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Obsessive–compulsive tendencies may be associated with attenuated access to internal states: Evidence from a biofeedback-aided muscle tensing task

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ABSTRACT

The present study was motivated by the hypothesis that inputs from internal states in obsessive–compulsive (OC) individuals are attenuated, which could be one source of the pervasive doubting and checking in OCD. Participants who were high or low in OC tendencies were asked to produce specific levels of muscle tension with and without biofeedback, and their accuracy in producing the required muscle tension levels was assessed. As predicted, high OC participants performed more poorly than low OC participants on this task when biofeedback was not available. When biofeedback was provided, the difference between the groups was eliminated, and withdrawing the monitor again reversed this effect. Finally, when given the opportunity, high OC participants were more likely than low OC participants to request biofeedback. These results suggest that doubt in OCD may be grounded in a real and general deficiency in accessing internal states.

1. Introduction

One of the principal symptoms in patients with obsessive–compulsive disorder (OCD) is persistent doubt that can invade many domains of actions and feelings and lead to a variety of pathological behaviors typical of OCD, including excessive self-monitoring, repeated checking, mental reconstruction, repeated questions and demands for external validation or reassurance (American Psychiatric Association, 2000; Dar, 2004). The role of this endemic doubt and uncertainty in the phenomenology and etiology of OCD has been widely acknowledged in research and in theoretical models of the disorder. Excessive doubt in OCD has been demonstrated in relation to various cognitive functions such as memory (e.g., Constans, Foa, Franklin, & Mathews, 1995; Cougle, Salkovskis, & Wahl, 2007; McNally & Kohlbeck, 1993; Sher, Frost, & Otto, 1983; Tolin et al., 2001), decision making and concentration (Nedeljkovic & Kyrios, 2007; Nedeljkovic, Moulding, Kyrios, & Doron, 2009), attention and perception (Hermans, Martens, De Cort, Pieters, & Eelen, 2003; Hermans et al., 2008; van den Hout, Engelhard, de Boer, du Bois, & Dek, 2008; van den Hout et al., 2009) and personal knowledge (Dar, Rish, Hermesh, Fux, & Taub, 2000). Classic models of OCD contended that OCD patients also doubt other internal states, such as feelings, preferences, comprehension, wishes and beliefs (Janet, 1903; Rapoport, 1989; Reed, 1985; Shapiro, 1965). Finally, more recent models of OCD have postulated a central role for doubt and uncertainty in regard to concerns about safety (Boyer & Lienard, 2006; Szechtman & Woody, 2004), task completion (Summerfeldt, 2004, 2007) and the self-concept (e.g., Aardema & O'Connor, 2007; Doron, Kyrios, & Moulding, 2007).

In line with the research and models mentioned above, we have recently hypothesized that obsessive–compulsive (OC) individuals have a reduced sense of subjective conviction. We suggested that this reduced conviction is not limited to

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harm-avoidance or task-completion concerns, but can be relevant to any internal state. By internal states we mean subjective states that cannot be fully assessed by outside observers or objective measures. Internal states can be cognitive (e.g., perception, memory, comprehension), affective (e.g., attraction, specific emotions) or bodily (e.g., muscle tension, proprioception). In addition, we suggested that OC individuals attempt to compensate for their deficient subjective conviction regarding these internal states by developing and relying on proxies for subjective experiences. By "proxies" we mean substitutes for the internal state that the individual perceives as more easily discernible or less ambiguous, such as rules, procedures, behaviors or environmental stimuli (Liberman & Dar, 2009). We termed this hypothesis Seeking Proxies for Internal States (SPIS; Lazarov, Dar, Liberman, & Oded, 2011; Lazarov, Dar, Oded, & Liberman, 2010). In terms of the SPIS hypothesis, compulsive rituals are seen as attempts to develop and rely on proxies as a compensation strategy against a reduced sense of certainty or subjective conviction regarding internal states. For example, learning school material by heart and reciting it three times can be adopted as a means of compensating for loss of conviction in regard to whether one has fully understood the material. In terms of the SPIS hypothesis, such procedures would be conceptualized as proxies for understanding.

The need for individuals with OCD to seek indicators or cues for internal states has been postulated in previous theoretical accounts of OCD. Wahl, Salkovskis, and Cotter (2008) have suggested that due to the operation of Elevated Evidence Requirements (EERs) in areas of inflated responsibility, OCD individuals use potentially counter-productive "stop criteria," seeking to achieve a particular "feeling of rightness" based on both external and internal cues. According to the EER model, individuals with OCD doubt whether it is "safe" to terminate an action until enough evidence – subjective internal feelings as well as objective sensory input – has been acquired. Although similar in several aspects, the SPIS hypothesis differs from the EER model in several ways. According to the SPIS hypothesis, individuals with OCD rely on proxies and use them not only as evidence for the appropriateness of stopping a compulsive act, but also more generally as relatively discernible or less ambiguous substitutes for internal states. Furthermore, we propose that this compensatory strategy can be manifested in any domain where doubt and uncertainty can emerge and is not limited to areas of inflated responsibility (although it is plausible that SPIS might be enhanced in situations that trigger responsibility or other OC-relevant concerns).

