

Assessment of Cognitive Inhibition in Patients with Obsessive-Compulsive Disorder

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Background: Obsessive-compulsive disorder (OCD) is not only one of the most prevalent psychiatric disorders, is also one of the most disabling medical disorders with some cognitive deficits, like poor cognitive inhibition.

Objectives: The main purpose of the present study is to compare cognitive inhibition between patients with OCD and a healthy control group.

Patients and Methods: This was a cross-sectional study, performed on 20 patients with OCD and 20 patients in the control group, selected with convenience sampling method, from outpatients and inpatients. They completed a computerized cognitive inhibition task and the Maudsley Obsessional-Compulsive Inventory (MOCI). Data were analyzed by SPSS and a P-Value less than 0.05 was considered significant.

Results: The results indicated that patients and control groups were equal according to sex and education and there was no significant difference. Also, the results show that the difference in negative prime between the two groups was significant, although the differences in positive prime and neuter stimuli were non-significant.

Conclusions: According to cognitive inhibition deficits in patients with obsessive-compulsive disorder, it seems that in protocol treatment, patients should be provided with instructions, in the field of cognitive rehabilitation.

Keywords: Cognitive Inhibition; Neuropsychology; Executive Function

1. Background

Obsessive-compulsive disorder (OCD) is not only one of the most prevalent psychiatric disorders, is also one of the most disabling medical disorders. Today, it is referred to as a neuropsychiatric disorder, mediated by specific neuronal circuitry, closely related to neurological conditions (1). According to DSM IV criteria, OCD is characterized by intrusive thoughts or images (obsessions), increasing anxiety and also repetitive or ritualistic actions (compulsions), decreasing anxiety (2). Patients with this disorder are thought to suppress or neutralize annoying thoughts they are facing. These intrusive and obsessive thoughts, contrary to the patients' will, frequently appear with failure to inhibit irrelevant information (3).

Cognitive deficits could function as intermediate variables, between neurobiological abnormalities and OCD symptoms (4). Different studies have focused on involvement of cortico-striatal-thalamic-cortical circuits in OCD patients and have mainly supported imaging researches and also the results of the developmental studies (5, 6). Accordingly, neuropsychological deficit is common among these patients. Involvement of the cortical region, especially in the frontal lobes, (7) proposes a possible ex-

ecutive function (EF) impairment. Executive function is defined as a set of cognitive skills, necessary to plan, monitor and execute a sequence of goal-directed complex actions (8). Assessment of the ability to inhibit, through these cognitive skills, known as EFs, was the main goal of the present study. Cognitive inhibition means slowing the response to an item, currently neglected. Indeed, it refers to delay or increase the errors, when responding to an item that had been overlooked in the past (3). Traditionally, cognitive inhibition was evaluated by priming and shifting tasks. Shifting and mental flexibility, as parts of EF, are necessary for humans' interactions with the environment. In the literature on shifting and priming effects, there are two situations; in the first case, the correct and incorrect features of stimuli features are repeated across two trials, called positive priming (PP) and the second case is when the correct and incorrect features are switched, known as negative priming (NP) (9).

The effect of priming task (negative or positive) is controversial, for example; Amir, Cobb and Morrison did a research on 19 patients with OCD and 19 healthy controls, evaluating the cognitive inhibition. The results demon-

Implication for health policy/practice/research/medical education:

The main purpose of the present study is to compare cognitive inhibition between OCD and healthy control.

