

Assessment of prospective, retrospective and short-term memory in obsessive-compulsive disorder regarding the severity of OC symptom

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ABSTRACT

Objective: Obsessive-compulsive disorder (OCD) is a debilitating condition affecting a considerable population of adults. Previous findings have indicated that OCD patients suffer from a wide range of neuropsychological impairments. The aim of the present research is to assess the memory functions in OCD. **Method:** The study followed a causal-comparative design. Thirty OCD patients and thirty healthy controls were selected using convenience sampling method from the population of OCD patients and staffs of the psychiatric centers in Shiraz, Iran. OCD patients and the controls were matched by their gender, age, and IQ. Yale-Brown Obsessive Compulsive Scale (Y-BOCS), the Prospective and Retrospective Memory Questionnaire (PRMQ), Digit Span (WAIS-R), and Raven's Progressive Matrices were used to collect the required data. Data were analyzed using MANOVA and independent t-test. **Results:** Results showed that individuals with OCD had significantly weaker performance in prospective and retrospective memory in comparison with the healthy control group. However, no significant difference was found between groups' short-term memory. In addition, OCD patients who suffer from severe OC symptoms had a significantly weaker performance on their prospective and retrospective memory. **Conclusion:** The results of study have concluded that OCD patients may have a weaker prospective and retrospective memory. Furthermore, symptom severity can affect patients' prospective and retrospective memory.

Keywords: Obsessive compulsive disorder, cognitive functions, prospective memory, retrospective memory, short-term memory

Introduction

Obsessive-compulsive disorder is a debilitating condition which is characterized by repetitive thoughts and mental images (obsessions) that provoke anxiety. In order to decrease or avoid this anxiety, OCD patients are involved in repeated and ritualized behaviors (compulsion). Although there are a variety of obsessions and compulsions among the populace, some specific symptoms like contamination obsessions and cleaning compulsions, symmetry obsessions and the related compulsions of repeating, ordering, and counting, forbidden thoughts and related compulsions, and harm (e.g., fears of harm to oneself or others) and related checking compulsions are associated with the disorder (American Psychiatric Association, 2013).

Some studies suggested that neurocognitive impairment in

OCD patients may be different from other disorders such as schizophrenia, depression and anxiety disorders [1, 2]. Neuropathology of OCD emphasizes the consistency of the frontostriatal dysfunction with neuropsychological deficits in executive functioning and nonverbal memory [3]. Currently, neuropsychologists consider prefrontal-striatal circuits' dysfunction that supports executive function as the key component of this disorder [4]. Moreover, at the point of the neural circuit, convergent findings of the neuroscience studies demonstrate the importance of the cortico-striato-thalamo-cortical (CSCT) pathways as the typical pathway of defining OCD. In addition, the research has identified some brain structures which depict abnormalities in OCD including the orbito frontal cortex (OFC), anterior cingulate cortex (ACC), striatum, thalamus, and amygdala [5].

Prospective memory (PM) is a cognitive function which enables individuals to remember their intentions in the future. Prospective memory is one of the most common abilities of our daily lives and its failure may result in significant consequences in one's daily life [6]. However, retrospective memory is an ability which helps individuals to remember what should be remembered [7]. In other words, retrospective memory focuses on recalling the past events and word lists; it can be considered as human's semantic memory [8].

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Furthermore, prospective memory is the ability to formulate one's intentions that frequently provoke checking compulsions in OCD patients. Accordingly, compulsive checkers have impairment in their prospective memory which results in frequent prospective memory failures. As a result, these failures undervalue OCD patients' confidence in their prospective memory, hence, they will use checking compulsions as a compensatory method to deal with the triggered doubts which stem from prospective memory failures^[9]. It can be mentioned that lack of confidence in prospective memory may trigger doubts that tasks were not done completely; therefore, patients feel the urge to check^[10]. Hence, lack of confidence in the ability to remember task performance may provoke intrusive doubts which affect other tasks to be executed properly and bring about checking compulsion^[11]. Although prospective memory deficits have been investigated in a wide range of neuropsychiatric disorders like Alzheimer's disease, Parkinson's disease, schizophrenia, attention deficit hyperactivity disorder and autism^[12], there are few studies which have assessed the prospective memory in OCD patients. Accordingly, due to some specific OCD characteristics including patients' elevated vigilance and checking behaviors, one may expect that OCD patients will never suffer from PM deficits. In contrast, neuropsychologists have found impairments in OCD patients' executive functions and retrospective memory which are associated with the PM. These findings highlight the likelihood of prospective memory dysfunctions in OCD patients^[13].

