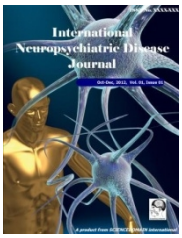

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Sensory Integration Capacity is Diminished in Obsessive Compulsive Disorder Patients with Poor Insight But Not in Patients with Intact Insight

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Authors' contributions

Authors KS and MG designed the study. Author SM performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author IJ managed the literature searches and data assessment. All authors read and approved the final manuscript.

Original Research Article

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ABSTRACT

Aims: The aim of the present study was to assess sensory integration ability of OCD patients with poor and good insight using a Haptic Test for adults.
Study Design: Experimental design.
Place and Duration of Study: Department of Psychiatry, University of Leipzig, between October 2010 and Mai 2013
Methodology: Results of 23 OCD out patients (7 poor insight, 16 good insight) and 23 healthy control subjects, matched for age and sex were compared. Visual-haptic integration was measured using the Haptic Figures Test (HFT).
Results: The analysis showed significant differences between the groups in their number of errors (F (2,43) = 4.68, p<.05) and mean total exploration time (F (2,43) = 9.00, p<.005). Post hoc analyses revealed that OCD patients with poor insight made significantly more mistakes and used longer exploration times than OCD patients with good insight and healthy adults.
Conclusion: The results are indicative of the necessity to use differentiated analyses and group comparisons of patients with OCD. The striking results of OCD patients with poor insight may indicate a deficit in sensory integration especially for this subgroup.

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Keywords: Obsessive compulsive disorder; anosognosia; sensory integration; haptic; tactile; exploration time.

1. INTRODUCTION

Obsessive compulsive disorder (OCD) is characterized by repetitive, unwanted intrusive thoughts and ritualistic behaviors, accompanied by anxiety (DSM-IV) [1]. Relatively little is known about its etiology [2] but a higher prevalence has been observed for first degree relatives [1]. Most models suggest that neurobiological abnormalities are involved in the emergence of OCD [3] with the most dominant current model focusing on abnormalities in orbitofronto-striatal circuits [2]. However, increasing evidence from imaging studies and neuropsychological assessments suggests, that structural brain abnormalities of OCD are not limited to orbitofronto-striatal circuitry [2,4,5]. Additional brain regions that should be considered are the parietal lobe, hippocampus, anterior cingulum and amygdala [2].

Studies focusing on the neuropsychology of OCD have contributed to a better understanding of the neurobiological basis of the disorder [3]. A wide range of neuropsychological comparisons of patients with OCD and healthy control subjects showed deficits of the patients with OCD especially in visuospatial abilities, executive functions and motor speed (among others) [3,4,6,7]. However, the goal to outline a typical neuropsychological profile of OCD has not yet been reached. Many of the past neuropsychological results did not prove to be consistent across different OCD samples (for reviews see) [8,9]. Visuospatial deficits rank as one of the most consistent findings in neuropsychological studies of OCD (among others: [3,4,7,9-11]). Repeatedly, deficits in these tasks have been discussed as a possible sign of parietal involvement in OCD symptomatology [2,3]. Deficits were reported mainly when Wais-R Block Design or Benton Line Orientation were used (for review see) [9]. On the other hand, it has been emphasized that elementary visuospatial perception may not be the key deficit in OCD [11]. In Moritz et al.'s large scale study, impairments were detected in only 10% of their OCD patient sample and then still only when complex tests like block design were administered. However, neither elementary nor complex visuospatial tests were able to discriminate OCD from both healthy and psychiatric control groups [11].

Other studies have shown deficits in sensory integration of other modalities. For instance, deficits in fine-motor ability and visual-motor integration have been shown to be correlated with the persistence of OCD into adulthood in children with OCD [12]. These so called neurological soft signs (NSS) denote minor sensory and motor abnormalities, which cannot be linked to any specific neurological disorder. But they have been associated repeatedly with diverse psychiatric disorders and are believed to indicate vulnerability for psychiatric disorders in children [12-15]. Especially difficulties in sensory integration and motor coordination have been associated with OCD [14,16]. Possibly, as has also been discussed, presence of OCD may only predict performance on measures of sensory-motor function, while deficits in executive abilities may be linked to comorbid depression [17]. Sophisticated neuropsychological tests for adult populations that measure sensory integration other than visuospatial perception are hard to find, however.

