Investigation of Theory of Mind, Disgust Sensitivity, and Mental Contamination in Patients with Obsessive-Compulsive Disorder

Obsesif-Kompulsif Bozukluğu Olan Hastalarda Zihin Kuramı, Tiksinme Duyarlılığı ve Mental Kontaminasyonun İncelenmesi

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ABSTRACT

Objective: The aim of this study is to examine the relationships between theory of mind (ToM), disgust sensitivity, and mental contamination patients with obsessive-compulsive disorder (OCD).

Methods: In this cross-sectional study, 37 patients with OCD and 45 healthy volunteers with similar socio-demographic characteristics were enrolled at the Silifke State Hospital Department of Psychiatry between October 2023 and March 2024. We utilized the Padua Inventory - Washington State University Revision, the Dokuz Eylül Theory of Mind Index, the Disgust Scale — Revised, and the Vancouver Obsessive-Compulsive Inventory — Mental Contamination Scale.

Results: Patients with OCD exhibited significantly higher sensitivity to disgust (mean ± standard deviation 68.19±12.28) and mental contamination (mean ± standard deviation= 25.54± 7.64) compared to healthy controls. Although the differences in ToM abilities approached significance, they did not reach statistical significance. A significant correlation was identified between the subscale of "disgust related to contamination" and "checking compulsions" (r = 0.433), as well as with "obsessive thoughts about harming oneself/others" (r = 0.515). No significant correlation was found between mental contamination and the other variables (r = 0.240).

Conclusion: The findings highlight impairments in certain ToM skills among patients with OCD, alongside elevated disgust sensitivity and mental contamination, relative to controls. The significant correlations between disgust sensitivity and specific OCD symptoms emphasize the influence of disgust in exacerbating certain compulsive behaviors. These insights contribute to our understanding of the interactions between OCD symptoms, ToM abilities, and disgust sensitivity.

Keywords: Obsessive-compulsive disorder, theory of mind, disgust sensitivity, mental contamination

ÖZ

Amaç: Bu çalışmada Obsesif-kompulsif bozukluk (OKB) hastalarında zihin kuramı (ZK), tiksinme duyarlılığı ve mental kontaminasyon arasındaki ilişkilerinin incelenmesi amaçlanmıştır.

Yöntem: Mevcut kesitsel çalışmaya Ekim 2023-Mart 2024 tarihleri arasında Silifke Devlet Hastanesi Psikiyatri kliniğine başvuran 37 OKB hastası ve sosyodemografik açıdan benzer özellikteki 45 sağlıklı gönüllü dahil edilmiştir. Çalışmada Padua Envanteri - Washington Eyalet Üniversitesi Revizyonu, Dokuz Eylül Zihin Kuramı İndeksi, Tiksinme Ölçeği - Gözden Geçirilmiş ve Vancouver Obsesif - Kompulsif Envanteri - Mental Kontaminasyon Ölçeği kullanılmıştır,

Bulgular: OKB hastalarında sağlıklı kontrollere kıyasla anlamlı düzeyde daha yüksek tiksinme duyarlılığı (ort±SS: 68,19±12,28) ve mental kontaminasyon düzeyleri (ort±SS: 25,54 ±7,64) saptandı. Zihin kuramı becerilerindeki farklılıklar anlamlılığa yakın olmakla birlikte, istatistiksel anlamlılığa ulaşmamıştır. "Kontaminasyon ile ilişkili tiksinme" alt ölçeğinin "Kontrol etme kompulsiyonları" ile (r=0,433) ve "Kendine/başkalarına zarar verme ile ilgili obsesyonel düşünceler" ile (r=0.515) arasında anlamlı bir korelasyon belirlenmiştir. Mental kontaminasyon ile diğer değişkenler arasında anlamlı bir korelasyon saptanmamıştır (r=0.240).

Sonuç: Bulgularımız, OKB hastalarında belirli ZK becerilerinde bozuklukların yanı sıra, kontrol grubuna göre daha yüksek tiksinme duyarlılığı ile mental kontaminasyon olduğunu vurgulamaktadır. Tiksinme duyarlılığı ile spesifik OKB semptomları arasındaki anlamlı korelasyonlar, tiksinmenin bazı kompulsif davranışları şiddetlendirmedeki etkisini öne çıkarmaktadır.

