Research Paper

Investigation of the Sensitivity and Specificity of the Persian Version of the New Multidimensional Depression Scale in Diagnosing Depressive Disorder

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ABSTRACT

Objectives: The accuracy of diagnosis in mental disorders, such as depression is the basis of correct treatment. The present study aimed to investigate the sensitivity and specificity of the new multidimensional depression scale in diagnosing depressive disorder.

Methods: Two groups of participants were assessed by the new multidimensional depression scale (NMDS) and structured clinical interview for axis i disorders (SCID-I). The experimental group included 55 outpatientswith major depressive disorder selected via the convenience sampling method. The control group included 95 university students recruited via a multi-stage cluster sampling method. Data were analyzed by receiver operating characteristics (ROC) analysis to achieve the cut-off score.

Results: Based on the results of the ROC analysis, the cutoff score of 106 was the intersection of the two sensitivity and specificity indices, where these two indices have an optimal relationship. This score simultaneously provided the lowest number of false positives and false negatives compared to other scores.

Discussion: It can be acknowledged that the present study supports the clinical efficacy of the new multidimensional depression scale as a screening instrument for diagnosing depressive disorder.

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Highlights

- The new multidimensional depression scale (NMDS) is the first tool to assess all four axes of depression symptoms.
- The cutoff score of 106 was the intersection of the two sensitivity and specificity indices in the Persian version of NMDS
- The efficacy of the NMDS as a screening instrument in diagnosing depressive disorder.

Plain Language Summary

Depression as one of the most prevalent psychiatric disorders makes people to be referred to psychiatric clinics. Precise and accurate evaluation of depression signs and symptoms is the key step to diagnose and design appropriate and effective therapeutic interventions. The New Multidimensional Depression Scale (NMDS) which was adapted in Persian, probably was the first tool to assess all axes of depression symptoms. One of the first and the most important feature that needed to be investigated about the Persian version of the new multidimensional depression scale (P-NMDS) is its efficacy in differentiating patients with depression from non-depressed patients. To reach this aim, this study was designed to define a cutoff score of the P-NMDS.

1. Introduction

Depression as one of the most prevalent psychiatric disorders makes people to be referred to psychiatric clinics. Depression includes up to 75% of inpatients in psychiatric wards [1]. Precise and accurate evaluation of depression signs and symptoms is the key step to diagnose and design appropriate and effective therapeutic interventions [2, 3]. To this point, clinical observations and empirical studies categorized depression semiotics around four symptomatic axes, including emotional, cognitive, physical, and interpersonal symptoms [4]. However, looking at current studies on depression symptoms show that only three categories (emotional, cognitive, and physical symptoms) have been a major concern and interpersonal symptoms have been underestimated [5]. The diagnostic and statistical manual of mental disorders , 5th edition (DSM-5) also eliminated most of the interpersonal defects from the diagnostic criteria of depression [6].

The lack of research on interpersonal symptoms of people with depression may be a result of structures of the most common tools structures designed to assess depression symptoms. Cheung and Power investigated 15 measures designed to evaluate depression symptoms and found out that only 3% of items in these measures were assigned to interpersonal symptoms [7]. Even, Beck depression inventory-II (BDI- II) as the main self-report scale [8] does not evaluate any depression interpersonal symptoms. It seems one of the solutions to fill the gap in the literature related to interpersonal symptoms of people with depression is to develop valid and reliable tools which have optimal sensitivity and specificity to diagnose and intervene accurately. The new multidimensional depression scale (NMDS) developed by Cheung and Power was probably the first tool to assess all four axes of depression symptoms [7].

The NMDS has been adapted to the Persian. Investigating psychometric features of the Persian NMDS showed that it had satisfactory convergent and divergent validity and high validity among people with depression (Cronbach's alpha coefficients between 0.70-0.83), and healthy students (Cronbach's alpha coefficients between 0.89-0.93) [9, 10]. However, this tool needs further psychometric evaluation before it becomes a daily clinical tool to evaluate depressive symptoms. The crucial feature that needs to be described is the accuracy of the Persian version of the new multidimensional depression scale (P-NMDS) in the report of the presence or absence of depression compared to the diagnosis of a psychiatrist. Such features should be evaluated in the terms of sensitivity, specificity, and cut-off score.

The trade-off between specificity[1] and sensitivity in the ROC curve is considered an exchange between true positive rate and false positive rate[2]. To achieve this aim, this study was implemented to calculate the diagnostic accuracy of the Persian NMDS by calculating sensitivity, specificity, and the ROC curve analysis.

1. Specificity (true negative rate) refers to the percentage of people who do not have the disease (compared to the "gold standard").
2. Sensitivity (true positive rate) refers to the percentage of people who have the disease (compared to the "gold standard").

