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BAHCESEHIR UNIVERSITY

GRADUATE SCHOOL OF EDUCATION

THE DEPARTMENT OF COGNITIVE NEUROPSYCHOLOGY

THE IMPACT OF COGNITIVE BEHAVIORAL THERAPY ON METACOGNITION AND RECOGNITION MEMORY IN PEOPLE WITH OBSESSIVE-COMPULSIVE DISORDER

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ISTANBUL 2023

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GRADUATE SCHOOL

09/06/2023

MASTER THESIS APPROVAL FORM

Program Name:	Cognitive Neuropyschology
Student's Name and Surname:	İlknur Yaren PALA
Name of The Thesis:	**The impact of cognitive behavioral therapy on metacognition and recognition memory in people with obsessive-compulsive disorder**
Thesis Defense Date	26.07.2023

This thesis has been approved by the Graduate School which has fulfilled the necessary conditions as Master thesis.

……

…

Institute

Director

This thesis was read by us, quality and content as a Master's thesis has been seen and accepted as sufficient.

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ABSTRACT

THE IMPACT OF COGNITIVE BEHAVIORAL THERAPY ON METACOGNITION AND RECOGNITION MEMORY IN PEOPLE WITH OBSESSIVE-COMPULSIVE DISORDER

Pala, İlknur Yaren

Cognitive Neuropsychology Masters Program

Thesis Advisor: Prof. Dr. Metehan Irak

January 2023, 36 pages

It was established that individuals with OCD experience cognitive effects associated with the disease. However, which cognitive processes and how this effect occurs is still unclear since studies investigating memory in OCD are controversial. Recent studies suggested that metacognitive processes differ in OCD compared to healthy controls and may be associated with both clinical symptoms and cognitive impact of the disease. Moreover, cognitive behavioral therapy (CBT) is reported that it is one of the most effective behavioral treatment methods and causes improvement in negative metacognitive processes seen in OCD. For this goal, 46 individuals diagnosed with OCD and 50 healthy controls were compared on JOL judgments, JOL accuracy, and recognition memory scores using familiar and unfamiliar neutral stimuli (word-scene photo pairs). Participants were also given BDI, BAI, MOCI, Y-BOCS(only for clinical group), SCID-V(only for control group). Additionally, it is sought to explore the potential impact of CBT on these cognitive areas. Ten sessions of CBT were applied to OCD patients; their clinical scores, memory, and metacognition scores were acquired following CBT. It was expected that individuals with OCD would have lower JOL judgments, JOL accuracy, and recognition performance scores. Also, it was hypothesized that an increase in these scores would be observed following CBT. It was observed that when non-disease-related stimuli were presented, OCD patients did not encounter a memory problem but gave lower JOL judgments and JOL accuracy scores. After the therapy sessions, participants' JOL judgments and JOL accuracy scores increased significantly, but memory scores did not change.

Keywords: Metacognition, Episodic Memory, Obsessive-Compulsive Disorder, Cognitive Behavioral Therapy

ÖZ

OBSESİF-KOMPULSİF BOZUKLUĞU OLAN BİREYLERDE BİLİŞSEL DAVRANIŞÇI TERAPİNİN ÜSTBİLİŞ VE TANIMA BELLEĞİ ÜZERİNDEKİ ETKİSİ

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Tez Danışmanı: Prof. Dr. Metehan Irak

Ocak 2023, 36 sayfa

Obsesif-kompulsif bozukluğu (OKB) olan bireylerin hastalıkla ilişkili bilişsel etkilenmeler yaşadıkları tespit edilmiştir. Ancak özellikle OKB'de hafızayı araştıran çalışmalar tartışmalı olduğu için bu etkinin hangi bilişsel süreçlerde ve nasıl gerçekleştiği hala belirsizdir. Son araştırmalar, üstbilişsel süreçlerin OKB'de sağlıklı kontrollere göre farklılık gösterdiğini ve hastalığın hem klinik semptomları hem de bilişsel etkisi ile ilişkili olabileceğini düşündürmektedir. Ayrıca bilişsel davranışçı terapinin (BDT) en etkili davranışçı tedavi yöntemlerinden biri olduğu ve OKB'de görülen olumsuz üstbilişsel süreçlerde de iyileşme sağladığı bildirilmektedir. Bu amaçla, OKB tanılı 46 birey ve 50 sağlıklı kontrol, tanıdık ve tanıdık olmayan nötr uyaranlar (kelime-manzara fotoğraf çiftleri) kullanılarak öğrenme kararı (ÖK), ÖK doğruluğu ve tanıma belleği puanları açısından karşılaştırıldı. Katılımcılara ayrıca klinik ölçekler verildi. Ek olarak, BDT'nin bu bilişsel alanlar üzerindeki potansiyel etkisinin araştırılması amaçlandı. OKB hastalarına on seans BDT uygulandı; klinik puanları, bellek ve üst biliş puanları BDT'yi takiben elde edildi. OKB'si olan bireylerin daha düşük öğrenme kararı derecelerine, öğrenme kararı doğruluğuna ve tanıma performansı puanlarına sahip olması bekleniyordu. Ayrıca BDT sonrası bu puanlarda artış olacağı varsayıldı. Hastalıkla ilgili olmayan uyaranlar sunulduğunda, OKB hastalarının bir hafıza sorunu yaşamadıkları ancak yine de daha düşük ÖK dereceleri ve ÖK doğruluk puanları verdikleri görüldü. Terapi seanslarından sonra, katılımcıların ÖK dereceleri ve ÖK doğruluk puanları önemli ölçüde arttı, ancak bellek puanlarında anlamlı bir değişikliğe rastlanmadı.

Anahtar Kelimeler: Üstbiliş, Tanıma Belleği, Obsesif-Kompülsif Bozukluk, Bilişsel Davranışçı Terapi

To My Mother,
Özlem

ACKNOWLEDGMENTS

I would first like to express my sincere gratitude to my advisor, Prof. Dr. Metehan IRAK, for their invaluable guidance and support throughout my master's program. Thanks to their expertise and encouragement, I was able to write this thesis.

I would like to express my deepest gratitude to Prof. Dr. Murat Kurt for introducing me to this field and being my mentor during my undergraduate education. They have not only trained me in the field but also guided me in life as well. I owe my current progress to the valuable guidance they have provided me.

I am incredibly grateful to my amazing classmates who have been in constant communication with me since we first met. I consider myself fortunate to have had supportive classmates who stood by me through difficult times and with whom I could share any topic.

Also, I would like to thank my friends İrem YILMAZ and Serra AKYURT-GÜVENER, whom I worked with on this project. Working with them on this project was a unique experience. I also would like to express my gratitude towards my roommate, İrem Yılmaz. Thank you for making the past two years in this city so enjoyable.

Finally, I would like to take this opportunity to express my gratitude to Dr. Burcu Pınar BULUT, Dr. Hurigül BAYRAM-GÜLAÇTI, and Dr. Ece BEKAROĞLU. Their presence has made our workplace where I enjoy, learn and grow. I have consistently felt their support and am grateful for it.

This study was concentrated on part of a TUBITAK project numbered 121K575, titled Investigating the Role of Cognitive Behavioral Therapy on the Relationship Between Encoding, Remembering, and Metacognition Processes in Obsessive-Compulsive Disorder.

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LIST OF ABBREVIATIONS

OCD	Obsessive-Compulsive Disorder
CBT	Cognitive Behavioral Therapy
JOL	Judgment of Learning

Chapter 1

Introduction

Obsessive-compulsive disorder (OCD) is a complex neuropsychiatric condition characterized by diverse obsessions and compulsions. Obsessions are persistent, disturbing, and inevitable thoughts that individuals frequently experience daily and struggle to disregard. Obsessions generally correlate to an individual's beliefs and interests, are time-consuming, and seriously affect the functionality of individuals. Compulsions are recurrent time-consuming behaviors or mental actions that individuals perform to reduce or cease the inconvenience yielded by obsessional thoughts (American Psychiatric Association [APA], 2013). Even though some individuals find these thoughts senseless and irrational, these thoughts can cause significant stress or fear (e.g., "I am going to die") differently from the stress that everyone experiences in daily life (APA, 2013). People with OCD have varying perspectives (insights) on their obsessions and compulsion; some recognize that their thoughts and actions are irrational, while others believe they are logical. These perspectives may also alter over time and may depend on the type of obsession (Abramowitz & Jacoby, 2015). Although the obsessions experienced by each individual differ from each other, the types of obsessions are generally categorized into four following types: contamination/cleaning/washing, forbidden thoughts (aggressive/sexual/religious), responsibility for harm and checking obsessions, and mixed obsessions (Abramowitz et al., 2010). Obsessions and compulsions are connected; compulsions are performed to reduce the distress of obsessions; nevertheless, they do not provide a solution that lasts long-term (Rachman, 1976). According to the obsession type, the compulsions are shaped around these themes: cleaning/washing, ordering/arranging/repeating, mental compulsions, and checking (Rasmussen & Eisen, 1992). Hoarding was previously considered one of the crucial symptoms of OCD and has now been removed from the OCD classification with the DSM-5 (Abramowitz & Jacoby, 2014). Although the diagnostic criteria of OCD in DSM-V remain similar to DSM-IV-TR in general, the most crucial change is that OCD has now been removed from the category of anxiety disorder, and a new category named obsessive-compulsive and related disorders (OCRDs) has been created (Abramowitz et al., 2014).

Kessler, Petukhova, Sampson, Zaslavsky and Wittchen (2012), in a study conducted in the United States, indicated that OCD has become more prevalent; 2.3% of individuals over 13 years suffer from OCD. Correspondingly, Çilli et al. (2004) demonstrated that the prevalence rate of OCD is 3% in the Turkish population, with individuals over the age of 18. Moreover, Yoldaşçan, Ozenli, Kutlu, Topal and Bozkurt (2009) claimed that this rate was 4.2% among university students, and OCD is more prevalent among university students in Turkey. According to World Health Organization (WHO), OCD was responsible for more life years lost to disability than Multiple Sclerosis and Parkinson's disease in a study conducted in 2004 (as cited in Hirschtritt, Bloch & Mathews, 2017). These findings point out that OCD is a condition that should be seriously addressed.

Although it is not yet known what causes OCD, studies point out that biological factors are influential in the formation of OCD and that it has a genetic aspect and emphasizes the attentional bias and memory deficits that are frequently encountered in addition to the clinical manifestations in OCD (Cuttler & Graf, 2009). Considering the clinical and cognitive characteristics of OCD, a bias towards disease-related and unrelated stimuli, and there may be a memory problem in OCD, especially in specific subgroups such as checkers (due to behaviors such as whether "I turned the stove off or not") (Muller & Roberts, 2005). However, cognitive processes in OCD are not yet well-understood. A growing body of literature has identified processes such as attention, executive functions, memory, metacognition, and metamemory that are affected or related to OCD (e.g., Abramovitch, Abramowitz & Mittelman, 2013; Cuttler & Graf, 2009; Nedeljkovic & Kyrios, 2007; Shin, Lee, Kim & Kwon, 2014; Snyder, Kaiser, Warren & Heller, 2015). In this current study, memory and metacognition processes were examined. Therefore, memory and metacognitive processes in OCD are discussed in the following sections.

1.1 Memory in OCD

Previous studies indicated that OCD has the strongest impact on a person's episodic memory (Exner, Martin & Rief, 2009; Kuelz, Hohagen & Voderholzer, 2004). Some of the researchers found a general memory deficit in OCD (Boone, Ananth, Philpott & Kaur, 1991; Savage et al., 1996; Zitterl et al., 2001), while others found no evidence of a memory problem in general (Abbruzzese, Ferri & Scarone, 1997; Brown, Koslyn, Breiter, Baer & Jenike, 1994; Foa, Amir, Gershuny, Molnar & Kozak, 1997; MacDonald, Antony, Macleod & Richter, 1997; McNally & Kohlbeck,

1993). Although there is an abundant amount of research on memory in OCD, these studies generated mixed outcomes about memory deficit in people with OCD.

A correlation exists between checking behaviors and reduced memory scores, meaning compulsive checking is associated with memory deficiencies (Sher, Mann & Frost, 1984). However, Cuttler and Graf (2009) demonstrated similar patterns of deficit in the memory scores of both checkers and non-checkers; this suggests that memory deficits are not exclusive to checkers. According to a meta-analysis study conducted by Abramovitch et al. (2013), which examined 115 studies comparing OCD patients and healthy individuals on ten neuropsychological domains, the results showed a small effect size for verbal memory but a large effect size for non-verbal memory. Another meta-analysis study by Shin et al. (2014) reported that individuals with OCD are impaired in visuospatial memory, verbal memory, processing speed, and verbal fluency. They also reported that among these cognitive areas, visuospatial memory and planning ability are the most impaired ones in OCD. Similarly, others claimed that OCD participants display a visual memory or visuospatial memory impairment (*for review,* Tallis, 1997). Muller and Roberts (2005) observed that individuals with OCD performed worse than healthy controls on recall tasks, not recognition tasks. According to a review study by Abramovitch and Cooperman (2015), people with OCD tend to struggle more with tasks assessing working memory with higher complexity and load. However, they perform similarly to healthy individuals on simpler tasks. Deckersbach, Otto, Savage, Baer, and Jenike (2000) claimed that individuals with OCD have a deficit in verbal and nonverbal memory, which is related to impairments in organizational strategies. Also, Savage et al. (1999) showed that there are nonverbal memory impairments in individuals with OCD and insufficient organizational strategies mediated impairments. Cabrera, Mcnally, and Savage (2001) demonstrated that individuals with OCD used organizational strategies less than healthy controls. Jurado, Junqué, Vallejo, and Salgado (2001) demonstrated that individuals with OCD display worse memory performance on incidental tasks, indicating that they tend to struggle when unsure about the nature of the task. This finding implies that whether the task is incidental or intentional can impact the inconsistencies in memory studies. Regarding clinical symptoms, individuals with OCD attach particular importance to their own thoughts and are intolerant to uncertainty; these clinical features may play a role in their low performance in tasks that lack a clear purpose.