Anahtar sözcükler: Obsesif-kompulsif bozukluk, zihin kuramı, tiksinme duyarlılığı, mental kontaminasyon

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Introduction

Obsessive-compulsive disorder (OCD) is a psychiatric condition characterized by persistent, unwanted intrusive thoughts, impulses, and images—termed obsessions—and repetitive behaviors or mental acts, known as compulsions, that are performed to alleviate the distress associated with these obsessions (Inchausti Gómez et al. 2015). This disorder significantly impairs social functioning and is associated with three primary deficits in social cognition: empathy, compassion toward others, and theory of mind (ToM), which pertains to the reasoning about others' beliefs, thoughts, and emotions (Salazar Kämpf et al. 2022). Research into the social-cognitive and affective dimensions of ToM includes a study by Bozikas et al. (2009), which utilized the Fantie's Affective Cartoon Test to compare 25 OCD patients with 25 healthy controls, revealing no significant differences in ToM between the groups. In contrast, Liu et al. (2017) employed the Yoni task to assess both the cognitive and affective components of ToM, finding that patients with OCD demonstrated notably poorer performance in understanding second-order emotional mental states compared to healthy controls, even when accounting for neurocognitive functions. Similarly, the Hinting Task, employed in another study, evaluated comparable ToM subcomponents and also found no statistically significant differences between patients with OCD and healthy controls (Mavrogiorgou et al. 2016). These varying findings underscore the complexity of ToM in OCD and highlight the potential limitations of relying on self-report measures (Salazar Kämpf et al. 2022).

Disgust is characterized as a protective emotional response to stimuli perceived as infectious or harmful (Yılmaz and Bahtiyar 2019). It plays a significant role in anxiety disorders, notably in obsessive and compulsive behaviors concerning contamination (Berle and Phillips 2006). Disgust sensitivity is defined as the intensity of the disgust response to a particular stimulus and the profound experience of adverse physical, emotional, and social consequences associated with this reaction (Berle and Phillips 2006, Van Overveld et al. 2006). Research suggests that heightened disgust sensitivity may intensify ritualistic compulsive behaviors in individuals with OCD that are aimed at mitigating anxiety (Berle and Phillips 2006, Ching et al. 2021). Disgust has been shown to be particularly pertinent to contamination-related obsessions and compulsions, where it correlates with increased avoidance behavior (Oaten et al. 2009, Broderick et al. 2013).

Mental contamination is described as the internal sensation of contamination that occurs without direct physical contact with a person or object (Rachman 1994). Coughtrey et al. (2012) reported that 46.3% of individuals with OCD experienced symptoms of mental contamination. It is posited that mental contamination precipitates contamination-related obsessions and cleaning compulsions and may further contribute to an increase in other ritualistic behaviors (Yılmaz and Bahtiyar 2019).

The objective of this study is to investigate the relationship between ToM, disgust sensitivity, and mental contamination in patients with OCD, addressing a gap in the existing literature. This study posits the following hypotheses: (1) ToM skills are impaired in patients with OCD; (2) disgust sensitivity is higher in patients with OCD than in a healthy population, compared to healthy populations; (3) individuals with OCD exhibit a higher prevalence of mental contamination; and (4) there is a correlation between disgust sensitivity, the level of mental contamination, and impairments in ToM skills in individuals with OCD.

Method

Sample

This cross-sectional study recruited participants from the Silifke State Hospital Department of Psychiatry between October 15, 2023, and April 15, 2024. The sample included 37 patients aged 18 and older who either had a prior diagnosis of obsessive-compulsive disorder (OCD) or were newly diagnosed with OCD, as determined through a Structured Clinical Interview for DSM-5 (SCID-5-CV), with 25 having a previous diagnosis and 12 being newly diagnosed. Additionally, this study included 45 healthy volunteers—comprising healthcare professionals and relatives of patients—who did not report any psychological complaints and who were administered the Symptom Checklist-90-Revised (SCL-90-R), and who had similar sociodemographic characteristics to the patient group. Previous studies in the literature were reviewed to determine sample size, and the G*Power software (Faul et al. 2007) was utilized. To achieve a statistical power of 80% and a Type II error rate of 5%, at least 30 participants per group were established as the target, resulting in an effect size of 0.65.