In order to gain knowledge and insight through the differences of the prospective and retrospective memory, self-rating questionnaires can be used. This method may enable experts to determine whether memory failures are prospective or retrospective in nature^[8].

Short-term memory is the ability to store an active representation of related information which is vital for the further processing^[14]. Currently, it has been declared that both temporal region and the neocortex are the crucial regions for the memory-related functions. The level of memory impairment will increase the level of temporal lobe impairments^[15].

During the middle of 20th century, neuropsychology became much more popular and dominant since neuropsychologists have been armed with a variety of toolkits including cognitive, motor and sensory tests which helped them to locate brain lesions and facilitate the diagnostic process of neurological and neuropsychiatric conditions^[16]. Although over the past 25 years, a considerable body of knowledge has highlighted the importance of the cortico-striato-thalamocortical circuit in developing OCD^[17], neuropsychologists have not yet reached a comprehensive manifestation and neuropsychological profile for the OCD since the neuropsychological test performance of the disorder has indicated inconsistent results^[18]. Moreover, according to the fact that OCD is one of the most prevalent psychological disorders by 1.2% in the United States (American Psychiatric Association, 2013) and 21.57% in Iran^[19], it would be of a noticeable importance to assess the root

neuropsychological causes of OCD in order to obtain a comprehensive overview towards the main causes of this disorder. As a result, it can be mentioned that drawing a detailed neuropsychological profile for the OCD will not only lead to a better and more sophisticated diagnosis, but also will improve the therapeutic procedure of OCD since an exhaustive neuropsychological profile for OCD may be responsible for a related encyclopedic knowledge which can facilitate the treatment process for the psychotherapists. Furthermore, there is only a few research which examined memory dysfunctions in OCD patients. Regarding this undebatable fact that memory is one of the most vital cognitive abilities of human-beings, by evaluating the different types of the memory of OCD patients, one may assume that it will result in expanding the boundary of knowledge which will help psychologists to interpret OCD symptoms in more depth. Hence, according to the above-mentioned statements, the main purpose of the current study was to examine the memory status of OCD patients. In correspondence with the stated studies, the following hypotheses and a question were made: 1) compared to the healthy control group, the OCD patients expected to have weaker functions in prospective memory; 2) compared to the healthy control group, OCD patients expected to have weaker short-term memory; 3) does the symptom severity affect the OCD patients' prospective, retrospective, and short-term memory?

Methods

The study followed a causal-comparative design since it attempted to determine the neuropsychological causes and differences which already exist between the OCD and control groups. In this study, independent variables were the group of OCD patients and the healthy control group, while dependent variables included prospective and short-term memory.

This study was conducted between May to November 2016. The sample was included 30 patients, diagnosed with OCD who visited psychiatric clinics in Shiraz and 30 healthy controls matched for age, IQ, and gender, selected from the psychiatric clinics' staffs. The age range of the participants was between 18 to 55 years old. Although the group of OCD patients was diagnosed by a psychiatrist, the Structured Clinical Interview for DSM-V^[20] was used to determine any psychiatric disorders among healthy participants and in order to confirm the OCD. Based on the psychiatrist diagnosis and the structured clinical interview, participants were assigned to either OCD or control groups. Participants who had the minimum literacy skills were included. Regarding patients' psychological history, those who suffered from comorbid disorders (according to DSM-V) were excluded from the OCD patients group. Control subjects who diagnosed with OCD or other psychiatric diseases were also excluded. Furthermore, participants suffered from physical deficits, visual, audible and speech difficulties were excluded as well. After a clinical interview, participants were randomly presented by the selected tests and tasks.