On the other hand, the fact that individuals with OCD tend to struggle more with incidental tasks (e.g., frequency of occurrence task (Pujol et al., 1992)) and higher-load tasks can support the notion that they cannot utilize organizational strategies sufficiently. Taken together, these findings may point out to an upper-managing system.

According to a meta-analysis conducted by Woods, Vevea, Chambless and Bayen (2002), the most significant factor that affects recognition in individuals with OCD is confidence regarding memory. A growing body of literature shows that individuals with OCD tend to rate their own memory with low confidence; this refers to the fact that the memory problem in OCD may not be an actual memory problem but rather a result of low confidence interfering with memory performance. In accord with this, previous studies demonstrated that individuals with OCD have lower levels of confidence in completing episodic memory tasks (Derin & Irak, 2020; Tuna, Tekcan & Topçuoğlu, 2005).

MacDonald et al. (1997) proposed that a lack of confidence regarding memory performances in individuals with OCD is in plain sight; through self-report measures about confidence ratings and by slower reaction times. Considering doubt, one of the prominent symptoms of OCD, it is not surprising that individuals with OCD have slow reaction times. Furthermore, various studies point out information processing speed impairments in OCD, and they proposed that cognitive impairments could stem from impairments in information processing speed (Abramovitch et al., 2013; Shin et al., 2014; Snyder et al., 2015). To test this effect, we design the episodic memory task, which allows for investigating processing speed during each phase.

There are three key points to note in OCD and memory impairment studies. Firstly, it may be related to insufficient organizational strategies. Secondly, individuals with OCD struggle with incidental tasks and high-load tasks, but they perform similar to healthy individuals in intentional tasks and non-high-load tasks. Lastly, those with OCD have lower confidence in their memory processes. All these key points imply the role of an upper managing system which is metacognition.

1.2 Metacognition in OCD

As reported by Rachman (1998), individuals with OCD are prone to give extreme significance to their disturbing thoughts, which impresses the development of the disorder. However, some researchers propose that OCD symptoms arise from deficiencies or biases within the information processing system (Enright, Beech &

Claridge, 1995; Tallis et al., 1997). It has been known that individuals with OCD tend to focus on their own thoughts and often have negative beliefs about them (Salkovskis, Forrester & Richards, 1998). Wells' (1997) in his theoretical model, known and named Self-Regulatory Executive Function (S-REF), suggest that obsessions occur when metacognitive beliefs about the meaning of thoughts are activated by showing that he differs from other researchers by arguing that obsessive-compulsive disorder begins in metacognition, not cognition.

Metacognition is about what we remember and forget, as well as what we know and do not know. Metacognition can be defined as "cognition about cognition" and specifically knowledge while performing a task (Fleming & Dolan, 2012). According to Nelson and Narens (1990), metacognitive process has two subsystems: control and monitoring. Monitoring involves receiving notifications that provide information about the status of cognitive processes; through these notifications, cognitive processes can be monitored, controlled, and evaluated for assessment. Control refers to the flow of information that triggers, sustains, or terminates an action. There are two types of metacognitive judgments: prospective and retrospective. Retrospective judgments are associated with recognition and recall performance for newly learned items. On the other hand, prospective judgments are made after responding to the item in question. Nelson and Naren (1990) divided prospective judgments into three groups: ease of learning (EOL), the judgment of learning (JOL), and feeling of knowing (FOK). EOL is about making a judgment on information that has yet to be learned. At the same time, JOL is related to judgments about learned knowledge and is attempted to predict past or future performance regarding the degree of knowledge learned. FOK occurs during or after learning; these decisions are related to how information that cannot be remembered correctly regarding new or previously learned information can be known or remembered in a later recognition test (Irak, 2005; Irak, Soylu & Çapan, 2019). In this study, only JOL judgments will be discussed.

According to the monitoring-retrieval hypothesis proposed by King, Zechmeister and Shaughnessy (1980), JOLs are depended on the monitoring of retrieved information related to the target and how well we remember information related to the target. Alternatively, Koriat (1997) claimed that JOLs are influenced by fluency and ease of processing; this refers to those that are not affected by past retrieval.

Along with the research in recent years, it has become more evident that the basic cognitive process underlying OCD is metacognitive beliefs about thinking (Irak & Tosun, 2008; Derin & Irak, 2020). Some studies have shown that there is a strong association between metacognitive processes and OCD symptoms (Hermans, Martens, de Cort, Pieters, & Eelen, 2003; Irak & Tosun, 2008). Woods et al. (2002) demonstrated that checking behavior is closely related to confidence in memory performance. In addition to retrospective judgments, it has been emphasized that the low confidence that OCD patients endure has an impact on prospective metacognitive judgments, and this is associated with negative metacognitive beliefs that one has generally weak memories (Derin & Irak, 2020; Irak & Tosun, 2008; Tuna et al., 2005; Wells, 2005). Dar, Sarna, Yardeni, and Lazarov (2022) reported in their meta-analysis study that individuals with OCD were less confident regarding their memory compared to controls. According to Moritz and Jeager (2018), the level of confidence regarding memory may differ between OCD and healthy controls, but the accuracy of memory remained similar between the two groups.

While studies are not conclusive about OCD individuals having memory deficits, they do suggest that their metacognitive beliefs may cause them to over-monitor their thoughts, which has a negative effect on memory performance. Additionally, individuals with OCD often have decreased confidence in their memory and may have biases toward relevant and threatening stimuli (Hezel & McNally, 2016). In this study, we used neutral stimuli that cannot be linked to disease to eliminate any biases related to OCD symptoms that can occur.

When studying memory, various methodological factors can impact the outcome. One such factor we take into account is familiarity. Familiarity with the cue that leads to trying to remember a stimulus can produce a sense of knowing that is not entirely correct (Metcalfe, Schwartz, and Joaquim, 1993). It is unclear whether the memory and metamemory problems in OCD are general or specific (type of stimulus, association with the symptom, etc.). This problem needs to be sufficiently investigated, whether related to coding or retrieval processes. If the memory and/or metacognitive problems in OCD are common, whether the stimulus is familiar or not will have no effect. It is essential to understand the role of metacognitive processes in OCD to determine whether memory impairments result from actual memory deficits or metacognitive judgments related to learned information. In this study, it is anticipated

that OCD participants will demonstrate a lack of confidence regarding their memory, despite the familiarity effect.

1.3 Effect of Cognitive Behavioral Therapy on OCD

There are various treatment methods for OCD symptoms. Among the treatments of OCD, serotonin reuptake inhibitors (SSRIs) medical treatment is known to be effective, but it is known that this effect remains partial (Franklin & Foa, 2011; McDonough & Kennedy, 2002; Pigott & Seay, 1999). It has been known that the most successful method in treating OCD is a combination of cognitive behavioral therapy (CBT) and medical treatment (SRIs). Cognitive Behavioral Therapy (CBT) is a very effective intervention among behavioral interventions (Foa et al., 2005). This section will discuss the effectiveness of CBT and how it affects cognitive processes.

Various researchers have demonstrated that CBT methods diminish the abnormal activity in the frontostriatal circuit (Nakatani et al., 2003; Schwarz et al., 1996) and enhance verbal memory, executive functions, and working memory performances (Bolton, Raven, Madronal-Luque & Marks, 2000; Kuelz et al., 2006; Nedeljkovic, Kyrios, Moulding & Doron, 2011; Hoexter et al., 2012). A meta-analysis reported that CBT has a positive impact on executive functions and memory in OCD. Medication-free OCD participants showed significantly improved cognitive functioning despite the fact that at the beginning, patients exhibited significantly worse performance compared to control (Voderholzer et al., 2013), indicating that cognitive dysfunctions in OCD may be condition-related and reversible with treatment.

Nedeljkovic et al. (2011) claimed that CBT might have improved one's perspective and confidence in one's own cognitive performance. Current approaches addressing CBT effectiveness in OCD primarily focus on metacognitive beliefs and strategies associated with these beliefs (e.g., Rachman, 1997; Salkovskis, 1985; Clark, 2004; Wells & Matthews, 1996). In the early theories of OCD, it was emphasized the exaggerated sense of responsibility (Salkovskis, 1985), misinterpretation of thoughts and thought-action fusion (Rachman, 1997), and the process of controlling thoughts (Clark, 2004). More recently, The Obsessive-Compulsive Study Group (OCWG) identified six false beliefs linked to metacognition: an exaggerated sense of responsibility, overemphasis on thoughts, the importance given to controlling thoughts, an exaggerated perception of threat, perfectionism, and intolerance to uncertainty (OCWG, 2005). Metacognitive therapy, which was developed to deal with these false beliefs and is one of the complementary techniques for CBT, was developed

based on the self-regulatory executive function theory (Wells & Matthews, 1994; 1996). The model suggests that beliefs about cognition, emotion, and behavior can either protect against or trigger various psychological issues. Based on this model, the metacognitive processes are the primary source of OCD in individuals, rather than cognitive or organic processes. Consequently, it can be believed that if a positive change in beliefs about one's self, then OCD can be healed.

Solem, Haland, Vogel, Hansen, and Wells (2009) evaluated cognitive and metacognitive changes in individuals with OCD who underwent CBT using metacognitive therapy techniques proposed by Wells (1997). They observed that changes in metacognition were the best accurate predictors of outcomes in OCD. Fisher and Wells (2008) demonstrated that metacognitive therapy is an effective and time-saving intervention when treating OCD.

Şafak et al. (2014) and Duman (2019) indicated that CBT is an effective method for OCD in the Turkish population as well. However, the effect of CBT on metacognitive and memory processes in OCD has not been clarified in our country. To the best of our knowledge, no study is investigating this topic apart from these two studies in a Turkish sample.

1.4 The Goals of the Study

It is evident that individuals with OCD experience some cognitive impairment. However, the nature of the cognitive impairment in OCD has not been clarified. Researchers have varying ideas regarding memory impairment in OCD, with some claiming actual memory deficits and others pointing to processes at the metacognitive level. To shed some light on this controversy and investigate familiarity effect, we measured JOL judgments during an episodic memory task consisting of symptom-free and familiar and unfamiliar word-scene pairs in this current study. And we calculated JOL accuracy scores. Investigating the JOL judgments and JOL accuracy scores is to gain insight into relationships between memory and the metamemory process. If there is a memory deficit, we aim to examine whether metacognitive decisions are related.

Some researchers have investigated the relationship between memory performances and metamemory using symptom-related stimuli; utilizing OCD-related items might bring memory bias since individuals with OCD have positive memory for disease-related stimuli (Constans, Foa, Franklin & Mathews, 1995; Radomsky & Rachman, 1999). Thus, neutral stimuli were used to avoid the possible memory bias triggered by symptom-related stimuli.

Through CBT, individuals with OCD have experienced transformative changes in their beliefs (Whittal, Thordarson & McLean, 2005). Suppose individuals with OCD modify their beliefs about themselves and their cognitive abilities. In that case, they will likely develop greater confidence in their memory and experience a reduction or elimination of memory impairment if there is a memory impairment and the underlying process is metacognitive. The effectiveness of CBT on cognitive functions in OCD has not been elucidated sufficiently. This shortcoming in the literature is evident; thus, in order to see how CBT will affect metacognitive and memory processes in OCD, patients will go through 10 sessions of therapy and be tested before and after the treatment with the same experimental paradigm. In addition, clinical scales will be applied to the participants to determine both the severity of the disease and their depression and anxiety levels. Since depression and anxiety are the most common comorbidities in OCD, and also OCD treatment is affected by initial depression level, depression and anxiety will be measured with clinical scales (Abramowitz, Franklin, Street, Kozak & Foa, 2000; Ruscio, Stein, Chiu & Kessler, 2010; Torres et al., 2006). We expected to observe that all of the clinical measures of the OCD groups would significantly reduce following therapy. As stated, CBT applications in treating OCD focus on dysfunctional metacognitive processes. In this case, if CBT is an effective method in treating OCD, it can be expected that this situation will also manifest in memory and upper memory processes. Thus, in this study, we investigated how individuals with OCD are impacted in terms of episodic memory and metamemory and how CBT affects these processes.

There are three aims of the present study. Firstly, we aimed to investigate clinical measures such as symptom severity, anxiety and depression, JOL judgments, JOL accuracy scores, recognition memory performances, and reaction times of the OCD group pre-CBT. It is expected to note the significant difference between the OCD group and healthy controls regarding their JOL judgments, JOL accuracy scores, recognition memory performances, and reaction times. It was expected that patients with OCD would have higher scores than the control group in all clinical measures. Regarding cognitive measures, it was anticipated that OCD patients had lower JOL judgments, recognition memory, and lower JOL accuracy but higher reaction times of these variables than healthy controls, despite the type of stimulus (familiar or nonfamiliar).