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strated a significant decrease in cognitive inhibition, in patients. They concluded that patients could not ignore OCD-relevant threat information (10). On the other hand, other researchers showed that patients with OCD have normal function on computerized cognitive inhibition test, compared with the normal groups (11). In a comparison between OCD and trichotillomania, regarding motor inhibition and cognitive flexibility, the authors concluded that both patient groups showed impaired motor response inhibition. In patients with trichotillomania, the deficit was worse than in those with OCD (12). Only patients with OCD showed cognitive flexibility deficits. In line with this research, Bannon and his colleagues stated that difficulty in inhibiting irrelevant information might play a principle role in the etiology of OCD, therefore, they evaluated the cognitive function and behavior by the Stroop and go/no go tasks. Results indicated that the OCD group had more mistakes on go/no go task, which evaluates the behavior inhibition. The patients also consumed more time on the Stroop tasks, which reveals cognitive inhibition impairment. The researchers implied that the impairment in both behavior and cognitive inhibitions may underlie the repetitive symptomatic behaviors of the disorder, like compulsions and obsessions (13). Although using neuropsychological tests, these studies demonstrated that inhibition impairments were found among the patients with OCD, a survey on a Chinese group claimed there were no differences in functional magnetic resonance imaging (fMRI) patterns, between patients with OCD or the control group, while completing the Chinese's Stroop task (14).

2. Objectives

The main purpose of the present study was to compare cognitive inhibition between patients with OCD and healthy controls. In the present study, we investigated whether negative, positive and neuter stimuli can discriminate between OCD and control groups.

3. Patients and Methods

This was a cross-sectional study, conducted using convenience sampling from outpatients and inpatients, referred to Emam Reza Clinic and Hafez and Ebne-Sina Hospitals. The clinic and hospitals are affiliated to Shiraz University of Medical Sciences (SUMS). The psychiatrist and psychologist involved in the study evaluated the new cases, referred to the centers during summer and fall 2012. The inclusion criteria consisted of age 20 to 60, having at least the primary education, enough vision, no alcohol or other substance consumption and meeting the DSM IV OCD criteria. Accordingly, 20 patients with OCD and 20 healthy controls were selected. The present study was approved by the Ethics Committee of Shiraz University of Medical Sciences before implementing. Written informed consent was obtained from all subjects to participate in the study, they had the right to leave the study

at any stage and were ensured of preservation of confidentiality. The patients completed the following task in one session. Computerized negative priming tasks, were extracted from Moritz et al. and modified to be used in Iran by changing its language to Persian, native language of Iran (11). The task runs on a 15 inch laptop and all participants were fully trained to use the related keys. The task consists of one to four identical digits ("1", "2", "3" or "4"), employed as the stimuli (e.g. "444"). The minimum and maximum number of digits used in this task are one and four digits, respectively and the language used is Persian. Subjects should press the key "V" on the keyboard for one digit on the screen, key "B" for two digits, key "N" for three digits and key "M" for four digits on an English keyboard. Responses were required for both prime and target displays. Each stimulus was shown for 150 ms. The computer screen turned blank after displaying the prime. Errors were automatically recorded by the computer, for which no feedback was provided to participants. The following three experimental conditions were evaluated: a) negative priming condition; b) positive priming condition and c) neuter condition. Each condition contained 27 randomly presented prime-target pairs. Maudsley Obsessional-Compulsive Inventory (MOCI) was used to measure the symptoms of OCD; this questionnaire consists of 30 items, filled out in the Likert scale. This scale has an acceptable validity (0.87) and reliability (0.84), according to an Iranian research (15). The collected data were analyzed using SPSS statistical software, version 16. Descriptive statistics and mean comparison test were used for each group. A P-Value less than 0.05 was considered significant.

4. Results

Results showed that among the total of 20 OCD patients studied, 11 patients (55%) were female. In the control group, 12 patients (60%) were female. Therefore, regarding genders the groups were almost equal. In the sample studied 35% of the patients with OCD had college education, versus 85% of the normal group. Also, the education cycle was found in 15% of the patients with OCD, whereas in the control group, there was no secondary education cycle; all subjects had high school education. As shown in Table 1, the mean scores of the patients with OCD, in all components of OC were higher than normal, including the control (4/80 vs. 1), washing (5/45 vs. 2), slowing / repeating (3/90 vs. 0/35) and doubt (5 vs. 2/25). Descriptive statistics for each group are presented in Table 1. In order to answer the research hypothesis, "whether there is a difference in cognitive inhibition between OCD patients and the normal group," t-test was used to compare the means of two independent groups, the results of which are presented in Table 2.

