



**International Journal of Biology, Pharmacy
and Allied Sciences (IJBPAS)**

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

**COMPARISON OF THEORY OF MIND AND FALSE BELIEFS IN PATIENT WITH
MAJOR DEPRESSION DISORDER, BIPOLAR DISORDER I, BIPOLAR
DISORDER II AND HEALTHY GROUP**

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ABSTRACT

The aim of this study was comparison of theory of mind and false beliefs in patient with major depression disorder, bipolar disorder I and bipolar disorder II and healthy individual.

The sample was 90 patient that was bedridden in Ostad Moharari Hospital and it include 30 patient with major depression disorder, 30 patient with bipolar disorder I, 30 patient with bipolar disorder II, and 30 healthy individual was selected as a control group that matched with the experimental group with the same sex, married, age, and education, social status. In this study "Reading the Mind in the Eyes" was used. The data was analyzed using MANOVA.

The results of analysis of variance showed that there were significant differences in theory of mind and false beliefs between the groups studied and the significant difference between the patient groups and the control group, but no significant difference was found between the patient groups. The defect of theory of mind and false beliefs can be considered as a social cognition deviation. Therefore, theory of mind and false beliefs training can be used as a treatment for this group.

Key words: Theory of Mind, Major Depression Disorder, Bipolar Disorder I, Bipolar Disorder

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INTRODUCTION

People usually experience different range of moodstates and the combination of their emotional pretention is great in the same rate, alsothey feel that they can be dominant over their mood and emotional conditions. Mooodisorders are the group of clinical disorders characterized by the lost authority and great suffering (1).

The recent global burden of disease study estimated that unipolar major depression is the fourth largest contributor to the global burden of disease. By the year 2020, unipolar major depression is projected to be the second largest contributor to the global burden of disease, following heart disease (2). World Health Organization studies from all regions of the world in 26 countries indicates that mood disorders in a row after anxiety disorders (Prevalence of mood disorders at 12 months obtained 8.0 to 6/9%)(3).

People who suffer from mood disorders, show inadaptability behavior that can affect relationships with others may lead to negative social interactions (4).This can be progressed and increased in depression symptoms(4,5).

One of the concept that used to understand social action damaged is theory of mind (6). The term of theory of mind,was presented by PERIMARK and VOUDROF in 1978 in the study of chimpanzees' behaviors for the first time(7).

People who experience defect of theory of mind, have difficulty in explaining the intentions of others, also do not understand how their behavior affects others, and they have problems with social interaction(8). Theory of mind used to know the mental states (goals, attention, beliefs) of others (9).

The depression symptoms have relation with the defect of theory of mind that including delayed in psychomotor and depressed mood. This defect of motivationfor pay attention to the mental states of others, possibly lead to poor performance (10).

Simply, those with a history of major depression in the past compared with those who do not, they have a defect in the theory of mind (11),So they show inability in the theory of mind's tests (12, 13). Also, major depression disorder has relation with impairment of ability to discover the mental states of others (10, 14, 15).

The previous research suggests that depressed people show the pattern of the dysfunctional of the Interpersonal interactions (15). Patients with depression have a poor perception of social situations (16). Therefore, research in the field of theory of mind abilities in bipolar disorder I and II was done, such as research of Schenkel, Chamberlain, Towne (17), Van Rheenen, Rossell (18), Javier, Sergio,

Strejilevich, Fassi, Marengo, Igoa (19), that their results showed that the theory of mind in people with bipolar disorder have been damaged.

Also the beliefs reflect the method exists in the world or we want it to be. So if we realize that a belief is wrong, we will try to change it according to external objects reality (20). Perception of false belief is the most important key component of theory of mind. The false belief means that the person for prediction and reasoning about others behaviors only relies on his interests and don't regard others beliefs. These people are usually unsuccessful in false belief tasks, while people, who react successfully in these tasks, possibly show skillful understanding of coordination of belief and desire, In this case, the person relying less on their desires and to predict the behavior use both of desire and belief (8).

In theory of mind, more emphasis is on the emotional aspects of the person, but false believe greater emphasis on the cognitive aspects of the individual. Several studies have been conducted on false belief in children, but in adults, especially in patients with mood disorders no research has been run.

Research literature that previously mentioned, shows that few studies in the field of theory of mind ability and false

belief in patients with major depression and bipolar has been done. Regard to the theory of mind as a new subject and the role of theory of mind in psychopathology and the limited number of articles that examines the ability of theory of mind and false belief in patients with major depression disorder and bipolar disorder, this study attempts to response this question whether the theory of mind and false belief is differences in patient with major depression disorder, bipolar disorder and healthy people?

