



ORIGINAL ARTICLE

Theory of Mind Skills in Adolescents with Obsessive-Compulsive Disorder

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ABSTRACT

Objective: The aim of study is to examine whether there is a deficit about Theory of Mind (ToM) skills of adolescents with obsessive-compulsive disorder (OCD) compared to the psychiatrically healthy controls and to examine the association between ToM deficit and variables such as OCD severity.

Methods: The study included 30 adolescents between 12 to 16 years old who were diagnosed with OCD according to the Diagnostic and Statistical Manual of Mental Disorders Fifth edition (DSM-5) and 30 adolescents without any psychiatric diagnoses. Sociodemographic characteristics of the participants were collected with a form; in addition, neuropsychological tests were administered to examine development of intelligence and ToM skills. Turkish version of Schedule for Affective Disorders and Schizophrenia for School-Age-Children Present and lifetime version, Children's Yale-Brown Obsessive Compulsive Scale, Children's Depression Inventory, and Childhood Anxiety Screening Scale were administered. Intelligence level of patients were assessed with Wechsler Intelligence Scale for Children-Revised; while ToM skills were evaluated with Hinting Task Reading the Mind in the Eyes Task and false belief tasks such as Sally-Anne, Smarties, Chocolate Bar and Ice-Cream Truck tests.

Results: It was determined those adolescents with OCD tended to fail in false belief tests and that the increase in OCD symptom severity did not affect ToM test performance.

Conclusions: Due to limited number of patients, our findings couldn't be generalized to all adolescents diagnosed OCD; therefore there is a need for more studies in this area.

Keywords: False belief, obsessive-compulsive disorder, theory of mind

INTRODUCTION

Theory of mind (ToM) refers to ability of an individual to realize that others have a different mind to understand and predict their behavior, knowledge, intentions, feelings, beliefs and to represent these mentally (1). ToM was originally used in 1978 by Premack and Woodruff (2) to describe chimpanzees' ability to understand the mental states of other creatures of the same species. Over time,

psychologists used term to describe the development of the mental aspects of children (3).

Studies on the ToM in infants have shown that the theory of mind has been able to have since the age of 3–4. The 6-month baby can distinguish between the movements of living and inanimate objects. At 12 months has the ability to joint attention. When 14–18 months can understand relationship between mental states like wishes, intentions, emotions, and the goals. A baby in 18–24 months can distinguish between real and cheating (4).

In terms of psychopathology, ToM disorders were first used to explain the symptoms of autistic spectrum disorder (5). Subsequent observations such as in developmental (Asperger syndrome), neurological

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(frontal lobe syndrome, frontotemporal dementia, Alzheimer's disease) and psychiatric (schizophrenia and mood disorders) disorders suggest that these disorders should be identified in a spectrum leads to different appearances rather than a single clinical outcome (6).

ToM disorders have been documented during manic and depressive episodes of bipolar disorder (7,8,9). There are studies showing that schizophrenia comes along with impaired cognitive functions as well as disorders in the field of ToM (10) and it is claimed that cognitive functions such as execution, memory and working memory are associated with ToM (11,12).

Studies about children and adolescents with OCD are focused on executive functions (13,14), non-verbal memory, spatial working memory problems (15,16), and attention (17). Although there are studies evaluating the skills of TOM in children and adolescents, ToM in OCD which is one of the most common psychiatric disorders has not been examined sufficiently.

METHODS

Participants

The sample was divided into 2 groups: patient group consisted of 30 patients with obsessive-compulsive disorder according to DSM-5, who were 12–16 years-old, whose symptoms started at 12 years old and who had a Children's Yale-Brown Obsessive Compulsive Scale (CY-BOCS) score of 10 or more; while psychiatrically healthy control group consisted of 30 participants who did not have any psychiatric diagnoses and with sociodemographic characteristics similar to patient group. The study approval was granted by the Clinical Research Ethics Committee of Uludag University School of Medicine on the date of 03.11.2015 with the decision number 2015-19/2. Informed consents were obtained from patients and parents.

Collection Form for Sociodemographic and Clinical Data

Researchers specially prepared this form for the study, it contains information about the identity, address,

telephone, education status, socioeconomic status of parents, parent's siblings, and family structure of participants.

Schedule for Affective Disorders and Schizophrenia for School-Age Children—Present and Lifetime Version (K-SADS-PL)

K-SADS-PL is a semi-structured interview form developed by Kaufman et al. (18) to detect current and life-time psychopathology in children and adolescents. Validity and reliability studies were conducted for Turkish sample of the scale (19). The information from the child and at least one parent was combined with the clinician's opinions and the evaluation was completed.