Inclusion criteria for both patients and healthy volunteers were those aged between 20 and 65 years and consenting to participate by signing an informed consent form. Exclusion criteria included any physical impairments that could hinder participation (e.g., uncorrectable visual or auditory impairments), cognitive

issues (e.g., dementia, epilepsy, Parkinson's disease, mental retardation, cerebral tumors or cerebrovascular diseases, neurological or systemic conditions accompanied by loss of consciousness), psychiatric comorbidities beyond simple phobias (e.g., neurodevelopmental disorders, bipolar affective disorder, psychotic disorders, post-traumatic stress disorder, somatoform disorders, dissociative disorders), substance abuse or misuse, recent use of medications that could affect neurocognitive testing (e.g., benzodiazepines, stimulants, alcohol), and a family history of OCD among healthy volunteers (i.e., first- or second-degree relatives).

At the outset of this study, 45 patients with OCD were included; however, two participants were excluded due to being under the age of 18, and six were excluded due to comorbid neurological and psychological disorders that could affect cognitive functions. Among the participants included in this study, 57.3% were female, with a mean age of 34.5 ± 10.1 years and an average educational duration of 15.5 ± 3.2 years. The findings showed that 37.8% of the participants were single, 54.8% were married, and 7.3% were divorced.

Procedure

Ethical approval for this study was obtained from the Scientific Research and Publication Ethics Committee of Toros University on September 29, 2023, under approval number 105. This research adhered to institutional and/or national research committee ethical standards, as well as the 1964 Helsinki Declaration and its subsequent amendments or comparable ethical standards. In this study, the scales administered to participants were conducted by a clinician with an at least five years of clinical experience. Maximum care was taken to protect the personal data of the participants. Each assessment was conducted following standard procedures and under optimal conditions for the participants.

Participants included in this study were first administered a sociodemographic data form containing questions about age, gender, education level, marital status, number of children, occupational status, presence of physical illnesses, harmful habits, and previous psychiatric history. Subsequently, the following assessments were conducted: the Padua Inventory-Washington State University Revision to evaluate obsessions and compulsions, the Dokuz Eylül Theory of Mind Index for assessing theory of mind, the Disgust Scale-Revised to measure the intensity of disgust, and the Vancouver Obsessive-Compulsive Inventory-Mental Contamination Scale to evaluate symptoms of mental contamination.

Measures

Sociodemographic Data Form

Developed by researchers, this form collected data on age, gender, education level, marital status, economic status, lifestyle, medical and psychiatric history, and current smoking and alcohol use.

Padua Inventory - Washington State University Revision (PI-WSUR)

A 39-item scale revised by Burns et al. (1996) to assess the nature and severity of obsessions and compulsions. It includes five subscales scored on a 5-point Likert scale: "Obsessional thoughts about harm to self/others," "Obsessional impulses to harm self/others," "Contamination obsessions and washing compulsions," "Checking compulsions," and "Dressing/Grooming compulsions". The Turkish validity and reliability study by Yorulmaz et al. (2007) reported a Cronbach's alpha of .95 for internal consistency. In this study, the internal consistency coefficient of the scale was calculated as 0.85.

Dokuz Eylül Theory of Mind Index (DEToMI)

Developed by Değirmencioğlu et al. (2008), this scale is utilized to assess the relationship between ToM and various psychopathologies, including schizophrenia and autism spectrum disorders. Participants are presented with seven stories and three pictures, accompanied by related questions, to evaluate their abilities in first-order and second-order false beliefs, empathy, metaphor, irony, and faux pas recognition. Each correct response is awarded a "1" score, with the total possible score ranging from 0 to 18. The internal consistency of the scale, as measured by Cronbach's alpha, has been determined to be 0.67. In this study, the Cronbach's alpha value of the scale was 0.56.