Secondly, the impact of CBT on JOL ratings and recognition memory performances was purposed to examine pre-CBT and post-CBT measures of the OCD groups compared with healthy controls. The David A. Clark (2004) technique was used in the CBT sessions. The sessions involved informing the patient about obsessions and compulsions, normalizing obsessions and compulsions, and exposure and response prevention (ERP) and metacognitive therapy techniques were used. The primary purpose of the CBT intervention is first to normalize the thoughts that the person has and has difficulty dealing with and then exchange them for better ways of thinking patterns. It is expected that negative evaluations of the person's metacognitive processes will reduce with therapy since CBT is an effective behavioral intervention. The elimination or reduction of negative evolutions in metacognitive processes is seen in cognitive processes. It was expected after the CBT that the OCD group would significantly improve the clinical measures. Additionally, after CBT, group differences would be nonsignificant in JOL judgment, JOL accuracy, recognition memory performance, and reaction times of these variables.

Lastly, it is expected to observe the difference between the OCD group's pre-CBT and post-CBT measures on clinical measures, JOL judgment, JOL accuracy and recognition memory performance, and reaction times of these variables. It is anticipated to increase JOL judgment, JOL accuracy, and recognition memory performance but decrease reaction time and clinical measures in post-CBT.

Thus, there are six hypotheses of the present thesis:

Hypothesis 1: The OCD group’s symptom-related measures will be significantly higher than healthy controls, and their symptoms will be significantly reduced following therapy.

Hypothesis 2: The OCD and healthy control groups will have significant differences regarding their JOL judgments and JOL accuracy for both familiar and unfamiliar items; the OCD group is expected to have lower JOL judgments and JOL accuracy compared to healthy controls.

Hypothesis 3: There will also be significant group differences in recognition performances of the episodic memory task; the OCD group will have lower recognition performances for familiar and unfamiliar items than healthy controls.

Hypothesis 4: The OCD group's JOL judgment and JOL accuracy scores will significantly increase after CBT, and there will be no significant differences between the two groups on JOL judgments and JOL accuracy scores.

Hypothesis 5: There will be no differences between the two groups on recognition performance after CBT, meaning that after CBT, the OCD group's recognition performances will increase significantly.

Hypothesis 6: The OCD group's reaction times for JOL judgments and recognition performance will be significantly higher compared to the healthy controls. After CBT, reaction times will be decreased, and this difference will be insignificant.

This thesis study is a part of TÜBİTAK Project (Project no: 121K575; Irak, 2021)

Chapter 2

Methodology

2.1 Participants

In this study, a total of 96 participants, consisting of two groups named as OCD group (n=46) and healthy control group (n=50), took part. Participation was voluntary. All participants were given a 75 TL valued gift card for their participation. Participants ages ranged from 18 to 47 years (*M*=25.64*, SD*=8.03). The clinical group involved individuals who met the Obsessive-Compulsive Disorder diagnostic criteria according to the Diagnostic and Statistical Manual of Mental Health Disorders (DSM-5) (American Psychiatric Association, 2013), were diagnosed by a psychiatrist at Ankara Şehir Hospital Psychiatry Clinic, scored 18 and above on the Yale-Brown Obsessive Compulsive Scale (Farris, McLean, van Meter, Simpson & Foa, 2013). 38 patients were using selective serotonin reuptake inhibitors (SSRIs), which are comparatively secure regarding memory performance (Thomsen, 2000). The distribution of the participants by obsession types is given in Table 1.

Two groups were matched concerning their education level and age. The healthy controls were recruited from the community sample via social media advertisements. In addition, the study was proposed to university students via e-mail. Control groups' participants were administered to Structured Clinical Interview for DSM-5 (SCID-5; First, Williams, Karg & Spitzer, 2016) to screen for any psychiatric disorder, including if they did not report any psychiatric disorder. In the OCD group, a total of four participants were excluded, two of them decided to withdraw from the study while completing questionnaires, and the other two decided to withdraw owing to they did not comply with the therapy procedure's exposure method; After the dropouts, the study was left with a total of 46 OCD participants. Two participants from healthy controls were excluded: one did not meet the SCID-5 criteria, and the other was excluded because they had significant difficulties with literacy, resulting in slow reading and writing skills, and the study was left with a total of 50 healthy control participants.

For the OCD group, exclusion criteria were: (1) any other comorbid psychiatric disorder, (2) history of any therapy, (3) any other medical condition, (4) usage of psychiatric medicine different from antidepressants and antipsychotics. Further exclusion criteria for all were: (1) color blindness, (2) alcohol and substance misuse,

(3) mental retardation, (4) head trauma, (5) history of neurological disease, (6) significant medical condition that might interfere with their cognitive performances.

2.1.1 Socio-demographic characteristics. The study sample, 71.9%, was comprised of males, and 28.1% was comprised of females. The demographic characteristics of participants are presented in Table 1.

Table 1

Demographic Characteristics of the Participants

Variables	OCD			HC		
	n	%	Mean(SD)	n	%	Mean(SD)
Gender						
Female	33			35		
Male	13			15		
Age	46		25.13(7.73)	50		26.06(8.38)
Year of Education						
University (More than 12 years)	18	39.10%		19	38%	
Highschool (12 years)	27	58.70%		29	58%	
Primary (8 years)	1	2.20%		2	4%	
Years of Ilness			7.14(7.14)			
OCD Type						
Contamination/Cleaning/ Washing	11	23.90%				
Aggressive/Sexual/ Religious	2	4.30%				
Responsibility for harm and checking	6	13%				
Mixed	27	58.70%				

2.2 Measurements

2.2.1 Episodic memory task. Five phases comprised the episodic memory task, containing word and scene-photo pairs. There were four phases of the study; learning, judgment of learning, recognition, and feeling of knowing phase. The words utilized in this task were chosen from common words consisting of 5-8 letters (Göz,

2016). Photos were selected from a database. To investigate the effect of familiarity, half of the scene photos were chosen from familiar scene photos (e.g., the Great Wall of China), and another half of the photos were chosen from unfamiliar scene photos (e.g., a random beach photo). In order to determine whether stimulants pose a threat stimulant (symptom trigger) for individuals diagnosed with OCD, a group of three experts consisting of two clinical psychologists and a psychiatrist were consulted. The stimulus pool, created for unknown words, places(scenes), and photos of familiar people, was tested in a pilot study with a sample of 75 people. According to this, the stimuli with the highest (for familiar stimuli) and lowest (for unknown stimuli) frequencies were selected. It is used a traditional classical learning-decision-recognition paradigm to measure memory and metacognitive decision. Similar forms of these tasks have also been used in previous studies conducted in our laboratory (e.g., Irak et al., 2019; Irak, Soylu, Turan & Çapan, 2019). The words can be considered clue stimuli, and photos can be considered target stimuli. The target images were the same size, 400 pixels wide and 500 pixels (14 cm x 17 cm). In the first phase of the task, learning, 44 word-photos of places were presented for 3 seconds in 40 points Ariel type, and 1-second intervals were given between each pair. Randomisation technique was used to decide order of the pairs

The researcher instructed participants to learn as much as possible about these pairs. In order to eliminate primacy and recency effects, the first and last two pairs were excluded from analyses. In the second phase, judgment of learning, participants were presented words, the clue stimuli, from the first phase and required to show whether they can or can not remember the scene photo of that word's pair. The responses in this phase were taken on a 3-point Likert-type scale ("1=definitely can not remember", "2=I am not sure", "3=Definitely remember"). The clue stimuli presented for three seconds and one-second intervals were given (a blank screen for one second), and 3 point Likert-type scale appeared on the screen for each item. In the third phase, recognition phase, 80 word-scene photo pairs were presented; half were inlist (presented in the first phase), and the other half were outlist (not presented in the first phase). Participants were instructed to click the Mouse's left button if they had already seen the pair and to click the Mouse's right button if they had not seen the pair previously in the task, each pair were presented on the screen for 3 seconds and participants had to give their answer during the presentation of each pair for each pair. In the fourth phase, the feeling of knowing phase, there were two stages: feeling of

knowing (FOK) judgments and second recognition. In the FOK judgments stage, participants were instructed to the following statement “We ask you to evaluate a feeling of knowing judgment for each word that you could not remember. Ask yourself the following question: "Even though I do not remember the answer now, do I know the answer to the extent that I am able to pick the correct answer from among several choices in the future?” Then, participants rated each question on a scale of 1 (surely will not be able to find the correct answer) to 6 (surely will be able to find the correct answer). In the recognition stage, clue words were presented on top of the screen, and four alternatives of photo places(scene), including the right option, were presented on the bottom of the screen. Participants had to select the right photo from the other four options. In the scope of this study, the first three phases were included.

JOL accuracy scores were computed based on Goodman-Kruskal’s Gamma correlation (Nelson, 1984). Gamma correlations are calculated with JOL judgments and memory performances and are actually based on the relationship between these two. Gamma is calculated by comparing each element's performance with another element's performance and counting congruences and mismatches. An item with a higher JOL judgment is recalled, then another item with a lower JOL judgment is not recalled then a congruence occurs. A mismatch occurs when an item with a higher JOL judgment is not recalled and another item with a lower JOL judgment is recalled. The gamma correlation is calculated as: (Compatibilities - Incompatibilities)/(Compatibilities + Incompatibilities).

2.2.2 Beck depression inventory. Beck Depression Inventory (BDI) was created by Beck, Ward, Mendelson, Mock and Erbaugh (1961). BDI was a self-report inventory designed to measure the presence and intensity of depressive symptoms, which consisted of 21 items; each item can be scored on a scale from 0 to 3. Participants read each item and chose the appropriate answer that best fits them, considering the past week from the options. Higher outcomes demonstrated that there were signs of greater degrees of depressed symptoms.

Hisli (1988) conducted reliability and validity studies of the Turkish version of the scale. In the Turkish population, split-half reliability was .74, and Cronbach's alpha was.80.

2.2.3 Beck anxiety inventory. Beck Anxiety Inventory (BAI) was initially developed by Beck, Epstein, Brown and Steer (1988). in order to measure the level of anxiety one endures. BAI is a self-report, 21-item inventory and aims to gain insight into one's anxiety level over the past week. Participants answered on a scale from 0 (not at all) to 3 (I could hardly stand). BAI's Turkish version's validity and reliability studies were conducted by Ulusoy, Şahin and Erkmen (1998). Cronbach's alpha was .93.

2.2.4 Yale-Brown obsessive compulsive scale (Y-BOCS). Y-BOCS was a semi-structured interview invented by Goodman et al. (1989), was used by clinicians, and had ten items. The clinician scores each item, and participants receive points between 0 and 4 based on their responses to each item. A score of 0 means no symptoms and a score of 4 means severe symptoms. The higher the participant's score, the more severe the disease is. Y-BOCS consisted of two parts: Obsessions and Compulsions, each of which had a total of five questions.

Tek et al. (1995) conducted the Turkish validity and reliability studies of the Yale-Brown Obsessive-Compulsive Scale. Interrater reliability was .96 and varied between .85 to .97 for obsession and varied from .74 to .97 for compulsion subscale.

2.2.5 Maudsley obsessive-compulsive inventory (MOCI). Hodgson & Rachman (1977) initially created the inventory to gain insight into the type of OCD and the intensity of symptoms. Maudsley Obsessive-Compulsive Inventory (MOCI) is a true/false self-report 30-item questionnaire. Participants should read each statement and check the box next to say whether they agree or disagree. They check the "true" box if they concur with the statement; otherwise, they check the "false" box. The test score is the sum of all "true" answers, each true worth one point. A high overall score meant that participants' symptoms were severe, whereas those who received a low score had less severe symptoms. The inventory comprises subscales for checking, slowness, doubting, and cleaning.

Erol and Savaşır (1988) carried out The Turkish validity and reliability studies of the Maudsley Obsessive-Compulsive Disorder Inventory. The Cronbach alpha coefficient varied from .61 to.65 for subscales, and it was =.86 overall. Test-retest reliability was .88. Turkish version of MOCI contains one additional 7-item sub-scale named "rumination."

2.2.6 State-trait anxiety inventory (STAII). State-Trait Anxiety Inventory (STAII) was a self-report questionnaire, which consisted of two subscales, State and Trait, and was invented by Spielberger, Gorsuch and Lushene (1970). STAII includes 40 items which half of the items measured state anxiety while the other half of the items measured trait anxiety. Participants answered each item on a scale from 1 (not at all) to 4 (very much). The trait anxiety scale evaluated the participant's usual anxiety level, whereas the state anxiety scale examined the participant's level of anxiety while they responded to the questions.

Öner and Lecompte (1983) conducted the Turkish Reliability and Validity studies of the scale. The reliability coefficient was .83. The Cronbach alpha coefficient was α= .96 for state anxiety and α= .87 for trait anxiety.

2.2.7 Structured clinical interview for DSM-5 (SCID-5). Participants in the control group were additionally administered Structured Clinical Interview for DSM-5 (SCID-5) to make certain that they did not have any diagnosis that might alter the findings (First et al., 2016). Elbir et al. (2019) conducted validity and reliability studies of the Turkish version of SCID-5, and it was discovered that kappa values were statistically significant and relatively high.

2.2.8 Socio-demographic information form. Socio-demographic information form was used to acquire knowledge about participants' personal information. In this context, various questions were prepared to be asked to the participants by the researcher (see Appendix A). The questions were about the participants' age, gender, education level, income level, marital status, preferred used hand, color blindness, or whether they had a condition that prevented them from performing the tasks to be used in the research, alcohol or drug use.

