

RESEARCH ARTICLE



Validity and reliability of the Dari version of the CES-D scale among the general population of Herat, Afghanistan: A methodological study

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ABSTRACT

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Background: Depression is considered one of the significant pressing public health problems globally. The Center for Epidemiologic Studies Depression (CES-D) scale is valuable for assessing subthreshold depression. The purpose of this study was to investigate various aspects of the CES-D scale's validity and reliability in the Afghan population.

Methods: This methodological study was conducted between 6th June 2021 and 12th July 2021 among the general population in the Herat province of Afghanistan. A total of 424 participants filled out the questionnaires provided to them. The forward-backward translation method translated the CES-D scale into the Dari language. The data was statistically analyzed using IBM SPSS version 24.0 and AMOS version 24.0 software for Windows. Exploratory (EFA) and confirmatory factor analysis were used to assess the factor structure (CFA). The reliability was assessed by Cronbach's alpha, inter-item correlation, and total item correlation.

Results: The exploratory factor analysis resulted in three factors (Depressed affect & Somatic complaints factor, the Interpersonal factor, and the Positive affect factor). The CFA result suggested that the resulted model of the Dari version of the CES-D scale with 19 items was the best fit for our data. The Cronbach's alpha for the 19 items scale was 0.874.

Conclusion: The results of this study show that the Dari version of the CES-D scale is valid and reliable to use among the general population of Herat province of Afghanistan. The scale can assess depression and its symptoms among the population mentioned above with confidence.



Introduction

Depression is considered one of the world's most significant public health issues. According to the World Health Organization (WHO), more than 300 million people, or about 4.4% of the world's population, suffer from depression (1). Sadness, disinterest or joylessness, feelings of guilt or low self-

esteem, sleep or eating disorders, fatigue, and poor concentration are symptoms of depressive disorders. Depression can be chronic or recurrent and severely limit a person's ability to function at work or school or manage daily life (1-2). It has also been described as a comorbidity for other diseases because it is associated

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with mortality and poor health (3-6). According to WHO (World Health Organization), depression or depressive disorders can be divided into two main categories: Major Depression/Depressive Episode and Dysthymia (7-8).

Four depression scales and databases which are most commonly used are the Center for Epidemiological Studies Depression Scale (CES-D), the Beck Depression Inventory (BDI), the Hamilton Rating Scale for Depression (HRSD), and the Zung Self-Rating Depression Scale (SDS). The BDI, the CES-D, the HRSD, and the SDS can all capture a single, overarching, and general depression factor and various lower-level specific depression symptom components. The CES-D is considered the most useful scale to assess depression (9-14). It is a self-report scale developed based on other depression assessments to assess symptoms of depression in the general population. The CES-D scale was developed in 1970. It was created to be used in epidemiologic research to determine the severity of depressive symptoms and to identify those who are at risk of developing depression in the general population (8). The CES-D scale contains 20 items, each of which has a specific role in assessing relevant symptoms of depression (8, 14-15). However, despite the widespread use of the CES-D, its latent structure has been questioned (16-17).

The CES-D scale is often used in epidemiological studies. However, it is usable for epidemiological studies and clinical practice (8). In Afghanistan, where there are large numbers of unemployed people, daily attacks by terrorists throughout the country affect people's mental health (18-20).

The purpose of this study was to investigate various aspects of the CES-D scale's validity and reliability in the Afghan population.

Materials and Methods

CES-D

CES-D scale is a 20-item questionnaire developed to measure depression-related symptoms. The original CES-D scale has four factors. The Depressed affect factor consists of seven items (CES-D

3, CES-D 6, CES-D 9, CES-D 10, CES-D 14, CES-D 17, CES-D 18). The Positive affect factor consists of four items (CES-D 4, CES-D 8, CES-D 12, CES-D 16). The Somatic complaints factor consist of seven items (CES-D 1, CES-D 2, CES-D 5, CES-D 7, CES-D 11, CES-D 13, CES-D 20). The fourth factor is the Interpersonal factor, consisting of two items (CES-D 15, CES-D 19) (34). Each item of the CES-D scale has four options from 0 to 3 and responds from low to the high occurrence of the symptom. The result of the total of 20 items scale results in a 0 to 60 score. A result of lower than 16 is indicative of normal (mild depressive symptomatology). Depression is indicated by a total score of 16 or higher. Each item of the CES-D scale measures the magnitude of depression (35).

