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ARAŞTIRMA / RESEARCH

Theory of mind abilities and its relationship with clinical features in euthymic bipolar patients

Ötimik bipolar bozuklukta zihin kuramı kavramları ve klinik özelliklerle ilişkisi

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Abstract

Purpose: The term of 'Theory of mind' (ToM), is the ability to understand one's own others' mental states, is an important capacity for social cognition and there is increasing data that theory of mind is compromised in bipolar patients even in euthymic periods. The aim of this study was to investigate theory of mind deficits in euthymic bipolar disorder patients and its relation to the clinical features.

Materials and Methods: Fiftytwo euthymic patients with bipolar I disorder according to DSM IV-TR and 60 matched healthy control subjects were involved in this study. ToM was assessed by Reading the Mind in the Eyes test and the Dokuz Eylül Theory of Mind Scale.

Results: The patient group had significantly lower performance on both of the ToM tests. We observed significant correlation between age of onset, the number of hospitalizations, the number of manic/mixed episodes and theory of mind performance.

Conclusion: The result we showed is that ToM is impaired in euthymic bipolar I patients, which is consistent with the studies suggesting that ToM might be a trait marker for bipolar disorder.

Keywords: Bipolar disorder, theory of mind, social cognition

Öz

Amaç: Zihin kuramı kavramı, kişinin kendisinin ve başkalarının zihinsel durumlarını anlama yeteneğidir ve sosyal biliş için önemli bir kapasitedir. Bipolar bozuklukta zihin kuramının ötimik dönemde bile etkilendiğine dair çalışmalar bulunmaktadır. Bu çalışmada ötimik olan bipolar bozukluk I hastalarında zihin kuramı özellikleri ve klinik özellikler ile ilişkisi araştırılmıştır.

Gereç ve Yöntem: Çalışmaya, bipolar I bozukluk tanısı konan 52 hasta ve yaş, cinsiyet, eğitim süresi açısından eşleştirilmiş 60 kontrol dahil edildi. Zihin kuramı (ZK), Gözler Testi ve Dokuz Eylül Zihin Teorisi Ölçeği ile değerlendirildi.

Bulgular: Hasta grubunun, her iki ZK testinde anlamlı olarak daha düşük puan aldığı tespit edildi. Klinik değişkenlerden hastalık başlangıç yaşı, hastaneye yatış süresi ve manik/mikst atak sayısının ZK becerileri ile ilişkisi olduğu gözlendi.

Sonuç: Bu çalışma zihin kuramının bipolar bozuklukta ötimik dönemlerde de etkilenmiş olduğu göstermiştir ve zihin kuramının bipolar bozuklukta bir yatkınlık belirleyicisi (trait marker) olabileceğini öne süren çalışmaları desteklemektedir.

Anahtar kelimeler: Bipolar bozukluk, zihin kuramı, sosyal biliş.

INTRODUCTION

Deficits in social cognition, involved in the aetiology of psychopathological symptoms and is an important predictor of social competence. Theory of Mind (ToM) is the ability to understand others' mental states and is thought to be an important capacity for social cognition[1,2]. Cognitive capciies including ToM abilities are first order beliefs, second order beliefs, irony, metaphoric comprehension and faux pas[2].

There is increasing data that theory of mind is compromised in bipolar patients not only in manic and depressive periods, but also in euthymic

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periods[3,4,5]. However, in the previous studies, results on the association with the symptom severity are controversial and social cognitive profile of illness throughout its three phases remains unclear[6,7]. ToM deficits were demonstrated significantly in acute episodes of the illness, whereas some studies showed that deficits exist even in remission periods[7]. Some researchers claim that ToM is affected by clinical properties, like number episodes[8,9], but the relationship with clinical features were not shown in some studies. Additionally, it has been claimed that deficits in ToM abilities might be independent of clinical features, also it is discussed that whether ToM is a trait marker[10,11]. Theory of mind is known to be affected in psychotic and schizophreniform spectrum disorders, so being a trait marker is also discussed for psycosis too[10].