Guz and Aygun [6] compared OCD patients to healthy controls and reported NSS impairments in Graphesthesia and 2-Point Discrimination (2PD). To test Graphesthesia the examiner draws capital letters in the test subject's palm. Both Graphesthesia and 2PD assess tactile ability. Deficits in tactile processing may be caused by sensory or conducting problems, or impairments in parietal integration areas [18]. Concerning touch, tactile requirements are among the simplest tasks. The subject remains motionless and passive.

Compared to tactile tasks, the integration requirements are greater when haptic tasks have to be solved (subject actively moves and explores). Haptic perception requires the integration of sensory information from skin receptors and because of the subject's movements, the information from receptors of muscles, joints and tendons [18]. The processing of this multisensory integration task has also been localized in the parietal lobe [19-22].

To add a piece of information to the discussion about the relevance of sensory integration ability in OCD, we are going to assess (multi-) sensory integration by means of a new visual-haptic integration test suitable for adults (HFT) [23]. We expect to find group differences between the OCD sample and healthy control group (Hypothesis 1), with deficits in the OCD group.

Additionally to Hypothesis 1 we want to analyze if deficits in solving a visual-haptic task are more common in patients with certain characteristics. For this purpose we will further analyze the data of patients with poor insight. Insight has been reported to be associated with symptom severity [5,16,24-26]. A medium to strong correlation of symptom severity and neuropsychological test performance has also been reported [7,16,27,28]. However, few systematic neuropsychological comparisons of OCD patients with good insight, poor insight and healthy controls are available from the literature.

DSM-IV [1] provides the supplementary coding 'insight', labelling patients with OCD either with insight or with poor insight. Patients of the latter group fail to recognize that their obsessions or compulsions are excessive or unreasonable. Besides an association of symptom severity and insight, several studies have shown a relationship of insight with earlier onset of OCD; comorbid depressive symptoms; higher comorbid schizotypal personality disorder; higher rate of schizophrenia spectrum disorders in 1st degree relatives as well as insufficient response to cognitive behavioural therapy and serotonin reuptake inhibiting medication (SRIs) among others [5,16,24-26]. As the possible reason for clinical and neuropsychological differences of patients with good and poor insight neurobiological differences have been discussed due to findings of a higher number of brain abnormalities in patients with poor insight [5,16].

Additionally, it has been shown that neurological soft signs in sensory integration (measured by audiovisual integration; stereognosis; graphesthesia; extinction und right/left confusion) may occur only in OCD patients with poor insight, but not in patients with good insight and healthy adults [16]. We assume, accordingly, that patients with poor insight will differ in their haptic integration ability from patients with good insight and healthy control subjects (Hypothesis 2). We expect to find longer exploration times and more mistakes in the visual-haptic task for that group, as previous studies have found psychomotor slowing (finger tapping) [7] and abnormalities in information processing speed [3,7,11] in their OCD samples compared to healthy control groups.

Our goal was, to our knowledge for the first time, to assess visual-haptic integration ability in OCD. With this primary parietal task we hope to contribute new neuropsychological information to the discussion of insight in patients with OCD.

2. METHODOLOGY

2.1 Participants

The study sample included 23 patients with a primary diagnosis of OCD according to ICD-10 criteria Table 1. Obsessive Compulsive symptom severity at intake according to Yale-Brown Obsessive-Compulsive Scale (Y-BOCS [29]; German version [30]) ranged from 18 to 35 (M = 26.64, SD = 4.98). On the basis of Y-BOCS item 11 patients were partitioned into patients with poor insight (7) and good insight (16). The majority of patients suffered from contamination and aggression obsessions and checking, cleaning, repeating compulsions. Only one patient was diagnosed with hoarding symptoms.

