Original Article

Comparison of psychiatric screening Instruments: GHQ-28, BSI and MMPI

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Abstract

Background: Clinical interview comprises a method for of psychiatric disorders diagnosis. Given the cost, time, and expertise required for clinical assessment; alternative tools to accurately substitute clinical interviews are having high value. We conduct this study to compare the screening accuracy of GHQ-28, BSI, and MMPI. **Materials and Methods:** Considering a diagnostic value, this study was conducted on 983 students and 3 psychiatric screening tools; GHQ-28, BSI, and MMPI were completed by students. Among the whole participants, 237 students were interviewed by the clinical psychiatrists on the basis of DSM-IV-IR Criteria. Based on ANOVO and Chi-square, results compare was made. Kappa correlation -coefficient was calculated in a pairwise manner; eventually the diagnostic accuracy of each tool was determined by the means of ROC analysis. **Results:** The diversity of psychiatric disorders by GHQ-28, was about 39.1, on the basis of BST was 44.8% and 44% for MMPI. The sensitivity and specificity of GHQ-28 was 85.9% and 87.8% considering 21.5 as the cut-off point; respectively. Considering 41/5 as the cut-off point for the BSI test, sensitivity and specificity were 81.2% and 90.8%; respectively, and 88.2% and 91.4% for the MMPI test with the cut-off point of 63.5 compared to clinical interview, the MMPI test was associated with the greatest accurate staging, ranging about 90.3%. **Conclusions:** The results of this study according to clinical assessment reveal that GHQ-28, BSI, and MMPI psychiatric tools have high sensitivity and specificity and MMPI possessed the greatest efficiency compared to other evaluated tools.

Keywords: BSI, clinical interview, GHQ, MMPI, screening, sensitivity, specificity

Background

Mental health comprises indispensable aspects of health and plays a major role in the efficiency of the society.[1,2] A recent report of WHO demonstrates that as many as 450 million people are affected by psychiatric disorders.[3]

Results from a wide variety of investigations reveals the prevalence of psychiatric disorders in Iran, ranging from 14.9% to 26.9% during 1969–2001.[4,5] And 34.8%–49.8% among the universities students.[6,7] Furthermore, regarding the studies conducted in 1999, 2008, and 2011, the prevalence of psychiatric disorders was estimated to be 21%, 17.1%, and 23.6%; respectively. Another study with the same study group and tools was carried out in Tehran in 1999, 2008, and 2011. In this study, the prevalence of psychiatric disorders was 21.5%, 34.2%, and 39.6%; respectively.[8] In order to estimate the prevalence of psychiatric disorders, the investigators turned to apply methods other than hospital reports, since World War II.[9]

Assuming the time and cost required for clinical interview performed by psychiatrists and psychologists, disorders may mask as a result of inappropriate referral to a physician.[10] Early and careful detection of psychiatric disorders may avoid the development of its serious complications. Appropriate determination of psychiatric disorders is not only beneficial in the treatment of patients, but also advantageous in avoiding unexpected expenses due to treatment and complications.[11]

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Considering the fact that detection of independent tools to evaluate the mental health may play an essential role in the society well-being, a wide variety of tools have been administered to evaluate psychiatric disorders and screening of the high-risk groups of the society and many studies have been conducted worldwide for the screening of psychiatric disorders; among which the diagnostic accuracy varies widely.[7,12] Up to now, Only a few studies have been aimed to compare the result of these screening tools.

Regarding the high prevalence of psychiatric disorders in the society and the importance of early diagnosis in reducing complications and lack of abundance-related studies, we conduct this study to compare the diagnostic value of GHQ-28, MMPI, and BSI for the diagnosis of psychiatric disorders.

Materials and Methods

Study type

This study carries diagnostic value, in which mental health of students was evaluated by the means of GHQ-28, MMPI, and BSI questionnaire. The results were further compared with the clinical interview.

Study group

This research was conducted among 983 students of Kashan university of medical sciences between 2011 and 2012. Furthermore, 237 students underwent clinical interviews based on DSM-IV-TR criteria.

Sampling method

Samples were taken availably style; that is, from each educational degree one class was selected and all the students of the mentioned class entered the study.

