

Deficits of 'Cognitive' and 'Affective' Theory of Mind in Euthymic Bipolar Patients Type I

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ABSTRACT

Objective: This study aimed to assess deficits of cognitive and emotional aspects of theory of mind in patients with bipolar disorder type 1 within a remission period.

Methods: In this case- control study, 30 bipolar patients and 30 normal individuals were selected through Purposive sampling method for the purpose of the study. Then, they were matched based on their educational background and age. Finally, all participants were asked to complete the Kessler Psychological Distress Scale (K10), eyes test, Theory of Mind Picture Stories Tasks. Data were analyzed using the independent t-test.

Results: Results show that there is a significant difference between two groups regarding their scores of cognitive theory of mind ($t=4.85$, $P<0.01$). and emotional theory of mind ($t=4.54$, $P<0.01$). and their reaction time for cognitive test ($t=10.34$, $P<0.01$) and emotional test ($t=4.61$, $P<0.01$).

Conclusion: The results show that bipolar patients type I with remission period have deficit regarding cognitive and emotional theory of mind. And because of this, they are weak in understanding others' cognitivemind states like opinions and ambitions, and others'emotional mind states like feelings and emotions. In fact, it can be concluded that the deficit in Theory of cognitive and emotional mind in bipolar patients with remission period can be the result of the malfunction of brain regions and cognitive infrastructures like executive performances.

Keywords:

Theory of mind, Bipolar disorder, Cognition, Affect

1. Introduction

The term Theory of Mind was introduced by Premack and Woodruff (1978) for the first time. Theory of Mind refers to the ability of understanding of others' thoughts and emotions on the basis of mental state perceptions (Carruthers, 2009). Ginsburg et al. (2003) believe that the ability of noticing and understanding of others' viewpoints is the foundation of effective and empathetic group work and an essential rule for members of that group in order to have a healthy relationship.

During the last decade, it is observed that deficits of theory of mind have a connection with clinical picture of lots of

psychiatrical and neurological disorders such as: Amygdala damage, Frontal damage, frontotemporal dementia, Schizophrenia, Parkinson, bipolar disorder, depression and personality disorders (Abu-Akel, 2003).

Bipolar disorder is a psychiatry disorder with unpredictable periods of Manic, Hypomanic, and depression; a severe psychiatric disorder which is related with emotional disfunction and chronic disorder in functioning (Purcell, Phillips, and Gruber, 2013). One of the major feature of bipolar patients is their problem in societal and interpersonal performances; theory of mind's deficit is one of the effective factors in the damaged relationships of these patients. That results in their inability in understanding other people's viewpoint. On the other hand, biological nerve

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studies show that in effectiveness of theory of mind, nerve connection between amygdale and superior cingulate gyrus and frontal cortex is important (Sayin, Oral, Utku, Baysak, & Candansayar, 2010). The similarity among affected areas in theory of mind with affected areas in bipolar disorder can determine the deficit theory of mind in bipolar disorder. (Yatham, 2011).

There are contrary findings related to the damage of theory of mind in people with bipolar disorder. In general it seems that theory of mind's damage would explain a wide range of symptoms of developmental disorders, schizophrenia, bipolar, some kind of dementia, and Anorexia nervosa (Inoue et al., 2006).

Recent studies in bipolar disorder have reported a deficit in social recognition and emotional deficit even in remission period of the disorder (Ibanez et al., 2012; Montag et al., 2010). Samame, Martino, Strejilevich meta-analysis (2012), and Tonelli, (2009) meta-analysis finding showed evidence for deficit in emotional and theory of mind processing in bipolar patients; even those patients who are euthymic. Different contrary reports in relation to theory of mind in Psychopathy can be the result of instruments used in the studies. That is, these eminent differences show that these assignments and instruments measure different processes. Some assignments are related to emotional aspect and some to cognitive one (Shamay, 2007). For theory of mind, the researcher has enumerated two factors as well. One is switching mental states (social perception) which is also called emotional theory mind and second is mental state reasoning (social recognition), also called a cognitive theory of mind (Samam و Martino, & Strejilevich, 2012).