2.3 Procedure

All participants were presented with an informed consent form before starting the study and signed (see Appendix B). A psychiatrist evaluated participants in the OCD group for symptom criteria and the degree of severity of their disease at Ankara City Hospital. If the psychiatrist determined to be a good fit for the study, they were scheduled for an appointment. The researcher reminded their experiment date via phone to the participants. Participants arrived at the clinic for their appointment and were taken into the experiment room. The clinical group was assigned the experiment in a single appropriate room at Ankara City Hospital, and the control group was

brought into the experiment room of the Brain and Cognition Lab for the study. All participants in the study concluded the experiment and questionnaires in a single session. In a counterbalanced order, all participants completed BDI, BAI, STAI, MOCI, and SCID-5 (only for the control group), and Y-BOCS (only for the OCD group). The episodic memory test, devised by the Bahcesehir University Brain and Cognition Laboratory, was given to participants. All tasks were completed on a computer equipped with a 15-inch monitor. Each participant's administration took around 45-60 minutes. Following the application of the experiment to the clinic group, an appointment was set with a specialized psychologist at Ankara City Hospital to get started on therapy. After ten therapy sessions, the patients were given the version created using various items from the same experimental paradigm (which includes different stimuli). The interval between the two periods ranged from 6 to 8 weeks.

This study was focused on part of a TUBITAK project (NO: 121K575, Irak 2021), The project consisted of three experimental paradigms, namely, word-word pairs, word-face photo pairs, and word-scene pairs. In this study, the experimental paradigm consisting of word-scene pairs described above was used.

Chapter 3

Results

3.1 Socio-Demographic Characteristics

Data were checked for missing values before analysis. There were no univariate or multivariate outliers (for $p < .001$). A total of 96 participants were analyzed. Based on the independent samples t-test, there was no significant difference found between the OCD and healthy control groups in terms of the participants' year of education (t (94) = .046, p = .963) and age (t (94) = -.563, p = .575). Participants' demographic characteristics and comparisons between the two groups regarding age and year of education were displayed in Table 2.

Table 2

Participant's Mean Age (and Standard Deviations), According to Gender and Year of Education

	OCD		*HC*	
Year of Education	Male	Female	Male	Female
Primary (8 years)	- n=0	45(-) n=1	35.5(5.5) n=2	43(-) n=1
High school (12 years)	19.71(1.97) n=7	22.55(6.28) n=20	24.50(8.54) n=6	21.95(4.57) n=22
University (12 years and more)	33.16(8.32) n=6	26.91(6.12) n=12	24.85(1.86) n=7	31.61(9.42) n=13

**OCD: Participants with obsessive compulsive disorder; HC: Healthy controls*

3.2 Group Comparisons on Clinical Measures Before Therapy

Mean scores and standard deviations for BDI, BAI, MOCI, and STAII, depending on group status, are depicted in Table 3. Participants in the OCD group had high scores on Y-BOCS scores implying moderate intensity (M=28, SD=4.48). A one-way analysis of variance (ANOVA) was performed to compare two groups on BDI, BAI, MOCI, and STAII. The OCD group performed significantly higher than the control group in all comparisons, as expected.

Table 3

Group Comparisons on Clinical Measures

Variables	OCD (n=46)	HC (n=50)	
	M (SD)	*M (SD)*	*F*
BDI total	21.8 (10.05)	5.38 (4.87)	106.41***
BAI total	25.98 (16.85)	5.60 (5.35)	63.53***
MOCI total	25.48 (5.47)	8.88 (4.63)	258.66***
STAI-T total	51.67 (8.65)	42.30 (13.57)	15.97***
STAI-S total	41.91 (7.41)	35.54 (9.04)	14.13***
Y-BOCS total	28 (4.48)	-	-

****p< .001; OCD: Participants with obsessive compulsive disorder; HC: Healthy controls. BDI: Beck Depression Inventory; BAI: Beck Anxiety Inventory; MOCI: Maudsley Obsessive-Compulsive Scale; STAI-T: State-Trait Anxiety Inventory-Trait; STAI-S: State-Trait Anxiety Inventory-State; Y-BOCS: Yale-Brown Obsessive Compulsive Scale.*

3.3 OCD Group's Clinical Measures Before and After Therapy

OCD groups prior to and following therapy clinical measurements were compared. A one-way repeated analysis of variance (ANOVA) was performed to compare BDI, BAI, MOCI, Y-BOCS, and STAII scores. Mean scores and standard deviations for BDI, BAI, MOCI, Y-BOCS, and STAII are presented in Table 4. OCD group scores on clinical measurements significantly decreased after the CBT, except for STAI-S.

Table 4

The OCD Groups Comparisons of Clinical Measures Before and After Therapy

Variables	Pre-measurement	Post-measurement (n=50)	
	M (SD)	*M (SD)*	*F*
BDI total	21.80 (10.05)	8.43 (7.96)	64.36***
BAI total	25.98 (16.85)	11.15 (10.15)	55.34***
MOCI total	25.48 (5.48)	12.35 (6.86)	161.84***
STAI-T total	51.67 (8.66)	45.39 (5.64)	21.77***
STAI-S total	41.91 (7.41)	42.11 (6.25)	.02

Table 4 (cont'd)

Y-BOCS total	28 (4.48)	8.58 (4.73)	492.14***

****p< .001; OCD: Participants with obsessive compulsive disorder; BDI: Beck Depression Inventory; BAI: Beck Anxiety Inventory; MOCI: Maudsley Obsessive-Compulsive Scale; STAI-T: State-Trait Anxiety Inventory-Trait; STAI-S: State-Trait Anxiety Inventory-State; Y-BOCS: Yale-Brown Obsessive-Compulsive Scale.*

3.4 Group Comparisons on Clinical Measures After Therapy

Mean scores and standard deviations for BDI, BAI, MOCI, and STAII, depending on group status, are presented in Table 5. Participants in the OCD group had lower scores on Y-BOCS scores implying mild intensity (*M*=8.58, *SD*=4.73). A one-way analysis of variance (ANOVA) was performed to compare two groups on BDI, BAI, MOCI, and STAII. Following therapy, the OCD group performed significantly higher than the control group in all comparisons except for STAI-T.

Table 5

Group Comparisons on Clinical Measures after CBT

Variables	OCD	HC	
	M (SD)	*M (SD)*	*F*
BDI total	8.43 (7.96)	5.38 (4.86)	5.24*
BAI total	11.15 (10.15)	5.60 (5.34)	11.12***
MOCI total	12.34 (6.85)	8.88 (4.63)	8.55*
STAI-T total	45.39 (5.63)	42.30 (13.65)	2.06
SAI-S total	42.10 (6.25)	35.54 (9.04)	16.8***
Y-BOCS total	8.58 (4.73)	-	-

** p <.05; ** p < .01; *** p <.001; CBT: Cognitive behavioral therapy; OCD: Participants with obsessive compulsive disorder; BDI: Beck Depression Inventory; BAI: Beck Anxiety Inventory; MOCI: Maudsley Obsessive-Compulsive Scale; STAI-T: State-Trait Anxiety Inventory-Trait; STAI-S: State-Trait Anxiety Inventory-State; Y-BOCS: Yale-Brown Obsessive-Compulsive Scale.*

3.5 Group Comparisons on Cognitive Measures Before CBT

In order to examine the differences between the two groups' scores on the JOL phase, separate ANOVAs were conducted. Dependent variables were the mean of JOL judgment (for all familiar and unfamiliar items) and JOL accuracy score and reaction times. Table 6 presents the ANOVA results, as well as the descriptive statistics. The

analyses revealed that the OCD group gave significantly lower confidence ratings for all items, as well as familiar and unfamiliar items (F (1, 94) ≥ 5.18; $p \leq .03$). Also, JOL accuracy scores significantly differed by group and OCD group's JOL accuracy was lower (F (1, 89) = 10.42, p=.002). No significant differences were found in reaction times for JOLs for all, familiar and unfamiliar items.

Table 6

Group comparisons on judgments of learning phase: ANOVA results with descriptive statistics.

Variables	OCD	HC	
	M (SD)	*M(SD)*	*F*
JOL Judgment for AI	1.82 (.35)	2.03 (.38)	7.72*
JOL Judgment for FI	1.82 (.36)	2.05 (.37)	9.92**
JOL Judgment for UFI	1.82 (.38)	2.01 (.41)	5.18*
JOL Accuracy	-.08 (.37)	.18 (.38)	10.42**
RT for JOL for AI	3253.42 (1049.53)	3209.73 (566.14)	0.06
RT for JOL for FI	3300.69 (1099.96)	3233.79 (760.99)	0.12
RT for JOL for UFI	3206.59 (1035.49)	3162.75 (468.05)	0.07

****p< .001; **p<.01; *p<.05. OCD: Participants with obsessive compulsive disorder; HC: Healthy controls; JOL: Judgment of learning; RT: Reaction times; AI: All items; FI: Familiar items; UFI: Unfamiliar items.*

Different ANOVAs were carried out to examine the group's effect on recognition performance. Dependent variables were the proportion of the correct recognition for all items, correct inlist recognition for all items, correct inlist recognition for familiar items, correct inlist recognition for unfamiliar items, correct outlist recognition for all items, correct outlist recognition for familiar items, correct outlist recognition for unfamiliar items and reaction times for correct and incorrect recognition. The ANOVA results and descriptive statistics are shown in Table 7. For both familiar and unfamiliar items in inlist and outlist items, recognition performances did not significantly differ by group except for correct recognition for all items (F(1,94)= 4.76, p= .03).

Table 7

Group comparisons on recognition phase: ANOVA results with descriptive statistics.

Variables	OCD	HC	
	M (SD)	*M(SD)*	*F*
Correct Recognition for AI	47.69 (12.86)	42.63 (9.79)	4.76*
Correct Inlist Recognition for AI	79.27 (16.98)	73.75 (21.56)	1.92
Correct Inlist Recognition for FI	84.57 (16.22)	78.20 (21.92)	2.58
Correct Inlist Recognition for UFI	76.19 (19.58)	68.90 (24.48)	2.57
Correct Outlist Recognition for AI	18.93 (28.59)	13.70 (21.33)	0.97
Correct Outlist Recognition for FI	15.65 (25.30)	10.50 (18.27)	1.31
Correct Outlist Recognition for UFI	16.30 (24.29)	12.90 (18.35)	0.61
RT for Correct Recognition	1161.39 (161.40)	1169.95 (140.49)	0.07
RT for Incorrect Recognition	1259.46 (244.23)	1265.50 (176.78)	0.02

****p< .001; **p<.01; *p<.05. OCD: Participants with obsessive compulsive disorder; HC: Healthy controls; RT: Reaction times; AI: All items; FI: Familiar items; UFI: Unfamiliar items.*

3.6 OCD Group's Cognitive Measures Before and After CBT

Another analysis was conducted on the OCD group before after CBT therapy to investigate CBT's effect on JOL and recognition performances. Dependent variables were the mean of JOL judgment (for all familiar and unfamiliar items) and JOL accuracy score and reaction times. Table 8 presents ANOVA results and descriptive statistics.

According to analysis, the OCD group's JOL judgments for all familiar and unfamiliar items significantly increased after the CBT (F (1,95) ≥ 15.03; $p \leq .000$) . JOL accuracy scores of individuals with OCD significantly increased (F(1, 86) =

10.44, p =.002). Also, JOL judgments' reaction times for all, familiar and unfamiliar items significantly reduced after CBT treatment (F (1,95) ≥ 5.14; $p \leq .026$). Correct recognition scores for all, familiar and unfamiliar items did not differ following therapy both inlist and outlist stimuli. Reaction times for correct recognition significantly decreased following therapy (F(1, 95)= 12.13, p=.001), reaction times for incorrect recognition did not differ (p>.05).

Table 8

OCD groups comparisons on pre and post measurements: Repated measure ANOVA results with descriptive statistics

Variables	Pre-measurement	Post-measurement	
	M (SD)	*M(SD)*	*F*
JOL Judgment for AI	1.82 (.36)	2.04 (.37)	25.58***
JOL Judgment for FI	1.81 (.37)	2. 04 (.40)	17.94***
JOL Judgment for UFI	1.82 (.38)	2.05 (.38)	20.94***
JOL Accuracy	-.08 (.36)	.13 (.39)	12.18***
RT for JOL for AI	3253.42 (1049.53)	2906.49 (328.01)	5.88*
RT for JOL for FI	3300.69 (1099.96)	2933.73 (372.33)	5.91*
RT for JOL for UFI	3206.59 (1035.49)	2880.56 (311.38)	5.39*
Correct Recognition for AI	47.69 (12.86)	48.80 (11.88)	0.44
Correct Inlist Recognition for AI	76.27 (16.98)	82.23 (19.34)	0.73
Correct Inlist Recognition for FI	84.57 (16.22)	83.80 (17.92)	0.05
Correct Inlist Recognition for UFI	76.19 (19.58)	79.78 (23.52)	1.76
Correct Outlist Recognition for AI	18.93 (28.88)	21.56 (50.97)	0.15
Correct Outlist Recognition for FI	15.89 (25.54)	13.52 (19.87)	0.47
Correct Outlist Recognition for UFI	16.33 (24.57)	16.94 (24.63)	0.02
RT for Correct Recognition	1161.39 (161.40)	1084.69 (127.94)	13.92**
RT for Incorrect Recognition	1259.46 (244.23)	1219.62 (217.48)	2.84

****p< .001; **p<.01; *p<.05. OCD: Participants with obsessive compulsive disorder; JOL: Judgment of learning; RT: Reaction times; AI: All items; FI: Familiar items; UFI: Unfamiliar items.*

3.7 Group Comparisons on Cognitive Measures After CBT

In order to evaluate the effectiveness of therapy in the OCD group, the measurements of the OCD group after therapy were compared with the control group.