Translation of CES-D

The translation and cultural adaptation of the Dari version of the CES-D scale was made in three steps, using the forward-backward translation method to achieve this goal. First, three independent psychologists translated the CES-D scale into the Dari language. Second, the translated version was reviewed by three individuals and a Dari literature professor to check its readability, comprehensibility, Afghan culture, and appropriateness. The changes suggested by the reviewers were implemented. Third, the English specialist back-translated the resulting questionnaire into English. The back-translated English questionnaire was compared to the original English CES-D scale. The outcomes were almost identical. Minor differences in word and sentence structure were noted, but the meaning of the sentences was the same. No changes were required. The version of the CES-D scale translated into Dari was used for a pilot study with 30 people. They reported no difficulty in reading and understanding the items of the questionnaire. The result of the pilot study was analyzed and interpreted by the team, and a final version of the questionnaire was prepared after the minor necessary changes were made to the translated scale. The final questionnaire used for this study included two parts. The first part of the questionnaire had 11 items to collect the participants' socio-demographic data. The second section of the questionnaire used in this study contained the CES-D scale's items.

Data collection

The data collection of this study was done between 6th June 2021 and 12th July 2021. This Dari version of the CES-D scale was administered among the general population of Herat province aged above eight years old. The sample size was determined using the CES-D scale's number of items. For each item, 20 participants were taken. Therefore, for 20 items of the CES-D scale, 400 participants were needed plus almost 5% to cover the error. Therefore, 424 participants participated in this study.

Statistical Analysis

The collected data was entered into IBM Statistical Package for the Social Sciences (SPSS) version 24.0 software for windows, and the statistical analyses were performed on this software as well as AMOS (Version 24.0). The socio-demographic characteristics of the participants were evaluated and presented by numbers (N) and percentages (%). Items of the scale were represented and evaluated using the Descriptive method and presented by Mean and SD (Standard Deviation). The factor structure was determined using exploratory factor analysis using the principal component analysis with Varimax rotation. Items of factors loaded with a score greater than 0.3 in the Communalities table were considered significant (considering the sample size). The Kaiser-Meyer-Olkin statistic and Bartlett's test were used for factor analysis to evaluate the internal consistency of the items, and Cronbach's alpha coefficients were used. The values of Cronbach's alpha of more than 0.6 were considered satisfactory.

Confirmatory factor analysis was used to determine the goodness-of-fit of the Dari version of the CES-D scale. The following parameters were used to achieve this goal: "Chi-Square to df ratio" (CMIN/df), which was considered permissible, the resulted value was less than 5. The "Comparative Fit Index" (CFI) was considered >0.8 as permissible. The "Goodness-of-Fit Index" (GFI) was considered the resulting value of >0.95 as permissible. The "Adjusted Goodness-of-Fit Index" considered the resulting value of >0.80 as permissible. The "Tucker-Lewis Index" (TLI) was considered the value of >0.95 as permissible. The "Standardized Root Mean Square Residual" (SRMR) was considered the value of <0.9 as acceptable. The

"Root Mean Square Error of Approximation" (RMSEA) was considered the value between 0.05 – 0.10 as moderate and acceptable (36).

In addition, to the scale's reliability, the Guttman split-half Coefficient and the Spearman-Brown Correlation Coefficient were used. The test-retest reliability result above 0.6 was considered satisfactory. Based on the study's sample size, a p-value of less than 0.05 was considered the indicator of statistical significance for results in this study.

Results

Four hundred twenty-five participants were interviewed in this study. 33.2% of the participants were aged between 9 and 17 years old. 42.8% of the participants were aged between 18 and 39 years old. 54.8% of the participants were male, 82.6% lived in urban areas of Herat province, 21.4% were illiterate, 46.4% had an average economic status, and 8.5% had a chronic disease. (Table 1)

Table 1: Characteristics of participants

Characteristic	Category	N (%)
Age group	9-17 years	141 (33.2)
	18-39 years	182 (42.8)
	≥40	102 (24.0)
Gender	Male	233 (54.8)
	Female	192 (45.2)
Marital status	Single	271 (63.8)
	Married	154 (36.2)
Residency	Urban	351 (82.6)
	Rural	74 (17.4)
Education	Illiterate	91 (21.4)
	School	166 (39.1)
	University	168 (39.5)
Economic status	High income	22 (5.2)
	Medium income	197 (46.4)
	Low income	206 (48.5)
Occupation	Occupied	100 (23.5)
	Non-occupied	325 (76.5)
Smoking	Never	387 (91.1)
	Left	24 (5.6)
	Yes	14 (3.3)
Presence of chronic disease	Yes	36 (8.5)
	No	389 (91.5)
Total		425 (100.0)

The items of the original CES-D scale are presented by

items' Mean and Standard Deviation values. (Table 2)

Table 2: Center for Epidemiological Studies Depression Scale (CES-D) by items Mean and Standard Deviation value.

