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Research Paper: Psychometric Properties of the Persian Version Post-stroke Depression Scale: The Case of Neurology Outpatients in Rasht City, North of Iran

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Running Title Validity and Reliability of the Persian Version Post-Stroke Depression Scale

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ABSTRACT

Background: Psychiatrists use different scales to evaluate post-stroke depression; however, some concerns have raised about their low specificity.

Objectives: This study aimed to assess the validity and reliability of the Persian version of the Post-Stroke Depression Scale (PSDS) in Iran.

Materials & Methods: In this analytical cross-sectional study, 155 patients with stroke who were referred to neurology clinics in Rasht City, Iran, were interviewed by a psychiatric assistant (Gold Standard DSM-5 interview was used to separate the depressed from the non-depressed). The participants were then assessed by the PSDS and the Hospital Anxiety and Depression Scale (HADS). Moreover, a Receiver Operating Characteristic (ROC) curve with the standard Gold DSM-5 interview was used to determine the ability of the scales and to categorize depression. Eventually, the data were analyzed in SPSS V. 19.

Results: Data analysis indicates that the factor structure of HADS is one-dimensional, and exploratory and confirmatory analysis supported the fit for the one-factor model as the best fitting model. Bartlett test (The Chi-square=408.217, df=28, P<0.001) showed significant relationships between variables. The internal consistency of HADS was 0.638 for depression and 0.617 for anxiety. The test-retest reliability is equal to for 60 subjects were randomly re-evaluated within one to two weeks, reported that r=0.783, for anxiety and r=0.741 for depression. Finally, based on the ROC curve, the cut-off point of 9 was chosen, and the different severity of depression was distinguished by 9, 14, and 20.

Conclusion: The Persian version of PSDS possesses appropriate psychometric properties among the Iranian population.

Keywords: Depression, Outpatients, Receiver Operating Characteristic (ROC) curve, Stroke

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Highlights

●The findings of the present study are of practical importance and fulfill a clinical and research requirement. This need goes beyond the field of psychiatry and encompasses other areas of medicine as well.

Introduction

Post-stroke Depression (PSD) is a frequent complication that lowers rehabilitation outcomes and quality of life and poses a substantial risk for suicide [1, 2]. A pooled estimate indicates that depressive symptoms are present in one-third of all stroke survivors at any time during the follow-up period [3, 4].

Early detection of PSD is essential to optimize the recovery of stroke patients and to prevent unfortunate incidents. Depression in stroke patients is generally assessed by scales developed for the psychiatric population [5].

Stroke patients who survive often suffer from severe physical and mental disabilities that need special care; meanwhile, long-term rehabilitation causes emotional distress for the families and increases the costs of care and maintenance [6].

Neuropsychiatric disorders are associated with cerebrovascular diseases, including depression, anxiety, apathy, cognitive dysfunction, mania, psychosis, pathological affective display, catastrophic reactions, fatigue, and anosognosia [7]. Affecting about 30% of patients, depression is the most common post-stroke psychiatric disorder. Although PSD is known to deteriorate one's performance, reduce the quality of life, and increase mortality, its pathogenesis is still unclear [8]. Roughly, one-third of the survivors experience depression within six months after the stroke [9]. Although the exact cause of PSD is unknown, many studies propose that the location of brain lesions plays a crucial role in the incidence of depression [10].

Folstein et al. argued that depression was significantly more common in patients with stroke compared to patients with physical impairments due to orthopedic injuries. The first systematic longitudinal study on PSD demonstrated how severely PSD could disrupt daily activities, social and cognitive functions [7]. The first experimental research on PSD, conducted by Martin Roth [7], established the link between atherosclerosis and depression. Folstein et al. [7] also observed that depression is significantly prevalent in stroke patients.

Numerous clinical studies recommend antidepressant treatment for PSD. Besides treating depression, this method can improve brain executive functions after stroke [11].