As the results in Table 2 reveal, in a subset of computerized negative priming task (cognitive inhibition) in obsessive and normal control groups, a significant difference was detected only in the negative condition

Table 1. The Maudsley Obsessional-Compulsive Inventory Descriptive Statistics of the Two Groups

	Grouping	Mean	Standard Deviation
Control	OCD	4.8	1.73
	Control	1	0.72
Washing	OCD	5.45	2.70
	Control	2	3.62
Slowing/Repeat	OCD	3.90	1.74
	Control	0.35	0.81
Doubt	OCD	5	1.21
	Control	2.25	0.91

Table 2. Comparison of Means of Cognitive Inhibition Between Patients With OCD and Normal Controls

	Grouping	Mean	Standard Deviation	T-Value	P Value
Negative prime	OCD	24.85	0.68	3.68	0.001
	Control	26.40	1.75		
Positive prime	OCD	26.05	1.19	1.66	0.104
	Control	25.4	1.27		
Neutral conditions	OCD	24.95	2.41	1.82	0.07
	Control	26.05	1.19		

($P = 0/001$, $t = 3/68$). The comparison indicated that patients with OCD had a lower mean score than the normal group; i.e. they made more mistakes in both positive and neutral conditions but no significant differences were observed between the two groups.

5. Discussion

The results of this study showed that people with OCD were significantly weaker in cognitive inhibition than normal subjects. Studies investigating cognitive inhibition in patients with OCD showed different and paradoxical findings. There are studies confirming cognitive inhibition deficits in patients with OCD. For instance, some studies confirmed impaired cognitive inhibition as an underlying justification for repetitive behaviors in patients with OCD (10, 15-18), while other studies did not support the theory of cognitive inhibition deficits in patients with OCD (11, 12, 14, 19-21). Previous studies in this field suggested that the differences in sample sizes and using various tools to assess cognitive inhibition (like the Stroop test, Simon computer tests, suppression of negative thoughts, etc.) may result in different findings. These differences may also be related to the differences in selection methods of patients with OCD, new recognized patients or previous patients who have been treated and type and amount of medications they use. Another reason might be the research tool used in other studies. For example, the Stroop test does not have the proper sensitivity for showing cognitive inhibition deficits in people with OCD. Therefore, for studying cognitive inhibition in patients with OCD, we should seek for a more precise tool. In this study, we tried to use a tool consistent with the description of the cognitive inhibition

process. Inhibition account of negative priming explains that cognitive inhibition is created by a dual-process selective attention mechanism, which stimulates targets and inhibits the distraction factor. In negative priming task, the distracted factor is inhibited in the first experiment. Our goal is to facilitate the process and respond to the target. In the second experiment, in terms of repeatedly ignored cognitive inhibition occurs. Therefore, the initial distractor appears as a target in the checkout experiment having a previous inhibition. This takes time for the inhibition to be disrupted, thus, delay occurs in our response. This is the core of all types of cognitive inhibition hypotheses (3). In addition, the results showed that some patients with OCD had done no wrong in the cognitive inhibition task. This may indicate that the deficit in cognitive inhibition is present in a certain subgroup of patients with OCD, which should be evaluated in other researches.

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References

- Stein DJ. Obsessive-compulsive disorder. *Lancet*. 2002; **360** (9330): 397-405.