Item Description	Mean	SD
01. I was bothered by things that usually don't bother me.	.87	.96
02. I did not feel like eating, my appetite was poor.	1.02	1.11
03. I felt I could not shake off the blues even with help from my family and friends.	1.14	1.10
04. I felt that I was as good as other people.	1.52	1.11
05. I had trouble keeping my mind on what I was doing.	1.18	1.12
06. I felt depressed.	1.12	1.11
07. I felt that everything I did was an effort.	1.61	1.12
08. I felt hopeful about the future.	1.80	1.13
09. I thought my life had been a failure.	.88	1.10
10. I felt fearful.	1.05	1.10
11. My sleep was restless.	1.04	1.3
12. I was happy.	1.62	1.4
13. I talked less than usual.	1.04	1.01
14. I felt lonely.	1.27	1.14
15. People were unfriendly.	.76	.97
16. I enjoyed life.	1.62	1.10
17. I had crying spells.	1.04	1.17
18. I felt sad.	1.06	1.12
19. I felt that people dislike me.	.65	.94
20. I could not get going.	1.05	.99

The explanatory factor analysis yielded a three-factor solution with a large eigenvalue of 6.388 for the first factor followed by two factors with an eigenvalue larger than 1. The first factor comprised 13 items that expressed the depressed mode. The second factor is comprised of two items related to and expressed the interpersonal relationship. The third factor that comprised four items expressed positive feelings. Also, the explanatory factor analysis resulted

in a two-factor solution by fixing the number of factors to extract to two. The 2F-1 with an eigenvalue of 6.388 comprises 15 items that expressed feelings, behavior, and thoughts related to depressed mode. And the 2F-2 with an eigenvalue of 1.935 comprised of 5 items that expressed positive feelings. The reliability of the CES-D scale was examined using Cronbach's alpha which was found to be high at 0.824. The Split-half coefficients were also found to be high at 0.720. (Table 3)

Table 3: Results from the factor analyses of the 3-factor and the 2-factor solution and reliability of CES-D

Item	Description	3-Factor solution			2-Factor solution	
		3F-1	3F-2	3F-3	2F-1	2F-2
		*6.388	*1.935	*1.351	*6.388	*1.935
6	Depressed	.833			.777	
18	Sad	.791			.791	
11	Troubled sleep	.763			.778	
14	Lonely	.652			.690	
3	Blues	.647			.683	
17	Crying	.443			.660	
9	Failure	.618			.500	
5	Troubles focusing	.611			.669	

Table 3 (Continued)

Item	Description	3-Factor solution			2-Factor solution	
		3F-1 *6.388	3F-2 *1.935	3F-3 *1.351	2F-1 *6.388	2F-2 *1.935
10	Fearful	.606			.580	
20	Not get going	.605			.580	
2	Poor appetite	.590			.568	
1	Bothered	.588			.612	
13	Talk less	.516			.497	
15	Unfriendly people		.783		.438	
19	Others dislike me		.765		.500	
16	Enjoy life			.763		.738
12	Happy			.743		.794
8	Hopeful			.691		.693
4	As good as others			.554		.435
Cronbach's alpha		.892	.651	.654	.896	.654
Total Scale Cronbach's Alpha						.874
Test-Retest (Spearman-Brown Correlation Coefficient)				.722		
Guttman split-half Coefficient				.720		
Extraction method				Principle Component Analysis		
Rotation method				Varimax		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy				.862		
Bartlett's Test of Sphericity – Chi-Square				3113.960		
Sig.				.000		
Cronbach's Alpha (Test-Retest)				.824		

*eigenvalue; 3F-1: Depressed affect & Somatic complaints factor; 3F-2: Interpersonal factor; 3F-3: Positive affect factor; 2F-1: Negative or depressed affect factor; 2F-2: Positive affect factor;