Separate ANOVAs were performed to investigate the differences between the OCD group and the control group on JOL judgments. Dependent variables were the mean of JOL judgment (for all familiar and unfamiliar items) and JOL accuracy score and reaction times. Table 9 displays the ANOVA results and descriptive statistics. Based on the findings, there were no significant differences in JOL judgments among all familiar and unfamiliar items. There were significant differences in reaction times for all familiar and unfamiliar items following therapy in favor of the OCD group ($F(1, 94) \geq 5.86$; $p \leq .02$). JOL accuracy scores did not differ by groups as opposed to the findings prior therapy.

Table 9

Group comparisons on judgments of learning phase following therapy: ANOVA results with descriptive statistics.

Variables	OCD	HC	
	M (SD)	*M(SD)*	*F*
JOL Judgment for AI	2.05 (.38)	2.03 (.38)	0.06
JOL Judgment for FI	2.04 (.40)	2.06 (.37)	0.05
JOL Judgment for UFI	2.06 (.39)	2.01 (.41)	0.37
JOL Accuracy	.11(.42)	.18 (.38)	0.63
RT for JOL for AI	2906.49 (328.01)	3209.73 (566.14)	10.08**
RT for JOL for FI	2933.73 (372.33)	3233.79 (760.99)	5.86*
RT for JOL for UFI	2880.56 (311.38)	3162.75 (468.06)	11.88***

****p< .001; **p<.01; *p<.05. OCD: Participants with obsessive compulsive disorder; HC: Healthy controls; JOL: Judgment of learning; RT: Reaction times; AI: All items; FI: Familiar items; UFI: Unfamiliar items.*

With the purpose of examining the effect of the group on recognition performance, different ANOVAs were carried out. Dependent variables were the proportion of the correct recognition for all items, correct inlist recognition for all items, correct inlist recognition for familiar items, correct inlist recognition for unfamiliar items, correct outlist recognition for all items, correct outlist recognition for familiar items, correct outlist recognition for unfamiliar items and reaction times

for correct and incorrect recognition. The ANOVA results and descriptive statistics are shown in Table 10. Results showed that there were significant differences between groups for correct recognition for all items, correct inlist recognition for all items, and correct inlist recognition for unfamiliar items, in favor of the OCD group (F (1, 94) ≥ 4.08; $p \leq .04$). Although the other variables were not significantly varied there was an increase in mean scores, individuals with OCD demonstrated better recognition abilities.

Table 10

Group comparisons on recognition phase following therapy: ANOVA results with descriptive statistics.

Variables	OCD	HC	
	M (SD)	*M(SD)*	*F*
Correct Recognition for AI	48.80 (11.88)	42.63 (9.79)	7.78**
Correct Inlist Recognition for AI	82.23 (19.34)	73.75 (21.56)	4.09*
Correct Inlist Recognition for FI	83.80 (17.93)	78.20 (21.92)	1.86
Correct Inlist Recognition for UFI	79.78 (23.52)	68.90 (24.48)	4.92*
Correct Outlist Recognition for AI	21.56 (50.96)	13.70 (21.33)	0.99
Correct Outlist Recognition for FI	13.22 (19.75)	10.50 (18.27)	0.49
Correct Outlist Recognition for UFI	16.94 (24.63)	12.90 (18.35)	0.83
RT for Correct Recognition	1084.69 (127.94)	1169.95 (140.49)	9.61**
RT for Incorrect Recognition	1219.62 (217.48)	1265.50 (176.78)	1.29

****p< .001; **p<.01; *p<.05. OCD: Participants with obsessive compulsive disorder; HC: Healthy controls; RT: Reaction times; AI: All items; FI: Familiar items; UFI: Unfamiliar items.*

Chapter 4

Discussion

4.1 Summary of the Results

In this study, we aimed to investigate the judgment of learning and recognition memory in individuals with OCD on an episodic memory task. Additionally, we sought to explore the potential impact of CBT on these cognitive variables.

As expected, the OCD group scores on clinical measures were significantly higher than healthy controls. After receiving CBT treatment, OCD group scores decreased to subclinical levels on Beck Depression Inventory, Beck Anxiety Inventory, and Yale-Brown Obsessive Scale. The OCD group's JOL judgments and JOL accuracy scores significantly differed from healthy controls in pre-CBT measurements. Following therapy, the OCD groups JOL judgments and JOL accuracy scores significantly increased. There were no differences between the two groups following CBT on JOL judgments and JOL accuracy scores. However, before CBT, the OCD group's recognition performance did not significantly differ from healthy controls. Only correct recognition for all items significantly differed between groups, in favor of the OCD group, contrary to our expectations. There were no significant differences in any other recognition variable, but the mean of the OCD group was higher. Following CBT, no significant differences were observed in the OCD group's recognition performance. OCD groups' correct recognition for all items, correct recognition for inlist-all items and unfamiliar items were significantly higher than healthy controls following CBT. Reaction times of JOL judgments for all, familiar and unfamiliar items and recognition performance were measured. The OCD group's reaction times did not significantly differ from healthy controls for JOL judgments; however, after CBT, the OCD group's reaction times significantly decreased for JOL judgments. Following CBT, the OCD group and healthy controls significantly differed in reaction times for JOL judgment for all, familiar and unfamiliar items, and the OCD group's reaction times were faster than healthy controls. The OCD group's reaction times for all correct and reaction times for all incorrect recognition did not differ significantly from healthy controls. Following therapy, reaction times for correct recognition significantly decreased, and the OCD groups were faster than healthy

controls on the post-CBT measurement, reaction times for incorrect recognition did not significantly differ. These findings partially supported our hypotheses.

4.2 Effect of CBT on Clinical Measures

According to the results of the clinical measures, at first OCD group had significantly higher scores, as expected. Following therapy, a significant reduction was observed in all clinical scales. The OCD group's anxiety and depression levels were reduced to minimal levels. Also, their scores on Maudsley Obsessive-Compulsive Inventory (MOCI) significantly decreased. State-Trait Anxiety Inventory scores were reduced for trait anxiety but did not significantly reduce for state anxiety, meaning that the anxiety of being tested in the hospital room remained.

Most importantly, results demonstrated that the OCD group's scores on Yale-Brown Obsessive Compulsive Disorder Scales (YBOCS) had significantly decreased. Kim, Dysken, and Katz (1989) reported that YBOCS is a "gold standard" when measuring the severity of OCD. Scores from YBOCS indicate the severity of obsessions and compulsions, and according to these scores: "0-7 subclinical", "8-15 mild", "16-23 moderate", "24-31 severe", and "32-40 extreme" symptom severity (Goodman et al., 1989). The clinically significant cut-off score is 16; in our study, participants with a YBOCS score of 18 and above were included by default, meaning that OCD patients with at least moderate severity were included in the study (Goodman et al., 1989). The OCD group had an average of 28 points at pre-CBT measurement; this value decreased to 8.59 points post-CBT, meaning that the OCD group's symptom severity drastically decreased, which was almost at a subclinical level. Based on this result, it can be deduced that the disease-related processes that interfere with the cognitive processes of the OCD group had reduced after post-CBT. These findings on the clinical measurements, in accordance with the literature, supported that CBT is an effective treatment method for OCD (Duman, 2019; McDonough & Kennedy, 2002; Şafak et al. 2014; Solem et al., 2009).

It should be noted that, although there is a significant decrease regarding OCD group clinical measures, the OCD group still had significantly higher scores than the control group on MOCI, BDI, BAI, and SAI. Simpson et al. (2008) examined CBT on OCD and concluded that seventeen sessions of CBT did not enough for most of the patients to reduce their symptoms to a minimal level. The OCD group received ten sessions of CBT in this study, which may not have been enough to completely alleviate their disease symptoms. A meta-analysis study investigating the effectiveness of CBT

in OCD reported that the number of weekly treatment sessions, the number of weeks in treatment, and the total number of sessions were not associated with the treatment outcomes. However, it was noted that only longer treatment sessions were associated with the treatment outcomes (Abramowitz, 1996). The effectiveness of the treatment may be related to the duration of the treatment sessions. A possible explanation for the significant difference in clinical scales between OCD and healthy controls on post-CBT measurement is the requirement of longer treatment sessions for all clinical scales and all symptoms to be utterly subclinical, and no significant difference from controls. Taking everything into account, it was seen that CBT is an effective method for reducing symptoms of OCD (Abramowitz, 1997), but the effectiveness may change according to therapy conditions.

4.3 Effect of CBT on JOL Judgment and JOL Accuracy

This study examined metacognitive processes by measuring pre- and post-CBT JOL judgment. Analyses showed that prior to therapy, OCD groups gave significantly decreased judgment ratings on JOL compared to healthy controls; this finding reinforces the argument in the literature that individuals with OCD have low confidence in their memory (e.g., Dar et al., 2022; Derin & Irak, 2020; Moritz & Jeager, 2018; Tuna et al., 2005). As expected, the OCD group's confidences regarding their memory were low despite the familiarity effect. Even on familiar items, the OCD group gave low rates on a scale that measured their confidence to recall that item. In healthy samples, it is expected that familiarity with a certain cue produces a sense of knowing that is not correct (Metcalfe et al., 1993). The fact that the familiarity effect seen in healthy samples is not seen in individuals with OCD may reinforce the evidence for the low memory confidence in OCD. When asked if they remembered the scene photograph paired with that word, either they failed to retrieve that particular photograph from their memory or did not even try because they had negative beliefs that they could not retrieve it.

Furthermore, OCD groups' JOL accuracy scores also significantly differed in favor of healthy controls; this result implies that their JOL judgments are not reliable information sources regarding their memory (Irak, Topçuoğlu, Duman, Akyurt, Yılmaz & Pala, in press). Lower JOL accuracy scores indicated that they could not remember the stimuli they thought they could remember, and they remembered the stimulus they thought they could not remember. If they had given a low score and failed to recognize that item in the memory test, their JOL accuracy scores would have

been high. It appears that there is a problem in monitoring their own memory. In other words, there is a problem in their ability to monitor their own cognitive processes, that is, metacognitive processes, their knowledge about what they can and cannot remember. Also, their metacognitive beliefs regarding their memory were usually negative. Negative beliefs about memory (i.e., metacognitive beliefs), such as "my memory is usually bad for places," made them rate themselves lower on confidence rating scales, even though they could remember.

Following CBT, OCD groups' JOL judgments and JOL accuracy scores significantly increased, and the significant difference from healthy controls disappeared, as we hypothesized. After receiving CBT treatment, individuals with OCD appeared to have confidence in their own memory to a level similar to healthy controls. To put it another way, false negative beliefs that interfered with their cognitive performance stopped interfering because they altered their negative beliefs with positive ones thanks to CBT treatment. Enhancement of the confidence ratings alluded that CBT is an efficient method to change negative metacognitive beliefs in one's own memory, in line with the previous studies (Nedeljkovic et al., 2011; Whittal et al., 2005). Also, following CBT, the accuracy of their verbal reports about their memory, that is, their JOL accuracy scores, also increased. It can be said that when they changed their negative metacognitive beliefs, their ability to monitor their memory also increased.

Wells and Purdon (1999) claimed that one's beliefs about the functioning of their mind are an integral part of information processing and have a guiding role in it, and therefore may affect further reactions. Similarly, Nedeljkovic, Moulding, Kyrios & Doron (2009), found that general beliefs regarding their memory performance were a unique predictor of the severity of OCD. Moreover, a study conducted by Myers and Wells in 2013 observed that inducing related negative metacognitive beliefs in nonclinical individuals caused them to develop OCD symptoms. According to a study by Solem et al. (2009), differences in metacognitive beliefs were found to be a predictor of improvement in symptom severity. All this information and our findings may support the hypothesis that OCD stems from a higher managing system, which is metacognition. In this study, participants gave lower confidence ratings when they had more symptom severity; following CBT, their symptom severity dropped to a subclinical level, and they gave higher confidence ratings regarding their memory. When their metacognitive beliefs about themselves changed, the symptom severity of

the disease decreased, or when symptom severity decreased, they could replace their negative metacognitive beliefs with positive ones. Both cases indicate that metacognitive beliefs and symptom severity are closely related, supporting previous studies (Derin & Irak, 2020; Tuna et al., 2005).

4.4 Effect of CBT on Recognition Memory

It is not entirely clear whether individuals with OCD experience memory problems due to an actual memory deficit or their lower performance is due to reduced confidence (Abbruzzese et al., 1997; Boone et al., 1991; Brown et al., 1994; Foa et al., 1997; McNally & Kohlbeck, 1993; Savage et al., 1996; Zitterl et al., 2001). In our study, OCD patients displayed reduced confidence ratings but preserved memory performances contrary to our hypothesis. We used neutral stimuli to prevent disease-related thoughts from interfering with OCD patients' performances. Our findings showed that individuals with OCD did not have memory deficits when using neutral stimuli. This can lead to the conclusion that memory problems in OCD (especially in checkers like, “did I turn off the stove?”) are related to the disease's clinical features rather than an actual memory deficit.

