

Theory of mind deficits in bipolar disorder in remission

Remisyon dönemi bipolar bozuklukta zihin kuramı işlev bozukluğu

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Abstract

Aims: Theory of Mind (ToM), a concept used to describe an individual's social cognitive abilities that play roles in social interaction, may have a significant role in explaining the clinical variables and social problems of affective disorders. This study aims to determine whether ToM functions are impaired in Bipolar Disorder (BD) compared to healthy controls as well as investigate the association between clinical variables of ToM deficit and social competence.

Methods: A total of 50 patients diagnosed with BD who were in remission and 50 healthy control subjects were included in this cross-sectional study. Demographic data and medical history of participants were assessed, and Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), Eyes test, Hinting Task, Social Adaptation and Self-Evaluation Scale (SASS), Wechsler Adult Intelligence Scale-Revised (WAIS-R) tests were administered.

Results: There were no significant differences with regards to age, gender and BDI scores between patient and control groups. Hinting test ($P=0.001$), Eyes test ($P=0.001$), SASS ($P=0.007$) and WAIS-R ($P=0.001$) scores were higher in the control group. There was a significant correlation between Hinting Test and WAIS-R ($r=0.430$, $P=0.001$), and between Eyes Test and age ($r=-0.590$, $P=0.001$), duration of bipolar disorder ($r=-0.554$, $P=0.001$), number of manic attacks ($r=0.590$, $P=0.001$) and WAIS-R ($r=0.343$, $P=0.050$). Logistic regression analysis showed that compared to the patient group, control group was related to Eyes test by 1.2-fold for each point increase in Eyes test ($P=0.001$) and 1.3-fold for each point increase in Hinting test ($P=0.003$).

Conclusion: ToM deficit was an essential factor that separated BD patients in remission from healthy individuals. ToM deficit may play a role in the essential pathology or affect the presence, or even onset, of BD.

Keywords: Bipolar disorder, Remission phase, Theory of mind, Social cognition

Öz

Amaç: Zihin kuramı (ZK) bireyin sosyal etkileşimde rol oynayan sosyal bilişsel yeteneklerini tanımlamak için kullanılan bir kavramdır ve duygu durum bozukluklarının kliniğinde ve sosyal problemlerini açıklamakta önemli bir rolü olabilir. Bu çalışmanın amacı, remisyon döneminde olan bipolar bozukluk (BB) hastalarında sağlıklı kontrollere göre zihin kuramı yetilerinde bozukluk olup olmadığı ve ZK kusurunun cinsiyet, eğitim düzeyi, hastalık süresi, atak sayısı, hastaneye yatış öyküsü, öz kıyım girişimi öyküsü gibi klinik değişkenler ve sosyal uyum ile ilişkisini araştırmaktır.

Yöntemler: Çalışma kesitsel dizaynda tasarlanmış ve remisyon döneminde olan 50 BB hastası ve 50 sağlıklı katılımcıdan oluşan kontrol grubu dahil edilmiştir. Demografik bilgiler ve hastalık öyküsü alınmış, Beck Depresyon Envanteri (BDE), Beck Anksiyete Envanteri (BAE), İma Testi, Gözler Testi, Sosyal Uyum ve Kendini Değerlendirme Ölçeği (SUKDÖ), Muhakeme Becerisi (MB) testleri uygulanmıştır.

Bulgular: Gruplar arasında yaş, cinsiyet ve BDE puanları arasında anlamlı fark yoktu. İma testi ($P=0,001$), Gözler Testi ($P=0,001$), SUKDÖ ($P=0,007$) ve MB ($P=0,001$) puanları kontrol grubunda anlamlı olarak yüksek idi. İma testi ve MB arasında anlamlı pozitif korelasyon vardı ($r=0,430$, $P=0,001$). Göz Testi ile yaş ($r=-0,555$, $P=0,001$), hastalık süresi ($r=-0,554$, $P=0,001$), manik atak sayısı ($r=0,590$, $P=0,001$) ve MB ($r=0,343$, $P=0,050$) arasında korelasyon saptandı. Lojistik regresyon analizi ile kontrol grubunun hasta grubu ile kıyaslandığında Gözler testinde her puan artışı ile 1,2 kat ($P=0,001$), İma testinin her puan artışı 1,3 kat ($P=0,003$) ilişkili olduğu gözlemlendi.

