Utility of Bender-Gestalt Test-II for Differential Diagnosis of Major Depressive Patients, Brain Damaged and Normal Subjects

Forough al-Sadat Bozorgpour[1], Changiz Rahimi[2], Norolah Mohamadi[3]

[1] MA. in Clinical Psychology, Shiraz University, Department of Psychology, Shiraz, Iran.
[2] PhD. in Clinical Psychology, Professor, Shiraz University, Department of Clinical Psychology, Shiraz, Iran.
[3] PhD; Professor, Department of Clinical Psychology, Shiraz University.

Submitted: 23 October 2016
Accepted: 21 March 2017

Int J Behav Sci. 2016; 10(4): 151-155

Corresponding Author:
Changiz Rahimi
PhD. in Clinical Psychology, Professor
Shiraz University, Department of Clinical Psychology, Shiraz, Iran
E-mail: crahimi2016@hotmail.com

Abstract

Introduction: The current study was performed with the aim of investigating the diagnostic utility of Bender-Gestalt Test-II (BDT-II) in two groups of patients with major depression and brain-damage, while comparing them with normal individuals. The study was a causal-comparative research.
Method: Major depressive patients (n=30), brain-damaged patients (n=30) and normal subjects (n=30) were compared using BDT-II in copying, recall, motor, and perceptual phases. Data was analyzed via one-way analysis of variance and Kruskal-Wallis test approaches. The patients with depression and also brain-damaged patients were not significantly different in the phases under study; however, the normal individuals had significantly better performances than the patients in all the three phases.
Results: The results indicated that BGT-II could differentiate the patients groups from normal subjects, although its differential diagnostic power between the patient groups was weak. In addition, it was found that, among the four subscales of BGT-II, recall, motor and perceptual phases had the highest power, while the copying subscale had the lowest power in differentiating different groups.
Conclusion: This test is not able to rule out organic brain pathology from psychiatric patients, but it could differentiate brain damaged and psychiatric patients with severe symptoms from normal subjects.
Keywords: Differential Diagnosis, Bender-Gestalt Test-II, Major Depression, Brain Damage

Introduction

Bender- Gestalt Visual-Motor Test, which is shortly called Bender-Gestalt Test (BGT), was originally published by Lauretta Bender in 1938 [1]. It was developed for assessing the maturational level of children [2]. The test is commonly used by clinical psychologists for screening neuropsychological and neurological deficits. BGT evaluates visual motor functioning and visual perception skills and the most common use of this test is identifying organic brain damage. The test has been made based on principles of Gestalt theory, especially Wertheimer, who was interested in Gestalt principles on perception [3].

BDG has been one of the most popular neuropsychological tests in the last decades due to some advantages, including its easy performance and scoring system, short amount of time to administer, and simple tools [4]. Bender (1938) pointed that perception and re-drawing of BGT designs are determined by biological principles of sensory-motor action and are influenced by two factors including subject's development styles and his/her pathology state which might have been caused by organic or functional factors. Bender's studies are basically about the clinical application of BGT on adult patients suffering from various disorders including brain damage, schizophrenia, and mental retardation. Studies showed that those patients who made mistakes in re-drawing the designs of BGT suffered from brain damages, and that the types of errors were related to the damage palace [1].

BGT is also employed as an important psychological test for screening brain dysfunctions and in ruling out diagnostic confusion [2]. By closely monitoring the subject's behaviors while doing the BGT, the examiner can discover his/her symptoms of depression, compulsive complications, as well as problems in cognitive processes. In patients with brain damages, design drawing is mostly impaired. Functions needed for drawing these designs have been considered as a function of the brain cortex [1]. It has also been implicated in identifying the nature of some psychological disorders, their prognosis and evaluating therapeutic recovery [2].

In 2003 the revised version of Bender-Gestalt Test called Bender-Gestalt Test-II (BGT-II) was published [5]. To change the test, a large group of consultants with different views, stated a great deal of ideas. Finally, it was agreed to preserve the 9 main designs but to increase the number of designs, to add a memory (recall) test, and to use a large sample for standardization.