Children's Depression Inventory (CDI)

Children's Depression Inventory is a self-assessment scale applied on children ages of 6–18. There are three different options for each item of the 27-item scale. The child is asked to choose the most appropriate option within the last two weeks. Each item is calculated according to symptom severity and gets 0, 1 and 2 points. The highest score is 54 and the cut point is 19. Turkish validity and reliability study was performed by Oy et al. (20).

Childhood Anxiety Screening Scale (CASS)

Childhood Anxiety Screening Scale consists of 41 items. It was developed by Birmaher et al. (21), Turkish validity and reliability study was conducted by Cakmakçı (22).

Children's Yale-Brown Obsessive Compulsive Scale (CY-BOCS)

It is a semi-structured questionnaire developed by Goodman et al. in 1986, based on clinical interview. The assessment relies on interviewer's clinical judgment based on information provided by child and parent. Eventually, obsessions severity score, compulsions severity score and total severity score are obtained. The reliability study of Turkish sample was performed by Yucelen et al. (2006) (23).

Wechsler Intelligence Scale for Children-Revised (WISC-R)

It is an intelligence test developed by Wechsler for children aged 6-16 years. It has two parts called verbal and performance. Each section includes six sub-tests and one of them being a backup test (17). Validity and reliability studies were conducted for Turkish sample (24). The WISC-R was applied to all cases in our study and participated in evaluating verbal, performance, and total intelligence scores.

ToM tests

To evaluate the ToM skills in the study, 2 First-order and 2 Second-order ToM tasks, the Hinting Task formed of 4 stories were used. These tasks consist of short stories and related questions. At the end of the stories, the adolescents were asked questions to evaluate the ToM skills. In the Reading the Mind in the Eyes Task (RMET), photographs of the eye area of faces were shown and expected to be responded correctly in understanding another person's emotions by adolescents. The scores of correct responses to all the questions indicate the ToM skill performance. First-order false belief tasks evaluate the first-order false belief skills and these skills that can be conceptualized at the simplest level as what one person knows and another person does not know. It is defined as the ability of one person to understand others' misconceptions, thoughts and it is the belief of a person related to their world (25). In the first-order false belief tasks, the Sally-Anne test and the Smarties test were used (26). Smarties box was showed and asked what it contained in "Smarties test." Subsequently, they were shown that the box contained a pencil. The test question was to predict what another child, who had never seen the box, would think it contained. One point was obtained if the participant answered smarties, candy or chocolate. The card is shown to the participant, pointing to the card (Sally, Anne, a box, a basket and a ball) in "Sally-Anne test." The story was told with drawings on cards. The participants were asked where Ann had put the ball and where it really was now. A score of 1 point was given if both questions were answered correctly. The function of

the second-order false belief is the ability to predict the thoughts of a second person about the thoughts of a third person (27). The participants were requested to make a prediction taking into account the information the person in the story had about a third person. In the second order false belief tests, the stories for the Chocolate Bar Task and the Ice-Cream Truck Task were used (28). The false belief tasks have been translated into Turkish and reliability studies have been conducted (29). The participants listened the stories about two children through the drawings on both tests. One of the stories was about the ice cream truck, another chocolate box. After listening the story, participants were asked to predict one's belief about other's belief. Two tests were scored in a pass/fail manner. If the participant made no mental state attributions, received a score of 0. If mental states were attributed for two characters, a score of 1 was given. Total False Belief Level, a composite ToM performance score, was generated by summing both orders of false belief tasks and it was compared between the groups.

The Hinting Task is one of the advanced level ToM functions (30). It tests the skill of being able to predict the real intention behind the words directly spoken. After listening the story, the participants were asked what the person in the story really had wanted to say. If the participant did not respond correctly to the first hint question, the practitioner moved on to a question including a clearer hint. If the correct answer was given for the first hint, a score of 2 was given, if the answer with a clearer hint was true, a score of 1 was given. If both hint questions were not answered correctly, a score of 0 was given. In the current study, 4 stories were used in the Hinting Task (31).

RMET was developed by Baron-Cohen et al. (32) as an advanced ToM test. In 2001, it was revised for use with children, using the photographs of the eyes of 28 females and males. With the inclusion of functions such as facial perception and recognizing emotions, it aims to test to what extent the participants can put themselves in another's place and to what extent they can conceptualize their mental state (33). After each picture of the eye was

shown, asked to choose the best one of 4 options. A score of 1 was given for each correct answer (maximum score was 28 points). The test was validated in Turkish (34).