Instruments

- (1) **Yale-Brown Obsessive Compulsive Scale (Y-BOCS):** This test was developed by Goodman et al. in 1989 in order to examine the severity and recuperation of obsessive-compulsive symptoms. This scale included a semi-structured interview and a series of questions for detecting OC symptoms and their severity. Y-BOCS is a 10-item questionnaire based on a Likert – type scale (0-4) to evaluate symptoms' severity based on OCD current condition. The Y-BOCS has acceptable interrater reliability ($r = .86$ to $.98$) and internal consistency ($r = .88$ to $.91$)^[21]. In the present study, use was made of the Persian version of Y-BOCS validated by Rajezi Esfahani, Motaghipour, Kamkari, Zahiredin, & Janbozorgi (2012) for diagnosing symptoms and their severity in the current study^[22].
- (2) **The Prospective and Retrospective Memory Questionnaire (PRMQ):** PRMQ is a 16- item self-report questionnaire based on a Likert – type scale (1-5) for measuring the prospective and retrospective memory slips in daily life. There are eight questions for assessing the prospective memory failures and eight other questions for examining the retrospective memory function. This test was developed by Crawford and his colleagues in 2003. According to a study conducted by Crawford and his colleagues, the test has an acceptable reliability. They reported Cronbach's alpha for the total scale and the prospective and retrospective scales at 0.89, 0.84, and 0.80 respectively^[7]. The current study made use of the standardized version normed for Iranian populations that has been reported to be valid in Iranian samples at 0.77, 0.81, and 0.88 for the mentioned scales respectively^[23].
- (3) **Digit Span (Wechsler Intelligence Scale-Revised, WAIS-R):** WAIS-R was developed in 1981 by David Wechsler as a measure for assessing IQ of adult individuals. Digit Span is one of the subtests of WAIS which examined short-term memory and attention. The examinee must recall and repeat auditory information in the proper sequence. Correct responses produce through a two-step process. First, the information must be accurately received, which requires attention and encoding. Second, the individual must recall, sequence, and vocalize the information accurately. The test is included two sections: Digits Forward and Digits Backward. Whereas Digits Forward is simple and straightforward compared to Digits Backward and requires rote memory, Digits Backward is more complex. The examinee must usually hold the memory longer and also transform it before making a restatement. Wechsler reported an acceptable reliability for the verbal subscales of WAIS-R at 0.97^[24].

- (4) **Raven's Standardized Progressive Matrices (RPM):** Participants' intelligence was evaluated by RPM. Raven's progressive matrices (RPM) are an abstract reasoning task. PRM has 60-item. The test is a multiple-choice paper and pencil task. The used stimuli are simple, nonrepresentational and two-dimensional designs. The main demand of the test is to find a rule in order to be generated to the next design in a series. Test items become progressively more difficult. RPM is an untimed test and examinees can work at their own paces. Accordingly, it takes 40 minutes to an hour for most of the individuals to complete the test^[25]. The manual of PRM describes studies from a wide range of age groups and on different cultural groups from clinical and normal populations which illustrate the reliability (alpha coefficient = 0.91) and validity of the measure^[26].

Procedure

Sampling procedure took place at the Psychotherapy and Counselling Clinic of Shiraz University. Examinees were given a complete oral and written description of the study and written informed consent forms were collected. Following informed consent, participants first participated in the clinical interview conducted by the examiner, who was a trained psychometrist, and then neuropsychological assessment was begun. The Psychology Review Board of the Shiraz University (Shiraz, Iran) approved the study.

Statistics

The Statistical Package for the Social Sciences (SPSS, Version 16) was used in order to assess the data. One-way ANOVA was conducted in order to check for group differences concerning demographical characteristics. Furthermore, independent sample t-test was used as a method to check groups matching regarding age and IQ. Moreover, MANOVA was used for evaluating the hypotheses of the study. The nominal level of significance was set at $\alpha < 0.05$.

Results

The current study included two groups, a group of OCD patients and a control group of healthy subjects. Participants were matched based on their gender, IQ, and age. Each group had members of both genders (15 women and 15 men). Independent sample t-test was used to check groups equality based on their IQ and age. The age mean and standard deviation of the OCD group were 26.03 and 7.16 respectively; however, the age means and standard deviation of the control group were 25.06 and 6.50. Additionally, Leven's test result approved the equality of the variances ($F=0.081$, $P=0.77$). The independent sample t-test did not show any significant differences between OCD and control groups regarding participants' age ($t=0.54$, $P>0.05$). The mean of OCD group regarding their IQ was 116.23 and the standard deviation was 12.37. In contrast, means and standard deviation for the control group were 118.37 and 10.49 respectively. The

Leven's test result approved the equality of the variances ($F=0.44$, $P=0.50$). The independent sample t-test showed no significant difference between OCD patients and healthy subjects regarding their intelligence ability ($t=-0.72$, $P>0.05$). The following tables show the descriptive indicators and MANOVA results of prospective, retrospective and short-term memories' subscales. Means and the standard deviations are shown in Table 1.

