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The temporal relationship between premonitory urges and covert compulsions in patients with obsessive-compulsive disorder

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ABSTRACT

Recent studies in patients with obsessive-compulsive disorder (OCD) have shown that many compulsions are associated with urges rather than obsessions. Premonitory urges are uncomfortable sensory feelings or a rising inner tension, often likened to the urge to scratch, yawn or blink. We studied premonitory urges preceding mental compulsions in 19 patients with OCD and preceding eye blinks in 16 healthy controls. Urge intensity was assessed continuously over 20 min using a real-time urge intensity monitor; compulsions and blinks were measured as discrete events in a free compulsion/blinking and a compulsion/blink suppression condition. Urge intensity showed an inverted U-shaped relationship (increase then decrease) around compulsions within a time-window of approximately 60 s in patients with OCD and within 13 s around blinks in healthy controls. Urge intensity was higher during compulsion / blink suppression and varied more independently of compulsion execution in patients with OCD. There is a close temporal relationship between premonitory sensations and compulsion execution that changes when compulsions are suppressed, indicating that urge intensity might drive the execution of and is then alleviated by compulsions. Suppression weakens the association between urge intensity and compulsion execution.

1. Introduction

Obsessive-compulsive disorder (OCD) is the fourth most common psychiatric disorder with a lifetime prevalence of 1–3% (Karno et al., 1988; Kessler et al., 2012; Ruscio et al., 2010). It is characterized by repetitive, intrusive thoughts or impulses (obsessions), and the repetitive execution of overt or mental (covert) acts (compulsions) aiming at "neutralizing" these distressing thoughts or feelings (DSM-5, 2013). Neutralizations, similar to overt compulsions, are carried out in an attempt to reduce the likelihood of a feared event to occur or to reduce the discomfort caused by intrusive thoughts or impulses, which are often experienced as morally or physically repulsive (Rachman and Shafran, 1998). Neutralization is mainly a covert mechanism and is referred to as a compulsion when the same neutralization is repeatedly used whenever a certain obsessive thought intrudes (Rachman and Shafran, 1998).

While it has long been assumed that obsessions and compulsions are the defining symptoms of this disorder (Fontenelle et al., 2004), more recent studies suggest that patients with OCD display highly heterogeneous symptoms and that existing treatments relieve symptoms only in a proportion of patients (Braga et al., 2010; de Haan, 2006; Farris et al., 2013). This has inspired the question whether treatment response in patients with OCD could be optimized if treatment could be tailored to specific subtypes of OCD (Ferrao et al., 2006; McKay et al., 2004), such as gender (Labad et al., 2008; Mathis et al., 2011), symptom dimensions, e.g. contamination/washing vs. checking (Ferrao et al., 2006; Leckman et al., 2010; Okada et al., 2015), comorbid tic disorders (Conelea et al., 2014; Jaisoorya et al., 2008) or experiencing sensory phenomena (Miguel et al., 2000; Prado et al., 2008).

Sensory phenomena have first been described in patients with Gilles de la Tourette syndrome (GTS) (Bliss, 1980) and typically precede repetitive behavior (Brandt et al., 2016). Researchers have recently defined different premonitory sensory phenomena, although they are not clearly distinct (Cavanna and Nani, 2013). "Premonitory sensation" refers to any sensation that precedes the onset of tics or compulsions. The temporal order of these sensations in relation to tics was long under

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debate and it has only recently been experimentally shown that the term "premonitory" is justified (Brandt et al., 2016). The specific premonitory sensation that accompanies tics and compulsions can be further classified into categories (Cavanna and Nani, 2013). An "urge" is a drive to execute repetitive behaviors in the absence of obsessions. "Just-right experience" refers to a feeling of imperfection and the need for things to feel or look a certain way. Patients will repeatedly execute compulsive behaviors until a feeling of completeness is reached. Sensory tics are uncomfortable bodily sensations, experienced, for instance, in muscles or joints that drive repetitive actions until the patient feels relieved (Cavanna and Nani, 2013). "Sensory phenomena" describe bodily sensations, such as pressure-like, warm, cold, or tickling sensations (Banaschewski et al., 2003). While the quality of these subjective sensations may be described in different ways, they are commonly thought to precede a repetitive behavior and subside when the behavior has been executed.

Premonitory sensations were initially assessed in patients with OCD with and without tics to differentiate subgroups of patients on the OCD-TS spectrum (Leckman et al., 1994; Miguel et al., 2000; Prado et al., 2008), but a recent study in a large sample of patients with OCD found that the majority (65%) of patients experienced premonitory sensations rather than obsessions prior to at least one repetitive behavior and that the strongest predictor was symmetry/ordering/arranging, followed by the presence of tics (Ferrao et al., 2012).

