



Over facilitation of unadapted cognitive processes in obsessive compulsive disorder as assessed with the computerized mirror pointing task



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ARTICLE INFO

Article history:

Received 17 October 2016

Received in revised form

22 December 2016

Accepted 26 January 2017

Keywords:

Obsessive Compulsive Disorder (OCD)

Neuropsychology

Cognition

Motor learning

Over facilitation

Response inhibition

ABSTRACT

Response inhibition has been suggested to be dysfunctional in obsessive-compulsive disorder (OCD). However, this process involves intentional cognitive control, which does not correspond to the automatic emergence of stereotyped thoughts and behaviours usually reported by patients with OCD. In the present study, the excessive facilitation of unintentional processes was assessed in OCD by using the *Computerized Mirror Pointing Task* (CMPT).

Seventy-six volunteers participated in this study, including 39 patients with OCD and 37 healthy controls. The CMPT was administered to all participants, and a score of appropriateness of the sensorimotor adaptation to the mirror inversion was computed from the initial deviation angle (IDA), that precedes the intentional readjustment of movement.

Results showed that throughout the 40 trials of the CMPT, the IDA score remained significantly abnormal in patients with OCD in comparison with control participants. Further analyses of IDA scores in OCD revealed a clear tendency to keep a natural visuomotor processing that is rigid and unadapted to the mirror condition.

Irrespective of the physical requirements of the environment, patients with OCD showed a strong tendency to initiate movements as per a previously consolidated - although unadapted - sensorimotor mapping. This suggests a tendency for an excessive facilitation of unintentional stereotyped processes. Further studies should be conducted on this question by using tasks sensitive to cognitive processes other than visuo-spatial abilities.

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1. Introduction

Obsessive-compulsive disorder (OCD) is a debilitating psychiatric condition with a world prevalence of 1.5–3% (Ruscio et al., 2010). Symptoms in OCD are characterized by persistent and distressing intrusive obsessions that trigger anxiety. These obsessive thoughts are often associated with rituals or compulsive behaviours, which the patients feel compelled to perform in order to

reduce or prevent distress (American Psychiatric Association, 2013).

Although the pathophysiology of OCD is not well known, brain imaging studies have demonstrated increased resting state frontostriatal activation, which was found to positively correlate with symptoms severity (Harisson et al., 2009). This abnormal activation in the frontostriatal network was particularly well evidenced during performance on tasks requiring response inhibition, planning, or switching (Aycicegi et al., 2003; Kwon et al., 2003; Lucey et al., 1997; Nabeyama et al., 2008; Schlosser et al., 2010; Van den Heuvel et al., 2005). Authors generally postulate that excess activity in this circuit is responsible for the obsessive thoughts or ritualistic compulsive behaviours in OCD, as excess tone in this

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pathway lowers the threshold to permit stereotyped or well-consolidated behaviours (Saxena and Rauch, 2000).

The triggering of stereotyped thoughts or behaviours has been suggested to result from a disturbance of a top-down cognitive processing, that is to say a reduced capacity to inhibit the automatic processing underlying these manifestations (Tolin et al., 2002). Conversely, a bottom-up disturbance has also been suggested, referring to an excessive facilitation of these stereotyped processing (Bannon et al., 2008). In OCD, difficulties in inhibiting automatic responses have been largely studied by using cognitive tasks such as the Stop Signal Task (Logan and Cowan., 1984), the anti-saccade task (Rosenberg et al., 1997), the object alternation test (Abbruzzese et al., 1995; Cavadini et al., 1998), the Stroop test (Martinot et al., 1990; Schmidtke et al., 1998), or the Go/NoGo task (Bannon et al., 2002). These tasks all require an intentional inhibition, which is a voluntary suppression of the irrelevant actions or thoughts taking place at the time of their occurrence. For example, in the Stop Signal Task the patients are required to rapidly respond to visual stimuli (go signals), knowing that on some trials an auditory stimulus (stop signal) will be presented, requiring them to intentionally inhibit their already pre-activated or pre-programmed response. However, inconsistent results have been obtained with such tasks, and a recent meta-analysis revealed no clear evidence that a response inhibition deficit may exist in OCD (Abramovitch et al., 2013).