In Iran, many studies have been performed on the first version of BGT by using different scoring systems [6-10]. Regarding to BGT-II, Bahramian et al., [11] studied the standardization of this test for preschool and primary school-children in Shiraz. They reported that the reliability coefficient obtained in copy phase was 0.94 and in recall phase was 0.76. The results of the validity assessment showed high validity of BGT-II for use in Iran. The children from higher cultural and social groups had a better performance compared to children from lower cultural and social groups. Also, the performance of girls was significantly better than that of boys. Prakash [2] also reported that the BGT was related to age, performance, IQ and sex.

Due to similarities between some symptoms of brain damaged and psychiatric patients, some neuropsychological tests were used to differentiate between the two groups [12]. In line with these features, some researchers have studied the clinical utility of BGT. Sheikhi [13] studied the clinical utility of BGT in screening brain damage in comparison with Magnetic Resonance Imaging (MRI) results and reported that in 57% of cases, both methods could differentiate brain damaged patients from normal subjects. Hain [14] compared brain damaged, psychiatric patients and normal subjects using BGT. Results indicated that BGT significantly differentiated between brain damaged and non-brain-damaged subjects.

However, none of these studies have ever investigated the diagnostic power of BGT-II. In the present study, brain damaged patients were compared with a group of psychiatric patients who, based on various research, do not show any damage, at least in the parietal lobe. The aim was to find out whether this test could differentiate brain-damaged patients from those patients with serious psychiatric problems. It should also be noted that some studies have reported impaired brain damages in depressed patients, but these defects are related to certain parts of the brain including frontal lobe and temporal lobe [15-17]. Alexopoulos et al. [16] reported that the symptoms of depression were consistent with the lesions that may damage striato-pallido-thalamo-cortical pathways. In fact, no injury of the partial lobe has ever been reported in depressive patients. Monkul et al.[17] reported that patients with major depression had smaller right and left orbitofrontal cortex gray matter volumes compared with healthy comparison subjects. Radaellia et al.[18] reported that the pattern of abnormal or reduced connectivity between dorsolateral prefrontal cortex (DLPFC) and amygdala, may reflect the abnormal modulation of mood and emotion typical of bipolar patients. This is while not all studies confirmed the neuropsychological disorders in depressive patients. Frodl et al. [19] did not find a significant association between frontal lobe volumes and the performance of patients with depression in Wisconsin Card Sorting Test. Cavedini et al. [20] rejected the existence of specific frontal lobe dysfunction in patients with major depressive disorders. McCarthy et al. [21] measured short-term visual memory in children and adolescents with psychotic and other severe disorders using BGT. They found no significant difference between psychotic patient groups including schizophrenia, schizoaffective disorder, and mood disorders.

Given the changes of this test and the need for gathering large objective information, studying the clinical utility of BGT-II in Iran seems extremely necessary. In response to this necessity, the current study was performed with the aim of investigating the diagnostic utility of BGT-II in two groups of patients with major depression and brain damage, and to compare them with normal individuals.

Method

The current research was a causal-comparative study. Two groups of brain damaged and depressed patients and a group of normal individuals were compared using BGT-II.

The statistical population consisted of all patients accepted in the psychiatry and brain surgery department of Golestan Hospital, and Ebn-e-Sina Hospital in Ahwaz city. The normal individuals selected for this study were the staff of the hospitals. The sample included brain damaged patients (n=30) and patients with major depression (n=30), and a group of normal individuals (n=30). The patients were selected using convenient sampling method. The inclusion criteria included suffering from major depression or brain damage deficit diagnosed by a psychiatrist or neurologist. To become sure of the accuracy of diagnoses in patients' documents, the researcher performed a diagnostic interview based on the DSM-5. The exclusion criteria included being diagnosed with other disorders of DSM-5. Neither the normal subjects nor their immediate relatives had a history of mental disorder or brain damage. These subjects were matched with a group of staff of the hospitals who were comparable to the patients in terms of age, gender and studies.