Table 1: Means and standard deviations of OCD and control groups in prospective, retrospective and short-term memory subscales

Variables	Groups	N	Mean	SD	Cohen's d
Prospective memory	OCD	30	19.20	5.99	0.54
	Control	30	16.56	3.45	
Retrospective memory	OCD	30	17.83	5.80	0.88
	Control	30	13.80	2.74	
Total result of PRMQ	OCD	30	37.03	11.41	0.75
	Control	30	30.36	5.28	
Digit Forward	OCD	30	7.70	1.74	0.11
	Control	30	7.50	1.81	
Total Digit Span	OCD	30	15.36	3.65	0.24
	Control	30	14.50	3.27	

Table 1 indicated that OCD group had higher scores in prospective memory subscale ($M=19.20$, $SD=5.99$) in comparison with the control group ($M=16.56$, $SD=3.45$) which means that OCD patients made more mistakes in their prospective memory than the healthy participants (Cohen's $d=0.54$). OCD patients had weaker performance in their retrospective memory ($M=17.83$, $SD=5.80$) in comparison with the healthy control subjects ($M=13.80$, $SD=2.74$) with a large size effect (Cohen's $d=0.88$). The overall result of the OCD patients' performance in PRMQ ($M=37.03$, $SD=11.41$) showed higher scores compared to the healthy subjects ($M=30.36$, $SD=5.28$) which demonstrate OCD patients' weaker performance in the total scale of PRMQ with approximately large effect size (Cohen's $d=0.75$).

MANOVA was used to examine the first hypothesis. The "Prospective", "Retrospective", and "Total result" subscales were considered as the dependent variables and the group type (OCD patients and control group) was the independent variable. For using MANOVA, first, the Pillai's indicator was assessed ($F_{(2, 57)}=6.26$, $P=0.003$, $\eta_p^2=0.18$) which showed a significant difference between OCD patients and the healthy control subjects regarding their performance in PRMQ subscales. As Table 2 shows, there were significant differences between OCD patients and the control group's performances in all three subscales of the PRMQ. Statistical results demonstrated that OCD patients had more mistakes in the prospective ($F_{(1, 58)}=4.35$, $p=0.041$, $\eta_p^2=0.070$) and retrospective memory ($F_{(1, 58)}=11.84$, $p=0.001$, $\eta_p^2=0.17$) subscales. OCD patients had a weaker performance on the total result subscale of the PRMQ ($F_{(1, 58)}=8.43$, $p=0.005$, $\eta_p^2=0.12$) with a large effect size. According to MANOVA results, it can be concluded that OCD patients had a weaker performance in their prospective and retrospective memory in

comparison with the healthy subjects. MANOVA result are shown in Table 2.

Table 2: Analysis of variance for OCD and control group in PRMQ subscales

Variables	Sum of Squares	df	Mean Square	F	P	Partial Eta Square
Prospective memory	104.01	1	104.01	4.35	0.041	0.070
Retrospective memory	244.01	1	244.01	11.84	0.001	0.17
Total Result	666.66	1	666.66	8.43	0.005	0.12
Prospective memory	1386.16	58	23.89	-	-	-
Retrospective memory	1194.96	58	20.60	-	-	-
Total Result	4585.93	58	79.06	-	-	-

The second hypothesis compared the short-term memory of the groups. Mean and the standard deviation are shown in Table 1. In order to assess the hypothesis, MANOVA was used. The "Digit Forward", "Digit Backward", and "Total Digit Span" subscales were deemed as the dependent variables and the group type (OCD patients and control group) as independent variables. First, the Pillai's indicator was examined ($F_{(2, 57)}=0.60$, $p=0.54$, $\eta_p^2=0.021$) which demonstrated that there was no significant difference between OCD patients and the control group regarding their short-term memory.

The question of this study attempted to evaluate whether symptom severity affects OCD patients prospective, retrospective and short-term memory or not. Determining the symptoms severity was based on psychiatric diagnosis and the Y-BOCS which is commonly used for determining the severity of OCD. Y-BOCS defined four groups based on the severity of the OC symptoms including: "mild symptoms" (scores of 0-13), "moderate symptoms" (scores of 14-25), "moderate-severe symptoms" (scores of 26-34), and "severe symptoms" (scores of 35-40). We used the Y-BOCS severity scale to assign patients to the different groups based on the scores that they gained in Y-BOCS. Accordingly, first, the means and standard deviations of prospective, retrospective, and short-term memories' subscales were assessed based on the symptoms' severity. Table 3 shows means and standard deviations for the effect of symptoms' severity on prospective, retrospective, and short-term memories' subscales.