Instruments

GHQ-28 (General Health Questionnaire-28)

This questionnaire was created by Goldberg in 1972 to detect psychiatric disorders in healthcare centers and many various settings.[13] This 28-item questionnaire was firmed by Goldberg and Hiller in 1979 which consists of 4 scales: Somatic symptoms, anxiety and insomnia, social dysfunction and severe depression.[14,15] This tool involves 28 questions and 4 subscales; each of which contains 7 questions. Scoring of this questionnaire is as follows: 0, 1, 2, and 3 score is given to A-D options; respectively. As a result, the score for each subscale ranges from 0 to 21 and 0 to 84 in the entire questionnaire. The score of 22 has been considered as the cut-off point of this study. Scores higher than 22 are indicative of psychiatric disorders, whereas scores below 22 are considered to be normal. Palahang and Yaghoubi estimated the reliability of this study 91% and 88%, respectively. They also calculated Cronbach's alpha values about 84% for somatic symptoms, 79% for social function, 81% for depression, and 91% for mental health status.[16,17]

BSI questionnaire (Brief Symptom Inventory)

This questionnaire is the summarized form of symptom checklist-90-R (SCL-90-R), which was first represented by Derogatis *et al.* (in 1973). It was further revised with psychometric interpretation and analysis. BSI consists of 53 questions, each of which is scored from 0 to 3. Derogates, Rickles, and Rock considered the intrinsic reliability of BSI as appropriate. The score of 41 is the cut-off point of this questionnaire, meaning that scores greater than 41 are considered to be sick.[18] This questionnaire was first translated and validated by Mirzaee in 1979.[19]

MMPI Questionnaire (Multiphasic Personality Inventory Minnesota)

This questionnaire was first published in 1943 and created by Start Hathaway and Charley McKinley. This questionnaire involves 71 questions and 0/91 is its appropriate reliability coefficient.[19] Besides, subscales exist in this questionnaire and score of 63 has been considered as the cut-off point.

Given the major disadvantages of the original 565-item MMPI questionnaire, for instance being time consuming and boring; the Iranian version of MMPI was developed on the basis of Iranian cultures. This new version was shorter and lesser time required answering. Considering the Iraninan culture, Okhovvat *et al.* extracted 71 questions from the original MMPI questionnaire and converted them into a short questionnaire. Furthermore, they initiated a series of investigations.[18,20,21]

Data collection

After selection of each class, the GHQ-28 questionnaires were distributed among the students. The participants were asked to write their personal details down. After 15 minutes, these questionnaires were collected. The BSI questionnaire was distributed in a same manner 1 week later. MMPI questionnaire was distributed 1 week later in a same manner too, except that the participants had 20 minutes to complete the forms. After the completion of these questionnaires, according to the psychiatric picture of each participant and the attitude of clinical psychiatrist, 237 students were selected on the basis of minimum and maximum scores. After that these students were asked to refer for clinical interview.

Data analysis

In the beginning, demographic characteristics of the study group were described. The participant's scores were determined in different psychometric tools and Chi-squared test was applied to compare these groups. Spearman correlation coefficient and Kappa contingency coefficient were used to compare tools. By the means of clinical interviews, the participant's results were compared (Gold standard). On the basis of ROC analysis, the sensitivity and specificity of each test was compared with the clinical interview. Considering YOUDEN index, the best cut-off point was determined and area under the ROC curve was calculated. Confidence interval was measured for each test. $P < 0.05$ was represented as a reliable baseline.

Results

Primary findings: Among the 983 participants, 250 students were male (25.4%) and remaining participants were female. 392 students (39.9%) were 20 years of age or younger; and the remaining participants were older. 862 students (87.7%) were single, and remaining participants being married. As a whole, 371 students (39.1%) were likely to be affected by psychiatric disorders on the basis of GHQ-28 test; whereas on the basis of BSI and MMPI test 388 students (44.8%) and 405 students (44%) were suspicious to be affected by psychiatric disorders; respectively. There were no significant differences between the score of GHQ-28 test with gender, educational degree, and matrimony status of participants ($P > 0.05$); mean while a significant correlation between age and educational degree and the scores were apparent ($P < 0.5$). According to the BSI test, there was a significant differences between the mean scores of both sexes ($P < 0.05$); whereas there was no correlation between other variables and the BSI score ($P > 0.1$). In addition, results of the MMPI test demonstrate no significant correlation with the other variables, except for the age ($P > 0.1$) [Table 1].

By the means of the GHQ-28, BSI, and MMPI tests the mean scores of students were calculated as: 20.7, 44.8, and 63.6, respectively. MMPI and GHQ-28 showed the maximum correlation coefficient of about 0.588 ($P < 0.001$). In addition, these tests possessed the maximum values of contingency as 0.445 ($P < 0.001$) [Table 2].