The measures used in this study, were as follows:

Bender-Gestalt Test-II (BGT-II): This test contains 16 stimulant cards, an evaluation page and perceptual and

motor complementary tests. Administration of the BG-II includes two phases: the copy phase and the recall phase [22]. In the recall phase, the subject copies the designs based on what he/she remembers of them. This phase was completed by the subjects exactly based on the principles mentioned in the booklet of BGT-II [5]. BGT-II is composed of two parts; one for ages 4-7 and one for ages 8-85+. Each test has 9 main designs. In addition, several more designs have been prepared for each age range. Additional information including raw scores and assessment of the subjects' function is written in the evaluation page.

The Global Scoring System (GSS) of BGT-II was used for evaluating each design in the copying or recall phases. In the GSS, there is a 5-point rating scale for scoring each item and a total score for each test. Each item is scored in a 5-likert scale (0-4). Eventually, a total score for each test (0-52 for subjects under 8 years; 0-48 for subjects above 8 years) is obtained. The higher the score, the better the subject's performance would be. As evaluating the subject's drawing partly depends on the scorer's judgment, a scoring guide has also been prepared. The nature of this scoring is based on the discrepancy of the subject's drawing and the main design. In fact, in this system, dissimilarity, random drawing, scribbling and lack of drawing takes 0; a small amount or vague similarity takes 1; near or average similarity takes 2; high similarity, almost the same, and right reconstructing takes 3; and almost perfect takes 4 scores. Because the GSS evaluates the total quality of each drawing, factors mainly considered in other scoring systems, such as rotation, distortion, linkage and repetition, have been spotted here, too. In this study, Copying, Recall, Perceptual and Motor phases were scored. The scores can be shown in different forms including, percentile ranks, scaled scores, T-scores, and confidence intervals. Reliability of BGT-II (using Cronbach's alpha method) and its concurrent validity (using it's correlation with Persian version of cancellation test) appeared to be acceptable. Bahramian et al. [11] reported that the reliability coefficient obtained in copy phase was 0.94 and in recall phase was 0.76. The results of the validity assessment showed high validity for using BGT-II in Iran. In this study, psychometric properties of BGT-II were computed and the reliability of BGT-II (using Cronbach's alpha method) was calculated to be 0.89.

The BGT-II was performed individually on the subjects by the researcher. The test was performed in the hospital. Patients took part in the research voluntarily and whenever they wanted, they could withdraw the sessions. All the participants completed a written consent for participating in the study. The data collection continued for 5 months.

In order to compare the subjects' performances on the copying phase, one way analysis of variance (ANOVA) and Scheffe post hoc test were used. In addition, U-Mann-Whitney post hoc test and Kruskal-Wallis test were performed to compare their performance in recall, perceptual and motor phases.

Results

Mean scores (standard deviations) of depressive patients, brain-damaged and normal subjects in the copying phase were 27.90 (11. 72), 26.56 (11.34) and 36.16 (8.92), respectively. In Table 1, the comparison of the three groups using ANOVA, for copying phase have been demonstrated. The differences between the three groups were significant ($p<0.001$). The results of Scheffe post hoc test showed that brain damaged patients had significantly lower scores than normal individuals in drawing the designs. However, the difference between brain-damaged patients and depressives and also the difference between depressive patients and normal subjects in the copying phase were not significant.