Sonuç: ZK kusurunun, diğer özellikleri ne olursa olsun BB düzelmeye döneminde olan bireyi sağlıklılardan ayıran önemli bir etmen olduğu saptanmıştır. ZK kusurunun BB'nin temel patolojisinde yer aldığı ve patolojinin varlığını etkilediği düşünülmüştür.

Anahtar kelimeler: Bipolar bozukluk, Remisyon fazı, Zihin Kuramı, Sosyal kognisyon

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Introduction

Bipolar mood disorder is a chronic disease characterized by periodical and recurrent course of depressive, manic, or mixed episodes as well as subthreshold symptomatic or asymptomatic periods, leading to loss of social and occupational function [1].

Theory of Mind (ToM) is a concept used to describe an individual's social cognitive abilities that play a role in social interaction. ToM, otherwise known as "mental theory" or "mentalization capacity", is the individual's ability to perceive that other people have a different mind from their own as well as the individual's comprehension of mental states including intentions, beliefs, and desires [2].

Some studies have divided the ToM into socio-cognitive and socio-perceptive paradigms [3,4]. Socio-cognitive Theory of mind is defined as the person's capability to deduce the underlying mental state of other people based on their behaviors. The second paradigm, socio-perceptive ToM, is the person's capacity to perceive the mental state of other people based on directly observable information. The Eyes Task is the most common tool for measuring this function [5].

ToM deficit in BD has been shown in studies and imaging methods. However, the correlation between its clinical features and ToM has not been comprehensively investigated. Most studies on ToM deficit have been conducted on patients diagnosed with autism and schizophrenia. Studies on patients with affective disorders are limited.

This study respectively examines the relationship between ToM deficit and clinical symptoms, social coherence, and cognitive functions in BD patients in remission.

Materials and methods

The study group consisted of patients who were admitted to the Department of Mental Health and Diseases outpatient clinic of the university hospital, diagnosed with "Bipolar Affective disorder" according to the Diagnostic and Statistical Manual of Mental Disorders 4th Edition (DSM-IV), in remission period, and met the study's inclusion criteria. The control group consisted of volunteers who met inclusion criteria, had no psychopathology based on psychiatric examination, no history of psychiatric disorders and were not undergoing any medical treatment.

- Patient group inclusion criteria: 18-65 years of age, BD diagnosis according to DSM-IV, in remission period (Young Mania Rating Scale ≤ 4), no Axis I pathology other than BD

- Control group inclusion criteria: 18-65 years of age, no presence or history of psychiatric illness or severe physical/neurologic disease, informed written consent obtained before study participation

- Exclusion criteria: Individuals with a condition preventing the administration of tests (illiteracy), organic brain pathology, history of substance or alcohol abuse/addiction, benzodiazepine use, and mental retardation were excluded from the study.

Both groups underwent a psychiatric evaluation. Appropriate tests were administered on the same day by a psychiatrist and a clinical psychologist.

Administered forms and tests

All study participants completed a sociographic data form developed for the study within a face-to-face interview session with the study conductor, along with Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), Hinting Task, Eyes test, Social Adaptation and Self-Evaluation Scale (SASS), Wechsler Adult Intelligence Scale-Revised (WAIS-R) tests.

Beck Depression Inventory: This depression scale consists of 21 questions with each response scored from 0-3. Total score intervals are as follows: 1-10 normal, 11-16 moderate affective disorder, 17-20 clinical depression, 21-30 moderate depression, 31-40 moderate-to-severe depression, and 41-63 severe depression. The Turkish validity and reliability study was conducted by Hisli [6].