The theory of mind components also has distinct neural connection. And even have a separate frontal neuronal circuitry (Vollm et al., 2006), although both in the pathology and imaging studies emphasized the outstanding role of prefrontal in functioning of the theory of mind (Gallagher et al., 2000). But it seems that emotional factor has a Frontal-limbic circuitry while the cognitive component is a dorsal frontal circuitry (Bodden et al., 2010). These components can selectively and distinctively be impaired in psychiatric and neurological disorders (Brothers & Ring, 1992).

The present study aimed to compare a normal group and a group with bipolar disorder type I during remission regarding the ability of cognitive and affective theory of mind. To this end, this research sought to answer the question of whether the ability of cognitive and affective theory of mind in euthymic bipolar patients is decreased

in comparison with normal population or not? If dropped in which aspect it is reduced. Therefore, in this study we used standard tools to measure both components of theory of mind in patients with bipolar disorder. Measurement of the ability of theory of mind both clinically and theoretically is important. The deficit of theory of mind can predict and explain a lot of bipolar patients' behavior in social relationships, and even explain many of their symptoms.

2. Methods

This is a Case-control study. The statistic population of the present research is comprised Bipolar patients. Two groups, patients (n=30) and control (n=30) were recruited for this study. Purposive sampling method was used for the selection of the participants. Patients with bipolar disorder were selected from patients attending health center of Welfare and Rehabilitation Sciences University. The diagnosis of bipolar disorder type I and the presence of remission period were confirmed by a psychiatrist and medical records of patients. The normal group was selected from the general population. Control group was matched with the patient group on certain variables such as age ($t=4.54$; $P\text{-value}=0.456$) and education level ($t=4.54$; $P\text{-value}=0.545$). Inclusion criteria for both groups were as follows: (1) a minimum of fifth grade elementary education and (2) having an age between 18 and 50 years. Inclusion criteria for the normal participants were receiving passing score (Score 20) on tests of mental health in normal individuals. The exclusion criteria for patient group were as follows: (1) having a psychiatric disorder or physical comorbid; (2) receiving physical shock one month before the study; and (3) drug abuse in the past month. The exclusion criterion for normal participants was having a psychiatric illness in their family members. Using SPSS ver. 16, the results were analyzed with the independent t test. The mean values of theory of mind tasks and reaction time in tasks were compared between the two groups. Demographic and clinical characteristics are listed in Table 1. This study was confirmed by the Research Ethics Committee of University of Social Welfare and Rehabilitation Sciences of Tehran and ethical issues like confidentiality of participants' information was observed and their written consent were obtained.

Reading the mind in the eyes

The eyes test or Reading the mind in the eyes which its original version is presented by Professor Baron-Cohen of Cambridge University. The test is one of the most reliable tests in studying emotional aspects of theory of mind. In this test, participants were shown 36 pictures of different people's eyes. They were asked to determine the mental

Table 1. Demographic and clinical characteristics of participants.

Demographics	Bipolar disorder I with Remission period (N)	Normal group (N)
Number	30	30
Sex	Male	Male
Education under diploma	3	5
Diploma degree	10	12
Bachelor's degree	17	13
Age	18-30	15
	31-40	5
	41-50	10

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status of photos owners. The test's maximum score was 36 and the cut-off point was set at 22 (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001). Internal consistency of Persian version of the test was 0.73 (Darvishi, 2014)

The theory of mind's pictorial story tasks

Corcoran, Cahill and Frith (1997) presented pictorial stories to assess cognitive theory of mind. This task includes 6 animation stories; the maximum score is 59; therefore, higher scores in this test are indicative of the ability of theory of mind (Brune, 2003). Internal consistency of Persian version of the test in Darvishi, et al.'s study (2014) was reported as 0.75.