Characterizing premonitory sensations in patients with OCD can be helpful in determining which behavioral interventions may be most effective in treating the associated compulsions (Summerfeldt, 2004). Although different types of premonitory sensations have been described in patients with OCD (Ferrao et al., 2012; Miguel et al., 2000), they have so far relied mostly on questionnaire data and self-reports (Ferrao et al., 2012; Sampaio et al., 2014). Little is known about the temporal relationship between premonitory sensations and compulsions in OCD. Although exposure with response prevention (ERP) relies on the assumptions that premonitory sensations increase before repetitive behaviors are executed, and then subside, this assumption has never been experimentally tested. Furthermore, it is unclear in what time-window clinicians should expect this rise and fall of urges to occur. There is some evidence showing that neutralizing thoughts leads to an immediate temporary relief in anxiety and the urge to neutralize (Rachman et al., 1996) but exact timings have not been assessed. However, knowledge about this relationship is essential in tailoring behavioral interventions to patients with OCD who experience premonitory sensations.

The following study aimed to address several open questions regarding the urge to perform mental compulsions in patients with OCD. First, we hypothesized that urge intensity increases prior to mental compulsions and decreases following the compulsion. We further tested the hypotheses that urge intensity increases overall when compulsions are suppressed and that variation in urge intensity becomes more independent from compulsion execution under suppression. Finally, we were interested in the time-window in which urge intensity increases and decreases around compulsions. The urge to execute compulsions was compared to the urge to blink in healthy controls. A control group was included to assure that the experimental paradigm worked and to compare a physiologically necessary urge (eye blinking) with an urge that has no apparent necessity (premonitory urge).

2. Methods and materials

2.1. Participants and clinical assessment

Nineteen patients with a diagnosis of OCD (aged 30.58 ± 9.68; 5 female), all of whom had mental compulsions, according to DSM-5 (DSM-5, 2013) and 16 healthy controls (aged 33.13 ± 13.59; 10 female) were included in this study. patients with OCD were recruited from the Department of Psychiatry and Psychotherapy at the University Clinic in Lübeck. All patients had undergone a comprehensive clinical assessment and had been diagnosed by an experienced clinician in a unit specialized for OCD treatment (for comorbidities see supplementary table 1). Patients received a written information sheet about the study in the clinic. If patients were interested, they could agree to be contacted by the experimenter or contact the experimenter. Inclusion criteria encompassed a confirmed OCD diagnosis, experiencing urges and mental compulsions and age > 18. Exclusion criteria encompassed psychosis and most neurological diseases (apart from tics). Exclusion criteria for healthy controls encompassed an OCD, ADHD or tic diagnosis and any neurological disease. All procedures contributing to this work complied with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. All participants gave their written informed consent.

In order to further characterize the sample, OCD symptom severity was assessed using the „Yale-Brown Obsessive Compulsive Scale" (Y-BOCS; Goodman et al., 1989a, 1989b) a structured interview with very good reliability (Goodman et al., 1989b) and good convergent but poorer divergent validity (Goodman et al., 1989a; Kim et al., 1990) and the „Obsessive Compulsive Inventory- Revised" (OCI-R; Foa et al., 2002), a self-report scale with good reliability, convergent and divergent validity (Gonner et al., 2008; Hajcak et al., 2004). Presence and severity of tics was assessed with the „Yale Global Tic Severity Scale" (YGTSS; Leckman et al., 1989), a clinician-rated tic scale with high internal consistency, stability and convergent as well as discriminant validity (Storch et al., 2005). Likelihood of having (had) a tic disorder was assessed with the „Diagnostic Confidence Index" (DCI; Robertson et al., 1999). Psychometric properties of the DCI are not well established but it is a useful, structured instrument to assess whether a patient may fulfil criteria for a tic disorder at present or in the past (Robertson et al., 1999).

2.2. Experimental procedure

Participants were seated in front of a laptop displaying the real-time urge monitor (Fig. 1A and B). The laptop screen showed a coordinate system with an intensity scale on the y-axis, which ranged from 0 − 100; 0 was equivalent to no urge and 100 represented the strongest urge participants typically experience. The x-axis represented time. After pressing the start button, a countdown (3–2 s – 1–0 s) indicated time to start. Then a blue line appeared on the right side of the coordinate system at level 50, moving towards the left, crossing the screen within 10 s. The blue line could be adjusted to the current level of urge intensity by moving a scroll bar on the right side of the screen via a mouse pad. All participants practiced the task for 1 min. The validity of the real-time urge monitor has been assessed and the task has been described in detail in a previous study (Brandt et al., 2016).

Participants were instructed to report changes in urge intensity immediately and continuously (Fig. 1A). Patients with OCD were asked to report the intensity of their current urge to execute a mental compulsion, whereas healthy controls reported their urge to blink. Patients with OCD were asked to additionally report the occurrence of mental compulsions by pressing a foot pedal (Fig. 1B). Urge intensity was measured a) during a free compulsions/blinking condition and b) during a compulsion/blink suppression condition (instruction: "please suppress the execution of compulsions / eye blinking in the next 10 min for as long as you can"). Each condition was assessed in 2 × 10 min blocks (Fig. 2A). Participants were given 2 min breaks between the blocks. The task always started with the free blocks, to avoid after-effects of compulsion/blink suppression on urge intensity or compulsion/blink frequency in the free condition. Blinks were captured by video using a Panasonic HDC-TM700, with a frame rate of 25 frames per second. Patients with OCD were also filmed during the task to detect overt compulsions or tics. None of the patients displayed overt compulsions during the task.