Table 1. Results of comparison of subjects' performances in the copying phase using ANOVA

Source of variance	SS	df	MS	F	p
Between Groups	2032.85	2	446.21	5.38	0.001
Within Groups	112706.2	87	112706.2		
Total	132654	89			

Table 2 shows the descriptive statistics of the subjects' performances in recall, perceptual and motor phases. As it is obvious, the depressed patients and normal individuals had the lowest and highest mean in the recall phase, respectively. Regarding the high mean of the normal individuals in the recall phase, it can be mentioned that the performance of this group has been acceptable and their drawings have been almost the same as those of the main cards. However, the low mean of the depressed patients' performances in the recall phase shows their weak ability to remember the main designs and their drawings has less resemblance to the main cards. In the motor phase, the highest and lowest mean of performance belonged to the normal individuals and brain damaged patients respectively. In other words, the normal individuals performed well in this phase and had the lowest hand shake, while the brain damaged patients had the highest rate of hand shake and lowest performance in the motor phase. Also, normal individuals had the highest mean of performance in the perceptual phase, while the depressed patients had the lowest mean. In fact, the normal individuals could perceive the similarity between the designs, but the ability of depressed patients to detect the designs' resemblance was low.

Table 3 shows results of Kruskal-Wallis test for each variable. The results showed a significant difference between the groups in terms of recall ($p<0.001$), motor ($p<0.001$) and perceptual phases ($p<0.001$). The results of U-Mann-Whitney test to examine a significant difference in the mean of subjects' performances in the recall, motor and perceptual phases showed that the patients with depression and the brain-damaged patients were not significantly different in different phases. However, compared to the patient groups, the normal individuals had significantly better performances ($p<0.001$) in all three phases.

Table 2. Mean scores of different groups in recall, motor and perceptual phases

Variables	n	Recall phase	Motor phase	Perceptual phase
Depression	30	90.12	105.73	73.53
Brain-damage	30	92.03	79.03	84.88
Normal	30	130.48	139.77	129.12

Table 3. Results of Kruskal-Wallis test for comparing the subjects' performances in recall, motor, and perceptual phases

Variables	df	χ^2	P
Recall	2	41.05	0.001
Motor	2	68.18	0.001
Perceptual	2	30.66	0.001

Discussion

The aim of the present study was to investigate the diagnostic utility of BGT-II in two groups of patients with major depression and brain damage, and to compare them with normal individuals. Findings revealed the high diagnostic power of Bender-Gestalt Test-II for differentiating patient groups from normal individuals. However, it was found that this test could not significantly differentiate psychiatric patients from brain damaged ones. In the copy phase, only the BGT-II could significantly differentiate brain damaged patients from normal individuals. In addition, BGT-II diagnostic power for differentiating brain damaged patients from the patients with depression was not significant in any of the recall, motor and perceptual phases. However, it was successful in significantly differentiating the brain damaged and patients with depression from the normal individuals in all three phases.

The finding of this study showed that BGT-II can differentiate brain-damaged patients from normal individuals in the copying phase. This is in line with the results of some other studies [9, 13, 23-29]. The patients with parietal lobe lesions are not able to copy designs. Therefore, this finding can be explained by the injury of the partial lobe in brain damaged patients of this study. This finding can be explained by the injury of the partial lobe in brain damaged patients of this study, since damage of the partial lobe impairs designs copying [30]. This finding is not unexpected and shows that BGT-II can differentiate patients with damage in the partial lobe from normal individuals.

Also, BGT-II could successfully differentiate brain damaged patients from normal individuals in terms of visual memory (*recall phase*) which is confirmed in other studies, too [14, 31]. This can be explained by the fact that head injuries in brain damaged patients may interrupt basic neural mechanisms that are responsible for decoding and retrieval of a stimulant [32].The diagnostic power of BGT-II in differentiating depressed patients from normal individuals in terms of visual memory was also revealed in the current study. This finding can be confirmed, because weakness of thinking ability and mental concentration are symptoms of depression [33]. On the other hand, the observations of the researcher during BGT-II performance showed that depressed patients performed weaker than normal individuals in the recall phase because of paying extreme attention to details and frequent erasing, and as a results extended the copying phase.