Disgust Scale-Revised (DS-R)

Developed by Haidt et al. (1994), this scale measures the intensity of disgust responses to various stimuli. The original version of the scale consisted of 32 items. In its revised form, the scale includes 27 items rated on a 5-point Likert scale. The test is divided into three subscales: "Core disgust," disgust related to "Animal reminder,"

and disgust related to "Contamination". Items 1, 6, and 10 of the scale are reverse-coded, and scores from items 12 and 16 are excluded from the total score. High scores on the scale indicate greater sensitivity to disgust (Olatunji et al. 2008). The Turkish validity and reliability study of the scale was conducted by İnözü and Eremsoy (2013), with the overall internal consistency Cronbach's alpha coefficient calculated to be 0.87. In this study, the Cronbach's alpha value of the scale was calculated as 0.87.

Vancouver Obsessive-Compulsive Inventory-Mental Contamination Scale (VOCI-MC)

Developed by Rachman (2005) to assess symptoms of mental contamination, this scale consists of 20 items rated on a 5-point Likert scale. The Turkish validity and reliability study of the scale was conducted by İnözü, Bilekli, and Özcanlı (2016), with an internal consistency Cronbach's alpha coefficient of 0.93 reported. In this study, the internal consistency coefficient of the scale was calculated as 0.73.

Statistical Analysis

Statistical analyses were conducted using the Jamovi v2.5 software package (The Jamovi Project 2024). Continuous variables were reported as means and standard deviations, while categorical variables were summarized with counts and percentages. Normality was assessed using skewness and kurtosis values, and visual inspection of histogram plots. According to the literature, a skewness value between -2 and +2 and kurtosis values between -7 and +7 are interpreted as indicative of normal distribution (Hair et al., 2010). For parameters exhibiting normal distribution, comparisons between the two groups were made using Student's t-tests for continuous variables such as age, number of children, duration of education, and scale scores; and chi-square tests for categorical variables including gender, employment status, presence of physical illness, history of suicide attempts, and number of psychiatric hospitalizations. The homogeneity of variance was evaluated using Levene's test. The correlations of the total and subscale scores of the patient group's DEToMI, PI-WSUR, DS-R, and VOCI-MC were assessed using Pearson correlation analysis. The results of the analyses are presented in tabular form. The significance level for all tests was set at $p < 0.05$.

Results

A comparison of sociodemographic data between patients with OCD and healthy controls is presented in Table 1.

Table 1. Comparison of sociodemographic and clinical characteristics of the participants				
Variables	Patients (n=37)	HCs (n=45)	df	(t/X2)
Age (mean±SD)	32.5 ± 10.6	36.3 ± 9.5	80.0	t=-1.709 p=0.091
Gender (n(%))			2	X2=0.646 p=0.421
Female	23 (62.1)	24 (53.3)		
Male	14 (37.8)	21 (46.6)		
Child number (mean±SD)	0.9 (0.9)	0.8 (0.9)	80.0	t=0.476 p=0.007
Education duration (years) (mean±SD)	14.4 ± 3.0	16.4 ± 3.2	80.0	t=-2.754 p=0.635
Number of employees (n(%))	16 (43.2)	38 (84.4)	1	X2=15.328 p<0.001
Marital Status (n(%))			2	X2=1.277 p=0.528
Single	14 (37.8)	17 (37.7)		
Married	19 (51.35)	26 (57.7)		
Divorced	4 (10.8)	2 (4.4)		
Presence of physical disease (n(%))	10 (27.0)	14 (31.1)	1	X2=0.163 p=0.686
Presence of suicide attempts (n(%))	4 (10.8)	0 (0)	1	X2=5.114 p=0.024
Psychiatric hospitalization (n(%))	3 (8.1)	2 (4.4)	1	X2=0.476 p=0.490

HCs: Healthy controls, n: number, SD: Standart deviation, t: Student t test, X2: Pearson Chi-square test, %: frequency