Kessler Psychological Distress Scale (K-10)

Kessler et al (Kessler et al., 2003) introduced this test to identify mental disorders in the general population. The test has a pool question of 6 or 10 which are scored from zero to four, a Likert-scale of never to always. The cutoff point of the scale is 20 and the maximum score is 40. In Darvishi, et al.'s (2014) Cronbach's alpha coefficient was calculated 0.87. We have used the software of SPSS 16 in order to analyze the data. Considering the research questions and the type of hypotheses, the research data were analyzed through t-test.

3. Results

Demographic and clinical characteristics of participants showed in Table 1. Comparing group on certain variables, such as age ($t=4.54$; $P\text{-value}=0.456$) and education level ($\chi^2=4.54$; $P\text{-value}=0.545$) was matched with patients group. Data from the tasks were analyzed by SPSS software. The variables were tested for normality of distribution and Homogeneity of variance and outliers were removed from the analysis.

Table 2 shows the mean scores of the patient and the normal groups on the theory of mind test and the spent time to answer the test. The independent t test analysis revealed a significant difference between two groups regarding the cognitive theory of mind. And cognitive scores of the patient group were significantly lower than that of normal group ($P\text{-value}=0.001$; $t=4.85$). With regard to the theory of emotional mind, there was a significant difference between two groups as well. The bipolar patients had lower scores compared to the normal group ($P\text{-value}=0.001$; $t=4.54$).

With regard to the time spent on cognitive and affective tasks of theory of mind, Table 3 shows non-directional results. Regarding the time spent on cognitive tasks, there was a significant difference between bipolar disorder and normal groups; the patient group spent more time on

Table 2. The mean scores of two aspects of theory of mind in two groups.

Group	Number	Mean	SD	df	T value	Sig.
Cognitive aspects of bipolar disorder patients	30	45.53	7.84	58	4.85	0.001
Cognitive aspects of normal people	30	55.53	6.44			
Emotional aspects of bipolar disorder patients	30	17	4.05	58	4.46	0.001
Emotional aspects of normal people	30	21.36	3.48			

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Table 3. The mean scores of the time spent of two aspects of theory of mind of two groups.

Group	Number	Mean	SD	df	T-value	Sig.
Cognitive spent time of bipolar	30	5.09	0.34	58	10.34	0.001
Cognitive spent time of normal	30	4.00	0.46			
Emotional spent time of bipolar	30	15.20	1.90	58	4.61	0.001
Emotional spent time of normal	30	17.73	2.33			

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cognitive tasks than the normal group (P -value=0.001; $t=10.34$). The difference in time spent on emotional tasks was significant between two groups and the bipolar disorder group spent less time than the normal group on emotional test (P -value=0.001; $t=4.46$).

4. Discussion

This study examined the cognitive and emotional theory of mind in patients with bipolar disorder type I within remission period and compares it with normal people. To this end, two hypotheses were raised: (1) the cognitive theory of mind in patients with bipolar disorder type I within remission period is lower compared to normal people and (2) The emotional theory of mind in patients with bipolar disorder type I within remission period is lower compared to normal people.

One of the characteristics of bipolar patients is disorder in their social and interpersonal relationship performance. One of the factors in their damaged social relationships is the deficit in theory of mind, which causes their inability to understand others' viewpoints. Understanding others' viewpoints necessitates understanding their state of mind. Mind states include cognitive components (e.g. beliefs, thoughts, and opinions) and emotional components (e.g. feelings and emotions). Therefore, cognitive theory of mind is related to understanding of mind states like thoughts and ambition and emotional theory of mind comprises understanding of other mind states like emotions and feelings.

The results of this study showed that patients with bipolar disorder type I within remission period with regard to emotional and cognitive theory of mind are significantly lower compared to the normal group, i.e. deficit in both aspects of theory of mind in bipolar disorder patients. The results of this study are in line with the results of Lahera et al. They conducted a study in order to assess social cognition and general performance of patients with bipolar disorder type I within the remission period. They used Baron-Cohen's eye and Faux pas tests to assess theory of mind.

Eyes test assesses emotional theory of mind and Faux test cognitive theory of mind. This study showed that patients with euthymic bipolar were lower in both tests compared to the normal group, which revealed deficit in both aspects.