As it can be observed, "mild symptoms" group was included the healthy control subject since their level of symptoms ranged between 0-4. Regarding the prospective and retrospective results, as the symptoms severity increased OCD patients' memory performances decreased in all three subscales of PRMQ. In addition, patients who suffered from severe symptoms of the disorder, had a weaker performance on prospective ($M=22.80$, $SD=9.06$), retrospective ($M=19.40$, $SD=8.61$), and Total PRMQ result ($M=42.20$, $SD=17.54$) subscales.

In order to examine the question of this study, MANOVA was used. Initially, the effect of symptom severity on PRMQ subscales was evaluated. Pillai's indicator showed a statistically

significant difference between the different groups of symptoms' severity and their performance in PRMQ ($F_{(6, 112)} = 4.31, P=0.001, \eta_p^2=0.18$). It can be seen that as the severity increased, OCD patients had more difficulties in their prospective ($F_{(3, 56)} = 5.98, P=0.001, \eta_p^2=0.24$) and retrospective ($F_{(3, 56)} = 5.67, P=0.002, \eta_p^2=0.23$). The overall result of the PRMQ illustrates a significant effect of symptom severity on the OCD patients' overall performance in PRMQ ($F_{(3, 56)} = 6.25, P=0.001, \eta_p^2=0.25$). Also, as the effect size analysis shows, all the differences had a very large effect size.

Table 3: Means and standard deviations for the effect of symptom severity on prospective, retrospective and short-term memory's subscales

Variables	Symptoms Severity	N	Mean	SD
Prospective memory	mild	30	16.56	3.45
	moderate	11	15.45	4.29
	moderate-severe	14	20.85	4.55
	severe	5	22.80	9.06
Retrospective memory	mild	30	13.80	2.74
	moderate	11	15.54	6.08
	moderate-severe	14	19.07	4.08
	severe	5	19.40	8.61
Total result of PRMQ	mild	30	30.36	5.28
	moderate	11	31.00	9.98
	moderate-severe	14	39.92	8.30
	severe	5	42.20	17.54
Digit Forward	mild	30	7.50	1.81
	moderate	11	7.36	1.02
	moderate-severe	14	8.14	1.95
	severe	5	7.20	2.38
Digit Backward	mild	30	7.00	1.96
	moderate	11	8.18	2.82
	moderate-severe	14	7.00	2.18
	severe	5	8.40	3.45
Total Digit Span	mild	30	14.50	3.27
	moderate	11	15.54	3.38
	moderate-severe	14	15.14	3.37
	severe	5	15.60	5.54

Table 4: Analysis of Variance for the effect of symptom severity on prospective and retrospective memory

Variables	Sum of square	df	Mean Square	F	P	rtial Eta Square	
Symptom severity	Prospective memory	361.57	3	120.52	5.98	0.001	0.24
	Retrospective memory	335.32	3	111.77	5.62	0.002	0.23
	Total result	1317.90	3	439.30	6.25	0.001	0.25
Error	Prospective memory	1128.60	56	20.15	-	-	-
	Retrospective memory	1103.65	56	19.70	-	-	-
	Total result	3934.69	56	70.26	-	-	-

Table 4 shows the MANOVA result for the effect of symptom severity on PRMQ subscales. MANOVA was used for examining the effect of symptom severity on short-term memory subscales. The "Digit Forward", "Digit Backward", and "Total Digit Span" subscales were considered as the dependent variables and the symptom severity as independent

variables. Initially, the Pillaie indicator was assessed ($F_{(6, 112)} = 1.34, p=0.24, \eta_p^2=0.067$). It can be concluded that symptom severity had no significant effect on OCD patients' short-term memory.

Discussion

The first aim of this study was to evaluate OCD patients' performance in three different types of memory which stems from human being cognitive function ability, including prospective, retrospective and short-term memory in comparison with healthy control subjects. The second purpose of the present study was to assess the effect of symptom severity on the stated memory functions. Statistical analysis showed a significant difference between OCD patients and healthy control subjects regarding their prospective and retrospective memory. In contrast, symptom severity did not have any significant effect on OCD patients' short-term memory. Analysis of the effect size (regarding Cohen's (1988) principle for interpreting partial eta square or R^2), indicated that the largest effects observed when the "retrospective memory" and "total result" subscales were assessed, while the effect size for "prospective memory" was small [27]. On the other hand, the Cohen's d for the short-term memory subscales was low. Findings of this study show that symptom severity has significant effects on prospective and retrospective memory of OCD patients. It can be mentioned that as the symptom severity surge, the prospective and retrospective memory performance level off. Patients who had the most severe OC symptoms, had the higher scores on all the three subscales of PRMQ (with very large effect size) which means that they had worse performance in comparison with patients who had less severe symptoms. Additionally, statistical results demonstrated that there was no significant effect of the symptom severity on the short-term memory of individuals with OCD.