2. Stein DJ, Kupfer DJ, Schatzberg AF. *The American Psychiatric Publishing Textbook of Mood Disorders*.: American Psychiatric Publishing; 2007.
3. Molaei M, Moradi AR, Gharaei B. Executive Function and Neuropsychological Evidence among OCD and GAD. *Journal of Behavior Sciences*. 2007;**1**(2):131-41.
4. Trivedi JK, Dhyani M, Goel D, Sharma S, Singh AP, Sinha PK, et al. Neurocognitive dysfunction in patients with obsessive compulsive disorder. *Afr J Psychiatry (Johannesbg)*. 2008;**11**(3):204-9.
5. Rosenberg DR, Keshavan MS. A.E. Bennett Research Award. Toward a neurodevelopmental model of obsessive-compulsive disorder. *Biol Psychiatry*. 1998;**43**(9):623-40.
6. Baxter LR, Jr, Schwartz JM, Bergman KS, Szuba MP, Guze BH, Mazziotta JC, et al. Caudate glucose metabolic rate changes with both drug and behavior therapy for obsessive-compulsive disorder. *Arch Gen Psychiatry*. 1992;**49**(9):681-9.
7. Garavan H, Ross TJ, Stein EA. Right hemispheric dominance of inhibitory control: an event-related functional MRI study. *Proc Natl Acad Sci U S A*. 1999;**96**(14):8301-6.
8. Royall DR, Lauterbach EC, Cummings JL, Reeve A, Rummans TA, Kaufer DI, et al. Executive control function: a review of its promise and challenges for clinical research. A report from the Committee on Research of the American Neuropsychiatric Association. *J Neuropsychiatry Clin Neurosci*. 2002;**14**(4):377-405.
9. Nigg JT. On inhibition/disinhibition in developmental psychopathology: views from cognitive and personality psychology and a working inhibition taxonomy. *Psychological bulletin*. 2000;**126**(2):220.
10. Amir N, Cobb M, Morrison AS. Threat processing in obsessive-compulsive disorder: evidence from a modified negative priming task. *Behav Res Ther*. 2008;**46**(6):728-36.
11. Moritz S, Kloss M, Jelinek L. Negative priming (cognitive inhibition) in obsessive-compulsive disorder (OCD). *J Behav Ther Exp Psychiatry*. 2010;**41**(1):1-5.
12. Chamberlain SR, Fineberg NA, Blackwell AD, Robbins TW, Sahakian BJ. Motor inhibition and cognitive flexibility in obsessive-compulsive disorder and trichotillomania. *Am J Psychiatry*. 2006;**163**(7):1282-4.
13. Bannan S, Gonsalvez CJ, Croft RJ, Boyce PM. Response inhibition deficits in obsessive-compulsive disorder. *Psychiatry Res*. 2002;**110**(2):165-74.
14. Nakao T, Nakagawa A, Yoshiura T, Nakatani E, Nabeyama M, Yoshizato C, et al. A functional MRI comparison of patients with obsessive-compulsive disorder and normal controls during a Chinese character Stroop task. *Psychiatry Res*. 2005;**139**(2):101-14.
15. Majlesi N, Behzadi S, Ganji H. A comparison between net reaction time span, short term spatial memory and cognitive inhibition in those suffering from compulsion and obsession. *APPLIED PSYCHOLOGY*. 2009;**3**(10):83-98.
16. Enright SJ, Beech AR. Reduced cognitive inhibition in obsessive-compulsive disorder. *Br J Clin Psychol*. 1993;**32** (Pt 1):67-74.
17. Enright SJ, Beech AR, Claridge GS. A further investigation of cognitive inhibition in obsessive-compulsive disorder and other anxiety disorders. *Personality and Individual Differences*. 1995;**19**(4):535-42.
18. Purcell R, Tyler P, Ambery F, Maruff P, Velakoulis D, O'Brien M, et al. Response inhibition and practice effects on a stroop paradigm in schizophrenia and obsessive-compulsive disorder (OCD). *Schizophrenia Research*. 2000;**41**(1):292.
19. MacDonald PA, Antony MM, MacLeod CM, Swinson RP. Negative priming for obsessive-compulsive checkers and noncheckers. *J Abnorm Psychol*. 1999;**108**(4):679-86.
20. Ghamari GH, Shaieghi H, Ghasemnejad S. Investigation of cognitive and motor inhibition in persons with obsessive compulsive and schizophrenic disorders. *Contemporary psychology*. 2009;**4**(2):45-58.
21. Kowalczyk M. [Cognitive inhibition and thought suppression in obsessive-compulsive disorder—a review]. *Psychiatr Pol*. 2006;**40**(6):1051-60.