Additionally, it was discovered that BGT-II could differentiate the patients with depression from normal individuals in the perceptual phase. Since another aim of the perceptual system, other than location and goal recognition, is perceptual stability (i.e. keeping objects appearances steady in spite of their constant changing in the retina), the perceptual steadiness is impaired in depressed patients due to a decrease in attention and focus. Based on the current study's results, BGT-II can also differentiate brain damaged patients from normal individuals in the perceptual phase. Given the fact that the brain damaged subjects of this study had injuries in the parietal lobe, and also the central role of this part in information perception, weak performance of the brain-damaged patients is not far from expectation.

Another finding showed that Bender-Gestalt Test II can differentiate depressed patients from normal subjects in the motor phase. These findings can be because of psychomotor retardation, which is one of the distinctive features of depressive patients. On the other hand, inability of Bender-Gestalt-II in differentiating the patients with brain damage from depressed patients can indicate the importance of the role of frontal lobe in motor functions. Some studies have reported frontal lobe disorders in depressive patients [16, 17].

In summary, the findings of the present study indicated that BGT-II could differentiate the brain damaged patients from normal individuals, but was unable to differentiate the psychiatric patients, who were not suspected of having any injury at the parietal lobe, from the brain-damaged patients. So, it seems that there are other factors, except injury to the parietal lobe, that underlie weak performance in this test. This study was performed on two groups of patients with mental disorders to examine differential diagnostic power of BGT-II. One limitation of this study was the absence of other psychiatric patient groups. But the test can be used for differentiating between normal subjects and depressive as well as brain damaged patients. It is recommended that future researchers perform BGT-II on other psychiatric patient groups in order to examine BGT-II power in differentiating patients with other mental disorders, as well as, obtaining more information on the patients' performance on this test. It is also recommended that other studies use brain damage patient groups with

lesions on different parts of their brain to determine the sensibility of BGT-II to local functions of the brain.

Conclusion

Regarding the diagnostic power of BGT-II`, it could be concluded that this test is not able to differentiate patients with brain damage pathology from psychiatric patients, but it could differentiate the brain damaged and psychiatric patients with severe symptoms from normal subjects.