In this study, we aimed to assess different components of the term ToM comprehensively by using visual and verbal tests. We tested the ToM abilities by Reading the Mind in the Eyes Test (Eyes Test) and Dokuz Eylül Theory of Mind Scale (DEToMS) which includes first order false belief, second order false belief, metaphor comprehension, irony comprehension, faux pas recognition and empathy tests[12,13,14]. We also wanted to find out if there is an association between ToM abilities and clinical features of the disease. The results were discussed in comparison with literature.

MATERIALS AND METHODS

Participants

52 euthymic patients with bipolar I disorder and 60 matched healthy control subjects were involved in this study. Bipolar patients were recruited from the Affective Disorders Unit and Outpatient Clinics of Bakirkoy Research and Training Hospital for Psychiatry, Neurology and Neurosurgery. The clinical state of the patients was determined by a psychiatrist using the sociodemographic clinical data form, Structured Clinical Interview for DSM-IV (SCID-I, DSM-IV), Young Mania Rating Scale (YMRS), Hamilton Depression Rating Scale (HDRS). Inclusion criteria were being between 18 and 65 years old, being in regular clinical assessments for follow up at least for 6 months, no hospitalization and being in remission and for at least 3 months (YMRS < 6 and HDRS < 6), being graduated from at least primary school. Subjects who had any neurological and physical illness that might have influence on cognitive functions, comorbid psychiatric disorder, substance or alcohol dependence or existence of abuse in last 6 months, electroconvulsive therapy or transcranial magnetic stimulation in last six months, serious cerebral trauma history, serious visual or auditory defects were excluded. Subjects with bipolar disorder II and other affective disorders are not included.

Control group was made up of healthy volunteers who has no history of psychiatric diagnosis or treatment and recruited form hospital staff or via contacts of the researchers. They were matched with the patients regarding age, gender and level of education.

All of the participants had the informed consent for the study and they were informed about the right of withdrawal from the study in any phase of the study.

Materials

Clinical measurements:

Sociodemographic and clinical data form was formed to gather information. The patients' clinical data was collected from the medical records of the hospital and also provided from patients' families and carers when needed. Age of onset, duration of illness, number of episodes (total, manic/mixed, hypomanic and depressive), number of episodes per year, number of hospitalisations, duration after last hospitalisation, duration of remission were investigated as clinical features. Structured Clinical Interview for DSM-IV (SCID-I, DSM-IV) used for diagnosis of Bipolar Disorder I according to DSM. Hamilton Depression Rating Scale and Young Mania Rating Scale were used to assess the mood symptoms of the patients[15,16,17,18,19].

ToM measurements:

Reading the Mind in the Eyes Test – Revised which is generated by Baron-Cohen et al. consists of photographs of eye region with options of corresponding emotions. There are options of emotions and mental states for each image. Subjects choose an option of mental state which they thought the most appropriate mental state for each photograph. The Turkish version of the test is used in this study[13,14].

Dokuz Eylül Theory of Mind Scale (DEToMS) (Degirmencioglu 2008) is a detailed scale which assesses subgroups of first order false belief, second

order false belief, metaphor comprehension, irony comprehension, faux pas recognition and empathy. There are 24 questions asked in seven stories and 5 picture tasks. 18 of them assess ToM, whereas 6 questions investigate physical realism. If subjects fail to answer the physical reality questions correctly, the test is regarded as invalid[12].

Statistical analysis

The analysis of the data was done by using Windows SPSS 18.0. Student t test were performed to evaluate the comparisons of parametric distributed quantitative measurements. To assess the quantitative data we used Chi-square test and Fisher exact test when needed. Pearson correlation analysis was used for the relationship between the scale rates and clinical features. Furthermore, to determine the predictors of total DEToMS, age, gender, educational level, duration of the disease, number of manic/mixed episodes, number of depressive episodes, existence of psychotic symptoms and regular use of mood stabilisers were accepted as independent variables and stepwise regression analysis was performed. Confidence interval was 95% and significance was set at $p<0.05$ for all analyses.

RESULTS

The bipolar group (BP) and healthy control group (HC) did not show any significant differences in age, gender and educational level ($p>0,05$) (Table 2). When ToM scores of DEToMS and Eyes test compared in between the groups; the the patient group had lower performance than healthy controls ($p<0.001$ and $p<0.001$ respectively). Also within the subgroups of DEToMS, the first and second order believes, irony, empathy and metaphoric comprehension abilities, scores were significantly worse in bipolar group (Table 2). We interestingly find no significant difference in faux pas test between the groups.