The sensitivity and specificity of GHQ-28 test were calculated as 85.9% and 87.7%. The score of 21 was considered as the best cut-off point for this tool and area under the curve of ROC was determined as about 0.926. Furthermore, the corrected classification was measured as 87.3%. BSI sensitivity and specificity were calculated as 81.2% and 90.8%. The remaining values for the BSI test are as follows: 41.5 as the cut-off point, 0.915 for the area under the curve and 87.3 for the corrected classification. The above values for the MMPI test were determined as 88.2%, 91.4%, 63.5, 0.928, and 0.796, respectively [Table 3 and Diagram 1].

Table 1: Frequency of mental disorder in students according screening tests and demographic variables

Demographic variables		GHQ-28 (>21.5)	BSI (>41.5)	MMPI (>63.5)
Age (year)	≤20	154 (41.5%)	171 (44.1%)	185 (45.7%)
	20-23	217 (58.5%)	217 (58.9%)	210 (51.8%)
	P	0.811	0.661	0.04
Gender	Male	90 (37.3%)	85 (38.8%)	109 (47.8%)
	Female	281 (39.7%)	303 (46.8%)	296 (42.7%)
	P	0.51	0.041	0.179
Matrimony state	Single	326 (39.3%)	333 (44%)	346 (44.9%)
	Married	45 (37.8%)	52 (50%)	41 (36.9%)
	P	0.752	0.251	0.111
level	continuous	252 (39.5%)	259 (43.9%)	291 (45.2%)
	discontinuous	71 (33%)	102 (48.6%)	92 (43.2%)
	P	0.091	0.243	0.612
Academic degree	Associate degree	17 (60.7%)	14 (50%)	12 (44.4%)
	Bachelor degree	333 (37.9%)	361 (45.1%)	383 (44.7%)
	medicine	21 (51.2%)	13 (33.3%)	10 (27%)
	P	0.014	0.299	0.106
Total		371 (39.1%)	388 (44.8%)	405 (44%)

Discussion

Our findings demonstrate that 39.1% of participants have likely positive scores on the basis of GHQ-28 test, 44.8% participants for the BSI test and 44% for the MMPI test. Compared to other studies conducted in Iran and other parts of the world, these results are comparatively significant. By the means of GHQ-28 test, Montazeri *et al.* estimated the prevalence of psychiatric disorders 44%.[22] A study of Salaki, from Ilam University of medical sciences and health services, presented the prevalence of psychiatric disorders 42%.[23] Regarding the SCL-90, the prevalence of psychiatric disorders ranges between 16.5-48.5% in another study conducted previously.[19] The prevalence of psychiatric disorders among Iranian female and Bulgarian children ranges between 8.6-39%.[24,25] Demographic characteristics of the area under study, the method of administration, performance time of study and various cut-off points, altogether; contributes to significant differences between the prevalence of psychiatric disorders.

Results of our study report Spearman correlation coefficient between GHQ-28 and BSI test as 0.588, between GHQ-28 and MMPI as 0/488 and 0.533 for the BSI and MMPI test. In multiple other studies, reported the correlation between MMPI and BSI; ranging between 0.3 and 0.72 and between BSI and SCL-90; ranging between 0.92 and 0.99.[26,27]

By the means of CIDI check list, our study aimed to determine the validity of three psychometric tools, the GHQ-28, MMPI, and BSI tests in comparison with clinical interview. Assuming 21.5 as the cut-off point, the sensitivity and specificity of GHQ-28 test were reported as 85.9% and 87.7%, respectively. Area under the curve and Alpha Cronbach's Coefficient Alpha

Table 2: The mean value and standard deviation and contingency and correlation coefficients of the psychometric tests

Instruments	Participants	$\overline{X} \pm SD$	Spearman correlation coefficient		Kappa coefficient for agreement	
			GHQ-28	BSI	GHQ-28	BSI
GHQ-28	944	20.7±11.7	-	0.588 (*P*<0.001)	-	0.445 (*P*<0.001)
BSI	858	44.8±32.5	0.588 (*P*<0.001)	-	0.445 (*P*<0.001)	-
MMPI	921	62.6±15	0.488 (*P*<0.001)	0.533 (*P*<0.001)	0.416 (*P*<0.001)	0.39 (*P*<0.001)

Table 3: The reliability and validity of psychometric tests in comparison with clinical interviews