Investigating depression in stroke patients by employing scales that were initially developed for psychiatric patients introduce bias in the results. Because conditions such as agitation, psychomotor retardation, insomnia, or significant loss of weight account for a large percentage of depression, while these disorders could be absent in stroke patients. Post-stroke Depression Scale (PSDS) is an instrument designed specifically for patients who have undergone stroke and usually endure physical and cognitive impairments [12].

Because patients with stroke subsequently encounter psychological disorders, and psychometric properties of PSDS have not been explored in Iran, we aimed to conduct this study to determine:

1. PSDS content validation,

2. PSDS structural validity through exploratory factor analysis,

3. PSDS internal consistency,

4. PSDS test-retest reliability,

5. The cut-off point through ROC curve with standard Gold DSM-5 interview.

Materials and Methods

This correlational descriptive-analytic study was performed at outpatient neurology clinics in the North of Iran in 2016-2017.

The post-stroke depression scale was translated in three steps:

1. In the first step, two translators translated this test independently. Both translators were fluent in the medical field, as well as Persian and English languages.

2. In the second step, two versions of the translation were presented to another expert to make his final judgment on the test.

3. In the third step, the test was initially administered to several patients, and if the sentence was incomprehensible to them, the translation of the text was revised.

The numerical value of the kappa coefficient of agreement in this study was 0.76.

The statistical population included all people living in Rasht City, Iran, with a history of stroke. Of them, 155 were selected through convenience sampling method. The research is correlational, and its objectives were to investigate the psychometric properties of the test, including validity and reliability by the statistical factor analysis method. At least 100 people are recommended [13].

The researchers chose the samples from the outpatients who had referred to the Rasht clinics and had been diagnosed with stroke based on imaging reports and the neurologist's opinion (recorded in the case). Those patients entered the study based on the following criteria: patients diagnosed with ischemic or hemorrhagic stroke through CT scan or MRI results in the last six months and who had an acceptable cognitive status (the mini-mental state examination score ≥18) and no aphasia agreed to enter the study. The exclusion criteria were a history of the serious psychiatric disorder before stroke (schizophrenia, bipolar disorder, major depression) that have been diagnosed by a psychiatric assistant before this research (it was done through a psychiatric interview), antidepressants use, severe medical conditions (diabetes, heart failure, ischemic heart disease, hypertension, and other severe medical problems that have caused unstable physical conditions in the patient), and substance dependency (opium, cannabis, methamphetamine, and alcohol).

Study instruments

Demographic questionnaire

After obtaining informed consent from patients, the demographic questionnaire (age, sex, marital status, occupational status, life status, education, and serious medical comorbidities such as a history of ischemic heart disease, heart failure, diabetes, and hypertension) was completed based on the patients' records and statements.

Mini-Mental State Examination (MMSE)

The Mini-mental State Examination (MMSE), devised by Folstein et al. (1975), is one of the most common tools for measuring overall cognitive function. The results of various studies have shown that the MMSE screening test, given its overall cut-off score of 18, can differentiate patients with dementia from healthy individuals with 95% sensitivity and 97% specificity. The cut-off point has also been calculated for males as 18 and for females as 17 [14, 15]. In the current study, the overall cut-off point was 18, and patients with a score below 18 were excluded.

The Hospital Anxiety And Depression Scale (HADS)

The Hospital Anxiety And Depression Scale (HADS) is a brief tool that appraises the level of anxiety and depression in physically disabled patients by excluding physical symptoms and concentrating on psychological ones. The authors recommend 11 as the cut-off score, beyond which the scores acquire a clinical significance. In Kaviani et al. study to validate this scale in the Iranian patients, the Cronbach α was below the depression scale (0.70), and the cut-off point was 6, indicating a good internal consistency [16]. In the present study, after the questionnaire was completed, and the total scores were calculated, the patient's depression condition was determined based on the cut-off point 11.