Table 1. Descriptive statistics

	OCD	CO	Statistics	
	M (SD)	***M (SD)***	***z*[a]**	***p***
N	23	23		
Age	35.39 (10.58)	34.83 (12.66)	-0.682	.49
Sex (male/female)	10 / 13	8 / 15	-0.598	.55
Y-BOCS total	26.64 (4.98)	-		

OCD = Obsessive Compulsive Disorder; CO = Control group; Y-BOCS = Yale-Brown Obsessive Compulsive Scale; [a]Mann Whitney U Test

At the time of testing 15 of the 23 subjects (4 of the patients with poor insight, 57.1% and 8 of the patients with intact insight, 68.8%) were medicated with selective serotonin reuptake inhibitors (SSRIs). All patients were treated with cognitive behavioural therapy. Five subjects have had previous depressive episodes, with two subjects mildly depressed at the time of testing. The outpatients were recruited from the Centre of Mental Health of the university hospital of Leipzig, Germany. Criteria to take part in the study were primary diagnosis of OCD and between 18 and 60 years of age. Patients with comorbid neurological disorders, any diseases possibly causing polyneuropathy (PNP) or brain lesions were excluded from the study.

The control group was comprised of 23 individuals matched for sex and age taken from a random community sample and rewarded 10€/h.

The study was approved by the local ethics committee of the university hospital of Leipzig. All test subjects took part voluntarily and gave written informed consent. They were naive to the stimuli and had never taken part in haptic experiments or similar studies. All data were anonymized and used confidentially.

2.2 Tests and Procedures

Demographic features and handedness were assessed before the administration of the Haptic Figures Test (HFT) [23] by the authors. Handedness was assessed via pantomime of common daily activities such as writing, brushing teeth and using a screwdriver.

The Haptic Figures Test (HFT) [23] is a culture fair instrument to measure visual-haptic integration ability. The test consists of 16 two-dimensional relief stimuli Fig. 1a. Each stimulus is presented in a small plastic box that is covered by an opaque PVC layer Fig. 1b.

Thus, the stimuli may be explored haptically with open eyes but remain invisible. The test subjects were asked to explore the stimuli and match them to a visual display which depicted all 16 figures (for further description of the stimuli and their application see) [23]. Exploration time per stimulus in seconds and correctness of recognition were measured. This led to two dependent variables per group: number of errors (errors) and mean total exploration time (expl_time). There was no time limit set for the exploration but stimuli were marked as „not recognized“, when exploration time exceeded 3 minutes.

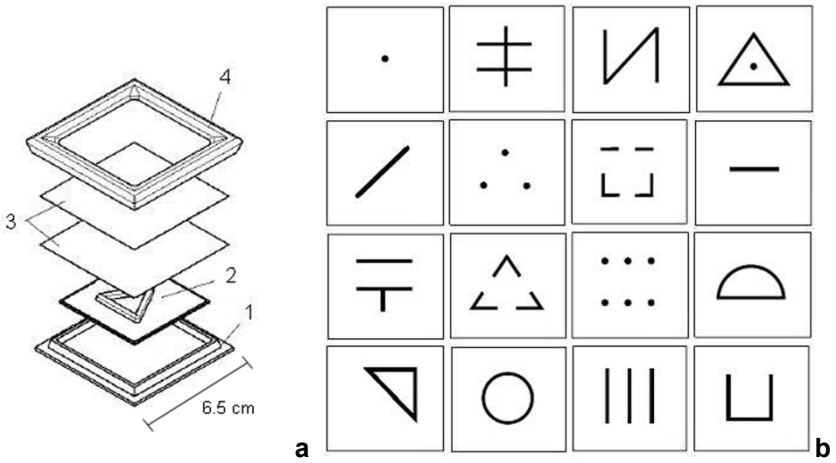

Fig. 1a. Sketch of the plastic box: 1. base plate, 2. relief stimulus, 3. opaque PVC layer, 4. retaining frame; 1b. Visual display of all 16 stimuli

To create a situation in which short term relief of anxiety through reassurance seeking [7] and reliance on external feedback to reduce doubt and responsibility for feared outcomes [31] would not be possible, feedback was not given during testing.