Table 1. Sociodemografic data

	Bipolar disorder N=52		**Control N=60**		t	p
	mean	S.S.	mean	S.S		
Age	34.46	8.62	32.51	8.94	1.166	>0.05
Educational level	11.51	3.93	11.91	3.96	-0.531	>0.05
	n	%	n	%	c^2	p
Gender					0.022	>0.05
Female	27	51.9	32	53.3		
Male	25	48.1	28	46.7		

t, Student t test; c^2,Chi square test

Table 2. ToM tests scores

	Bipolar disorder N=52		**Control N=60**			
	mean	S.S.	mean	S.S	t	P
First order false belief	3.26	0.84	3.56	0.67	-2.042	<0.05
Second order false belief	1.92	0.85	2.68	0.50	-5.598	<0.001
Irony	2.21	1.27	2.66	0.65	-2.325	<0.05
Empathy	4.55	0.77	4.90	0.30	-2.985	<0.01
Metaphor	1.91	0.27	1.69	0.49	-3.033	<0.01
Faux pas	0.42	0.49	0.53	0.50	-1.161	>0.05
DEToMS total score	13.88	2.306	16.22	1.552	-6.178	<0.001
Eyes test	21.38	4.117	25.56	3.852	-5.517	<0.001

t, Student t test

When we look at the clinical features we can observe that only age of onset is negatively correlated with total rate of DEToMS, it is also negatively correlated with metaphoric comprehension. Regarding the subscales of ToM, the number of manic/mixed episodes and number of hospitalisations seem to be significantly negatively correlated with 1st order false beliefs.There were positive correlation of metaphoric comprehension with number of manic/mixed episodes and number of hospitalizations. There was no significant correlation with other clinical features (Table 3). Stepwise linear regression analysis for total score of DEToMS was

conducted in which age, gender, educational level, duration of illness, number of depressive episodes, number of manic/mixed episodes, existence of psychotic symptoms and medication of mood stabilizers were introduced as independent variables. Educational level, number of manic/mixed episodes and duration of illness were significant predictors of DEToMS performance (Table 4).

Table 3. Relationship of ToM abilities with clinical features

		DEToMS total score	First order false belief	Second order false belief	Irony	Empathy	Metaphor	Faux pas	Eyes test
Age at onset	r	-0.288*	0.013	-0.196	0.016	0.038	-0.351*	-0.089	-0.095
Duration of illness	r	0.098	0.013	-0.161	0.140	0.020	0.253	0.048	-0.268
# episodes	r	-0.110	-0.067	-0.131	-0.054	0.003	0.175	-0.080	-0.119
# manic/mixed episodes	r	-0.250	-0.319*	-0.266	-0.121	-0.011	0.310*	-0.120	-0.133
# hypomanic episodes	r	-0.068	0.075	-0.039	-0.039	0.015	-0.029	-0.083	-0.025
# depressive episodes	r	0.182	0.083	0.083	0.082	-0.004	0.181	0.117	-0.123
# episodes per year	r	-0.039	0.110	0.035	-0.044	-0.006	-0.072	-0.154	0.142
# hospitalizations	r	-0.259	-0.337*	-0.247	-0.166	0.026	0.279*	-0.150	-0.011
Duration since last hospitalization	r	0.130	-0.041	0.130	0.081	0.191	-0.013	0.138	-0.024
Duration of remission	r	0.145	0.160	0.016	0.061	0.180	0.015	-0.023	0.030

*significance p<00.5, ** significance p<0.0. No.: Number

Table 4. Linear regression analysis for predictors of total score of DEToMS

Model		B	Standart error	Beta	T	p	95% confidence interval	
1	Educational level	0.254	0.075	0.434	3.408	<0.001	0.104	0.404
2	Educational level	0.260	0.072	0.443	3.602	<0.001	0.115	0.404
	No. of manic/mixed episodes	-0.199	0.092	-0.265	-2.155	0.036	-0.385	-0.013
3	Educational level	0.287	0.070	0.489	4.091	<0.001	0.146	0.427
	No. of manic/mixed episodes	-0.276	0.095	-0.367	-2.915	0.05	-0.466	-0.086
	Duration of illness	0.89	0.38	0.294	2.313	0.25	0.012	0.166