Statistical Analysis

All statistical analyses were performed using IBM SPSS Statistics for Windows, version 23.0 (IBM Corp., Armonk, NY, USA). Descriptive data were expressed in mean, standard deviation, frequency, and rate. Shaphiro-Wilk test was used at compliance control of constant variables with normal distribution. Student’s t-test was used for normally distributed variables in comparison of numeric variables at two independent groups, and Mann-Whitney U test was used for ones not normally distributed. Linear regression analysis of predictors on Yale-Brown total score was performed. P values of <0.05 were considered statistically significant.

RESULTS

The OCD group comprised 30 children and the control group was formed of 30 children with no psychiatric diagnosis. The children comprised 46.7% (n=28) females and 53.3% (n=32) males and all were in the age range of 12–16 years. The distributions of mean age and gender were found to be similar between the three groups (Table 1). There was no difference between the control and OCD groups in the WISC-R verbal (t=0.773; p=0.442), performance (t=1.757; p=0.084, and total scores (t=0.685; p=0.496) (Table 2).

When OCD group was evaluated for comorbid psychiatric disorders, 83.3% of the patients had comorbid psychiatric disorder, 63.3% anxiety disorder, 26.6% depression, 23.3% attention-deficit/ hyperactivity disorder, 3.3% trichotillomania, and 3.3% tic disorder.

In terms of Sally-Anne and Smarties tests, which were conducted to evaluate first-degree false beliefs, (n=5) 8.3% of 60 children had an error in one question and failed. All the failed children were in patient group. Control group did not fail in first-degree false belief tests. Whereas patient group tended to fail in first-degree false belief tests, this difference was not significant (Fisher’s exact test; p=0.052).

As a result of the Chocolate Bar and Ice-cream truck task applied to evaluate second-degree false beliefs; (n=14) 23.3% of 60 children failed in one and (n=4) 6.7% failed in two questions. Out of 14 children who failed in one question, (n=11) 78.6% were in patient group; and also 75% of the 4 children who failed in two questions were in patient group. OCD group also tended to make significantly higher number of errors in second-degree false belief tests ($\chi^2=7.808$; p=0.015).

When total error numbers in all false belief tests were evaluated; (n=12) 20% of 60 participants failed in one question, (n=6) 10% in two questions and (n=1) 1.6% in three questions. It was determined that 75% of 12 children who failed in one question, 83.3% of 6 children who failed in two questions and 1 child who failed in three questions were in patient group. OCD group tended to make significantly higher number of errors in all false belief tests ($\chi^2=9.256$; p=0.013).

Table 1: Sociodemographic characteristics in patient and control groups

	Patient	Control	Test statistic	p
Age (mean±SD)	13.73±1.48	13.37±1.32	$\chi^2=4.036$	0.303
Gender: % (n)			$\chi^2=5.753$	
Male	%53.3 (16)	%53.3 (16)		>0.99
Female	%46.7 (14)	%46.7 (14)		

Table 2: WISC-R test results in patient and control groups

	Patient	Control	Test statistic	p
Wisc performance: Mean±SD	94.60±12.244	100.17±12.298	t=1.757	0.084
Wisc verbal: Mean±SD	95.43±13.801	92.97±10.708	t=0.773	0.442
Wisc total: Mean±SD	94.57±10.298	96.40±10.444	t=0.685	0.496

Table 3: ToM test results in patient and control groups

	Patient	Control	Test statistic	p
First degree false belief tests			-	
Smarties test (successful)	%100; 30	%100; 30		>0.99
Sally-anne test (successful)	%88.3; 25	%100; 31		0.052
Second degree false belief tests			$\chi^2=7.808$	0.015
Chocolate bar task (successful)	%80; 24	%96.7; 29		0.103
Ice-cream truck task (successful)	%63.3; 19	%86.7; 26		0.072
Advanced ToM tests				
Hinting task: mean \pm SD	16.80 \pm 1.937	16.43 \pm 2.063	Z=0.923	0.477
Eyes test: mean \pm SD	20.23 \pm 2.661	20.27 \pm 3.095	t=0.045	0.964

Table 4: Linear regression analysis of predictors on Childhood Yale-Brown total score

	B	t	p
Constant	-20.498	-0.996	0.324
Age	1.877	2.005	0.050
CDI	-0.242	-0.726	0.471
CASS	0.445	2.940	0.005
WISC-R	-0.032	-0.254	0.801

In the Eyes Task, the mean correct number of patient group was 20.23 \pm 2.661 and of control group was 20.27 \pm 3.095; so there was not significant difference between groups (t=0.045; p=0.964). In Hinting Task, the mean score of patient group was 16.80 \pm 1.937 and controls were 16.43 \pm 2.063. There were no significant differences (Z=0.923; p=0.477) (Table 3).