There was no significant difference between the recognition performances of the OCD group and healthy controls. This may have happened for several reasons. First, previous findings found that individuals with OCD were not significantly different from the control group in tasks that were not higher load (Abramovitch & Cooperman, 2015); the experimental paradigm used in this study may not have required a high cognitive load. Some researchers observed that individuals with OCD use organizational strategies less than healthy controls when learning new material (Cabrera et al., 2001). If this is true, because higher-load tasks require more organizational strategies to perform that task, OCD-related organizational strategy deficiencies may have reflected themselves in higher-load tasks. Consequently, because the task was not complex, the results of the failure to utilize organizational strategies may not have been reflected in our results. If the task was a higher load, individuals had to resort to organizational strategies to complete the task; then, individuals with OCD would have impaired memory performance. This finding from the memory task obtained in this study may imply that individuals with OCD do not have an actual memory deficit but tend to use organizational strategies insufficiently. Second, additionally, several studies reported that visual memory was impaired, and visual memory was the most consistently reported impaired cognitive area in OCD

(Shin et al., 2014). Tallis (1997), in his review, reported that individuals with OCD are impaired in visual and visuospatial memory, not verbal memory. If there is an actual memory deficit in OCD, this deficit may occur in visual memory, not verbal memory. In this study, word-scene photos were matched; if verbal memory is intact and nonverbal memory is impaired in OCD, then using verbal stimulus in this task may compensate for the impairment in visual memory. Thirdly, some researchers observed that individuals with OCD had worse memory in incidental tasks but preserved memory performance in intentional tasks (Jurado et al., 2001). The episodic memory task used in this study included well-structured instructions, and at the beginning of each stage, the participants were given guidance on what to face and what to do. Using a well-structured memory task may have minimized the effect of insufficient organizational strategies if individuals with OCD suffer from organizational strategy deficiencies, not an actual memory deficit.

This study measured recognition performance for each item participants gave JOL judgments. It is difficult to anticipate how one will perform in a task that relies on remembering information rather than just recognizing it. The OCD group could be worse than healthy controls as the recall task would be more difficult than the recognition task and require better encoding strategies. Perhaps the cognitive processes of individuals with OCD may be intact in terms of their recognition performance but impaired in tasks that require remembering since it is the more complex nature of the task itself. Deckersbach et al. (2000) observed that individuals with OCD have verbal and nonverbal memory; however, these deficits are related to organizational and semantic clustering strategies. Savage et al. (1999) also reported that disorganized encoding strategies mediated the low performance of OCD participant's performances on nonverbal memory tasks.

In light of all this information, organizational strategies may have played a role in the inconsistent results of memory studies on OCD. The differences in the results of the memory studies on OCD may have stemmed from organizational strategies, and it may have been reflected differently in different studies by manipulation of the burden of the task and the type of the task.

It is known that organizational strategies have vital importance for memory performance. Related studies have found that the memory performance of individuals with excellent memory is actually mediated by advanced coding strategies acquired as a result of long practice (Morrison & Chein 2011). Memory can be enhanced through

specific training, also some research revealed that metacognitive strategies are related to improved control over memory performance (Drigas, Mitsea & Skianis, 2022). Inadequate organizational strategies and low memory confidence in OCD patients may indicate a disruption in the metacognitive process. According to earlier research, people with OCD tend to overthink irrelevant details performing tasks (Exner et al., 2009; Irak et al., in press; Olson et al., 2016; Savage et al., 2000). Moreover, having negative metacognitive beliefs may have caused them not to utilize their cognitive capacity adequately they may have used. In this study, their preoccupation with these negative metacognitive beliefs was manifested in metacognitive judgments (as seen in low memory confidence ratings), but it was not reflected in memory performance because the task was well structured and did not have much task load. Considering the previous studies, the results of our study imply that individuals with OCD do not actually have an actual memory deficit and that the deterioration in metacognitive processes that cause them to constantly over-monitor occurs in high-load and incidental tasks.

The lack of a significant difference after CBT also supports the finding. In pre-CBT measurements, the OCD group did not differ significantly from healthy controls but gave their memory a significantly lower confidence rating. Although there was no deterioration in their memory performance, their beliefs regarding themselves were in this direction.

4.5 Effect of CBT on Reaction Time

The present study investigated reaction times on an episodic memory task. We hypothesized that there should be slow reaction times about doubt, which is one of the most important clinical symptoms of OCD. At the beginning, there were no significant differences between groups. However, following therapy the OCD group reaction times for all, familiar and unfamiliar items JOL judgments and JOL accuracy scores had significantly decreased. Also, reaction times for correct recognition for all items significantly reduced following therapy. Along with CBT, the decrease in reaction times of these variables may mean that the mental energy directed here decreases due to the disappearance/decrease of negative cognitive beliefs.

Previous studies indicated that individuals with OCD shows longer reaction time, and are seen mostly when there is a conflict (Bucci et al., 2007; de Geus et al., 2007; Moritz, Von Mühlenen, Randjbar, Fricke & Jelinek, 2009; Penadés et al., 2007). First, Rachman, in 1974, reported the “obsessional slowness” phenomenon in OCD.

Contemporary research has focused chiefly on cognitive function slowness, meaning processing speed. Neuropsychological test performances of individuals with OCD have shown reduced processing speed related to OCD (*for review* Abramovitch & Cooperman, 2015). van der Straten, Huyser, Wolters, Denys, and van Wingen (2018), reported that pediatric OCD patients had slower reaction times than healthy controls, but after CBT treatment, their reaction times significantly reduced, even after 2-year follow-up measurements, their reaction times did not differ from healthy controls.

In our study, OCD patients did not exhibit slower reaction times on recognition performances. A possibility is that using non-disease-related stimuli could make away with attentional bias. Perhaps the slowness in OCD is evident when presented with disease-related stimuli because these stimuli induce anxiety, and perhaps the process manifests differently in different subtypes of this OCD. Moritz et al. (2009) reported that individuals with OCD were slower on disease related-items because they had difficulty in diverting their attention from the stimulus related to the disease. In order to investigate this, Sizino da Victoria, Nascimento & Fontenelle (2012), tested OCD-related and nonrelated items in individuals with OCD. They observed that individuals with OCD were slower when presented with disease-related stimuli, but they did not observe a significant difference in general slowness between the OCD group and healthy controls. Also, they reported that obsession severity positively correlated with reaction times, and they tested this for two different OCD subtypes (for checking symptoms- opened door, for ordering symptoms-disorganized shoes). Based on this, we may conclude that the severity of symptoms can affect the results inconsistently.

4.6 Limitations

In this study, we presented the participants with an experimental task from the computer screen. Maybe our experimental paradigm was not ecologically valid, and if individuals with OCD have memory problems in their daily lives, we may not have been able to see this fully with this task. A different task could have been used, but the experimental paradigm was also practical for examining familiar and unfamiliar stimuli. This could be problematic because the database of unfamiliar stimuli is more limited than that of familiar stimuli. Yet, we conducted a pilot study to prevent this deficiency. Some participants were recruited during the pandemic period, and some were recruited after the pandemic period, so there may be different sample characteristics. While some studies examining the impact of the coronavirus disease (COVID-19) on OCD have indicated that the virus does not exacerbate symptoms of

the disorder (Chakraborty & Karmakar, 2020), other research has shown that COVID-19 can increase the severity of OCD and lead to higher levels of depression and anxiety (Nissen, Højgaard & Thomsen, 2020; Wheaton, Ward, Silber, McIngvale & Björgvinsson, 2021). Also, OCD patients reported that their treatment process was affected by COVID-19 (Wheaton et al., 2021). In order to control this possible bias, screening was made, but it might happen by default. COVID-19 may have increased the severity of the disease and lessened the effects of CBT. Furthermore, the heterogeneity of the sample (different subtypes of OCD) may affect the results, and the OCD group could be analyzed by dividing them into groups according to their subtypes. Although there were breaks during the experiment, the participants may have experienced fatigue effects because they completed three experimental paradigms and clinical scales.

4.7 Conclusion

Individuals with OCD do not experience an intense memory deficit, instead, they experience problems in higher-cognitive processes. Following CBT, improvement in clinical symptoms was also reflected in metacognitive processes, and the OCD group's JOL judgments increased. The increase in JOL judgments when the symptom severity of the individuals decreased supports the findings that OCD symptoms and metacognitive processes are related. Also, CBT is an efficient method for reducing OCD symptoms, and it can cause positive metacognitive change. It was seen that metacognition plays a vital role in OCD. This information can be beneficial when designing treatment procedures. It must be taken into account when treating OCD; focusing on negative metacognitive beliefs may be timesaving and more efficient.

4.8 Recommendations for Future Research

OCD is a heterogeneous disorder with various subtypes. These different subtypes may require different treatment methods (Mataix-Cols, Rauch, Manzo, Jenike & Baer, 1999). Future studies may separately investigate different subtypes of the cognitive and clinical outcomes of treatment methods. Also, people with OCD may have varying comorbidities. OCD with different comorbidities can be examined in future studies since different comorbidities may affect the disease prognosis. It is very well known that memory performance is affected by depression (Burt, Zembar, & Niederehe, 1995), and since depression is the most prevalent comorbidity among OCD

participants (Altıntaş & Taşkıntuna, 2015), depression must be controlled when investigating memory in OCD. Moreover, individuals with OCD may have varying insights regarding their obsessions and compulsions (Abramowitz & Jacoby, 2015), which may be related to metacognitive processes and may give information about treatment outcomes. Future studies can investigate this link.

REFERENCES

Abbruzzese, M., Ferri, S., Scarone, S. (1997). The selective breakdown of frontal functions in patients with obsessive–compulsive disorder and in patients with schizophrenia: a double dissociation experimental finding. *Neuropsychologia*, *35(*6), 907-912.

Abramovitch, A., Abramowitz, J. S., & Mittelman, A. (2013). The neuropsychology of adult obsessive–compulsive disorder: A meta-analysis. *Clinical Psychology Review*, *33*(8), 1163-1171. doi:10.1016/j.cpr.2013.09.004.

Abramovitch, A., & Cooperman, A. (2015). The cognitive neuropsychology of obsessive-compulsive disorder: A critical review. *Journal of Obsessive-Compulsive and Related Disorders*, *5*, 24-36. doi:10.1016/j.jocrd.2015.01.002.

Abramowitz, J. S. (1996). Variants of exposure and response prevention in the treatment of obsessive-compulsive disorder: A meta-analysis. *Behavior Therapy, 27*(4), 583–600. doi:10.1016/S0005-7894(96)80045-1.

Abramowitz J. S. (1997). Effectiveness of psychological and pharmacological treatments for obsessive-compulsive disorder: a quantitative review. *Journal of consulting and clinical psychology*, *65*(1), 44–52. doi:10.1037//0022-006x.65.1.44

Abramowitz, J. S., Baucom, D. H., Wheaton, M. G., Boeding, S., Fabricant, L. E., Paprocki, C., & Fischer, M. S. (2013). Enhancing exposure and response prevention for OCD: a couple-based approach. *Behavior modification*, *37*(2), 189–210. doi:10.1177/0145445512444596

Abramowitz, J. S., Deacon, B. J., Olatunji, B. O., Wheaton, M. G., Berman, N. C., Losardo, … Hale, L. R. (2010). Assessment of obsessive-compulsive symptom dimensions: development and evaluation of the Dimensional Obsessive-Compulsive Scale. *Psychological assessment*, *22*(1), 180–198. doi:10.1037/a0018260.

Abramowitz, J. S., Fabricant, L. E., Taylor, S., Deacon, B. J., McKay, D., & Storch, E. A. (2014). The relevance of analogue studies for understanding obsessions and compulsions. *Clinical psychology review*, *34*(3), 206–217. doi:10.1016/j.cpr.2014.01.004.

Abramowitz, J. S., Franklin, M. E., Street, G. P., Kozak, M. J., & Foa, E. B. (2000). Effects of comorbid depression on response to treatment for obsessive-

compulsive disorder. *Behavior Therapy*, *31*(3), 517-528. doi:10.1016/S0005-7894(00)80028-3.

Abramowitz, J. S., & Jacoby, R. J. (2014). Obsessive-compulsive disorder in the *DSM-5*. *Clinical Psychology: Science and Practice, 21*(3), 221–235. doi:10.1111/cpsp.12076.

Abramowitz, J. S., & Jacoby, R. J. (2015). Obsessive-compulsive and related disorders: A critical review of the new diagnostic class. *Annual Review of Clinical Psychology, 11,* 165–186. doi:10.1146/annurev-clinpsy-032813-153713.

Altıntaş, E., & Taşkıntuna, N. (2015). Factors Associated with Depression in Obsessive-Compulsive Disorder: A Cross-Sectional Study. *Nöropsikiyatri arşivi*, *52*(4), 346–353. doi:10.5152/npa.2015.7657.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). doi:10.1176/appi.books.9780890425596.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry, 4*(6), 561–571.

Beck, A. T., Epstein, N., Brown, G., & Steer, R. (1988). *Beck Anxiety Inventory* [Database record]. APA PsycTests. doi:10.1037/t02025-000.

Bolton, D., Raven, P., Madronal-Luque, R. & Marks, I. M. (2000). Neurological and neuropsychological signs in obsessive compulsive disorder: interaction with behavioural treatment. *Behaviour Research and Therapy, 38*, 695-708.

Boone, K. B., Ananth, J., Philpott, L. & Kaur, A. (1991). Neuropsychological characteristics of nondepressed adults with obsessive-compulsive disorder. *Neuropsychiatry, Neuropsychology, & Behavioral Neurology, 4*(2), 96–109.

Brown, H. D., Koslyn, S. M., Breiter, H. C., Baer, L., & Jenike, M. A. (1994). Can patients with obsessive–compulsive disorder discriminate between percepts and mental images? *A signal detection analysis. Journal of Abnormal Psychology, 103*, 445–454.

Bucci, P., Galderisi, S., Catapano, F., di Benedetto, R., Piegari, G., Mucci, A., & Maj, M. (2007). Neurocognitive indices of executive hypercontrol in obsessive-compulsive disorder. *Acta Psychiatrica Scandinavica, 115*(5), 380–387. doi:1111/J.1600-0447.2006.00911.X.

Burt, D. B., Zembar, M. J., & Niederehe, G. (1995). Depression and memory impairment: A meta-analysis of the association, its pattern, and specificity. *Psychological Bulletin, 117*(2), 285–305. doi:10.1037/0033-2909.117.2.285.