Model 1: F=11,613, SD=1,50, p<0.001, Adjusted R^2=0.172
Model 2: F=8,552, SD=2,49, p<0.001, Adjusted R^2=0.228
Model 3: F=7,990, SD=3,48, p<0.001, Adjusted R^2=0.291

DISCUSSION

In our study the results showed that patients with bipolar I disorder may be impaired on Theory of Mind tasks even in remission periods and some of the clinical features of the disease may be correlated with ToM tasks. All the ToM scores including first order false beliefs, second order false beliefs, metaphor and irony comprehension, Eyes test were lower in the bipolar group with statistically significance. Only, faux pas test, although was higher in control group too, did not show a significant difference.

The findings of this study seemingly are consistent with many other studies that reveal ToM deficits in euthymic phase of the disease [4,9,20,21,22,23]. Barrera et al. showed ToM deficits in remitted patients performing Eyes test and faux pas test. Compared with this study the Eyes test results were lower in the patient group in our study although that was not significant in faux pas test in our sample. Bora et al. found impairment in euthymic patients in both Eyes

test and hinting task. Van Rheenen and Russell, although showed impairment of ToM, interestingly found no difference in the ToM performance of symptomatic versus euthymic patients.

There are other studies with contradictory results. Kerr et al., found impairment of ToM in depressive and manic groups but not in remitted patients. However, in their study ToM performances were measured only by first- and second-order false beliefs which may not be sensitive enough to subtle ToM deficits[6]. Some authors like Montag et al, investigated ToM abilities as cognitive and emotional ToM, found only deficits in emotional ToM whereas the cognitive component seemed to be intact[5]. Also, Olley et al. found poor performance only in verbal ToM tasks[20]. In our study the DEToMS is not assessed according to emotional or cognitive tasks, so that we could not make interpretation of these results. Also, we did not evaluate ToM performance as verbal and nonverbal. However, we used DEToMs which is a detailed battery for ToM abilities and includes both stories and pictures, so that verbal and nonverbal tasks are used, but they should be categorised. We used Eyes test which have pictures of eyes with different emotion for each. This test is conceived as an advanced theory of mind test, is also used to assess emotion recognition. In a metaanalysis study of ToM in bipolar patients revealed that ToM performance was significantly impaired in bipolar patients including strictly remitted patients although impairment is shown to be more severe in episodes[7]. Impairments in false beliefs, faux pas, hinting task and Eyes test were found in individual task analyses in this study. Another metaanalysis conducted by Samame et al in euthymic bipolar patients, total score of ToM abilities as well as basic ToM and complex ToM were shown to be impaired [25,26]. Eyes test results was also found decreased but second order false belief analysis interestingly did not reveal any significant difference in this study.

In our study we did not expect to find no significant difference in faux pas test between the groups, because faux pax is accepted as more complicated ability of ToM and this finding is not consistent with previous studies and the aforementioned meta-analytic studies [23,27]. During performing the test we observed the interpretations of the control subjects regarding cultural aspects of the task were controversial. Although we cannot claim clearly, we interpreted that the diversity of cultural comprehension of this task might have affected the answers.

Relationship of clinical features are investigated relatively detailed in our study. We demonstrated that age of onset was negatively correlated with total DEToMS score and metaphor, also first order belief test was negatively correlated with number of hospitalisations and number of manic/mixed episodes. This is contrary with the results of the Inoue et al's study which showed no correlation between age of onset, duration of illness and first and second order false beliefs [3]. We did not show any relationship between Eyes test and the clinical features which is consistent with Bora et al's study [4]. McKinnon et al. showed severity of depressive symptoms and duration of the illness is associated with ToM, however this study differs from ours as it includes subsyndromal patients as well [8]. There are different results for the correlation of psychotic episodes and ToM and we could not demonstrate any relationship [7,21]. Wang et al. research results revealed that second order beliefs test was associated wih psychotic and depressive symptoms [28]. Also, we found some clinical variables may be predictor for ToM, therefore for social cognition. Because the data are controversial, clinical features of bipolar disorder for social cognition should be investigated more.