When CY-BOCS scores of those who did and did not succeed in first and second-degree false belief tests among OCD group were compared; there were no significant differences between CY-BOCS obsessions scores in the first-degree false belief tests (Z=1.539; p=0.123) and compulsion scores were significantly higher in favor of unsuccessful ones (Z=2.076; p=0.038). There wasn't significant difference between CY-BOCS obsession (Z=1.067; p=0.286) and compulsion (Z=0.378; p=0.705) scores in second-degree false belief tests.

When the results of the Eyes Task and CY-BOCS in OCD group were compared, there were no significant correlations between obsessive (r=0.035; p=0.854) and compulsive (r=0.035; p=0.820) scores. When Hinting Task scores and CY-BOCS test results were compared in OCD group, there were no significant correlations between CY-

BOCS obsession (r=0.042; p=0.276) and compulsion scores (r=0.042; p=0.134). It has been shown in previous studies that ToM development and ToM skills are influenced by many factors. It is difficult to create pure groups in the absence of comorbidities and in terms of confounding factors. Moreover, this selection may limit the clinical assessment of the nature of the disorder. For this reason, we want to evaluate these confounding factors by conducting advanced analysis in our present study.

Age, CDI, CASS and WISC-R results were found to be the predictors effected CY-BOCS total scores. Predictors in the model explained 26.7% of CY-BOCS total score variance. CY-BOCS total score was the most affected by CASS (t=2.940; p=0.005) and age (t=2.005; p=0.05), there was no significant effect of CDI and WISC-R on CY-BOCS total score (p>0.05) (Table 4).

DISCUSSION

To the best of our knowledge, this is the first study that compared ToM skills in healthy adolescents and adolescents who were diagnosed with OCD. ToM studies in children are seen as a noticeable gap in the literature. Studies of children constitute only 4% of the total ToM studies (35). Therefore, by including adolescents aged 12–16 years in this study, it was aimed to make a contribution to filling this gap in the literature.

The first main finding of the current study was that OCD patients exhibited significant reduction in the first and second-order false belief performance. Conversely, the findings of previous studies (36,37) suggesting that the basic ToM is generally intact in OCD patients, our

patients with OCD performed significantly worse than healthy controls in the first and second-order false belief ToM performance. Our findings were consistent with studies of the Hinting Task and the RMET performance in OCD patients in terms of not finding advanced ToM impairment in OCD patients (38,39).

The probability that ToM impairment might be attributed to other neurocognitive dysfunctions has been a recurring problem. Notably, ToM has been predicted to correlate with other neurocognitive functions with executive dysfunctions in particular being linked to ToM (40,41). However, some researchers have described separation between ToM and executive functions (42,43).

Our results that people diagnosed with OCD reported experiencing more depressive and anxiety symptoms than healthy control are coherent with prior studies (Vivan et al., 2013; Whiteside et al., 2006). However, we found no evidence of a relation between ToM deficit and OCD symptom severity or depressive and anxiety symptoms in OCD adolescents. The present results suggest that the ToM deficit observed in OCD patients is related to OCD and cannot be attribute to any other clinical condition.

Current study has certain limitations. Firstly, we used a convenience sampling method when selecting the participants, due to limited time and resources, which limits the generalizability of our findings. Secondly, our sample was relatively small. ToM evaluations should be repeated with larger numbers of adolescents with OCD. Thirdly, Our cross-sectional study does not inform about how ToM impairments evolve with OCD progression, treatment response, or changes in OCD clinical presentation. Longitudinal studies of how ToM may distinct between patients with active OCD and those with improved OCD should be follow up.

In conclusion, first and second-order false belief ToM was selectively impaired in adolescents with OCD. Although the aforementioned limitations, this study adds to the quite limited literature on social cognition in OCD. In the treatment of OCD, effective methods for ToM may benefit adolescents with OCD.

Ethics Committee Approval: The study protocol was approved by the Institutional Ethics Committee. The parents and children provided written informed consents.

Conflict of Interest: The authors declared no conflicts of interest.

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