Beck Anxiety Inventory: Beck et al. developed the scale in 1988 [7]. Turkish validity and reliability was conducted by Ulusoy et al. [8]. The self-assessment scale evaluates the person's frequency of anxiety symptoms and consists of 20 questions, each scored between 0-3. The items assess how bothered the individual is by the symptoms during the past week. A high score represents elevated levels of anxiety.

Hinting Task: One of the advanced ToM tests, the Hinting Task was developed by Corcoran et al. [9]. The test consists of ten brief passages demonstrating the interaction between two characters. Each passage ends with one of the characters distinctly hinting at something. The test administrator asks the subject what they believe the character was implying. An appropriate initial response grants two points, and the test continues to the next passage. If the subject does not respond the first time correctly, the story continues, and a more obvious hint is given. If the subject responds correctly at the second hint, one point is given. If no correct response is given for the passage, zero points are given. Total scores range from 0-20 [9]. The test's Turkish adaptation was initially conducted by Bora et al. [10] and later by Taş et al. [11].

Eyes Task: The Eyes Task assesses the person's ability to form inferences based on the photographs of people's eyes only. The test also comprises functions such as facial perception and identifying emotions—the Turkish adaptation for adults, along with the test's validity and reliability study were conducted by Yildirim et al. [12]. The test consists of 36 questions with four options for each photograph of a person's eyes. Results are assessed according to the number of correct responses.

Social Adaptation and Self-Evaluation Scale: This scale was developed by Bosc et al. [13] to determine "social functioning" in depression patients for use in clinical research. The 21-item self-assessment, in which the only one of the first two items is answered according to occupational status, for a total of 20 responses, is scored between 0-3. Three main factors were identified according to the results of the factor analysis of SASS. Factor 1 represents 32% of the total variance, Factor 2, 8%, and Factor 3, 5%. Therefore, factor 1 alone has the power to represent the whole scale with all its items.

Wechsler Adult Intelligence Scale-Revised (WAIS-R): Developed by Wechsler [14], this scale is used to measure the person's vocabulary as well as usage of words and self-expression, sensitivity to new information, long-term memory, and when necessary, regrouping, and semantic memory [15].

Ethics: The study received ethics approval by the Uludag University Clinical Research Ethics Committee (date: 5/13/2014 number: 2014-10/14), and informed consent was obtained from all participants.

Statistical analysis

Statistical analysis of the data was carried out on the SPSS 25.0 statistical package program. Conformity of the variables to normal distribution was evaluated with analytical methods (Kolmogorov–Smirnov / Shapiro–Wilks tests). Descriptive findings were expressed as distribution of number and percentage, median, and interquartile range (IQR) values. Dependent variables were assessed as continuous variables. In the analysis of the correlation between dependent and independent variables, Student's t-test and Mann-Whitney U test were used to assess independent variables with two categories. Pearson Chi-square test, Fisher's exact Chi-square test, and Fisher-Freeman-Halton tests were used to evaluate categorical data. Pearson's correlation analysis was applied in measurement-type variables. Logistic regression analysis was used for the retrospective elimination between control and patient groups using ToM tests. The *P*-value <0.05 was considered the level of significance of all analyses and correlations.

Results

A total of 100 volunteers between 18-65 years of age were included in the study, with 50 patients and 50 controls. The patient group consisted of 30 females and 20 males, while the control group consisted of 33 females and 17 males. There were no significant differences between the groups with regards to gender (*P*=0.679), educational status (*P*=0.474), and marital status (*P*=0.512). The patient group included 11 (22%) patients with a history of suicidal attempt and 31 (62%) with previous hospitalizations.

Median and IQR of Age, BDI, BAI, Hinting Task, Eyes Task, SASS, and WAIS-R tests for both groups are presented in Table 1. There were no significant differences between age, gender and BDI scores between patient and control groups. Hinting test (*P*=0.001), Eyes test (*P*=0.001), SASS (*P*=0.007) and WAIS-R (*P*=0.001) scores were higher in the control group.