2. Materials and Methods

Participants

The experimental group included 55 patients with major depressive disorder in a stable phase recruited by the convenience sampling method. An experienced psychologist conducted a structured clinical interview one by one in a quiet and proper room in the department of psychiatry of Taleghani Hospital, Tehran City, Iran, to select participants according to the inclusion and exclusion criteria of the current study. Participants should be between 18 and 40 years of age and have major depressive disorder diagnosed by a psychiatrist according to the DSM-5 criteria. People with other types of mood disorders, such as bipolar disorder, any intense psychotic symptoms, and depression caused by drug abuse or a general medical illness were excluded from the study.

Study sample size

The sample size was calculated via Equation 1 [11]:

1. $nSe= \frac{Z^2_{a/2}\widehat{Se}(1-\widehat{Se})}{d^2\times Prev}$

The research team considered α=0.05, (Zα/2: 1.96). The values of sensitivity and prevalence of depression ('Se', and 'Prev' sequentially) were predetermined to be 95% and 73% [12]. The maximum marginal error or 'd' (the precision of estimate which is usually a predetermined value by the clinical judgment of the research team) was inserted at 0.1 with a 95% confidence level.

The number of controls was twice of the participants with depression (n=95) matched by age. They were selected from students at three major universities in Tehran using the multi-stage using cluster sampling method (this method of sampling allows researchers to apply random sampling after determining the groups. With this approach, the researcher reaches the desired size or type of group). According to the participants' self-report, the controls did not have any history of depression or other types of psychiatric disorders and a history of using psychiatric medicine and drug abuse in the past and present. All participants read the information sheet and signed the consent form to enter the study.

Study tools

Structured Clinical Interview for Axis I Disorders (SCID): Two different versions of the SCID are designed by First et al. for clinical and research purposes [13, 14]. The research version of the SCID abbreviated, as SCID-RV is more comprehensive and longer than the clinical version, and covers all psychiatric disorders, their subtypes, and criteria related to the intensity and the cause of the disorder. However, the present study implemented the clinical version of SCID, which was able to evaluate major psychiatric disorders because its validity and reliability have been reported for Iranian people. Sharifi et al. showed a moderate to high level of concordance (Kappa higher than 60%) for general and specific diagnoses. Moreover, the overall agreement obtained was satisfactory (the total Kappa of the current diagnoses was 52% and the total lifetime diagnoses were 55%), indicating the proper validity and desirable applicability of this interview in the Iranian community [14].

The Persian version of the new multidimensional depression scale (P-NMDS): Darharaj and colleagues developed the new multidimensional depression scale. This is a 48-factor scale designed to assess 4 areas of depression, including cognitive, emotional, physical, and interpersonal symptoms (12 questions for each area, a total of 48 questions) [9, 10]. Studies have indicated good internal consistency for all subscales; Cronbach's alpha factor ranged from 0.70 for the emotional subscale to 0.83 for the interpersonal subscale [9]. Implementing the factor analysis in a non-clinical sample approved the four-factor structure of the NMDS. In this study, the internal consistency of the NMDS was satisfactory and the Cronbach's alpha had a range from 0.89 for the somatic subscale to 0.93 for the cognitive subscale [10]. Its items are scored based on a five-point Likert scale (0=never to 4=always). Therefore, the total score for each subscale has range from 0 to 48. The P-NMDS after being implemented on a group of Iranian patients with major depressive disorder and non-depressed individuals showed a satisfactory convergent validity (i.e., the correlation of the scale's total score with the total score of the BDI-II questionnaire) and the re-test reliability in the sample of patients with depression (with validity reliability of 0.52 and the re-test reliability of 0.76) and non-depressed subjects (with a reliability coefficient of 0.68 and a re-test reliability of 0.78). Thus, the P-NMDS can evaluate the presence and intensity of depression symptoms in Iranian people well [9].

Study procedure

The present study was designed to evaluate some psychometric features of the P-NMDS. To run the study, the examiner who was a Ph.D. student in psychology was introduced to the department of psychiatry of Taleghani Hospital. Each patient who visited the clinic received the research information sheet, and the clients who signed the consent form were interviewed according to the clinical version of SCID.

The clinical version of SCID was implemented in one session for 45 to 90 minutes. Participants of both groups (experimental and control) filled out the P-NMDS individually according to the instructions on the scale. The examiner was present during the whole session to help in case of any ambiguity or difficulty with the items' meanings.

Study statistical analysis

In SPSS 21, in addition to descriptive analysis of data, analytical tests including Shapiro-Wilk and independent t test were used to find possible data distribution and differences. To calculate the diagnostic accuracy of the P-NMDS, the receiver operating characteristic (ROC) curve was implemented [15].

3. Results

Table 1 presents the demographic characteristics of the participants, including gender distribution, age, and marital status. The Mean±SD of total depression scores in the group of patients with major depressive disorder was 137.56±12.01 and 47.42±29.98 in the control group. To summarize, highlight, and emphasize the differences between the two groups, the compare means procedure was applied. Based on the results of the independent t test, the difference in the total score of depression between the two groups was significant (P<0.001; t (148)=-21.30), so that the average depression score in the clinical group was significantly higher than the control group (Table 1).