There have been questions that if theory of mind might be a trait marker for bipolar disorder. Addressing this question Zarrabipoor et al. showed impairment of ToM in adeoloscents with bipolar disorder, they claimed that ToM might be a trait marker. Also, evidence of ToM deficits in relatives of bipolar disorder patients support the trait marker hypothesis [29]. Contrarily, some researchers concluded that it may be due to underlying cognitive deficits not a trait marker [10,30].

Our study has some limitations. Absence of IQ assessment and evaluation of other cognitive abilities were the important limitations. Also, we do not know the effects of the medications on social cognition. Bipolar sample was recruited from the patients who had regular follow up thus may be regarded as concordant to treatment, which may limits the clinical variety of the sample.

Overall, we demonstrated ToM deficits in euthymic bipolar patients and clinical features may affect ToM. These data support that ToM may be a state dependent trait marker for bipolar disease. Further

investigations including first episode patients, studies with population at risk for bipolar disorder and relatives of the patients and longitudinally designed researches are required for a better understanding of theory of mind and social cognition in bipolar disorder.

Yazar Katkıları: Çalışma konsepti/Tasarımı: EAB; Veri toplama: EAB, SK; Veri analizi ve yorumlama: EAB, SK; Yazı taslağı: EAB; İçeriğin eleştirel incelenmesi: EEB; Son onay ve sorumluluk: EAB, SK, EEB; Teknik ve malzeme desteği: EAB; Süpervizyon: EEB; Fon sağlama (mevcut ise): yok.
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REFERENCES

1. Brüne M, Brüne-Cohrs U. Theory of mind - evolution, ontogeny, brain mechanisms and psychopathology. Neurosci Biobehav Rev. 2006;30:437-55.
2. Baron-Cohen S, Leslie AM, Frith U. Does the autistic child have a 'theory of mind'?. Cognition. 1985;21:37-46..
3. Inoue Y, Tonooka Y, Yamada K, Kanba S. Deficiency of theory of mind in patients with remitted mood disorder. J Affect Disord. 2004;82:403-9.
4. Bora E, Vahip S, Gönül AS, Akdeniz F, Alkan M, Ogut M et al. Evidence for theory of mind deficits in euthymic patients with bipolar disorder. Acta Psychiatr Scand. 2005;112:110-6.
5. Montag C, Ehrlich A, Neuhaus K et al. Theory of mind impairments in euthymic bipolar patients. J Affect Disord. 2010;123:264-9.
6. Kerr N, Dunbar RI, Bentall RP. Theory of mind in bipolar affective disorder. J Affect Disord. 2003;73:253-9.
7. Bora E, Bartholomeusz C, Pantelis C. Meta-analysis of theory of mind impairment in bipolar disorder. Psychol Med. 2016;46:253-64.
8. McKinnon MC, Cusi AM, Macqueen GM. Impaired theory of mind performance in patients with recurrent bipolar disorder: Moderating effect of cognitive load. Psychiatry Res. 2010;177:261-2.
9. Barrera A1, Vázquez G, Tannenhaus L, Lolich M, Herbst L. Theory of mind and functionality in bipolar patients with symptomatic remission. Rev Psiquiatr Salud Ment. 2013;6:67-74.
10. Bora E. Şizofreni spektrum bozukluklarında zihin kuramı. Türk Psikiyatri Dergisi. 2009;20:269-81.
11. Zarrabipoor H1, Tehrani-Doost M2, Shahrivar Z2. Theory of mind in adolescents with bipolar disorder in euthymic phase: using the strange stories test. Iran J Psychiatry. 2016;11:133-9.
12. Değirmencioğlu B. İlk kez geliştirilecek olan Dokuz Eylül Zihin Teorisi Ölçeğinin (DEZTÖ) geçerlik ve güvenirlik çalışması (Yüksek lisans tezi). İzmir, Dokuz Eylül Üniversitesi, 2008.
13. Baron-Cohen S, Wheelwright S, Hill J, et al. The "Reading the Mind in the Eyes" Test revised version: a study with normal adults, and adults with Asperger syndrome or high-functioning autism. J Child Psychol Psychiatry. 2001;42:241-51.
14. Yıldırım EA, Kaşar M, Güdük M, Ateş E, Küçükparlak I, Ozalmete. Investigation of the reliability of the "reading the mind in the eyes test" in a Turkish population. Turk Psikiyatri Derg. 2011;22:177-86.
15. Young RC, Bigss T, Ziegler VE, Meyer DA. A rating scale for mania; Reliability, validity and sensitivity. Br J Psychiatry. 1978;133:429-35.
16. Karadağ F, Oral ET, Aran Yalçın F, Erten E. Young Mani Derecelendirme Ölçeğinin Türkiye'de geçerlilik ve güvenilirliği. Turk Psikiyatri Derg. 2002;13:107-14.
17. Amerikan Psikiyatri Birliği. Mental bozuklukların tanısal ve sayımsal el kitabı, Yeniden Gözden Geçirilmiş Dördüncü Baskı (DSM-IV-TR). Amerikan Psikiyatri Birliği, Washington D.C, 2000'den çeviri editörü: Köroğlu E, Hekimler Yayın Birliği, Ankara: Medico Graphics Ajans ve Matbaacılık Hizmetleri, 2001.
18. Williams BW. A structured interview guide for Hamilton Depression Rating Scale. Arch Gen Psychiatry. 1978;45:742-7.
19. Akdemir A, Örsel S, Dağ İ, Türkçapar HM., İşcan N, Özbay H. Hamilton Depresyon Derecelendirme Ölçeği'nin geçerliliği, güvenilirliği ve klinikte kullanımı. Psikiyatri Psikoloji Psikofarmakoloji Dergisi. 1996;4:251-9.
20. Olley AL, Malhi GS, Bachelor J, Cahill CM, Mitchell PB, Berk M. Executive functioning and theory of mind in euthymic bipolar disorder. Bipolar Disord. 2005;7:43-52.
21. Lahera G, Montes JM, Benito A, Valdivia M, Medina E, Mirapeix I, Sáiz-Ruiz J. Theory of mind deficit in bipolar disorder: is it related to a previous history of psychotic symptoms? Psychiatry Res. 2008;15:309–17.
22. Ibanez A, Urquina H, Petroni A, Baez S, Lopez V, do Nascimento M et al. Neural processing of