The factor analysis using Cronbach's Alpha resulted in the total item correlation being high enough, ranging from 0.430 to 0.725. But it also resulted to some low values of 0.077, 0.185, 0.290, 0.320, 0.364, and 0.363 for items 4 (as good as others), 7 (too much effort), 8 (hopeful), 12 (happy), 15 (unfriendly people), 16 (enjoy life), and 19 (other dislike me). However, the investigation of the internal consistencies of the three extracted factors' correlation resulted as follows: The correlation of four items related to the positive feelings factor was found to be high enough, ranging from 0.432 to 0.532 except for item 4 (as good as others) which was found 0.272; The correlation of the two items related to interpersonal factor was found to be high enough; The correlation of the 14 items related to negative feelings factor was found to be high enough ranging from 0.446 to 0.738 with a quite high Cronbach's alpha except for the item 7 (too much effort) which was found to be 0.272. (Table 4)

Table 4: Results from the reliability analysis using the Cronbach's Alpha

N	TS Alpha: .869		F1 Alpha: .892		F2 Alpha: .651		F3 Alpha: .654	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
1	.563		.567					
2	.474		.513					
3	.615		.611					
4	.077	.877					.272	.691
5	.572		.576					
6	.689		.738					
7	.185	.874	.294	.897				
8	.147	.875					.432	
9	.574		.577					
10	.520		.518					
11	.725		.721					
12	.290	.870					.517	
13	.430		.446					
14	.657		.634					
15	.320				.483			
16	.364						.532	
17	.588		.596					
18	.697		.736		.483			
19	.363							
20	.501		.518					

N: Item number; TS: Total Scale; F1: Factor 1; F2: Factor 2; F3: Factor 3

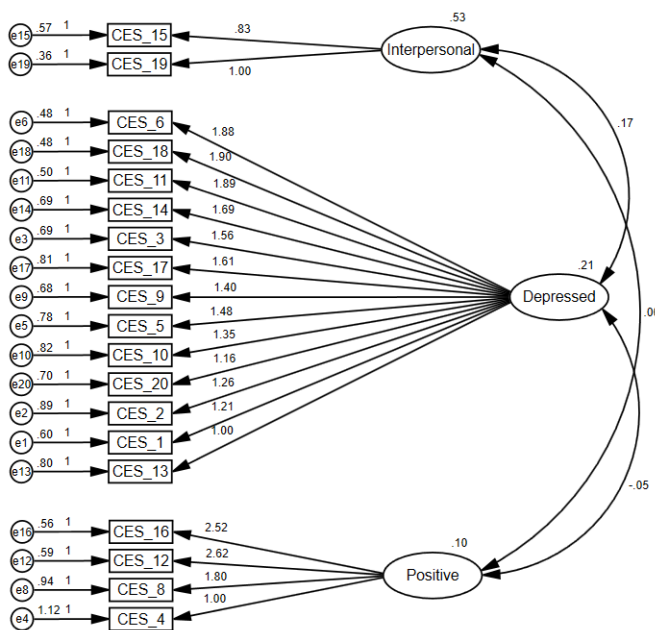
As shown in Table 4, item 7 of the CES-D scale did not result in the minimum needed Cronbach's alpha. In the validation process of the Dari version of the CES-D scale in the Herat province of Afghanistan, this item has been deleted. (Table 5)

Table 5: Center for Epidemiological Studies Depression Scale (CES-D) – Item(s) deleted

Item Description
07. I felt that everything I did was an effort.

The confirmatory model for the CES-D scale resulted in the following components: CMIN/df was found at 4.363; CFI was found at 0.833; GFI was found at 0.868; AGFI was found at 0.832; TLI was found at 0.808; SRMR was found 0.000; RMSEA was found 0.089. (Figure 1)

Figure 1: Three factor model for CES-D scale from confirmatory factor analysis



Discussion

While self-administered scales save time for data collectors and researchers, they are highly dependent on the reading ability and cooperation of the study participants. On the other hand, there are not enough reliable and valid studies conducted, nor do enough different translations of the scale exist. This is also applicable to the Zung Depression Rating Scale (21-23). We conducted this study to assess the reliability and validity of the Dari version of the CES-D

scale among the general population of Herat province of Afghanistan who was selected randomly. This study demonstrates that the Dari version of the CES-D scale's internal consistency and test-retest reliability is high. Confirmatory factor analysis revealed that the scale's normed fit index value was less than the optimal value. After one of the scale's items was removed (Item 7), Cronbach's alpha for the total items was found to be 0.874. The factor analysis showed three factors that explain the "Positive feelings factor", "Negative feelings factor," and "Interpersonal relationship factor." In a meta-analysis study of the factor structures of the CES-D, it was found that the scale generally has a 3-factor structure (37).