Post-stroke Depression Scale (PSDS)

The Post-stroke Depression Scale (PSDS) was designed by Yue et al. in China (2014) to screen depression in post-stroke patients and measured its reliability and validity [12]. PSDS is featured by 8 items that accurately assess the patient's feelings over the past seven days. Patients receive a maximum score of 24. In the original version, based on the defined cut-off point, a score below 6 shows the absence of depression, 6-15 signify mild depression, 15-17 denote moderate depression, and 17 or more indicate severe depression.

Results

Table 1 presents the frequency and percentage of demographic variables in the subjects. Of the total 155 study samples, 68 (43.9%) were female, and 87 (56.1%) were male. Moreover, 85 participants (54.8%) lived in urban, and 70 (45.2%) in rural areas.

To assess PSDS content validity, seven senior psychiatrists confirmed the Persian translation of the PSDS. The kappa coefficient and its statistical analysis is a numerical measure ranging from 0 to +1. Values closer to +1 indicate a direct and proportional agreement. Values closer to 0 indicate the existence of inverse agreement and disagreement. In this study, the kappa coefficient was 0.8, indicating a high agreement between the referees.

Table 1: Frequency distribution of demographic characteristics of individuals in the sample group

Variable		No.	%
Gender	Female	68	43.9
	Male	87	56.1
Residence	City	85	54.8
	Village	70	45.2
Age (y)	Less than 50	12	8
	50-60	59	38
	61-70	54	35
	71-80	21	14
	Over 80	9	5
Education	Illiterate	65	41.9
	Elementary school	50	32.3
	Secondary School	23	14.8
	High School Diploma	13	8.4
	Bachelor Degree and over	4	2.6
Marital status	Single	0	0
	Married	129	83.2
	Divorced	1	0.6
	Widow	25	16.1
Occupation	Unemployed	78	50.3
	Laborer	11	7.1
	Employee	2	1.6
	Retired	30	19.4
	Self-employed	34	21.9
Life status	With the family	153	98.7
	Nursing home	2	1.3
Personal history of psychiatric disorder	Has it	6	3.9
	Does not have	149	96.1
Family history of psychiatric disorder	Has it	8	5.2
	Does not have	147	94.8
History of a medical disorder	Diabetes	13	8.4
	Heart failure	6	3.9
	Ischemic heart disease	9	5.8
	Blood pressure	83	53.5
	All items	17	.11
	Does not have	27	17.4

PSDS content validation:

Structural validity through exploratory factor analysis

It includes finding out the dispersion of scores, as well as the mean and standard deviation in each component of the PSDS. The structural validity of the PSDS questionnaire for patients was assessed using exploratory factor analysis. To investigate the reliability of the data for exploratory factor analysis, the Kaiser-Mayer-Olkin measure of sampling adequacy was used to measure the adequacy of sampling in factor analysis. In the present study, the KMO value was 0.889, indicating the suitability of the selected sample. The value of KMO always fluctuates between 0 and 1.

If the KMO is less than 0.5, the data will not be suitable for factor analysis. If the value is between 0.5 and 0.69, the data are moderately fitted, and if the value is greater than 0.7, the correlations between the data would be appropriate for factor analysis (Hair, 2010). Bartlett's method is another way of identifying data suitability. Bartlett's test of sphericity examines the hypothesis that the observed correlation matrix belongs to a community of dependent variables. For a factor model to be useful and meaningful, variables need to be correlated. In this study, Bartlett test (Chi-square=408.217, df=28, P<0.001) showed significant relationships between variables.

Table 2 presents the mean and standard deviation of each question.

Table 3 presents the extracted components. Based on this Table, PSDS has 1 factor. The first factor explains 48.765% of the total variance.

The correlation coefficient between the HADS questionnaire and PSDS questionnaire was used to determine concurrent criterion validity. Pearson's correlation coefficient was between 0.150 and 0.539, indicating a significant relationship between the two questionnaires.