Table 2 shows the comparison of data from the scales used in this study. Statistically significant differences were found between the two groups in terms of the severity of obsessive-compulsive symptoms assessed by the Padua Inventory - Washington State University Revision (PI-WSUR) (t=-11.672, p<0.001), levels of disgust sensitivity assessed by the Disgust Scale - Revised (DS-R) (t=3.686, p<0.001), and mental contamination levels assessed by the Vancouver Obsessive-Compulsive Inventory-Mental Contamination Scale (VOCI-MC) (t =-4.285, p<0.001). However, the Dokuz Eylül Theory of Mind Index (DEToMI) scores, which assess the ToM abilities, did not show a statistically significant difference between the two groups, although the result was close to significance (t =-1.941, p=0.056).

Table 2. Comparison of the scale scores according to study groups			
Variables	**Patients (n=37)**	**HC (n=45)**	**Statistic**
DEToMI	12.62 ± 2.50	13.77 ± 2.81	t=-1.941 p=0.056
First-order false-belief	3.11 ± 0.96	3.31 ± 0.84	t=-1.013 p=0.314
Second-order false-belief	1.43 ± 0.92	1.84 ± 0.87	t=-2.059 p=0.043
Irony	2.13 ± 0.97	2.24 ± 0.93	t=-0.516 p=0.607
Empathy	4.54 ± 0.80	4.60 ± 0.75	t=-0.345 p=0.730
Metaphor	1.08 ± 0.74	1.37 ± 0.74	t=-1.956 p=0.054
Faux pas	0.35 ± 0.48	0.40 ± 0.49	t=-0.447 p=0.656
PI-WSUR	61.56 ± 27.77	37.86 ± 21.14	t=-11.672 p<0.001
Checking compulsions	21.02 ± 10.35	10.35 ± 8.66	t=-6.710 p<0.001
Contamination obsessions and washing compulsions	22.29 ± 10.89	14.64 ± 9.19	t=-7.155 p<0.001
Obsessional thoughts about harm to self/others	11.32 ± 6.14	5.26 ± 4.07	t=12.223 p<0.001
Dressing/Grooming compulsions	3.51 ± 3.28	3.28 ± 2.91	t=-3.051 p=0,003
Obsessional impulses to harm self/others	3.40 ± 1.75	4.67 ± 2.57	t=-0.412 p=0.682
DS-R	68,19 ± 12,28	55,27 ± 19,22	t=3.686 p<0,001
Core disgust	34,24 ± 7,04	28,80 ± 8,94	t=3.011 p=0.003
Animal reminder disgust	22,16 ± 5,71	16,78 ± 7,41	t=3.620 p<0.001
Contamination disgust	11,78 ± 3,33	9,69 ± 4,78	t=2.330 p=0.022
VOCI-MC	25,54 ± 7,64	22,37 ± 8,94	t=-4.285 p<0.001

DEToMI: Dokuz Eylül Theory of Mind Index, DS-R: Disgust Scale-Revised, PI-WSUR: Padua Inventory - Washington State University Revision, SD: Standart Deviation, t: Student t test, VOCI-MC: Vancouver Obsessive-Compulsive Inventory-Mental Contamination Scale

Table 3 provides the correlation data between variables in patients with OCD. A positive and statistically significant correlation was observed between "Checking compulsions" and the "Contamination" subscale of disgust sensitivity (r=0.433, p<0.01). Furthermore, a positive and statistically significant correlation was found between "Obsessional thoughts about harm to self/others", and both the "Contamination" subscale (r=0.515, p<0.01) and the total disgust score (r=0.341, p<0.05) of disgust sensitivity. There was also a positive and statistically significant relationship between "Dressing/Grooming compulsions," and the "Core disgust" subscale (r=0.388, p<0.05), the "Contamination" subscale (r=0.348, p<0.05), and the total disgust score (r =0.349, p<0.05).