Tests	Status	Result of clinical interview*		C.C[1]	Sen[2]	Sp[3]	AUC[4]	C. I[5] (95%)
		Healthy	Disease					
GHQ-28	Negative	134 (88.2)	12 (14.1)	87.3	%85.9	%87.8	0. 926	(0.894, 0.958)
	positive	18 (11.8)	73 (85.9)					
BSI	Negative	138 (90.8)	16 (18.8)	87.3	%81.2	%90.8	0. 915	(0.876, 0.954)
	positive	14 (9.2)	69 (81.2)					
MMPI	Negative	139 (91.4)	10 (11.8)	90.3	%88.2	%91.4	0. 928	(0.888, 0.969)
	positive	13 (8.6)	75 (88.2)					

[1]Corrected classification, [2]Sensitivity, [3]Specificity, [4]Area under the curve, [5]Confidence Interval

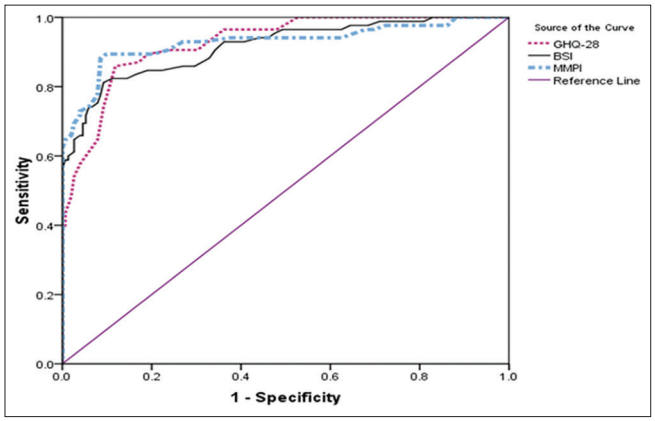

Diagram 1: ROC curve and the area under the curve for GHQ-28, BSI, and MMPI

were calculated as 0.926 and 0.942, respectively. In addition, internal consistency coefficient of Spearman-Brown correlation was 0.822. Results from another study shows the sensitivity and specificity of GHQ-28 test as 81% and 58.2%, respectively.[28] Corresponding other related studies, the validity coefficient varies widely through a wide spectrum, in which the sensitivity and specificity of GHQ-28 test ranges between 35.7%–91% and 10%–98%; respectively.[29,30] Our study demonstrates the values of sensitivity, specificity, area under the ROC curve, and corrected classification for the BSI test as 81.2%, 90.8%, 41.5 and 87.3%; respectively. Furthermore, 0/967 was calculated as its Alpha Cronbach's Coefficient Alpha. Meanwhile, in another study this coefficient was estimated at 0.82 and 0.87 for the quantification depression and anxiety, respectively.[31] According to the results of various studies, the Internal consistency of DSI-98 and BSI-18 were reported to be profitable.[32] Compared to clinical interview, BSI test possessed the greatest accurate categorization, being about 72.4%.

The sensitivity, specificity, area under the ROC curve and Cronbach's Coefficient Alpha of MMPI are as follows: 88.%, 91.4%, 0.928 and 0.875, respectively. The corrected classification was measured about 83.4%; however, this value was reported in another study as about 0.8.[30,31] In another study, values of corrected classification, sensitivity, and specificity of the MMPI test were reported as 86%, 86% and 100%, respectively.[28,32] A study of Ali Ghaffari *et al.* measured the rate of concordance between MMPI and clinical interview for the diagnosis of mental disorders of being about 0.35.[27] Another study represents the sensitivity and specificity of MMPI test for the diagnosis of mood disorders of being 26% and 91% and Kappa correlation coefficient as 0.20, respectively, when it is compared to the clinical interview. Results of another study demonstrate the contingency coefficient of MMPI test and clinical interview of about 0.6.

Considering the results of our study and previous researches, MMPI carries high diagnostic reliability in diagnosis of psychiatric disorders in comparison with GHQ-28 and BSI tests. Several studies revealed similar results. Meanwhile, only a single study was conducted by the authors of this research, which involved smaller study group; The results of which was in favor of MMPI greater validity in comparison to other tests.

Conclusion

By the mean of GHQ-28, MMPI, and BSI tests, the prevalence of psychiatric disorders were estimated to be relatively high. Significant correlation was observed among psychometric tests. All the tools were of high validity in diagnosis of psychiatric disorders, with the MMPI being the most accurate.

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Conflicts of interest

There are no conflicts of interest.

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