Original Article

Working Memory Deficits In Obsessive Compulsive Disorder

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Abstract

Background: Cognitive deficits could be functioning as an intermediate variable between neurological abnormalities and OCD symptoms. There is lack of such data in our country. Aim: To assess the cognitive functioning of a group of patients with OCD and a group of matched normal controls using Spatial Working Memory Test (SWMT). Method: Patients of OCD were screened for selection criteria. Diagnosis of OCD was made on the basis of DSM IV TR. They were assessed using SWMT for neuro-cognitive impairments and compared the same with matched controls. Conclusions: On SWMT, OCD patients showed significant impairment.

Introduction

Cognitive deficits could be functioning as an intermediate variable between neurological abnormalities and OCD symptoms. Reductions in social competence and the capacity for independent living and vocational success may be the result of neurocognitive compromise. Neuropsychological testing has revealed evidence of impairment in visuospatial abilities1, non-verbal memory2-3 and executive function4. However, results of the neuropsychological studies have been inconsistent.

There is a range of evidence that cortico-striatal thalamic cortical system (CSTC) is disrupted in OCD. CSTC plays a crucial role in the implicit learning of procedural strategies, and their subsequent automatic execution.

Executive function deficits (reflecting involvement of fronto-striatal systems) have been seen in several studies of OCD patients5-7. Some workers question whether slowness, secondary to indecisiveness, plays a factor8. This slowness may include intrusive and perseverative features, which could result from fronto-striatal dysfunction9.

Also, milder OCD cases had better selective attention than those with more severe symptomatology. Results further showed a defective visuospatial recognition, which worsens with chronicity, deteriorated set-shifting abilities. Obsessive cases had a defective visual memory, while compulsive cases had delayed perception of task-relevant stimuli. Mixed cases showed disturbed information processing both early and late.

Most studies have reported several other cognitive dysfunctions. Most studies suggest that encoding and retrieval are impaired in OCD, while storage of information remains intact. Some studies suggest that deficits in encoding of new information are primarily responsible for these performance problems7,10-12.

The deficits in SWMT in patients of OCD was significantly only for a region covering the anterior cingulate cortex hence suggesting that the abnormal performance pattern may be secondary to another aspect of executive dysfunctioning of OCD13.

In a study, functional MRI administered while 11 OCD patients and 11 healthy controls performed SWMT with multiple levels of difficulty. The OCD patients performed poorly on the tasks at the highest
level of difficulty and showed elevated activity in the anterior cingulate cortex, compared with the controls\textsuperscript{14}. Cingulate has been implicated in other studies also\textsuperscript{14-15}.

The studies in field of cognitive dysfunctions in OCD patients have been done primarily in the West and one lacking in the developing nations. The objective of the present study was to assess the cognitive functioning of a group of patients with OCD and a group of matched normal controls, so as to throw more light on the neurocognitive aspect of the disorder and pave way for more extensive research.

**Material and Methodology**

This is a single point, non-invasive, hospital based study, involving assessment of administration of a battery of neuropsychological tests using Revonsue and Portin Spatial Working Memory Test (SWMT).

The study was carried out between November 2009 to November 2011. New and follow up cases of age between 18 to 55 years , attending the outpatient section of the Department of Psychiatry, Subharti and K.G.’s Medical University on specified days of the week who criteria for OCD according to Diagnostic and Statistical Manual for Mental disorder-IV (DSM IV), had scores less than 24 on Yale Brown’s Obsessive Compulsive scale score (YBOCS) and have passed at least Class tenth, according to Indian Standards were included after taking informed conscent. Those who were found to be having co-morbid neurological illness, substance abuse and receiving drugs which has effect on cognition (such as TCAs, Lithium, Antipsychotics) were excluded. Control group was recruited who were age, gender and education group matched to the patient group. All the persons in control group were 18 to 55 years of age, gave informed consent, passed at least 10th standard and scored 3 or less on General Health Questionnaire, 12 item version (Goldberg, 1972). they  were excluded on the basis of history of psychiatric illness in present or past, psychoactive substance abuse and psychiatric illness in first degree relative.

Finally, Mean, Standard Deviation and ‘t’ Test for independent samples were applied for analysis of findings.

**Results**

Out of 175 patients screened for the study only 20 patients fulfilled the selection criteria for the patient group. In control group out of 23 subjects 20 fulfilled the selection criteria.

Table-1 depicts clinical group and the control group on the parameters of age, gender and education. Statistically no significant difference was found. Hence the control group was age-gender and education group matched. Majority of the patient group and the control group were in the age group 18-26 years, were males (60%) and graduates (40%).

On spatial working memory test (SWMT), as compared to the control group OCD patients have mild to moderate severity made less correct responses at 0 second (p < 0.01) and 20 seconds (p < 0.01) and more non adjacent errors at 0 seconds and after 20 seconds (p < 0.05 each) which were statistically significant (Table-2).

**Table-1. Sociodemographic Variables**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group A (N=20)</th>
<th>Group B (N=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (in years)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 - 26</td>
<td>13(65%)</td>
<td>13(65%)</td>
</tr>
<tr>
<td>&gt; 26 - 36</td>
<td>5(25%)</td>
<td>5(25%)</td>
</tr>
<tr>
<td>&gt; 36 - 46</td>
<td>2(10%)</td>
<td>2(10%)</td>
</tr>
<tr>
<td>&gt; 46</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Mean Age</td>
<td>27.1</td>
<td>26.45</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>12(60%)</td>
<td>12(60%)</td>
</tr>
<tr>
<td>Female</td>
<td>8(40%)</td>
<td>8(40%)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate</td>
<td>7(35%)</td>
<td>7(35%)</td>
</tr>
<tr>
<td>Graduate</td>
<td>8(40%)</td>
<td>8(40%)</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>5(25%)</td>
<td>5(25%)</td>
</tr>
</tbody>
</table>

**Discussion**

In the present study, 20 patients with OCD were compared with 20 well matched, control group subjects.

All the patients were on medication – all on fluoxetine, 13 of the clinical group were on benzodiazepines (clonazepam <1 mg/day). However, none had taken BZD on the day of cognitive assessment, so that it was ensured that the patient’s psychomotor activity and reaction were not impaired and they were not sedated. The patients who were on tricyclic anti-depressants and/or
This immediate or working memory has been associated reliably with skill acquisition.

The criterion of being ‘useful or relevant only transiently’ distinguishes working memory from other aspects or forms of memory that are maintained over longer periods of time.

The deficits in spatial working memory in OCD as suggested by the study, point towards the involvement of dorsal and ventral streams of neural connections originating at posterior regions, parietal region for spatial stimuli, and feeding forward to the prefrontal cortex.

The results indicate that the patients with OCD shows a specific pattern of cognitive deficits related to spatial working memory, set shifting, abstract reasoning, planning ability and concentration and attentional task.

This interpretation appears to the line with findings from several brain imaging studies, showing in OCD patients a hyperactivity of the circuit including the orbitofrontal, the prefrontal and the cingulate cortex, as well as the caudate nucleus. The frontal and cingulate cortex are crucial for the activity of generating internal cues for initiating planning and monitoring behavioural responses, the basal ganglion in turn, are partly responsible for the gating mechanisms of both internal and external sensory input.

As a result of hyperactivity of this circuit, OCD patients might be overwhelmed by internal cues and might take longer to choose those relevant to the ongoing task and to exclude the irrelevant ones.

References
4. Lucey JV, Bumess CE, Costa DC, et al. Wisconsin Card Sort Task (WCST) errors and...