Table 3. Correlation between variables in patients with obsessive - compulsive disorder

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	–																	
2	0.522***	–																
3	0.477***	0.225	–															
4	0.758***	0.279	0.117	–														
5	0.325*	-0.221	-0.024	0.188	–													
6	0.413*	-0.047	0.005	0.219	-0.004	–												
7	0.524***	0.154	-0.100	0.485**	0.141	0.255	–											
8	0.173	0.155	-0.021	0.144	0.246	-0.077	0.048	–										
9	0.179	-0.124	0.154	0.071	-0.026	0.370*	0.210	0.292	–									
10	-0.070	0.145	-0.193	-0.033	-0.111	-0.006	-0.020	0.508**	0.261	–								
11	0.164	0.071	0.007	0.107	0.099	0.127	0.119	0.848***	0.704***	0.685***	–							
12	-0.046	0.349*	0.062	-0.213	-0.192	-0.125	-0.117	0.144	-0.003	0.433**	0.199	–						
13	0.158	0.230	-0.054	0.055	-0.082	0.281	0.058	0.012	0.271	0.417*	0.246	0.411*	–					
14	-0.111	0.229	-0.087	-0.220	-0.154	-0.059	-0.075	0.257	0.116	0.515**	0.341*	0.693***	0.725***	–				
15	-0.046	0.243	-0.099	0.023	-0.206	-0.183	0.043	0.388*	0.068	0.348*	0.349*	0.323	0.289	0.659***	–			
16	0.014	0.302	0.218	-0.111	-0.262	-0.302	0.177	0.304	0.167	0.247	0.319	0.468**	0.180	0.545***	0.665***	–		
17	-0.193	0.215	0.000	-0.142	-0.288	-0.311	-0.191	0.207	0.089	0.298	0.241	0.576***	0.124	0.576***	0.723***	0.631***	–	
18	-0.079	0.104	0.052	0.015	-0.368*	-0.111	0.035	-0.119	0.166	0.259	0.079	0.200	0.162	0.093	0.084	0.294	0.240	–

1: Dokuz Eylül Theory of Mind Index, 2: First-order false beliefs, 3: Second-order false beliefs, 4: Irony, 5: Empathy, 6: Metaphor, 7: Faux pas, 8: Core disgust, 9: Animal reminder disgust, 10: Contamination disgust, 11: Disgust sensitivity-total, 12: Checking compulsions, 13: Contamination obsessions and washing compulsions, 14: Obsessional thoughts about harm to self/others, 15: Dressing/Grooming compulsions, 16: Obsessional impulses to harm self/others, 17: Padua Inventory - Washington State University Revision-total, 18: Vancouver Obsessive-Compulsive Inventory-Mental Contamination Scale, *p<0.05, **p<0.1, ***p<0.001

Discussion

The results of the investigation into the relationship between theory of mind, disgust sensitivity, and mental contamination in patients with OCD revealed that although there was no statistically significant difference in ToM abilities between the patients and healthy controls, the difference was marginally significant. Patients with OCD demonstrated elevated levels of disgust sensitivity and a higher incidence of mental contamination.

Theory of mind, assessed through first-order false belief tasks, pertains to the ability to comprehend others' thoughts. Second-order ToM involves recognizing false beliefs about another person's belief regarding an event or another individual. Generally, at least a first-order ToM is necessary for understanding metaphors, which require an interpretation beyond the literal meaning. Conversely, the recognition of irony is thought to necessitate advanced second-order ToM skills (Şahin et al. 2019). The link between ToM and neurochemical pathways has been investigated in studies on autism and schizophrenia, where it has been postulated that anomalies in dopaminergic and serotonergic pathways may influence mentalizing abilities (Abu-Akel 2003). Therefore, it is crucial to consider that this study did not explore the influence of patients' medical treatment histories on their ToM capabilities.

A review of the literature reveals a paucity of studies addressing ToM abilities in patients with OCD, with existing studies utilizing diverse assessment tools. Sayın et al. (2010) conducted a comparative analysis between patients with OCD and healthy controls, identifying a statistically significant difference solely in advanced ToM abilities. The study proposed that this impairment, ascertained through a double-blind test, could be associated with reduced memory capacity. Similarly, research by Mavrogiorgou et al. (2016) employed tests to assess the detection of implications and social faux pas among patients with OCD. Findings indicated that while basic ToM abilities were comparable to those of healthy controls, advanced ToM skills, such as interpreting proverbs, were impaired in patients with OCD. Further, Ayribas et al. (2020) compared first- and second-order ToM abilities among patients with OCD, schizophrenia, and healthy controls. Results demonstrated that patients with OCD scored lower on both first- and second-order ToM tests compared to healthy controls, suggesting deficiencies in both basic and advanced ToM abilities.