References

1. Bender L. A visual-motor Gestalt test and its clinical use. American Orthopsychiatric Association Monograph Series Number 3. NY: American Orthopsychiatric Association; 1938.
2. Prakash A. Bender-Gestalt Test Correlates of Prognosis in Unipolar Depression (Brief Communication) (Clinical Report). Internet Journal of Medical Update. 2010;5(2):34-37.
3. Wertheimer M. Untersuchungen zur Lehre von der Gestalt. II. Psychologische forschung. 1923;4(1):301-350.
4. Groth-Marnat G, Wright A. Handbook of Psychological Assessment. 6 ed. Chicago: Wiley; 2016.
5. Brannigan G, Decker S. The Bender-Gestalt II. American Journal of Orthopsychiaty. 2006;76(1):10-12.
6. Yousefi F. Validation of visual-motor Bender-Gestalt test in elementary schools of Shiraz city: Shiraz University; 1990.
7. Tirgari A. Bender-Gestalt Test: normalization of adults' performances by Lex scoring system. Journal of Medical Science University of Mazandaran. 2000;10(26):38-44.
8. Radi M. Examining performances of elementary students of Najaf Abad city on Bender-Gestalt Test and comparing then with that of the American students. Tehran: Allame Tabatabayi University; 1994.
9. Saravani M. Examining validity and reliability of Bender-Gestalt Test for diagnosing brain damage and comparing it with E.E.G results: Allame Tabatabyi University; 1994.
10. Mohammadi pour B. Examining validity and reliability of Bender-Gestalt Test in for diagnosing male schizophrenic patients hospitalized in hospitals of Mashhad city 1995.
11. Bahramian A, Hadianfard H, Mohamadi N, Rahimi C. Standardization of Bender-Gestalt II in Children Aged Between 4 and 11 Years in Shiraz. Training Measurement. 2013;4(11):165-188.
12. Eysenck M. Psychology: Taylor and Francis Inc; 2001.
13. Sheikhi S. Clinical application if Bender-Gestalt Test in screening brain damages and comparing them with MRI results. Journal of School of Nursing and Midwifery of Orumiye. 2007;5(1):12-14.
14. Hain J. The Bender Gestalt Test: A scoring method for identifying brain damage. Journal of Consulting Psychology. 1964;28(1):34-40.
15. Rahimi C. Neuropsychological Disorders and Clinical Symptoms in Schizophrenic and Depressive Patients: Osnabrueck University; 2000.
16. Alexopoulos G, Meyers B, Young R, Kakuma T, Silbersweig D, Charlson M. Clinically defined vascular depression. Am J Psychiatry. 1997;154(4):562-565.
17. Monkul E, Hatch J, Nicoletti M, Spence S, Brambilla P, Lacerda A, et al. Fronto-limbic brain structures in suicidal and non-suicidal female patients with major depressive disorder. Molecular Psychiatry. 2007;12:360-366.
18. Radaellia D, Sferrazza Papaa G, Vaia B, Polettia S, Smeraldia E, Colomboa C, et al. Fronto-limbic disconnection in bipolar disorder. European Psychiatry. 2015;30(1):82-88.
19. Frodl T, Schaub A, Banac S, Charypar M, Jäger M, Kümmler P, et al. Reduced hippocampal volume correlates with executive dysfunctioning in major depression. J Psychiatry Neurosci. 2006;31:316-323.
20. Cavedini P, Ferri S, Scarone S, Bellodi L. Frontal lobe dysfunction in obsessive-compulsive disorder and major depression: a clinical-neuropsychological study. Psychiatry Res. 1998;78:21-28.
21. McCarthy J, Rabinowitz D, Habib M, Goldman H, Miley D, Stefanyshyn H, et al. Bender Gestalt Recall as a measure of short-term visual memory in children and adolescents with psychotic and other severe disorders. Percept Mot Skills. 2002;95(3 Pt 2):1233-1238.
22. Brannigan G, Brunner N. Guide to the qualitative scoring system for the Modified Version of the Bender-Gestalt Test. Springfield. IL: Charles C Thomas; 2002.
23. Eno L, Deichmann J. A review of the Bender-Gestalt test as a screening instrument for brain damage with school-aged children of normal intelligence since 1970. The Journal of Special Education. 1980;14:37-45.
24. Wagner E, Murray A. Bender-Gestalt of organic children: Accuracy of clinical judgments. Journal of projective techniques and personality Assessment. 1969;33:240-242.
25. Ackerman P, Peters J, Dykman R. Children with specific learning disabilities: Bender-Gestalt test findings and other signs. Journal of Learning Disabilities. 1971;4:437-446.
26. Hamid N, Ghaffari M. Examining performances of brain-damaged patients in Bender-Gestalt visual-motor Test in comparison to MRI images of their minds with normal individuals. Journal of Medical Science. 2009;8(2):185-190.
27. Ibrahim pour M. Examining and comparing brain damages in children with autism and Asperger: Allame Tabatabayi University; 2008.
28. Seif Allahi M. Differential diagnosis of Epilepsy by Bender-Gestalt Test: Tehran University; 1978.
29. Tizdast T. Comparing the drawing pattern of normal individuals and brain-damaged patients based on the location of damage in each of the brain lobes in Bender-Gestalt Test: Islamic Azad University; 1995.
30. Moazemi D. Introduction to Neuropsychology. Tehran: SAMT; 2000.
31. Marley M. Organic brain pathology and the Bender Gestalt Test: A differential diagnostic scoring system. New York: Grune & Stratton; 1982.
32. Holt DJ, Lebron-Milad K, Milad M, Rauch S, Pitman R, Orr S, et al. Extinction memory is impaired in schizophrenia. Biological Psychiatry. 2009;65:455-463.
33. Dadsetan P. Psychopathology transformation: from childhood to adulthood (Second Press). Tehran: SAMT; 1996.