Table 2. Distribution of the dispersion of PSDS questions, Mean±SD

Questions	Skewness	Kurtosis	Mean±SD
Decreased speech (don't want to speak)	0.141	-1.292	1.33±1.088
Easy fatigability	0.153	-1.070	1.46±1.014
Easy to cry up too early	0.029	-1.331	1.43±1.105
Insomnia, waking	0.045	-0.859	1.15±0.999
Feeling of decreased capability	0.024	-1.299	1.5±1.065
Suicidal ideation	0.141	-1.746	0.21±0.546
Feeling of difficult to recover	0.784	-1.074	1.16±1.003
More irritable than usual	0.452	-0.0768	1.16±0.95

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Table 3. Common coefficients of each PSDS question

Components	Special Value			Rotation of the Squares of Roots		
	Total	Percentage of Variance	Cumulative Percentage	Total	Percentage of Variance	Cumulative Percentage
1	3.901	48.765	48.765	3.901	63.828	63.828
2	0.889	11.233	59.998			
3	0.805	10.06	70.058			
4	0.581	7.266	77.324			
5	0.546	6.827	84.152			
6	0.489	6.111	90.262			
7	0.402	5.021	95.283			
8	0.377	4.717	100.000			

Extraction Method: Principal Component Analysis.

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Table 4. The correlation coefficient between HADS questionnaire scores and PSDS

Variable		PSDS
HADS	Anxiety	0.638**
	Depression	0.617**

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Internal consistency of PSDS

Table 4 presents the result of internal consistency. Using the correlation coefficient, the values obtained were 0.638 for depression and 0.617 for anxiety. This suggests that the scale can be considered reliable with the samples.

Test-retest reliability of PSDS

Test-retest reliability was conducted to confirm the stability over time for each measuring instrument. The test was performed twice; in the case of a questionnaire, this would mean giving a group of participants the same questionnaire on two different occasions. If the correlation between separate administrations of the test was high (~0.7 or higher), then it had good test-retest reliability. Test-retest reliability in this study was performed for 60 subjects and was randomly re-evaluated within one to two weeks. The values were reported as r=0.783 for anxiety and r=0.741 for depression. In general, these results represent a moderate level of reliability (P<0.01).

PSDS cut-off point through ROC curve with standard Gold DSM-5 interview

Descriptive statistics indices such as percentage, frequency, mean, and SD were used to describe the data. ROC curve method was also used to determine the sensitivity (correct diagnosis ratio) and specificity (correct diagnosis ratio of healthy individuals from the patient group) and to obtain the best cut-off point of PSDS in agreement with clinical interview findings. The ROC curve is a graph obtained by dividing the sensitivity ratio (true positive rate) by the false positive rate. In this case, the further the curve to the left-hand corner of the graph, the more accurate it is because there is a real positive value of 'one' and a false positive of 'zero' (Figure 1). The prevalence of depression based on the Persian version of the standardized mean and standard deviation in the four classes of non-depressed (<9), mild depression [9-14], moderate depression [15-20], and severe depression (>20). Results showed that 48% had no depression, 29% had mild depression, 21% had mild depression, and 2% had severe depression.

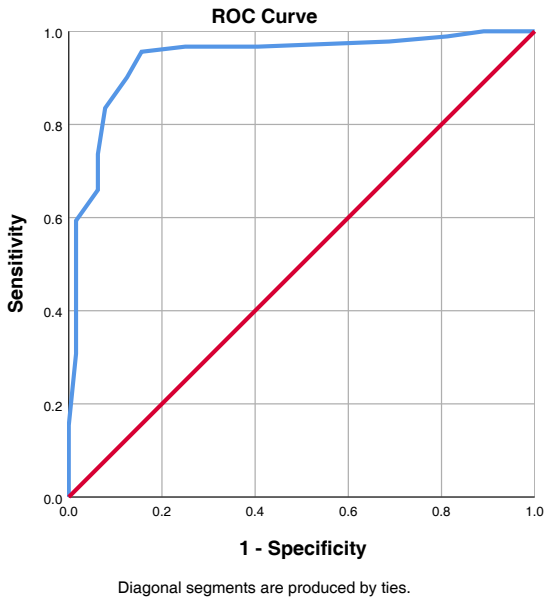

Figure 1. ROC curve

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The questionnaire has 8 items, and patients receive a maximum score of 24. A score of less than 9 non-depressed, a score of 9-14 with mild depression, a score of 15-20 with moderate depression, and a score of 21 and above are considered severe depression.