Correlation of clinical variables with ToM tests inpatient group is presented in Table 2. There was a significant correlation between Hinting Test and WAIS-R (*r*=0.430, *P*=0.01). Also there were significant correlations between Eyes Test and age (*r*=-0.555, *P*=0.001), duration of bipolar disorder (*r*=-0.544, *P*=0.01), number of manic attacks (*r*=-0.590, *P*=0.01) and WAIS-R (*r*=0.343, *P*=0.05). When age was controlled, negative correlation between Eyes Test and Number of Manic Attacks increased to *r*=-0.650. On the other hand, when age was controlled, negative correlation between Eyes Test and Duration of Bipolar Disorder decreased to *r*=-0.252, which was insignificant (*P*=0.081).

Logistic regression analysis with clinical variables and ToM tests between control and patient groups are presented in Table 3. The logistic regression model was statistically significant in both steps. In Step 2, compared to the patient group, control group was related to Eyes test by 1.2-fold for each point increase in Eyes test (*P*=0.001) and 1.3-fold for each point increase in Hinting test (*P*=0.003).

Table 1: Comprasion of sociodemographic variables

	Patients Median (IQR)	Control Median (IQR)	Statistics	<i>P</i> -value
Age	39.0 (32.0-50)	38.0 (34.0-39.0)	Z:0.842	0.400
Gender	Male 60.0% (n:30)	66.0% (n:33)	χ^2 :0.386	0.339
	Female 40.0% (n:20)	34.0% (n:17)		
BDI	5.0 (1.0-9.3)	5.5 (1.8-10.0)	Z:0.118	0.906
BAI	6.5 (3.0-14.0)	5.0 (2.0-10.0)	Z:2.019	0.044
Hinting Test	15.0 (12.8-17.0)	18.0 (16.8-18.3)	Z:4.524	0.001
Eyes Test	20.0 (15.7-23.0)	24.0 (22.0-27.0)	Z:4.826	0.001
SASS	39.5 (34.0-46.3)	44.0 (40.0-47.0)	Z:2.707	0.007
WAIS-R	22.5 (17.0-25.3)	28 (24.8-31.0)	Z:5.063	0.001

BDI: Beck Depression Inventory; BAI: Beck Anxiety Inventory; SASS: Social Adaptation and Self-Evaluation Scale; WAIS-R: Wechsler Adult Intelligence Scale-Revised.

Table 2: Correlation analysis of clinical variables with ToM tests in patient group

	Hinting Test <i>r</i>	Eyes Test <i>r</i>
Age	-0.140	-0.555**
Age at Bipolar disorder onset	0.095	-0.092
Duration of disorder	-0.134	-0.544**
Number of hospitalization	0.072	-0.270*
Number of manic attacks	-0.001	-0.590**
Number of depressive attacks	0.184	-0.127
BDI	0.075	-0.049
BAI	0.133	-0.026
SASS	0.267	-0.243
WAIS-R	0.430**	0.343*

BDI: Beck Depression Inventory; BAI: Beck Anxiety Inventory; SASS: Social Adaptation and Self-Evaluation Scale; WAIS-R: Wechsler Adult Intelligence Scale-Revised, *r*: Pearson correlation coefficient; * *P*<0.05; ** *P*<0.01

Table 3: Logistic regression analysis with clinical variables and ToM tests between control and patient groups

	χ^2	R ²	<i>b</i> (SE)	<i>P</i> -value	OR
Step 1					
Model	38.027	0.422		0.001	
Eyes Test			0.181 (0.057)	0.001	1.198
Hinting Test			0.272 (0.104)	0.009	1.313
SASS			0.057 (0.044)	0.199	1.058
Constant			-10.744 (2.478)	0.001	
Step 2					
Model	36.318	0.406		0.001	
Eyes Test			0.188 (0.056)	0.001	1.207
Hinting Test			0.304 (0.102)	0.003	1.355
Constant			-9.021 (1.962)	0.001	

Variables entered on Step 1: Age, WAIS-R, Eyes Test, Hinting Test and Social Adaptation and Self-Evaluation Scale (SASS), OR: Odds ratio

Discussion

In this study, the Eyes Task and Hinting Tasks were administered in patient and control groups to evaluate the socio-perceptive and socio-cognitive paradigms of ToM deficit, respectively.