Within the sample of this study there should be no variance due to examiner-examinee interaction (cf. [7]), since all OCD patients were tested by the same examiner in a strict test setting. The experimenter was blind to the study's hypotheses.

2.3 Statistical Analysis

To analyze the data statistics software SPSS 20.0 (for windows, SPSS, Chicago, IL) was used. Group comparisons were conducted using Mann Whitney *U* Tests, Chi-square tests and one-way ANOVAs.

3. RESULTS

3.1 Hypothesis 1: Comparing CO and OCD

OCD patients (entire sample) did not differ from the healthy control group in sex or age Table 1.

The one-way ANOVA showed significant differences between OCD patients and the healthy control group in their mean total exploration time ($F(1,44) = 7.79$, $p<.01$; $M_{CO} = 14.86$, $SD = 7.61$; $M_{OCD} = 25.88$, $SD = 17.34$; Fig. 2). The OCD patient group and control group did not

differ in their number of errors, however (F(1,44) = 0.24, p = .624; M_{CO} = 0.78, SD = 0.90; M_{OCD} = 0.96, SD = 1.43).

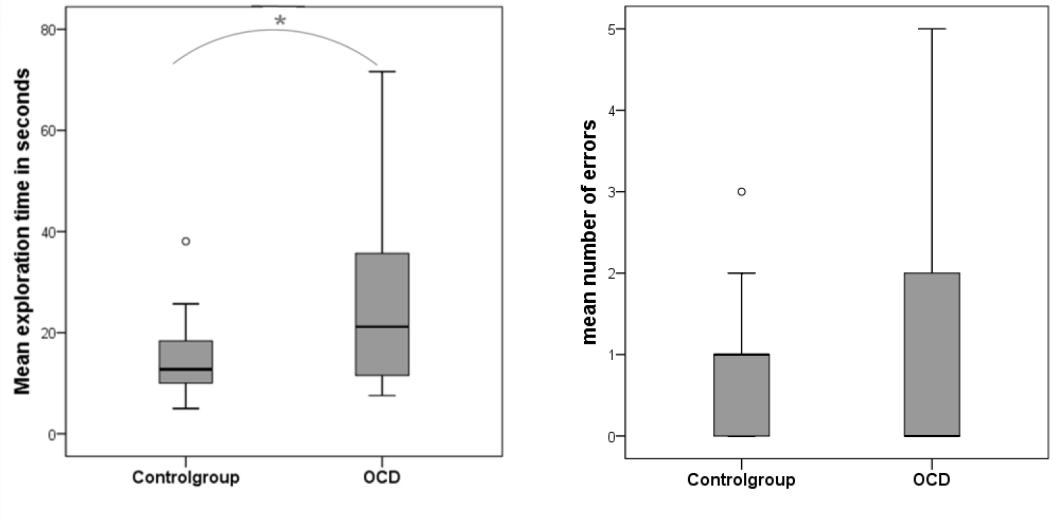

Fig. 2. The box plots depict the mean distributions of exploration times and number of errors of the control and patient group. The little circles mark outlier values. Asterisks indicate significant differences.

3.2 Hypothesis 2: Insight

OCD subgroups with good and poor insight did not differ from the healthy control group in sex or age (χ^2 = 1.13, p = .57; χ^2 = 1.20, p = .55).

A one-way ANOVA was conducted to evaluate the differences between patients with poor insight and good insight and healthy controls in their number of errors and exploration times. The analysis showed significant differences between the number of errors (F(2,43) = 4.68, p<.05) and mean total exploration time (F(2,43) = 9.00, p<.005). Post hoc analyses using the Scheffé post hoc criterion for significance indicated that patients with poor insight made significantly more mistakes than the participants of the control group (p < .05) and OCD patients with good insight (p < .05; M_{Co} = 0.78, SD = 0.90; M_{OCD_GI} = 0.50, SD = 1.09; M_{OCD_PI} = 2.00, SD = 1.63; Fig. 3a) – confirming hypothesis 2. Post hoc analyses (Scheffé test) for mean total exploration time showed a similar picture: Patients with poor insights needed significantly longer exploration times than the participants of the control group (p < .005) and OCD patients with good insight (p < .05; M_{Co} = 14.86, SD = 7.61; M_{OCD_GI} = 20.82, SD = 16.31, M_{OCD_PI} = 37.44, SD = 14.58; Fig. 3b).