emotional facial and semantic expressions in euthymic bipolar disorder (BD) and its association with theory of mind (ToM). PLoS One. 2012;7:e46877.
23. Martino DJ, Strejilevich SA, Fassi G, Marengo E, Igoa A. Theory of Mind and facial emotion recognition in euthymic bipolar I and bipolar II disorders. Psychiatry Res 2011;189:379–84.
24. Van Rheenen TE, Rossell SL. Picture sequencing task performance indicates theory of mind deficit in bipolar disorder. J Affect Disord. 2013;1511132-4.
25. Samamé C. Social cognition throughout the three phases of bipolar disorder: a state-of-the-art overview. Psychiatry Res. 2013;210:1275-86.
26. Samamé C1, Martino DJ, Strejilevich SA. Social cognition in euthymic bipolar disorder: systematic review and meta-analytic approach. Acta Psychiatr Scand. 2012;125:266-80.
27. Shamay-Tsoory S, Harari H, Szepsenwol O, Levkovitz Y. Neuropsychological evidence of impaired cognitive empathy in euthymic bipolar disorder. J Neuropsychiatry Clin Neurosci. 2009;21:59–67.
28. Wang YY, Wang Y, Zou YM, Ni K, Tian X, Sun HW et al. Theory of mind impairment and its clinical correlates in patients with schizophrenia, major depressive disorder and bipolar disorder. Schizophr Res. 2017; doi: 10.1016/j.schres.2017.11.003..
29. Santos JM1, Pousa E, Soto E, Comes A, Roura P, Arrufat FX et al. Theory of mind in euthymic bipolar patients and first-degree relatives. J Nerv Ment Dis. 2017;205:207-12.
30. Ioannidi N, Konstantakopoulos G, Sakkas D, Oulis P. The relationship of theory of mind with symptoms and cognitive impairment in bipolar disorder: a prospective study. Psychiatriki. 2015;26:17-27.