Additionally, Mısır et al. (2018) utilized the Dokuz Eylül Theory of Mind Index (DEToMI) and found significantly lower ToM function scores in the patient group. There was a moderate negative correlation between DEToMI scores and the Yale-Brown Obsessive-Compulsive Disorder Scale, suggesting that ToM impairments, which are linked to executive functions, might be partially influenced by neurocognitive functions. In our study, we observed no significant difference in total ToM scores between the two groups. However, a detailed analysis of ToM subscales revealed more nuanced findings. While there was no significant difference in first-order false belief scores, a near-significant difference emerged in metaphor scores associated with this ability. Additionally, a significant difference was identified in second-order false belief scores. Conversely, no significant difference was detected in irony scores, which are believed to relate to second-order ToM. These findings are noteworthy and add valuable data to the existing literature, which has produced inconsistent results. Comparing our results with the literature, the diversity in measurement methods and the limited sample sizes present interpretative challenges. Moreover, the lack of consideration of the effects of medical treatment on ToM abilities in patients with OCD underscores the need for comprehensive measurements and neurocognitive evaluations in future research.

Disgust is hypothesized to serve an evolutionary function in protecting individuals from contamination and diseases. However, the potential role of disgust and disgust sensitivity in OCD remains incompletely understood due to the heterogeneous nature of these constructs and their clinical presentations (Tolin et al. 2006). Thorpe et al. (2003) identified an association between disgust sensitivity and OCD symptoms, excluding hoarding, in a diverse sample. Similarly, Olatunji et al. (2004) reported a statistically significant correlation between disgust sensitivity and contamination fear. Further, Georgiadis et al. (2020) demonstrated that disgust sensitivity uniquely predicted moral obsessions. Tolin et al. (2006) conducted a study involving 105 non-clinical volunteers. They found that, even after controlling for depression and anxiety, OCD symptoms such as checking, organizing, and washing were associated with disgust sensitivity, with the strongest relationship observed between washing symptoms and disgust sensitivity to hygiene-related stimuli.

Our study also examined the relationship between disgust sensitivity and OCD symptoms. Consistent with existing literature, our findings indicated that the patient group exhibited higher levels of disgust sensitivity and elevated scores on OCD symptom scales. This underscores the necessity of evaluating the impact of OCD on disgust sensitivity within a broader context. Unlike previous studies, we found the strongest relationship between disgust sensitivity and specific OCD symptom groups, such as "dressing/grooming compulsions" and

"obsessional thoughts about harm to self/others." These results suggest that disgust sensitivity is linked to patients' ritualistic behaviors and safety concerns aimed at self-protection or protecting others. However, a significant correlation was observed between disgust sensitivity and all OCD symptom groups except for the "contamination obsessions and washing compulsions" subscale and the "obsessional impulses to harm self/others" subscale. This indicates that disgust sensitivity, as a complex phenomenon, may exhibit variability in its relationship with different symptomatic aspects of OCD, and patients' sensitivity to specific symptoms may be heterogeneous.

Although our study did not identify a correlation between ToM skills and other variables, it is hypothesized that ToM, which explores the evolutionary origins and shaping of human behaviors, might be associated with disgust sensitivity. Disgust sensitivity plays a crucial role in helping individuals avoid potential threats that could cause harm or illness. Some studies suggest increased empathy in individuals with OCD (Fontenelle et al. 2009), while others report contrary findings (Pino et al. 2016, Bora 2022). It is important to recognize that empathy comprises both affective and cognitive components, with cognitive empathy being related to ToM (Bora 2022). Mentser and Nussinson (2020) found that individuals with high disgust sensitivity perceive less similarity between themselves and "foreign others," indicating that pathogen-related disgust sensitivity may act as a psychological defense mechanism that limits social closeness. Despite the hypothesis that empathy levels, as part of ToM skills, would influence perceptions of "similarity" and differ between the patient group and healthy controls, no statistically significant difference was observed. These findings underscore the significance of further investigating the effects of OCD's clinical presentation and ToM skills on disgust sensitivity. Further research should aim to elucidate the complex relationships between specific symptom groups of OCD, ToM skills, and disgust sensitivity through detailed neuropsychological and neurobiological studies. Therefore, there is a need for studies that comprehensively assess the clinical features of OCD symptoms, individual differences in cognitive functioning, and additional psychopathological factors such as anxiety levels.