Method

This study was descriptive, causal comparison and retrospective. The population in this study included patients with major depression disorder and bipolar disorder I and II who were bedridden in Ostad Moharrey Hospital and healthy individual were the staff on this hospital in Shiraz. The samples were selected through purposive sampling that included 30 patient with major depression disorder, 30 patient with bipolar disorder I, 30 patient with bipolar disorder II, and 30 healthy individual was selected as a control group that matched with the experimental group with the same sex, married, age, and education, social status. Patients were selected by psychiatrist based on the semi-structured clinical interview and criteria of DSM-IV-TR and diagnosis of major

depression disorder and bipolar disorder I, II. Individuals with any history of neurological disease, drug addiction, severe trauma to the head, that loss of consciousness to be followed, were Fired from this study. People with the age domain of 20 to 50 who had the minimum education for reading and writing entered to this research.

Reading the Mind in the Eyes Test (RMET)

This test is a psychological test presented by Baron-Cohen, Wheelwright, Hill, Raste, & Plumb (21) and contained images from actors and famous foreigner players whose Part of the eyes images was cut to 36 different mental states like quiet, despondent and frightened and so on. For each image the mental states of emotional capacity with similar feature presented. Each item comes with four described of mental state. Only by using the visual information the respondents asked to choose the best thought or feeling of eyes. The maximum score acceptable for the term selection in this test was 36 and the lowest was 0.

The Baron-Cohen test scoring is based on the respondent correct reply and the total scores of answers make his final score. The scores between 22 to 30 indicates moderate theory of mind, less than 22 shows the theory of mind is low and the

score higher than 30 shows the theory of mind is high. Fakhari, Minashiri, AlizadeGoradel (22) obtained the Cronbach's alpha coefficient 0.73 through the reading the mind in the eyes test, in addition, Nejati, Zabihzade, Maleki, Mohseni(23), also calculated the Cronbach's alpha coefficient for this test 0.72, also the Alilu, Bakhshipour, Bafande Gharamaleki, Khanjani, Ranjbar (24) obtained the Cronbach's alpha coefficient 0.73 for validity of this test. In this research the validity of reading the mind in the eyes test calculated by Cronbach's alpha coefficient and it was 0.68.

Unexpected Transfer Task

The unexpected transfer task was used to investigate the theory of mind which applied by two Australian psychologists named Perner & Wimer to assess the "False Belief"(25). Nesaeyan, Bahrami, Mirzamani, Salehi (25) changed the name of these task's dolls to Persian and named them as Ali & Maryam. The story is as below: one day Ali entered to the room and began to play with his ball. After a while got tired and put the ball in the closet and left the room, After a few minutes Maryam came into the room and went to the closet, picked up the ball and started to play with the ball, after a while, she got tired, she did not put it in the first place. She put it in the bucket and left the

room. Then Ali returned to the room to play with his ball again but he has not entered to the room, after this story the following questions made from the individual:

Does Ali know where his ball is? (The reality question).

Where does Ali look for his ball? (The question of prediction of belief).

Where does Ali put his ball first? (The memory question).

The scoring method in this test is each of the questions score "zero" or "one" based on who is answering True or False. In the end, those who have correctly answered all of the questions, as a successful person and those who did not answer any of the

questions, or the others were answer wrong score (zero) as the person who is unsuccessful. The data was analyzed by SPSS-21. Descriptive statistics was used such as mean and standard deviation and to compare the performance of four through the reading the mind in the eyes test and false belief task was used Multivariate analysis of variance and Bonferroni posthoc.

RESULTS

The mean of group's age for the depression disorder group was 33.83, and for the bipolar disorder I group was 36.8 and for bipolar II group was 33.34. Table 1 indicates the demographic feature of the sample.

Table 1: The sample demographic feature

Healthy group	Bipolar disorder II	Bipolar disorder I	Major depression disorder			
Frequency(%)	Frequency(%)	Frequency(%)	Frequency(%)			
(%26/7) 8	(%43/3) 13	(%36/7) 11	(%50) 15	under diploma	Education	
(%33/3) 10	(%30) 9	(%50) 15	(%23/3) 7			Diploma
(%6/7) 2	(%6/7) 2	(%3/3) 1	(%6/7) 2			Post diploma
(%30) 9	(%20) 6	(%10) 3	(%16/7) 5			B.A
(%3/3) 1	(% 0) 0	(% 0) 0	(%3/3) 1	Over than B.A		
(%40)12	(%50)15	(%53/3)16	(%60) 18	Single	Marriage status	
(%60)18	(%50)15	(%46/7) 14	(%40) 12	Married		
(%56/7)17	(%43/3)13	(%60) 18	(%56/7) 17	Male	Gender	
(%43/3)13	(%56/7)17	(%40) 12	(%43/3) 13	Female		