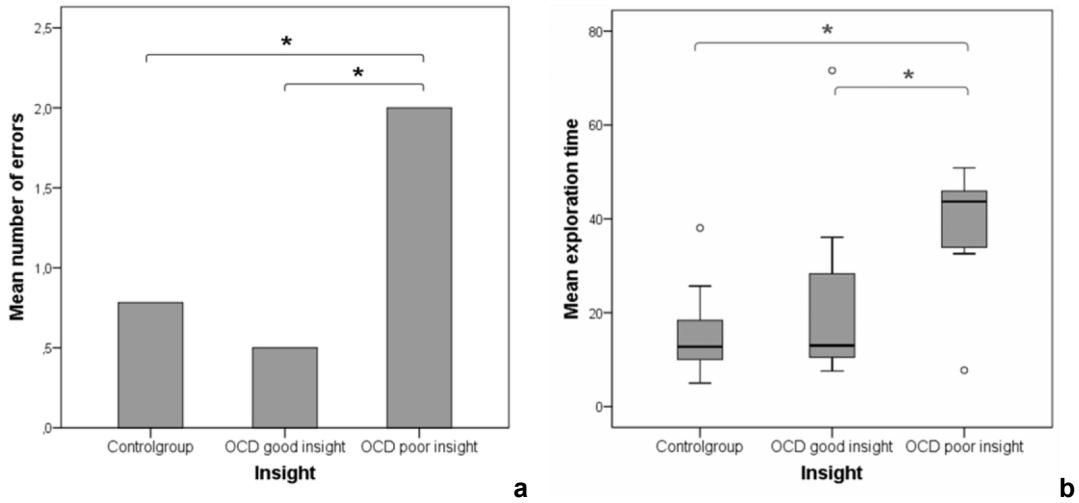

Fig. 3a. The box plots depict the mean distributions of exploration times and number of errors of the control group, OCD patients with good insight and poor insight. 3b. The diagram depicts the mean number of errors of the control group, OCD patients with good insight and poor insight. Asterisks indicate significant group differences. Little circles mark outlier values.

4. DISCUSSION

We expected to find significant group differences indicating a deficit for the OCD patient group, with both longer exploration times and more mistakes in the poor insight group.

The OCD group (entire sample) and healthy control group did not differ in their number of errors. But the OCD patients used significantly longer exploration times to achieve this. This finding partially confirms Hypothesis 1. So far neuropsychological trials have consistently revealed deficits in OCD patients among others [9,32,33]. Some authors have suggested that neuropsychologically OCD may be characterized primarily by psychomotor slowing and information processing speed [7]. As opposed to this, no difference in operating speed (TMT B – A, Trail making test) could be found in the large Dunedin long-term study between OCD patients and a non-OCD sample (participants of the study that had not developed OCD by the age of 32 [13]. According to the very extensive and detailed review of Kuelz et al. [9] decelerations in OCD were found in about half of all studies that measured processing speed.

The impact of selective serotonin reuptake inhibitors (SSRI) on neuropsychological test results of OCD patients is widely analyzed and discussed with few consistent findings so far [7,11,34]. From the analysis of effect sizes of medicated versus unmedicated samples, impairments in speed of information processing seem at least partly due to psychotropic medication [9]. Reduction in processing speed cannot entirely be explained by SSRIs, however, as the study by Tükel et al. [3] showed: unmedicated patients with OCD were slower than healthy adults in TMT B – A. As more than half of the participants in the present sample were medicated, the prolongation of exploration time may possibly be due to SSRI intake.