The presence of deficit in the ability of cognitive theory of mind in bipolar patients shows that these patients are not able to recognize others' thoughts and opinions and cannot correctly understand the cause of others' behavior. This inability can cause misbehavior and disorder in their interpersonal relationships. They may take a joke as an insult which leads to aggression. This may distance others from them and leave them alone. The cognitive theory of mind is a prerequisite for understanding jokes, humor, teasing, lies, and deception.

The results of this study is consistent with Montag et al. (2010) and Bora et al. (2005) results. In their study they found that euthymic bipolar patients in cognitive theory of mind had a lower performance than the normal group. The reason might be cognitive deficits in bipolar patients. Recent studies suggest that cognitive abilities in theory of mind tasks (where multiple perspectives related to the task, and the self-inhibition awareness and what is wrongly believed to be associated with emotions and subsequent actions should be taken into account) have a vital role (Inoue et al., 2004). On the other hand, FMRI studies of bipolar patients have shown that one of the brain regions which are damaged is the prefrontal region; which is a key region in the nervous autopsy of mood regulation (Taylor, 2006). Prefrontal region of the brain is a part of brain which is called the social brain. FMRI¹ and PET² studies have shown that in doing TOM tasks prefrontal cortex is directly activated (Inoue et al., 2004).

On the other hand, emotional theory of mind is related to the perception of mind states like feelings and emotions. It enables the person to correctly recognize others' emotions and properly reacts to them. Deficit in emotional theory of mind causes a patient with bipolar disorder not to under-

1. Functional magnetic resonance imaging
2. Positron emission tomography

stand others' feelings and emotions, to make mistake in his or her perception, and show an inappropriate response. For example, if other people are sad or impatient, the patient cannot correctly recognize this feeling and shows an inappropriate behavior. Therefore, in dealing with others, the patient experiences a challenge; and when others suffer from the patient's careless and reckless behavior, they would abandon the patient. The results of this study is consistent with Lahera et al. (2012) and Wiener, Andrzejewska, Bodnar, & Rybakowski (2011) findings

Simon Baron-Cohen (2002) believes that amygdala is a part of the theory of mind network. The key role of the amygdala in emotional processes in the brain has long been known. Baron Cohen found that when a person wants to look at the others' eyes to guess their feelings and intentions, the amygdala is activated. On the other hand, there is evidence that the amygdala in patients with bipolar disorder is malfunctioning. Three different research groups, which have studied the size of amygdala in adult patients with bipolar disorder, suggested that the amygdala in these patients has been changed in size and function (Soares & Young, 2007). Given the evidence of malfunction of amygdala structure in patients with bipolar disorder and the importance of this structure in emotional theory of mind, deficit seems obvious in patients with emotional aspect of bipolar disorder. These structural and functional defects make patients to act differently in the time of responding to the tasks of the theory of mind.

Regarding the cognitive aspects, patients spent more time compared to the normal group. This is because to do the cognitive tasks needs a correct performance in cognitive structures and information processing. Any defect in these structures will reduce the speed of performance. With regard to emotional aspect, deficits in the existing infrastructure of the emotional reactions are damaged as well, but these damages are the opposite of cognitive results. The patients responded more quickly than the normal group to the emotional task. These findings suggest that emotional decision making is accelerated in patients with bipolar disorder. This acceleration causes a lot of mistakes in everyday activities with regard to emotional reactions and inappropriate emotional responses. The results showed that patients with bipolar disorder type I with remission period have deficit regarding theory of cognitive and emotional mind. Accordingly, they act poorly in understanding others' cognitive mind states like opinions and ambitions, and others' emotional mind states like feelings and emotions.

This study like other studies of behavioral and psychological sciences has some limitations; e.g. the limited

number of participants, lack of female participants, and selection of accessible population. So, it is suggested that in the future studies both genders be included and structural interviews be used for determining periods of bipolar disorder. The relation between theory of mind and other functions could be measured as well. Interpersonal and sociobehavioral therapy is recommended to improve the patient's interpersonal relationships

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