Cabrera, A. R., McNally, R. J., & Savage, C. R. (2001). Missing the forest for the trees? Deficient memory for linguistic gist in obsessive-compulsive disorder. *Psychological medicine*, *31*(6), 1089–1094. doi:10.1017/s0033291701004354.

Chakraborty, A., & Karmakar, S. (2020). Impact of COVID-19 on obsessive-compulsive disorder (OCD). *Iranian Journal of Psychiatry*, *15*(3), 256-259. doi:10.18502/ijps.v15i3.3820.

Clark, D. A. (2004). *Cognitive-Behavioral Therapy for OCD.* New York: The Guilford Press.

Çilli, A. S., Telcioğlu, M., Aşkın, R., Kaya, N., Bodur, S., & Kucur, R. (2004). Twelve-month prevalence of obsessive-compulsive disorder in Konya, Turkey. *Comprehensive Psychiatry*, *45*(5), 367-374.

Constans, J. I., Foa, E. B., Franklin, M. E., & Mathews, A. (1995). Memory for actual and imagined events in OC checkers. *Behaviour research and therapy*, *33*(6), 665–671. doi:10.1016/0005-7967(94)00095-2

Cuttler, C., & Graf, P. (2009). Checking-in on the memory deficit and meta-memory deficit theories of compulsive checking. *Clinical Psychology Review*, *29*(5), 393-409. doi:10.1016/j.cpr.2009.04.003.

Dar, R., Sarna, N., Yardeni, G., & Lazarov, A. (2022). Are people with obsessive-compulsive disorder under-confident in their memory and perception? A review and meta-analysis. *Psychological Medicine, 52*(13), 2404-2412. doi:10.1017/S0033291722001908.

de Geus, F., Denys, D. A. J. P., Sitskoorn, M. M., & Westenberg, H. G. M. (2007). Attention and cognition in patients with obsessive-compulsive disorder. *Psychiatry and Clinical Neurosciences, 6*1(1), 45–53. doi:10.1111/J.1440-1819.2007.01609.X.

Deckersbach, T., Otto, M. W., Savage, C. R., Baer, L., & Jenike, M. A. (2000). The relationship between semantic organization and memory in obsessive-compulsive disorder. *Psychotherapy and Psychosomatics, 69*(2), 101–107. doi:10.1159/000012373.

Derin, S. & Irak, M. (2020). Obsesif kompulsif bozuklukta bellek, belleğe güven ve bilme hissi kararları arasındaki ilişkiler. *Psikiyatride Güncel Yaklaşımlar, 12*, 1-1.

Drigas, A., Mitsea, E., & Skianis, C. (2022). Metamemory: Metacognitive Strategies for Improved Memory Operations and the Role of VR and Mobiles. *Behavioral Sciences*, *12*(11). doi:10.3390/bs12110450.

Duman, T. D. (2019). *Psikotrop ilaç kullanimina rağmen obsesif kompulsif bozukluk belirtileri devam eden vakalarda bilişsel davranişçi terapi'nin etkinliğinin değerlendirilmesi.* (Yayınlanmamış Yüksek Lisans Tezi). Yakın Doğu Üniversitesi Sosyal Bilimler Enstitüsü, Lefkoşa.

Elbir, M., Alp Topbaş, Ö., Bayad, S., Kocabaş, T., Topak, O. Z., Çetin, Ş., &Aydemir, Ö. (2019). DSM-5 bozuklukları için yapılandırılmış klinik görüşmenin klinisyen versiyonunun türkçeye uyarlanması ve güvenilirlik çalışması, *Türk Psikiyatri Dergisi*, *30*(1).

Enright, S. J., Beech, A. R., & Claridge, G. S. (1995). A further investigation of cognitive inhibition in obsessive–compulsive disorder and other anxiety disorders. *Personailty and Individual Differences, 19*, 535–542.

Erol, N., & Savaşır, I. (1988, September). *Maudsley Obsesif Kompulsif Soru Listesi. XXIV.* Paper presented at the meeting of the Ulusal Psikiyatri ve Nörolojik Bilimler Kongresi, Ankara, Türkiye.

Exner, C., Martin, V., & Rief, W (2009). Self-focused ruminations and memory deficits in obsessive–compulsive disorder. *Cognitive Therapy and Research, 33,* 163–174. doi:10.1007/s10608-007-9162-x.

Farris, S. G., McLean, C. P., van Meter, P. E., Simpson, H. B., & Foa, E. B. (2013). Treatment response, symptom remission and wellness in obsessive-compulsive disorder. *The Journal of Clinical Psychiatry, 74*(7), 685. doi:10.4088/JCP.12M07789.

First, M. B., Williams, J. B. W., Karg, R. S., & Spitzer, R. L. (2016). *User's guide for the SCID-5-CV Structured Clinical Interview for DSM-5® disorders: Clinical version.* American Psychiatric Publishing, Inc..

Fisher, P. L., & Wells, A. (2008). Metacognitive therapy for obsessive–compulsive disorder: A case series. *Journal of Behavior Therapy and Experimental Psychiatry*, *39*(2), 117-132. doi:10.1016/j.jbtep.2006.12.001.

Fleming, S. M., and Dolan, R. J. (2012). The neural basis of metacognitive ability. *Philos. Trans. R. Soc, 367*, 1338–1349. doi: 10.1098/rstb.2011.0417.

Foa, E. B., Amir, N., Gershuny, B., Molnar, C. & Kozak, M. J. (1997). Implicit and explicit memory in obsessive-compulsive disorder. *Journal of Anxiety Disorders, 11*(2), 119-129.

Foa, E. B., Liebowitz, M. R., Kozak, M. J., Davies, S., Campeas, R., Franklin, M. E., Huppert, J. D., Kjernisted, K., Rowan, V., Schmidt, A. B., Simpson, H. B., & Tu, X. (2005). Randomized, placebo-controlled trial of exposure and ritual prevention, clomipramine, and their combination in the treatment of obsessive-compulsive disorder. *The American journal of psychiatry*, *162*(1), 151–161. doi:10.1176/appi.ajp.162.1.151.

Franklin, M. E., & Foa, E. B. (2011). Treatment of obsessive-compulsive disorder. *Annual Review of Clinical Psychology, 7*(1), 229-243. doi:10.1146/annurev-clinpsy-032210-104533.

Goodman, W. K., Price, L. H., Rasmussen, S. A., Mazure, C., Delgado, P., Heninger, G. R. & Charney, D. S. (1989). The Yale-Brown obsessive-compulsive scale. *Archives of General Psychiatry, 46*(11), 1012–1016.

Göz, İ. (2003). *Yazılı Türkçe'nin kelime sıklığı sözlüğü*. Ankara: Türk Dil Kurumu Yayınları.

Hermans, D., Martens, K., de Cort, K., Pieters, G., & Eelen, P. (2003). Reality monitoring and metacognitive beliefs related to cognitive confidence in obsessive compulsive disorder. *Behaviour Research and Therapy, 41*(4), 383–401. doi:10.1016/S0005-7967(02)00015-3.

Hezel, D. M., & McNally, R. J. (2016). A Theoretical review of cognitive biases and deficits in obsessive–compulsive disorder. *Biological Psychology, 121*, 221–232. doi:10.1016/J.BIOPSYCHO.2015.10.012

Hirschtritt, M. E., Bloch, M. H., & Mathews, C. A. (2017). Obsessive-Compulsive Disorder: Advances in Diagnosis and Treatment. *JAMA*, *317*(13), 1358–1367. doi:10.1001/jama.2017.2200

Hisli, N. 1988. Beck depresyon envanterinin geçerliği üzerine bir çalışma, *Türk Psikoloji Dergisi. 6*(22), 118-126.

Hodgson, R. J. & Rachman, S. (1977). Obsessional-compulsive complaints. *Behaviour research and therapy*, *15*(5), 389-395.

Hoexter, M. Q., de Souza Duran, F. L., D'Alcante, C. C., Dougherty, D. D., Shavitt, R. G., Lopes, A. C., … Busatto, G. F. (2012). Gray matter volumes in obsessive-compulsive disorder before and after fluoxetine or cognitive-behavior therapy: a randomized clinical trial. *Neuropsychopharmacology : official publication of the American College of Neuropsychopharmacology*, *37*(3), 734–745. doi:10.1038/npp.2011.250

Irak, M. (2005). Is it metacognition or executive functions? the prediction of feeling of knowing from attention processes which are measured with neuropsychological tests. *Turkish Journal of Psychology, 20*(56), 97-118.

Irak, M. (2021). **Obsesif-Kompulsif Bozuklukta Kodlama, Hatırlama ve Üstbiliş Süreçleri Arasındaki İlişkilerin Bilişsel Davranışçı Terapi Etkinliğine Göre Değişimi**. 1001 - TÜBİTAK - Bilimsel ve Teknolojik Araştırma Projelerini Detekleme Programı (No: 121K575).

Irak, M., Soylu, C. & Turan, G. (2019). Comparing electrophysiological correlates of judgment of learning and feeling of knowing during face-name recognition. *Cognitive Neuropsychology, 36* (7-8), 336-357.

Irak, M., Soylu, C., Turan, G. & Çapan, D. (2019). Neurobiological basis of feeling of knowing in episodic memory. *Cognitive Neurodynamics, 13*, 239-256.

Irak, M., Topçuoğlu, V., Duman, T. D., Akyurt, S., Yılmaz, İ., & Pala, İ. Y. (in press). Investigating retrospective and prospective metamemory judgments during episodic memory in patients with obsessive-compulsive disorders. *Behavior Therapy.*

Irak, M. & Tosun, A. (2008). Exploring the role of the meta-cognition in obsessive-compulsive and anxiety symptoms. *Journal of Anxiety Disorders, 22,* 1316-1325.

Jurado, M. Á., Junqué, C., Vallejo, J., & Salgado, P. (2001). Impairment of incidental memory for frequency in patients with obsessive–compulsive disorder. *Psychiatry Research*, *104*(3), 213-220. doi:10.1016/S0165-1781(01)00322-5.

Kessler, R. C., Petukhova, M., Sampson, N. A., Zaslavsky, A. M., & Wittchen, H.-U. (2012). Twelve-month and lifetime prevalence and lifetime morbid risk of anxiety and mood disorders in the United States. *International Journal of Methods in Psychiatric Research*, *21*(3), 169–184. doi:10.1002/mpr.1359.

Kim, S. W., Dysken, M. W., & Katz, R. (1989). Rating scales for Obsessive Compulsive Disorder. *Psychiatric Annals, 19*(2), 74–79. doi:10.3928/0048-5713-19890201-07.

King, J. F., Zechmeister, E. B. & Shaughnessy, J. J. (1980). Judgments of knowing: The influence of retrieval practice. *The American Journal of Psychology, 93*(2). 329-343. doi:10.2307/1422236

Koriat, A. (1997). Monitoring one's own knowledge during study: A cue-utilization approach to judgments of learning. *Journal of Experimental Psychology: General, 126*(4), 349– 370. doi:10.1037/0096-3445.126.4.349.

Kuelz, A. K., Hohagen, F., & Voderholzer, U. (2004). Neuropsychological performance in obsessive-compulsive disorders. *Biological Psychology, 65*, 185–236.

Kuelz, A. K., Riemann, D., Halsband, U., Vielhaber, K., Unterrainer, J., Kordon, A. & Voderholzer, U. (2006). Neuropsychological ımpairment in obsessive-compulsive disorder improvement over the course of cognitive-behavioral treatment. *Journal of Clinical and Experimental Neuropsychology, 28*(8), 1273-1287.

Macdonald, P. A., Antony, M. M., Macleod, C. M., & Richter, M. A. (1997). Memory and confidence in memory judgments among individuals with obsessive compulsive disorder and non-clinical controls. *Behaviour Research and Therapy*, *35*(6), 497-505. doi:10.1016/S0005-7967(97)00013-2.

Mataix-Cols, D., Rauch, S. L., Manzo, P. A., Jenike, M. A., & Baer, L. (1999). Use of factor-analyzed symptom dimensions to predict outcome with serotonin reuptake inhibitors and placebo in the treatment of obsessive-compulsive disorder. *The American journal of psychiatry*, *156*(9), 1409–1416. doi:10.1176/ajp.156.9.1409.

McDonough, M., & Kennedy, N. (2002). Pharmacological Management of Obsessive-Compulsive Disorder: A Review for Clinicians. *Harvard Review of Psychiatry, 10*(3), 127–137. doi:10.1080/10673220216215

McNally, R. J. & Kohlbeck, P. A. (1993). Reality monitoring in obsessive compulsive disorder. *Behaviour Research and Therapy, 31*(3), 249- 253.

Metcalfe, J., Schwartz, B. L., & Joaquim, S. G. (1993). The cue-familiarity heuristic in metacognition. Journal of Experimental Psychology: Learning, Memory, and Cognition, 19(4), 851–861. doi:10.1037/0278-7393.19.4.851.

Moritz, S., & Jaeger, A. (2018). Decreased memory confidence in obsessive–compulsive disorder for scenarios high and low on responsibility: Is low still too high? *European Archives of Psychiatry and Clinical Neuroscience, 268*(3), 291–299. doi:10.1007/s00406-017-0783-0

Moritz, S., Von Mühlenen, A., Randjbar, S., Fricke, S., & Jelinek, L. (2009). Evidence for an attentional bias for washing- and checking-relevant stimuli in obsessive–compulsive disorder. *Journal of the International Neuropsychological Society, 15*(3), 365-371. doi:10.1017/S1355617709090511

Morrison, A. B., & Chein, J. M. (2011). Does working memory training work? The promise and challenges of enhancing cognition by training working memory. *Psychonomic Bulletin & Review*, *18*(1), 46–60. doi:10.3758/s13423-010-0034-0.