Hypothesis 2 was confirmed as OCD patients with poor insight showed severe difficulties in solving the HFT. They required longer exploration times than patients with good insight and healthy adults and made significantly more mistakes. Our results show similar indications as Karadag and colleagues [16] who proposed that neurological soft signs in sensory integration (measured by audiovisual integration; stereognosis; graphesthesia; extinction und right/left confusion) occur only in OCD patients with poor insight, but not in patients with good insight and healthy adults. Since approximately the same percentage of patients were medicated in both groups (poor insight 57%, good insight 68%), but only the participants of the poor insight group showed significantly longer exploration times, it may be possible that the deceleration of exploration may be associated with poor insight rather than medication.

Poor insight has been linked to general cognitive impairment and cognitive dysfunction with possible organic origin in patients with bipolar I disorder; schizophrenia as well as OCD [5,27,35,36]. Aigner et al. [5] performed MRI scans on 82 patients with OCD and assessed their insight level. They found brain abnormalities in 40 of the patients (with 30 of them diagnosed with poor insight) with most patients' abnormalities localized in basal ganglia and second most in the parietal cortex. 83% of the patients with poor insight showed brain abnormalities, while only 20% of the good insight patients did. Systematical studies that compare neuropsychological and imaging results of OCD patients with poor and good insight are not yet available, however.

In line with our hypothesis and previous studies (e.g.) [16] OCD patients with poor insight had the most difficulties solving the HFT. In our sample all but one patient with poor insight were also diagnosed with indecisiveness. Therefore, no conclusions can be drawn at this point about the relationship of test results and insight alone. However, evidence suggests a negative correlation of insight and indecisiveness [26]. Possibly, as Jaafari et al. [26] suggest, there may be a regular association between insight and indecisiveness which in turn may be associated with underlying cognitive impairment. So far, an association has been shown for patients with checking and hoarding compulsions [26,37,38]. In our sample 16 of 23 patients were diagnosed with a checking compulsion and only one with hoarding.

Feedback was not given during testing. Therefore, test subjects did not have any possibility to soothe doubts or to seek reassurance to avoid possible mistakes (cf.) [31]. The consequences of blocking this urge, that has been associated with indecisiveness [7,39], may reflect in the long exploration times of the subgroup with poor insight and indecisiveness combined.

In summary, the results underline the necessity to further analyze subgroups of patients with OCD. The present study suggests that insight may be a mediating variable behind inconsistent neuropsychological findings for heterogeneous OCD samples. In the present study, 7 participants with poor insight accounted for the mean group differences found between the patient and control sample. However, future studies should try to evaluate the impact of SSRIs on sensory integration measures. As more than half of the patients with OCD were treated with SSRIs, the lack of difference between control and study group could also be due to SSRI treatment.

The inconsistent findings of previous studies have been attributed to small sample size, inadequate accounting for comorbid illnesses and the heterogeneity in symptom presentation of OCD among others [12]. The sample size of our study was small as well, with fewer patients with poor insight than with intact insight. Future studies will require bigger

sample sizes and covariate tests. Especially sex differences should be considered, since studies have shown that men and women differ in their haptic perception [40;41].

In our study, insight was assessed by item 11 of the Y-BOCS, which has been used in many other studies investigating insight in OCD [5,42,43]. Due to the exploratory nature of the study this should not pose as a problem. However, in future studies a more discerning dimensional measure should be applied, e.g. OVIS (overvalued ideas scale; cf.) [16]. Also, regular indecisiveness assessments should be conducted to elucidate the relationship of insight and indecisiveness.

5. CONCLUSION

The present study contributed to existing evidence that shows that OCD patients with poor insight show greater neuropsychological deficits. Patients with good insight did not show any deficits in solving the HFT. Our results may suggest differential cognitive functioning of OCD patients with good and poor insight which may have implications for treatment and research (cf.) [44]. Possibly, the HFT may be useful as a tool to monitor novel treatment paradigms for OCD.

Future studies should determine whether results of visual-haptic integration tasks correlate with results from imaging procedures and whether OCD patients with good and poor insight differ in their white or gray matter.

CONSENT

All participants took part voluntarily and gave their consent.

ETHICAL APPROVAL

The study was approved by the ethical review committee of the university hospital of Leipzig.

ACKNOWLEDGEMENTS

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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