Mean and Standard Deviation for theory of mind and false belief in the groups presented at table 2

Table 2: The mean and standard deviation of theory of mind and false belief

N	Standard Deviation	Mean	Group	Variable
30	5/2	14/26	Major depression disorder	Theory of mind
30	3/4	13/06	Bipolar disorderI	
30	4/65	13/63	Bipolar disorderII	
30	4/63	20/06	Healthy group	
30	0/47	0/33	Major depression disorder	false belief
30	0/49	0/4	Bipolar disorderI	
30	0/49	0/36	Bipolar disorderII	
30	0/5	0/53	Healthy group	

According to table 2, mean of theory of mind in major depression disorder group is 14.26 and in bipolar disorder I group is 13.06, in bipolar disorder II is 13.63 and in healthy group is 20.06. The theory of mind mean for healthy group is higher than patient groups. Also the theory of mind mean among three groups of patient groups, the major depression disorder and bipolar disorder I, II has been higher. The

mean of falsebelief in major depression disorder group is 0.33, in bipolar I is 0.4 and in bipolar disorder II it is 0.36 and in healthy group is 0.53. The false belief mean in healthy group is higher than other groups. For comparing the theory of mind and false belief for four groups of this study the Multivariate analysis of variance applied which is presented in table 3.

Table 3: Multivariate analysis of variance for theory of mind and false belief in four under study groups

Sig	F	Error df	Hypothesis df	value	Test name
0/001	6/59	232	6	0/29	PILAI
0/001	7/1	230	6	0/71	VEKILIES LAMBDA effect
0/001	7/7	228	6	0/4	The HOTILING effect as the greatest root
0/001	15/51	116	3	0/4	

According to **table 3** the Multivariate analysis of variance by regarding Wilks Lambda test showed that theory of mind and false belief in studied groups (major

depression disorder, bipolar disorder I, II and healthy group) was significantly different ($P=0.001$, $F_{(6,230)}=7.1$).

Table 4: Bonferroni post hoc test for paired comparison groups

Sig	Standard error	Mean difference	Comparing group	Source group	Variable
1	1/16	1/2	Bipolar disorder I	Major depression disorder	Theory of mind;
1	1/16	0/63	Bipolar disorder II		
0/001	1/16	-5/8	Healthy		
1	1/16	-1/2	Major depression disorder	Bipolar disorder I	
1	1/16	-0/56	Bipolar disorder II		
0/001	1/16	-7	Healthy		
1	1/16	-0/63	Major depression disorder	Bipolar disorder II	
1	1/16	-0/56	Bipolar disorder I		
0/001	1/16	-6/4	Healthy		
0/001	1/16	5/8	Major depression	Healthy group	

			disorder		
0/001	1/16	7	Bipolar disorder I		
0/001	1/16	6/4	Bipolar disorder II		
1	0/12	-0/06	Bipolar disorder I	Major depression disorder	False belief
1	0/12	-0/03	Bipolar disorder II		
0/7	0/12	-0/2	Healthy		
1	0/12	0/06	Major depression disorder	Bipolar disorder I	
1	0/12	0/03	Bipolar disorder II		
1	0/12	-0/13	Healthy		
1	0/12	0/03	Major depression disorder	Bipolar disorder II	
1	0/12	-0/03	Bipolar disorder I		
1	0/12	-0/16	Healthy		
0/7	0/12	0/2	Major depression disorder	Healthy group	
1	0/12	0/13	Bipolar disorder I		
1	0/12	0/16	Bipolar disorder II		

According to **table 4**, theory of mind in major depression group and bipolar disorder I, II and healthy group there was significant differences. But theory of mind between the major depression group and bipolar disorder I, major depression and bipolar differences II, and bipolar disorder I and II there is no significant differences. In addition, the Bonferroni test shows that healthy group compared to other groups has the highest score in theory of mind and then in order the major depression disorder, bipolar disorder II and then bipolar disorder I, but the false belief did not show significant differences among four groups.

DISCUSSION AND CONCLUSION

The aim of this study was to compare the theory of mind and false belief in patient with major depression disorder, bipolar disorder I and II and healthy group. The findings of this study showed that there is significant difference in theory of mind and false belief among major depressive disorder, bipolar disorder I, bipolar disorder II and healthy group. This finding is consistent with the results of Inoue et al (12). These researchers found significant difference in theory of mind tasks in patients with mood disorders (unipolar and bipolar mood disorder) that is recovered and control group.