According to total scores of both Eyes and Hinting Tasks, the patients in remission had significantly impaired mental comprehension compared to healthy controls, suggesting decreased socio-cognitive and socio-perceptive function. These findings are consistent with a study by Bora et al. [16], in which healthy controls had a higher level of function in comprehending mental states compared to euthymic BD patients. The results of our study suggest that BD patients face difficulties in daily and working life in interpreting facial and body language of others and in rapid decision-making due to socio-perceptive and socio-cognitive deficits. This seems to be associated with decreased functions, even when patients are in remission.

Similarly, Bora et al. [16] found no association between age of onset and ToM deficit. Our study also found that the Eyes Task score decreased with an increase in several previous manic episodes, accounting for decreased socio-perception. These findings, together with data from other studies, are indicative that neuronal loss in the brain is associated with many previous episodes rather than early-onset [17-19].

Upon screening the literature, we did not encounter any study which reported an association between age and socio-perceptive paradigm of ToM in BD patients. Although the small patient sample of our cross-sectional study included many

confounding factors such as intelligence, our study was the first to show that socio-perceptive deficit increased with age.

Some studies show that the WAIS-R intelligence test also measures reasoning [20-23]. Evaluation of our subjects' WAIS-R test results revealed that BD patients in remission had significantly impaired reasoning compared to healthy controls. This finding is consistent with the study by Wolkenstein et al. [24], indicating that the patient group had more reduced performance in the integration of conceptual information (reasoning) regarding other people, compared to the control group.

Frequent symptoms of anxiety in patients with chronic illness [25-26] has led to the questioning of the association between levels of anxiety and ToM. Therefore, anxiety levels of both groups were evaluated using BAI to find that it was significantly higher in the patient group. Correlation between BAI scores and Hinting and Eyes Task was evaluated, and no significant correlation was determined between anxiety levels and ToM deficit in BD patients in remission. This also led us to believe that ToM deficit may occur regardless of anxiety levels in BD patients in remission.

It is known that individuals acquire ToM ability required to adapt to their social environment and use this ability to solve problems encountered in their daily lives [27,28]. Therefore, patients with ToM deficit face difficulties in daily adaptation and socialization [29]. In this study, SASS was used to measure the social functionality of patients and healthy controls to reveal a significant difference between the groups. This finding is consistent with the literature [30].

WAIS-R test results were correlated with both the Hinting Task and Eyes Task tests. This connotes that reasoning ability is also associated with ToM. The deficit in reasoning causes difficulty in integration of conceptual information. It was inferred that both perceptual and cognitive impairments in these individuals occur as a result of this difficulty. Furthermore, evaluation of patients and healthy controls revealed that there was a correlation between the Hinting Task and Eyes Task, suggesting that socio-perceptive and socio-cognitive paradigms of ToM may be interrelated.

Limitations

The sample was few, making it challenging to generalize. Since patients were undergoing medical treatment during the study period, the association between clinical evaluation scales and cognitive functions could not be ruled out.

Conclusion

It was determined that the ToM deficit occurs independently from variables such as gender, social functionality level, anxiety levels, and history of depressive episodes. Socio-perceptive ToM function was inversely related to age and number of manic episodes. Reasoning ability positively impacted both socio-perceptive and socio-cognitive paradigms of ToM. ToM deficit also seems to be an essential factor distinguishing BD patients from healthy individuals. This is possible evidence that ToM deficit plays a role in the essential pathology or affects the presence, or even onset, of BD.

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