calculated to be 0.883, the Gutmann split-half coefficient was 0.859, and the Spearman Brown

coefficient was 0.863. The Cronbach alpha value of the first half was 0.862, and that of the second half was 0.724, and the correlation between the two halves was 0.758 (Table 3). When an item was deleted, there was no change in the reliability level of the scale greater than 0.10.

Item-Total Score Correlation Coefficient

A positive correlation at a statistically significant

our study, the calculated value of RMSEA=0.079 was within the acceptable values. Goodness of fit index (GFI) shows the extent to which the model measures the covariance matrix in the sample. In the study, the value of 0.942 obtained was found to be within the acceptable values. As the values of RMR and SRMR approach zero, the tested model shows a better goodness of fit. The SRMR value, calculated as 0.05 in the study, is within the acceptable values. Assuming a lack of relationship between the variables, it shows the difference between the model set up and the null model. It is a model which predicts that there is no relationship between the variables. In our study, CFI was calculated as 0.971, which expresses a good fit.

Reliability

Reliability is one of the characteristics which a scale must possess. Measurement values obtained in measurements repeated under the same conditions will show conformity [16]. There are many methods in the literature to evaluate conformity [16-20]. The methods used in this study for reliability were Cronbach's alpha coefficient, temporal invariance, and item analyses. Thus, the Cronbach's alpha coefficient in the study was 0.87 and was seen to be at an acceptable level. In order for a measurement instrument to be counted as having adequate reliability, its alpha coefficient must be as close as possible to 1 [21]. In this study, the scale was tested with internal consistency analyses, half-test reliability, and temporal invariance analyses. Its Cronbach's alpha score was calculated as 0.87, and it was found to be valid and reliable with high internal consistency and a high Cronbach's alpha value. In the original work on the scale developed by Anderson, the overall Cronbach's alpha coefficient was found to be 0.96 [8]. The Cronbach alpha value in the present study was found to be similar to the original. In studies in which the DES has been adapted to different languages and chronic illnesses, similar results have been seen [10, 11].

For internal consistency analysis, both the values of the scale and the load of each item on the scale are important. There is no standard view on which measurement the item-total correlation coefficient should fall for its reliability to be counted as inadequate. Generally, items with a coefficient of less than 0.50 are evaluated as having low reliability, and it has been said that this coefficient should be over 0.30 and should not be negative [21, 22]. It has been commented that if the item-total correlation coefficient of an item on the scale is very low, that item can be taken out of the measurement instrument. However, it has been emphasized

that in order to remove an item from the scale, it is necessary to look at the changes in the alpha coefficient and the mean. It has been stated that an item that does not change the reliability is an item which supports the scale and therefore it is not necessary to remove these items from the scale [23]. The scale total correlation value of item 6 on the scale was found to have a value of "negative". Not only is an item-total correlation coefficient not expected to be negative, but if this item is taken out, the Cronbach alpha value of the scale does not show a different rise, and so it was not seen as suitable to remove it.

In the study, the Gutmann Split-Half reliability coefficient was calculated for the first half, the second half and for all of the items for two half-test reliability of the scale. The Gutmann Split-Half reliability coefficient of the form adapted for old people of the DES-SF was 0.857, the Spearman-Brown reliability coefficient was 0.858, and the Cronbach's alpha reliability coefficients for the first and second halves were 0.862 and 0.761, respectively. When reliability coefficients approach a value of 1, the reliability of the scale is accepted as high [21]. In line with supporting literature information, it was concluded that the two half-test reliability results of the scale were highly reliable.

The temporal invariance of the scale was evaluated by the test-retest method, and the results were tested by ICC analysis. The ICC values vary between 0.00 and 1.00; values of 0.60-0.80 indicate that the reliability is good, and values of over 0.80 indicate that the reliability is excellent. In methodological studies, the number of units to which retest is applied in the evaluation of temporal invariance must be at least 30 [18]. In the present study, retest was applied to 41 units, and this was accepted as a sufficient number. Examining the ICC values of the test-retest application in Table 4, it was found that they were between 0.889 and 0.918, and that the ICC results of temporal invariance and the test-retest values of the scale were at an excellent level.

Study limitations

The study contains a number of limitations. The study was conducted in a single center; a university hospital. The sample group consisted of old people who volunteered to participate, and the research findings can only be generalized to this group. Additionally, the study has a cross-sectional design; therefore, the conclusions drawn from the study cannot suggest causation.

It is recommended that this scale should be further evaluated in different regions of Turkey with larger samples.

In conclusion, It was determined that in all the statistical analyses applied to evaluate the validity and reliability of the scale obtained by adapting the DES-SF to old people, it was an instrument with high validity and reliability. The scale is a short and practical instrument to evaluate the empowerment levels of old people.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Ege University (89/2016).

Informed Consent: Oral informed consent was obtained from the patient who participated in this study.

Peer-review: Externally peer-reviewed.

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