The first finding of this study demonstrated a significant difference between OCD patients and control group regarding their prospective and retrospective memory. It is consistent with the findings stemmed from Yang et al. (2015), Cuttler & Taylor (2012) and Cuttler et al. (2013) studies [6, 10, 11]. Statistical results showed that OCD patients had weaker performance in all three subscales of PRMQ which means that generally, they had a weaker prospective and retrospective memory compared to the healthy subjects. Regarding the described effect sizes which were small and large, it can be concluded that the prospective and retrospective memory dysfunction was significant between OCD and control groups. The stated finding indicates that OCD patients have weaker prospective and retrospective memory comparing to the healthy control subjects. It can be explained in the way that OCD patients have some problems which not only bring about difficulties in remembering their intentions and mental plan for the upcoming tasks but also result in some problems in recalling past events. As a result, they will try to face these memory deficits by using their compulsions as a compensatory method [9]

to make sure that they won't make mistakes due to their impaired memory functions. In other words, it can be seen that since they face some problems in recalling what they did in the past, for instance, washing their hands or close the door, (deficit in retrospective memory) or in remembering their intentions for doing something in future (deficit in prospective memory), they will use their compulsions (mostly washing and checking compulsions) to overcome this memory impairment. Additionally, since prospective and retrospective memories are subgroups of individuals' memory function which take place in temporal regions of human's brain and regarding this finding of the prospective and retrospective memory deficit, it can be assumed that this memory deficit may stem from temporal regions' dysfunction in OCD patients.

The second finding of the current study illustrated no significant difference between OCD patients and healthy control subjects in short-term memory. To the best of our knowledge, there is not enough literature available which assess the short-term memory of OCD patients. The results reported by Demeter et al (2013) was in line with the current finding of the study since they also did not report any short-term memory problems in OCD patients^[28]. Generally, it can be surmised that the short-term memory of the OCD patients seems to be healthy and their scores were ranged in the healthy domain of the WAIS-R. However, according to the small effect size of Cohen's d in the short-term memory subscales, it can be mentioned that the differences between the OCD and control group were not significant enough to reach a conclusion.

The third finding of this study demonstrated a significant effect of symptom severity on patients' prospective and retrospective memory. As the severity surges, patients' prospective and retrospective memory functions decline. The effect size analysis of the stated subscales of PRMQ was very large which means that the effect of symptom severity is considered significant. Regarding this finding, it can be stated that as the symptoms get more severe, patients' prospective and retrospective memory functions will face a wider range of deficits and according to this increased level of memory deficits, they may learn to use some compensatory methods (specifically their compulsions) and as they get used to their compensatory methods, a loop will develop which reinforce their memory deficits and their compulsions in the long run and result in memory dysfunction. In contrast, it can be mentioned that statistical results of the study did not illustrate any significant symptom severity effect on the patients' short-term memory. To the best of our knowledge, there is no similar research regarding the symptom severity effects on OCD patients' memory and this study is the first which has examined this effect.

The findings of this study can contribute to improving the neuropsychological profile of the OCD which may not only bring about a comprehensive understanding about this disorder but also will help to find the most suitable therapeutic methods for OCD. Furthermore, regarding the prospective and retrospective dysfunction of the OCD patients which may result from their temporal lobe dysfunction, it can be concluded that

psychologists must turn their focus on exploring innovative neuropsychological methods in order to modify the dysfunctional brain circuits.

This study also had some limitations which will be considered in the following lines. Regarding the convenience sampling method which was used in the current study, the generalization must be considered cautiously. Additionally, considering the fact that different OCD types were not assessed in the present study, it is suggested that future research assess the effect of symptom severity on patients' memory based on the different subtypes of the disorder.

It is recommended that future studies compare different types of memory in OCD patients who receive different forms of therapies including psychotherapy and medication with the OCD patients who do not receive any medication.

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