Muller, J., & Roberts, J. E. (2005). Memory and attention in obsessive–compulsive disorder: a review. *Journal of Anxiety Disorders, 19*(1), 1-28.

Myers, S. G., & Wells, A. (2013). An experimental manipulation of metacognition: A test of the metacognitive model of obsessive-compulsive symptoms. *Behaviour Research and Therapy*, *51*(4-5), 177-184. doi:10.1016/j.brat.2013.01.007

Nakatani, E., Nakgawa, A., Ohara, Y., Goto, S., Uozumi, N., Iwakiri, M. … Yamagami, T. (2003). Effects of behavior therapy on regional cerebral blood flow in obsessive–compulsive disorder, *Psychiatry Research: Neuroimaging, 124*, 113−120.

Nedeljkovic, M., & Kyrios, M. (2007). Confidence in memory and other cognitive processes in obsessive–compulsive disorder. *Behaviour Research and Therapy*, *45*(12), 2899-2914. doi:10.1016/j.brat.2007.08.001

Nedeljkovic, M., Kyrios, M., Moulding, R. & Doron, G. (2011). Neuropsychological changes following cognitive-behavioral treatment of obsessive-compulsive disorder (OCD). *International Journal of Cognitive Therapy, 4*(1), 8-20.

Nedeljkovic, M., Moulding, R., Kyrios, M., & Doron, G. (2009). The relationship of cognitive confidence to OCD symptoms. *Journal of Anxiety Disorders*, *23*(4), 463-468. doi:10.1016/j.janxdis.2008.10.001

Nelson, T. (1984). A comparison of current measures of the accuracy of feeling of knowing predictions. *Psychological Bulletin, 95*(1), 109–133. doi:10.1037/0033-2909.95.1.109

Nelson, T. O. & Narens, L. (1990). Metamemory: A Theoretical Framework and New Findings. *The Psychology of Learning and Motivation, 26*, 125–173.

Nissen, J.B., Højgaard, D. & Thomsen, P.H. (2020). The immediate effect of COVID-19 pandemic on children and adolescents with obsessive compulsive disorder. *BMC Psychiatry, 20*, 511. doi:10.1186/s12888-020-02905-5.

Obsessive Compulsive Cognitions Working Group. (2005). Psychometric validation of the obsessive belief questionnaire and interpretation of intrusions inventory—Part 2: Factor analyses and testing of a brief version. *Behaviour Research and Therapy*, *43*(11), 1527-1542. doi: 10.1016/j.brat.2004.07.010.

Olson, C. A., Hale, L. R., Hamilton, N., Powell, J. N., Martin, L. E., & Savage, C. R. (2016). Altered source memory retrieval is associated with pathological doubt in obsessive–compulsive disorder. *Behavioural Brain Research*, *296*, 53-60. doi:10.1016/j.bbr.2015.08.031.

Öner, N., & Le Compte, A. (1983). *Durumluk Surekli Kaygi Envanteri El Kitabi.* Boğazici Üniversitesi Yayınları.

Penadés, R., Catalán, R., Rubia, K., Andrés, S., Salamero, M., & Gastó, C. (2007). Impaired response inhibition in obsessive compulsive disorder. *European Psychiatry, 22*(6), 404–410. doi:10.1016/j.eurpsy.2006.05.001.

Pigott, T. A. & Seay, S. M. (1999). A review of the efficacy of selective serotonin reuptake inhibitors in obsessive-compulsive disorder. *Journal of Clinical Psychiatry*, *60*, 101–106.

Pujol, J., Junqué, C., Vendrell, P., Grau, J. M., Martí-Vilalta, J. L., Olivé, C., & Gili, J. (1992). Biological significance of iron-related magnetic resonance imaging changes in the brain. *Archives of Neurology*, *49*(7), 711–717. doi:10.1001/archneur.1992.00530310053012.

Rachman S. (1974). Primary obsessional slowness. *Behaviour research and therapy*, *12*(1), 9–18. doi:10.1016/0005-7967(74)90026-6.

Rachman, S. (1976). The passing of the two-stage theory of fear and avoidance: Fresh possibilities. *Behaviour Research and Therapy, 14*(2), 125-131. doi:10.1016/0005-7967(76)90066-8.

Rachman, S. (1997). A cognitive theory of obsessions. *Behaviour research and therapy*, *35*(9), 793-802.

Rachman, S. (1998). A cognitive theory of obsessions: elaborations. *Behaviour Research and Therapy, 36*, 385–401.

Radomsky, A. S., & Rachman, S. (1999). Memory bias in obsessive-compulsive disorder (OCD). *Behaviour research and therapy*, *37*(7), 605–618. doi:10.1016/s0005-7967(98)00151-x

Rasmussen, S. A., & Eisen, J. L. (1992). The epidemiology and clinical features of obsessive-compulsive disorder. *The Psychiatric clinics of North America*, *15*(4), 743–758.

Ruscio, A. M., Stein, D. J., Chiu, W. T., & Kessler, R. C. (2010). The epidemiology of obsessive-compulsive disorder in the national comorbidity survey replication. *Molecular Psychiatry*, *15*(1), 53-63. doi:10.1038/mp.2008.94.

Şafak, Y., Karadere, M. E., Ozdel, K., Ozcan, T., Türkçapar, M. H., Kuru, E., & Yücens, B. (2014). The effectiveness of cognitive behavioral group psychotherapy for obsessive-compulsive disorder. *Turk psikiyatri dergisi = Turkish journal of psychiatry*, *25*(4), 225–233.

Salkovskis, P. M. (1985). Obsessive compulsive problems; a cognitive behavioral analysis. *Behaviour Research and Therapy, 23*(5), 571-583.

Salkovskis, P. M., Forrester, E., & Richards, C. (1998). Cognitive-behavioural approach to understanding obsessional thinking. *The British journal of psychiatry. Supplement*, (35), 53–63.

Savage, C. R. (1998). Neuropsychology of obsessive-compulsive disorder: research findings and treatment implications. *Obsessive-Compulsive Disorders: Practical Management*, 254-275.

Savage, C. R., Baer, L., Keuthen, N. J., Brown, H. D., Rauch, S. L., & Jenike, M. A. (1999). Organizational strategies mediate nonverbal memory impairment in obsessive–compulsive disorder. *Biological Psychiatry*, *45*(7), 905-916. doi:10.1016/S0006-3223(98)00278-9.

Savage, C. R., Deckersbach, T., Wilhelm, S., Rauch, S. L., Baer, L., Reid, T., & Jenike, M. A. (2000). Strategic processing and episodic memory impairment in obsessive compulsive disorder. *Neuropsychology*, *14*(1), 141–151. doi:10.1037//0894-4105.14.1.141.

Savage, C. R., Keuthen, N. J., Jenike, M. A., Brown, H. D., Baer. L., Kendrick. A. D., … & Albert, M. S. (1996). Recall and recognition memory in obsessive-compulsive disorder. *The Journal of Neuropsychiatry and Clinical Neurosciences. 8*(1), 99-103

Sher, K. J., Mann, B. & Frost, R. O. (1984). Cognitive dysfunction in compulsive checkers: further Explorations. *Behaviour Research and Therapy, 22*(5), 493-502.

Shin, N., Lee, T., Kim, E., & Kwon, J. (2014). Cognitive functioning in obsessive-compulsive disorder: A meta-analysis. *Psychological Medicine, 44*(6), 1121-1130. doi:10.1017/S0033291713001803.

Simpson, H. B., Foa, E. B., Liebowitz, M. R., Ledley, D. R., Huppert, J. D., Cahill, S., … Petkova, E. (2008). A randomized, controlled trial of cognitive-behavioral therapy for augmenting pharmacotherapy in obsessive-compulsive disorder. *American Journal of Psychiatry*, *165*(5), 621–630. doi:10.1176/APPI.AJP.2007.07091440.

Sizino da Victoria, M., Nascimento, A. L., & Fontenelle, L. F. (2012). Symptom-specific attentional bias to threatening stimuli in obsessive-compulsive disorder. *Comprehensive psychiatry*, *53*(6), 783–788. doi:10.1016/j.comppsych.2011.12.005.

Snyder, H. R., Kaiser, R. H., Warren, S. L., & Heller, W. (2015). Obsessive-compulsive disorder is associated with broad impairments in executive function: A meta-analysis. *Clinical psychological science: a journal of the Association for Psychological Science*, *3*(2), 301–330. doi:10.1177/2167702614534210.

Solem, S., Håland, Å. T., Vogel, P. A., Hansen, B., & Wells, A. (2009). Change in metacognitions predicts outcome in obsessive–compulsive disorder patients undergoing treatment with exposure and response prevention. *Behaviour Research and Therapy*, *47*(4), 301-307. doi:10.1016/j.brat.2009.01.003.

Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). *Manual for the State–Trait Anxiety Inventory*. Consulting Psychologists Press.

Tallis, F. (1997). The neuropsychology of obsessive-compulsive disorder: a review and consideration of clinical implications. *British Journal of Clinical Psychology, 36*, 3-20.

Tek, C, Uluğ, B, Rezaki, B. G., Tanrıverdi, N., Mercan, S, Demir, B. & Vargel, S. (1995). Yale-Brown obsessive-compulsive scale and US National Institute of Mental Health Global obsessive-compulsive scale in Turkish: Reliability and validity. *Acta Psychiatrica Scand. 91*(6), 410-413.

Thomsen, P. H. (2000). Obsessive-compulsive disorder: Pharmacological treatment. *European Child and Adolescent Psychiatry, 9*, I76–I84. doi:10.1007/s007870070021.

Torres, A. R., Prince, M. J., Bebbington, P. E., Bhugra, D., Brugha, T. S., Farrell, M., … Singleton, N. (2006). Obsessive-compulsive disorder: prevalence, comorbidity, impact, and help-seeking in the British National Psychiatric Morbidity Survey of 2000. *The American journal of psychiatry*, *163*(11), 1978–1985. doi: 10.1176/ajp.2006.163.11.1978.

Tuna, Ş., Tekcan, A. I. & Topçuoğlu, V. (2005). Memory and Metamemory in Obsessive–Compulsive Disorder, *Behaviour Research and Therapy, 43*(1), 15-27.

Ulusoy, M., Şahin, N. H., & Erkmen, H. (1998). Turkish Version of the Beck Anxiety Inventory. *Journal of Cognitive Psychotherapy, 12*, 163-172.

van der Straten, A., Huyser, C., Wolters, L., Denys, D., & van Wingen, G. (2018). Long-term effects of cognitive behavioral therapy on planning and prefrontal cortex function in pediatric obsessive-compulsive disorder. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, *3*(4), 320-328. doi:10.1016/j.bpsc.2017.11.009.

Voderholzer, U., Schwartz, C., Freyer, T., Zurowski, B., Thiel, N., Herbst, N., … Kuelz, A. K. (2013). Cognitive functioning in medication-free obsessive-compulsive patients treated with cognitive-behavioural therapy. *Journal of Obsessive-Compulsive and Related Disorders*, *2*(3), 241-248. doi:10.1016/j.jocrd.2013.03.003

Wells, A. (1997). Cognitive Therapy of Anxiety Disorders: A Practice Manual and Conceptual Guide. Chichester: Wiley.

Wells, A. (2005). The Metacognitive Model of GAD: Assessment of Meta-Worry and Relationship with DSM-IV Generalized Anxiey Disorder, *Cognitive Therapy and Research, 29*, 107-121.

Wells, A., & Matthews, G. (1994). *Attention and emotion: A clinical perspective.* Lawrence Erlbaum Associates, Inc.

Wells, A., & Matthews, G. (1996). Modelling cognition in emotional disorder: The S-REF model. *Behaviour Research and Therapy*, *34*(11-12), 881-888. doi:10.1016/S0005-7967(96)00050-2.

Wells, A., & Purdon, C. (1999). Metacognition and cognitive-behaviour therapy: A special issue. *Clinical Psychology & Psychotherapy*, *6*(2), 71-72.

Wheaton, M. G., Ward, H. E., Silber, A., McIngvale, E., & Björgvinsson, T. (2021). How is the COVID-19 pandemic affecting individuals with obsessive-compulsive disorder (OCD) symptoms? *Journal of Anxiety Disorders*, *81*, 102410. doi:10.1016/j.janxdis.2021.102410.

Whittal, M. L., Thordarson, D. S., & McLean, P. D. (2005). Treatment of obsessive-compulsive disorder: cognitive behavior therapy vs. exposure and response prevention. *Behaviour research and therapy*, *43*(12), 1559–1576. doi:10.1016/j.brat.2004.11.012.

Woods, C. M., Vevea, J. L., Chambless, D. L., & Bayen, U. J. (2002). Are compulsive checkers impaired in memory? A meta-analytic review. *Clinical Psychology: Science and Practice*, *9*(4), 353-366.

Yoldaşçan, E., Ozenli, Y., Kutlu, O., Topal, K., & Bozkurt, A. I. (2009). Prevalence of obsessive-compulsive disorder in Turkish university students and assessment of associated factors. *BMC psychiatry*, *9*, 40.

Zitterl, W., Urban, C., Linzmayer, L., Aigner, M., Demal, U., Semler, B., & Zitterl-Eglseer, K. (2001). Memory Deficits in Patients with DSM-IV Obsessive-Compulsive Disorder. *Psychopathology, 34*(3), 113–117. doi:10.1159/000049292