There is a difference results about theory of mind defect in patients with major

depression disorder. The results of this study is confirming the findings of Fakhari et al (22), Zeraatkar, Najafi, RfyyNya (26), Nejati et al (23), Fakhari, Minashiri, Fallahi, Panah (27), Nejati et al (28) which suggests that the theory of mind and mind reading ability has lost and damaged in people with major depression compared with the general population. In addition, research conducted outside of Iran, including Cusi, Nazarov, MacQueen, McKinnon (29), Zobel, Werden, Linster, Dykieriek, Drieling, Berger, Schramm (30), Werden, Elikann, Linster, Dykieriek, Berger (31), Wang et al (15), Inoue et al (13) was coordinate with this result which indicate that major depression was significantly associated with failure to identify mental states of others. But this result was not coordinate with result of researchers such as Wolkenstein, Schenberg, Schirm, & Hautzinger (32), Kettle, O'Brien-Simpson, Allen (33), Doody, Goetz, Johnstone, Frith, Owens (34). The findings of these research showed that patients with major depression compared with the control group did not show a defect in the theory of mind. These different results may be due to diagnostic of subgroups of depression, which plays an important role in clarifying the inconsistent results associated with theory of mind, false belief and depression.

Moreover, about the differences of theory of mind and false belief between two groups Bipolar disorder I and healthy people, almost all studies have found similar results. The results are coordinate with result of researchers such as Nejati et al (28), Schenkel et al (17), Purcell, Phillips, Grubera (35), Javier (19), McKinnon, Cusi, MacQueen (36), Kerr, Dunbar, & Bentall (37). The results of this research indicate that Bipolar disorder I was significantly associated with a defect in the theory of mind, and people with Bipolar disorder I have been damaged in recognizing mental states of others. In addition, this result is coordinate with result of Lahera, Montes, Benito, Valdivia, Medina, Mirapeix, Sáiz-Ruiz (38) that show the bipolar disorder with or without the psychotic symptoms in both groups compared to control group has lower performance in theory of mind's test. Also according to the results of these researchers, theory of mind performance reduction in these patients has relation with the longer duration time of illness and symptoms intensity enhancement.

Moreover, there are conflicting findings in differences of theory of mind and false belief between bipolar disorder II and healthy people, that is coordinate with result of Van Rheenen and Rossell (18), Purcell, Phillips, Grubera (35), Javier et al

(19), Kerr et al (37). Results of these researchers showed that the theory of mind in people with bipolar disorder II is damaged. But this result is not coordinate with result of Schenkel et al (17), Barrera, Vázquez, Tannenhaus, Lolich, Herbst (39). They found that theory of mind in people with bipolar disorder II and not significantly different from healthy people. This paradox results may be due to differences in culture, the type of test and the patient is hospitalized. If taking into account the biological aspects of mood disorders have been made to explain this finding, it can be assumed that the damage to the right frontal damage theory of mind and social behavior and the four main areas of the brain in bipolar disorder, which is involved the amygdala, hippocampus, prefrontal cortex and anterior cingulate areas of the brain that are common in the theory of mind and also in patients with bipolar disorder and the regions involved, including anterior cingulate, prefrontal cortex. The common areas of mood disorders can also view on the psychological and physiological perspective.

In general, the results showed that there is no difference in terms of performance and cognitive theory of mind and mental states of others in three groups of patients with mood disorders (major depressive

disorder, bipolar I and bipolar II). But theory of mind and false belief was different between three patient groups compared to healthy group had lower in theory of mind. The mood disorders have difficulty to understand social cognition and emotional states of others and it can be used as a treatment. Difficulty in mental states is the basis of theory of mind which is very important for social interaction. Considering the fact that the theory of mind and false belief as well known as a cognitive ability and emotional understanding of the social environment, however, that patients with major depression have a problem in the functions and social interactions, this could be related to theory of mind. Since the study about false belief in patients with mood disorders was for the first time, so there is a need for further studies to be able to generalize the results of research on a false belief.

The limitations of this study was confounding factors, such as duration of disease, drug type and amounts of overlap disease is uncontrolled and it is better to control of confounding factors. It also recommended that the study be repeated in other clinical samples.

Despite the defect in theory of mind and false belief in this group of patients, psychiatrists and psychologists should

have a greater focus on patient's social cognition and use cognitive therapy and social support for their interpersonal skills. The results of this research can be used to treat mood disorders through education and reinforcement the theory of mind and false belief.

ACKNOWLEDGMENTS

According to performance of this research in the Ostad Moharreri Hospital, it is important that we thank the cooperation of Mr. Keshtkar and Mr. Kaviani and all hospital staff and patients who helped us in this research.

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