The literature contains studies on the validity and reliability of the scale in different languages and populations. The Greek study had a Cronbach's alpha of 0.95, and factor analysis showed that three factors explained 66% of the total variance of the CES-D: "positive affect," "irritability and interpersonal relations," and "depressed affect and somatic complaints." Therefore, the Greek study is reliable, valid, and suitable for clinical and research use (38). According to a study by Jiang et al., the CES-D is a trustworthy and valid three-factor instrument with a Cronbach Alpha value of 0.87 for assessing subthreshold depression in Chinese university students (39). The American validation study was conducted with 1,233 participants who were middle-aged American adults, and a Cronbach's alpha of .90 was obtained. In addition, the 4-factor model had the best model fit (40). Stahl et al. found the CES-D scale to be a reliable instrument in a validation study of 522 multiethnic diabetes patient groups in Singapore (41). It has been found that the Italian translated version of the scale was valid and reliable to be used (24). Also, Cronbach's alpha of the short form of the CES-D scale among Chinese adults was 0.78-0.79, meaning that the scale was valid and reliable (25). A Spanish trial checking the validity and reliability of the CES-D found Cronbach's alpha 0.9 and reported that the scale was valid and reliable (26-30).

Furthermore, another study conducted by Zhang et al. resulted in the Cronbach's Alpha 0.90 for the scale and found that the scale is valid and reliable to use in different ages among the urban population of China (31). In examining studies with various patient

populations, the CES-D screening instrument is reliable and valid for assessing depression in stroke patients, HCV patients, and cancer patients (42-44). In a validity study on 102 female and 102 male Canadian military peacekeepers, CES-D was usable for several different measures (45).

Item No. 7 of the scale was omitted from the structure due to its complexity and understandability problem among the population in Afghanistan. It was also omitted in some other studies by Yang et al. to achieve a valid structure and present best-fitted items for the version of the CES-D scale (32).

The CMIN/df for the confirmatory factor analysis was 4.363, which is lower than the result found by Radloff LS and McCauley et al.; however, the Chi-Square/df found in this study is permissible. In addition, the CFI was found to be 0.833 in this study which is also permissible and shows a good fit (8, 33).

This study resulted in the Dari version of the CES-D scale being reliable among Dari speakers in Herat province in Afghanistan. In addition, the Spearman-Brown correlation coefficient was found to be 0.722, which is an acceptable score to show the reliability of a scale.

Limitations

This survey was conducted among native Dari speakers living in Herat Province, Afghanistan. To apply the Dari version of the CES-D scale among Dari speakers from all over Afghanistan, more studies covering the country's general population would need to be conducted. The data in this study were collected in Herat province, the second-largest city in Afghanistan. The researchers are recommended to conduct the study in a larger universe by expanding it to different provinces.

Due to the high percentage of illiterate people, we had to read out the questions and record the participants' answers. Many illiterate people make it difficult to claim that residents of Herat province in Afghanistan can fully understand the items on the scale. However, the inherent limitations of using self-report scales should always be considered.

Conclusion

This study resulted that the Dari version of the CES-D scale is valid and reliable to use among the general population of Herat province of Afghanistan. The scale can be used to assess depression and its symptoms among the above-mentioned population with confidence.

Ethical approval and consent to participate

Ethical approval was obtained from the AMSA Medical Research Center Ethical Committee on 2nd May 2021. During the initial contact with the participants, a description of the study was presented to them. All participants in this study were required to sign a written consent form.

Availability of data and materials

On reasonable request, the corresponding author will provide the datasets used in and/or analyzed during the current work.

Competing Interest

The authors declare that they have no competing interests.

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The research received no external funding.

Author contribution

All the authors contributed to designing the conception of the study. AN contributed to data collection and data entry as well as data analysis and data interpretation. AN, NT and FH contributed to drafting the article. All the authors gave the final approval of the version to be published and agreed to be accountable for all aspects of the work.

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