Discussion

The purpose of this study was to examine the reliability and validity of PSDS (designed and validated in China, 2014) in Rasht City, Iran. To the best of the authors' knowledge, this is the first study on this issue conducted in Iran. In terms of cognitive status, 32 subjects were normal, and 123 had a mild cognitive problem. According to the inclusion criteria, none of the samples had a moderate or severe cognitive problem. After calculation of the cut-off point of the PSDS, it was found that 48% of the subjects had no depression, 29% had mild depression, 21% had moderate depression, and 2% had severe depression.

A similar study used the BDI (Beck Depression Inventory) and CES-D scales (Center for Epidemiologic Studies Depression Scale) to examine 30 elderly patients who had referred to an outpatient clinic. Reportedly, the prevalence of post-stroke depression (within at most three months) was 68% [17]. This figure is more than the incidence (52%) of depression in the current research. It could be argued that psychosocial differences in residence and the sensitivity, as well as specificity of the scales used, can be due to the time elapsed from the stroke, the adaptation one makes to the stroke, and the difference in sample size.

Also, comparing the results of this study with the research carried out in China shows that the prevalence of depression after stroke is higher in Iran (52% vs. 34%). Considering that in both studies, the sample size and the time elapsed from the stroke and the scale (PSDS) used were the same, this difference could be explained by recourse to psychosocial factors in Iranian society. Also, in line with the present study, Kaviani et al. observed that the prevalence of depression in Iran was higher [17]. To determine the new cut-off point, the ROC analysis was used, and the resulting point was 9, which exceeds that reported by Yingying Yue et al. [12] (the clinical cut-off point in the Chinese version of this scale is 6). This finding can also be owing to the greater incidence of depression in Iran. Based on the results, researchers may regard 9 as a criterion to differentiate people who develop depression after the stroke from those who do not in future studies in Iran. It is worth noting that these points have only a conventional aspect, and it is suggested that future research focus on the validity of these cut-off points.

The findings demonstrated that HADS had good sensitivity and specificity in identifying PSD [18]. The study of Kaviani et al. has also substantiated the good validity of this test in Iranian society [16]. In terms of the number of questions, the depression subscale of this test (7 questions) is in good proportion with PSDS (8 questions). Meanwhile, both scales are self-assessing tools and superior over HDRS, which was used by Yingying Yue et al. [12]. This fact justifies the role of this test as an external measure in the present study. Consequently, besides clinical evaluations, which are a subjective operation, the authors of the current study were able to deploy the scores of this test as an objective evaluation to determine the concurrent criterion validity of the test. After the data were analyzed, the Pearson correlation coefficient was found 0.66, indicating a significant relationship between the two questionnaires (P=0.01). Therefore, PSDS can be effectively used to measure depression in this type of patients.

In Yingying Yue et al. study, the Hamilton depression scale was used to appraise the validity of PSDS, and the correlation coefficient was 82.22 [12], implying its high validity and consistency with the present research. The slight difference in the correlation coefficients of the present study and that performed in China suggests that the correlation coefficient of the Chinese version of the PSDS as measured by Hamilton scale is greater than the correlation coefficient of the Persian version of PSDS as calculated by HADS. This variation can be due to the differences in the sensitivity and specificity of the scales, the statistical method adopted in every case, the sample size, the scales' language, as well as psychosocial factors in Chinese and Iranian patients. Meanwhile, this variation is not statistically significant.

Analyzing the average score obtained from each component of PSDS showed that the mean scores ranged from 0.2 to 1.5. Furthermore, analyzing the standard deviation, which is the most stable index of dispersion, revealed that the highest dispersions in the questionnaire used in this study belong to "easy to cry", "decreased speech (don't want to speak)", and "feeling of decreased capability". The resulting standard deviation for these three components was respectively 0.105, 1.088, and 1.065. The patients indicated a lower dispersion (0.546) with respect to the component measuring suicidal thoughts.