The concept of mental contamination, characterized by a sense of contamination without physical contact, has been identified in approximately 10% of individuals with OCD. This phenomenon is believed to trigger impulses and behaviors related to washing and cleaning, analogous to those elicited by physical contamination (Coughtrey et al. 2012). An early study by Fairbrother and Rachman (2004) involving survivors of sexual assault revealed that recalling traumatic memories induced mental contamination and subsequent washing behaviors. Similarly, research by Badour et al. (2013) demonstrated a significant relationship between mental contamination, disgust sensitivity, and the severity of post-traumatic stress disorder. These findings have garnered interest due to the association between mental contamination and disgust sensitivity.

In a study investigating the relationship between mental contamination and OCD symptoms (Carraresi et al. 2013), significant correlations were observed between OCD symptoms, mental contamination, and disgust sensitivity, even after controlling for anxiety and depressive symptoms. Research by Melli et al. (2014) indicated that mental contamination was present in 61.9% of the patient group, and this construct mediated the relationship between disgust sensitivity and contamination-related OCD symptoms. Although our study did not assess threshold scores for mental contamination levels, it was determined that patients exhibited significantly higher mental contamination levels compared to healthy volunteers. However, contrary to previous results, no statistically significant relationship was observed between OCD symptoms and disgust sensitivity. There are several possible explanations for this discrepancy. First, methodological differences, such as differences in sample characteristics or assessment tools, could account for the divergent findings. Second, the small sample size might have influenced the observed relationship. Further studies should address these variables to clarify the conditions under which a relationship between OCD symptoms and disgust sensitivity may or may not emerge.

Considering the findings obtained in this study, the results should be interpreted with an awareness of certain limitations. First, the cross-sectional design of the study, combined with reliance on self-report measures for data collection, may introduce bias into individuals' self-assessments. Additionally, the limited scope of the questionnaire used may not fully capture the spectrum of OCD symptoms, thereby complicating the objective assessment in the absence of clinical observation. Second, the sample was derived from a single center and comprised a limited number of participants, thus potentially limiting the generalizability of the findings to a broader population. Another notable limitation in the present is the exclusion of individuals with psychiatric comorbidities, which is especially pertinent in the context of a clinical condition such as OCD. Lastly, the omission of participants' medication usage in the study further restricts a comprehensive evaluation of the findings, and the lack of control for OCD symptom severity also constitutes a significant limitation.

Conclusion

This study investigated the interrelations among ToM skills, disgust sensitivity, and mental contamination in individuals diagnosed with OCD. The results suggest that patients exhibit notable differences in ToM skills compared to healthy controls, with significant impairments especially in second-order ToM skills. Furthermore, elevated levels of disgust sensitivity and mental contamination were observed in the patient cohort. Additionally, a significant relationship was identified between specific symptom clusters of OCD and disgust sensitivity, while no correlation was evident between mental contamination and other examined variables. These insights enhance the understanding of the intricate associations among the symptomatologic diversity of OCD, ToM abilities, and disgust sensitivity. In light of these findings, professionals working with patients with OCD and those researching the variables of the ToM, disgust sensitivity and mental contamination should consider integrating these findings into their diagnostic and therapeutic frameworks. Such integration could help to develop more tailored interventions and improve patient outcomes through a deeper understanding of the complex interplay between these factors. Further studies should endeavor to provide more detailed neuropsychological and neurobiological elucidations of these relationships.

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