A recent series of studies using biofeedback procedures have provided preliminary support for the SPIS hypothesis. Lazarov et al. (2010) asked participants to relax deeply while being connected to a biofeedback monitor, which recorded their galvanic skin response (GSR) fluctuations, an established physiological index of relaxation. As predicted, high OC participants performed worse than low OC participants on this relaxation task. More importantly, when a proxy for relaxation was provided in the form of the biofeedback monitor, it improved the ability to relax among high OC participants but not among low OC participants. Finally, when given the opportunity, high OC participants were more likely than low OC participants to request biofeedback in trying to achieve a state of relaxation. In another study, Lazarov et al. (2010) found that high OC participants, compared to low OC participants, were more influenced by false biofeedback in judging their own level of relaxation, indicating that they were less certain about this internal state. Similar results emerged when participants were asked to relax their muscles, and muscle tension (EMG) was measured instead of GSR (Lazarov et al., 2011).

The studies by Lazarov et al. (2010, 2011) demonstrate that OC tendencies are associated with a reduced sense of one's own level of relaxation, as well as with an increased tendency to seek and to rely on objective proxies for these states. These studies, however, leave two open questions, both of which we attempt to address in the present report. First, it is unclear whether these findings are specific to relaxation. Possibly, because OC tendencies are related to anxiety, they are also associated with inability to relax and perhaps with deficient access to one's state of relaxation. We therefore tested our hypothesis in this study with a task that is not confounded with relaxation ability. Specifically, we used a magnitude-production task (see Procedure below), previously used in electromyography biofeedback studies to test muscle-tension awareness and control ability, which are distinct from decreasing muscle tension (Bayles & Cleary, 1986; Glaros & Hanson, 1990; Segreto, 1995; Stilson, Matus, & Ball, 1980). This procedure requires participants to achieve specific levels of muscle tension rather than to relax their muscles, and therefore would not be expected to correlate with anxiety.

The second question that our previous results left open is whether participants high in OC tendencies had deficient access to their state of relaxation, or rather had intact access but doubted their assessment of this internal state. In the second scenario, the doubts and the self-questioning they produced may have disrupted the ability of high OC participants to relax. The first possibility is consistent with recent models that postulate a real deficiency in internal signals, cues or feelings in OCD, a deficiency that leads to repetitious behaviors and compulsions (e.g., Boyer & Lienard, 2006; Summerfeldt, 2004, 2007; Szechtman & Woody, 2004). This possibility is also consistent with memory studies showing real deficits in memory abilities among OCD patients (e.g., Abramovitch, Dar, Schweiger, & Hermesh, 2011; Boone, Ananth, Philpott, Kaur, & Djenderjian, 1991; Christensen, Kim, Dyksen, & Hoover, 1992; Savage et al., 2000; Sher et al., 1983; Tallis, Pratt, & Jamani, 1999; Tuna, Tekcan, & Topçuoğlu, 2005; Woods, Vevea, Chambless, & Bayen, 2002; Zitterl et al., 2001) and with experimental evidence of a dysfunctional biological-somatic marker in OCD participants, affecting decision-making processes (Cavedini et al., 2012; Stracke, Tuschen-Caffier, Markowitsch, & Brand, 2009). The second possibility is consistent with studies showing that excessive checking, whether behavioral (Ashbaugh & Radomsky, 2007; van den Hout & Kindt, 2003a, 2003b; van den Hout et al., 2008, 2009; Radomsky, Gilchrist, & Dussault, 2006; Tolin et al., 2001) or mental (Radomsky & Alcolado, 2010), can lead to increased distrust of one's own memory and perception. It is also consistent with studies that found no real memory deficits in OC individuals other than memory confidence (e.g., Abbruzzese, Bellodi, Ferri, & Scarone, 1993; Ceschi, Van der Linden, Dunker, Perroud, & Bredart, 2003; Foa, Amir, Gershuny, Molnar, & Kozak, 1997; Jelinek, Moritz, Heeren, & Naber, 2006; Karadag, Oguzhanoglu, Ozdel, Atesci, & Amuk, 2005; Kim et al., 2006; Simpson et al., 2006).