To assess the construct validity, Yingying Yue et al. used the Spearman rank correlation coefficient, which showed the relationship between each single item and the total score. The high correlation in the ranges of -0.5 and 1 to 0.5 confirms the good stability of this scale, demonstrating that PSDS is a suitable measure for evaluating

depression in these patients. Also, differential reliability showed a statistically significant difference between depressed and non-depressed individuals [12].

The findings of this study established that all items are consistent with factor analysis. In this study, the common extraction coefficients were 0.6 for "early fatigue"; 0.5 for "easy to cry", "decreased speech (don't want to speak)", "feeling of decreased capability", and "feeling of difficult to recover"; 0.49 for "more irritable than usual"; 0.3 for "insomnia"; and 0.2 for "suicidal ideation".

As mentioned, in this research, a test-retest was carried out on a random sample (40%) to determine the reliability of PSDS. Comparing the correlation coefficients between the scores obtained from the test and retest indicated that this scale has a good reliability. Another method used for assessing reliability was to determine the Cronbach alpha. The reliability thus obtained was 0.84, which is acceptable in psychological tests.

Sirvioglu et al. [19] used the geriatric depression scale to evaluate post-stroke patients. Accordingly, 49 subjects were regarded non-depressed, and 36 subjects were considered to have developed the minor depressive disorder. The Cronbach α coefficient was 0.89 in data analysis, and it was observed that this scale could be employed to measure depression in post-stroke patients.

In a study in 2012, Kang et al. compared the screening properties of four assessment scales for post-stroke depression. In this study, discriminating abilities of all scales for major and all PSD were good (area under ROC values 0.88-0.93 and 0.88-0.92 at two weeks; and 0.93-0.96 and 0.89-0.91 at one year, respectively) [20].

In another study, Li J et al. reported the factor structure and psychometric properties of a new measure of early symptoms of PSD in 2014. The EFA extracted a theoretically consistent, clinically interpretable, 29-item, 6-factor model for early symptoms of PSD. A first-order CFA retained the 6-factors but deleted three underperforming items [21]. In our study, the confirmatory factor analysis by using structural equation modeling showed that all indicators are of good value and confirm the structure of one factor of the questionnaire.

Conclusion

The post-stroke depression scale presents an appropriate validity and reliability in measuring depression among Iranian patients who have undergone a stroke. The findings of the present study are of practical importance and fulfill a clinical and research requirement. This need goes beyond the field of psychiatry and encompasses other areas of medicine as well. Regarding the limitations of this research, it should be mentioned that this scale was examined only on outpatients who had referred to neurological clinics, and its results might not be generalized to all stroke patients. Besides, the exclusion of patients with severe cognitive problems, medical comorbidities, illiteracy, and substance abuse is another limitation of this study. Therefore, it is suggested that future studies use a wider scale and larger sample size.

Ethical Considerations

Compliance with ethical guidelines

The study protocol was approved by the Ethics Committee of Guilan University of Medical Sciences (No. IR.GUMS.REC.1395.339). All the study procedures were in compliance with the ethical guidelines of the Declaration of Helsinki, 2013.

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Authors contributions

Conceptualization, resources, supervision: Somayeh Shokrgozar and Robabeh Soleimani; Methodology: Mahnaz Fallahi, Somayeh Shokrgozar; Investigation: Maryam Alizadehnia, Sareh Maadi Raad; Writing – original draft: Aida Yahyazadeh, Somayeh Shokrgozar, Robabeh Soleimani; Writing – review & editing: Aida Yahyazadeh, Somayeh Shokrgozar, Robabeh Soleimani; Funding acquisition: Mahnaz Fallahi, Somayeh Shokrgozar.

Conflict of interest

The authors declared no conflict of interest.

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