In contrast with the response inhibition theory, the hypothesis that OCD symptoms may result from stronger facilitation of stereotyped processes has not been extensively studied (Bannon et al., 2008). Evidence has been obtained mostly through using traditional repetition-priming tasks (Hartston and Swerdlow, 1999; Thomas et al., 2016). In these tasks, stimuli identification or recognition is typically faster when a relevant cue has been presented just before. This priming effect is a non-intentional phenomenon found to be exaggerated in OCD, suggesting an excessive facilitation process. Thought suppression studies (Janeck and Calamari, 1999) have also contributed to the view that some excessive facilitation processes may underlie the unintentional occurrence of obsessive thoughts and compulsive behaviours in OCD. In such a task, participants are asked to identify a recent intrusive thought that would be used as a suppression target. Then, the frequency of occurrence of this target thought is assessed in three consecutive conditions lasting five minutes each in which the participant is required respectively to 1) think about anything, 2) not to think about target thought, and 3) think again about anything. Patients with OCD consistently reported higher frequency of the target thought compared to normal controls, irrespective of the condition, even in the initial and last monitoring periods when no thought suppression was required. This reinforces the view of unintentional excessive facilitation of stereotyped processing in OCD, instead of a difficulty in thoughts suppression. Hartston and Swerdlow (1999) note « The automatic and repetitive nature of obsessions may be the result of the obsession establishing a prime for itself and facilitating its own recurrence, like a groove in the brain ». A similar process was suggested to contribute to the automatic and self-facilitating nature of compulsions.

These results underline the importance of developing new tools allowing the detection and quantitative measurement of excessive facilitation processes in OCD. Such measurements must therefore be independent from the participant's intention to control thoughts or actions. Rather, they must be able to detect the covert or internal processing underlying the stereotyped behaviours or thoughts. A tool such as the Computerized Mirror Pointing Task (CMPT) (Paquet et al., 2008; Richer et al., 1999) would be useful for such a purpose. It has been used in the past to assess the overt difficulty that patients with frontostriatal disorders have sometimes to adapt their sensorimotor processing to a new physical environment. CMPT was

employed here as a surrogate measurement of the covert stereotyped processing in OCD.

In the present study, patients with OCD were compared with control participants on the CMPT, in order to verify the hypothesis that an excessive facilitation of stereotyped processes might underlie unadapted thoughts and behaviours in this clinical condition.

2. Methods

2.1. Participants

The sample included 39 patients with a diagnosis of OCD, and 37 healthy participants considered as control subjects. Both groups were matched for age, sex, education, handedness and the WAIS-III vocabulary sub-score as a surrogate measurement of general IQ. All participants were enrolled and assessed at the Research Centre of the Montreal Mental Health University Institute. They were all self referred following local advertisements announcing a larger research project, aiming to assess the efficacy of psychotherapy in OCD, and requiring both healthy individuals and patients with OCD. A telephone screening was conducted first to verify the inclusion and exclusion criteria in both OCD and healthy participants. Then, in patients with OCD, a face-to-face interview was scheduled to confirm the primary diagnosis of OCD based on the Structured Clinical Interview for DSM-IV (SCID-IV). Aside from the DSM-IV criteria, OCD was also confirmed by a score over 16 in the Yale-Brown Obsessive Compulsive Scale (Y-BOCS) (Goodman et al., 1989a, 1989b). All participants had to be free of any current substance abuse, current or past schizophrenia, bipolar disorder, or medical conditions that may affect behaviour or cognition. Medications for OCD, and the presence of secondary anxiety or depression were not considered as exclusion criteria.

2.2. Procedure

All participants with OCD were required to complete a series of five clinical scales, and two neuropsychological tests, in addition to the experimental task. The latter consists of the CMPT (See below). These tests were all administered during the face-to-face screening session by a trained independent evaluator, prior to initiating the larger research project on the OCD psychotherapy. None of the participants were undergoing any psychotherapy at the time of data acquisition for the current study.

2.3. Clinical scales

The Y-BOCS (Goodman et al., 1989a, 1989b) was administered as a semi-structured interview assessing two major dimensions of OCD: obsessions and compulsions. Each subscale is composed of five items, rated from 0 to 4, and assessing frequency, interference, distress, resistance, and control. The total score may vary between 0 and 7 (sub-clinical), 8–15 (mild), 16–23 (moderate), 24–31 (severe), or 32–40 (extreme).

The Overvalued Idea Scale (OVIS) (Neziroglu et al., 1999) is an 11-item clinician administered rating scale for measuring overvalued ideas, over a 1-week period in patients with OCD. Overvalued ideas are present in a proportion of OCD patients, and refer to the strength, or conviction associated with beliefs, and which are difficult to erase from the mind. The OVIS average score provides an estimate of degree of overvalued ideas. The greater the OVIS score, the greater is the intensity of the overvalued ideas.

The Inferential confusion questionnaire (ICQ) (Aardema et al., 2005) was used to assess the confusion between reality and possibility, considering that patients with OCD usually persists in obsessional beliefs despite sense information to the contrary. The

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