Table 1. Demographic data of participants

Variables		Mean±SD/No. (%)	
		Major Depressive Disorder	Control
Sex	Male	18 (32.7)	18 (19.0)
	Female	37 (67.3)	77 (81.0)
Age (y),		24.21±3.42	23.47±3.55
Marital status	Married	18 (32.7)	13 (13.6)
	Single	37 (67.3)	82 (86.4)

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Table 2. Psychometric indices of the Persian new multidimensional depression scale (P-NMDS)

Raw Score	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value	Youden's Index
83	100	87.37	82.1	100	87.37
85	100	88.42	83.3	100	88.42
86	100	89.47	84.6	100	89.47
95	100	90.53	85.9	100	90.53
96	100	91.58	87.3	100	91.58
97	100	92.63	88.7	100	92.63
99	100	93.68	90.2	100	93.68
102	100	94.74	91.7	100	94.74
106	100	95.79	93.2	100	95.79
111	96.36	95.79	93	97.8	92.15
113	96.36	97.89	96.4	97.9	94.25

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Table 3. Psychometric Indices of the new multidimensional depression scale (NMDS)

Indice	Value
Area under the ROC curve	0.99
Standard error	0.002
95% confidence interval	0.97-1
Z	246.53
P	0.0001

ROC: receiver operating characteristics.

The ability of the P-NMDS to categorize people in clinical and control groups was evaluated via ROC analysis. Table 2 lists the new psychometric features of this scale according to the ROC analysis.

Table 2 lists the best score calculated based on Youden Index. This score showed high sensitivity and specificity, and the best balance between these two psychometric features was 106. Therefore, 106 was considered the best cut-off score of the P-NMDS with a sensitivity of 100 (true positive), specificity of 95.79 (true negative), positive prediction of 93.2 and negative prediction of 100.

Analysis of the ROC curve revealed a critical value of 106 as the best cut-off score to assess the perceived P-NMDS. As seen in Table 3, the area beneath the curve was 99%, which is significantly different from 50% of the random estimations suggesting the high accuracy of the scale according to Strainer and Cairney [16].

4. Discussion

P-NMDS is one of the most comprehensive scales used to assess the symptoms of depression. It has already been validated in 2016 by Darharaj et al. [9]. The sample size of the present study (n=55) can be considered proper for investigating the diagnostic accuracy of the P-NMDS. Our results indicated that the P-NMDS was able to discriminate patients from controls with a sensitivity of 100 and a specificity of 95.79. To find out the best cut-off score to categorize clients into two groups with depression and without depression in the P-NMDS, the ROC curve analysis was applied and the score of 106 had the highest sensitivity and specificity.

Cheung and Power developed the original version of NMDS and evaluated the reliability, validity, and confirmatory factor analysis. However, the diagnostic accuracy of the NMDS was not their aim [17]. When Darharaj and colleagues adapted the NMDS for the Persian community, the diagnostic accuracy of the P-NMDS was not in their perspective, too [9, 10]. Therefore, the results of the present study should be compared with the results of other studies administered to assess the diagnostic accuracy of other questionnaires on depression. Iverson & Remick reported a cut-off score of 9, a sensitivity of 0.92, and a specificity of 0.99 for the British Colombia major depression inventory, the test did not identify about 8% of the cases with depression and had 1.5% false positives [18]. Krishnamoorthy and colleagues in a systematic and meta-analysis article reviewed the diagnostic accuracy of all versions of the geriatric depression scale. Among 53 papers with 17,018 participants, the sensitivity and specificity of all forms of the geriatric depression scale were 86-74% and 75-71% in order [19]. Basker and colleagues evaluated the psychometric features of the Beck depression inventory to be used in the diagnosis of depression in adolescence. They reported a cut-off score ≥22, sensitivity of 27.3%, and specificity of 90% for Beck depression inventory in adolescence [20].

5. Conclusion

Since the NMDS and the adapted version have not been investigated in many different studies, it is difficult to reach a firm conclusion. However, regarding the figures obtained in the present study and with a rough comparison with results reported for other types of tools to diagnose depression, the professional can use this scale to diagnose the depression. The present study confirmed that this tool is highly sensitive and specific to diagnose and differentiate depression in nonclinical populations, which means the P-NMDS can be considered a proper tool in the diagnosis of depression especially when the experts want to take the interpersonal symptoms of depression into their accounts to diagnose this disorder.

Limitation

It is important to note that the widespread use of PNMDS requires clinical and non-clinical settings

and further evaluation in different cultures. Since the sample of this study was limited to students and outpatients, generalizing the results to other people without a university education or hospitalization should be done with caution. Future studies may be conducted in larger samples and different populations.

Ethical Considerations

Compliance with ethical guidelines

The Ethics Committee of the Semnan University of Medical Sciences approved the project (IR.SEMUMS.REC.1395.68).

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Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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