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Can doubt attenuate access to internal states? Implications for obsessive-compulsive disorder



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ABSTRACT

Background and objectives: We have previously reported that obsessive-compulsive individuals perform more poorly on tasks that require accurate perception of internal states. As these individuals are also characterized by elevated levels of doubt regarding internal states, the causal relationship between doubt and accurate perception remained unclear. The presented study examines whether undermining participants' confidence in their ability to accurately produce a specific internal state would affect their performance on a task that requires accurate perception of this state.

Methods: Participants were trained to produce specific levels of forearm muscle tension and then required to produce various tension levels in four experimental phases. The first three alternated in terms of whether the participants viewed a biofeedback monitor while the fourth offered participants several times the choice to view the monitor. Prior to the task, half of the participants received instructions that undermined their confidence in their ability to accurately assess their own muscle tension. We measured participants' accuracy in producing the required muscle tension levels and the number of times they requested to view the monitor in the final phase.

Results: Undermined confidence participants were less accurate in producing the required muscle tension levels in the absence of biofeedback, and were also more likely to request the monitor in the final phase.

Conclusions: Doubt can affect performance on tasks that require perceiving and experiencing internal states. This finding supports the possibility that access to internal states in OCD is attenuated due to elevated levels of doubt regarding these states.

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1. Introduction

Obsessive and relentless doubts are considered to be one of the primary features of obsessive-compulsive disorder (OCD; [American Psychiatric Association, 2013](#)). These doubts typically trigger a variety of OCD related pathological behaviors such as repeated checking, excessive hand washing, persistent mental reconstructions, enhanced self-monitoring and exhausting validation and reassurances seeking from one's immediate environment (e.g., [Dar, Hermesh, Fux, Rish, & Taub, 2000](#)). Obsessive-compulsive (OC) doubt has been demonstrated in relation to many cognitive functions ranging from memory (e.g., [Dar, 2004](#); [Tolin et al., 2001](#)) to attention and perception (e.g., [Hermans et al., 2008](#); [Hermans,](#)

[Martens, De Cort, Pieters, & Eelen, 2003](#); [van den Hout, Engelhard, de Boer, du Bois, & Dek, 2008](#); [van den Hout, Engelhard, Smeets, Dek, Tuksma, & Saric, 2009](#)) and its central role in OCD has been acknowledged in both early theories (e.g., [Janet, 1903](#); [Rapoport, 1989](#); [Rasmussen & Eisen, 1989](#); [Reed, 1985](#); [Shapiro, 1965](#)) and more recent ones (e.g., [Boyer & Liénard, 2006](#); [Hinds, Woody, Van Ameringen, Schmidt, & Szechtman, 2012](#); [O'Connor, Aardema, & Pélissier, 2005](#); [Summerfeldt, 2004, 2007](#); [Szechtman & Woody, 2004](#); [Tolin, Abramowitz, Brigidi, & Foa, 2003](#); [Wahl, Salkovskis, & Cotter, 2008](#); [Woody & Szechtman, 2005, 2011](#); [Zor, Szechtman, Hermesh, Fineberg, & Eilam, 2011](#)).

Recently we have outlined a new model of OCD, which we termed Seeking Proxies for Internal States (SPIS; [Lazarov, Dar, Oded, & Liberman, 2010](#); [Lazarov, Dar, Liberman, & Oded, 2012a, 2012b](#); [Lazarov, Liberman, Hermesh, & Dar, 2014](#); [Liberman & Dar, 2009](#)). SPIS joins earlier models in considering OC doubt as a main component in the phenomenology and etiology of OCD. According to the SPIS model OC doubt is relevant to and can be manifested in

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any internal state, be it cognitive (e.g., perception, memory, comprehension), affective (e.g., attraction, specific emotions) or bodily (e.g., muscle tension, proprioception), and thus is not limited to typical OC concerns such as safety, task-completion, the self-concept or intimate relationships (e.g., Aardema & O'Connor, 2007; Boyer & Liénard, 2006; Doron, Kyrios, & Moulding, 2007; Doron, Szepeswol, Karp, & Gal, 2013; Summerfeldt, 2004, 2007; Szechtman & Woody, 2004). Furthermore, we proposed that doubting one's internal state is accompanied by attenuated access to that state, resulting in difficulties in experiencing and perceiving it accurately. In addition, the SPIS model delineates a compensation strategy through which OC individuals attempt to defend against OC doubt regarding internal states, namely the development and reliance on *proxies*. Proxies are defined as substitutes for the internal state that the individual subjectively perceives as more easily discernible or less ambiguous, such as rules, procedures, behaviors or environmental stimuli (Lieberman & Dar, 2009). For example, an OCD patient was asked during a therapy session how she knew that her hands were clean. Her reply was: "I never really *know* whether they are clean or not. What I do know is that I have completed my ritual." In terms of the SPIS model, the washing ritual serves as a proxy signaling to that patient that her hands are clean, thus compensating for her missing internal feeling of cleanness.

The present study follows two previous studies in which we used an electromyography biofeedback apparatus as a proxy for the internal states of muscle tension (Lazarov et al., 2012b, 2014). We chose muscle tension as the designated internal state to be examined as it is not obviously related to any specific or typical OC concern, rendering this task as a particularly strong test of the SPIS model. Participants in the first study (Lazarov et al., 2012b) were students with high and low OC tendencies scores, as measured by the Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002). In the first three phases of the experiment (the magnitude production task; for details, see Procedure below) we asked participants to achieve different levels of forearm muscle tension either with or without the aid of the biofeedback monitor. During the fourth phase we offered participants the chance to view the biofeedback monitor at several trials, after warning them that choosing to see the biofeedback monitor might impair their performance on the task. As predicted, high OC participants were less accurate than low OC participants in producing the designated muscle tension levels without the biofeedback, but performed equally well when biofeedback was available. In addition, when given the opportunity, and despite the potential cost in performance, high OC participants were more inclined to request access to the biofeedback compared with the low OC participants. Similar findings were obtained in a more recent study using the same magnitude production task with OCD participants compared to anxiety disorder (AD) and non-clinical (NC) control participants (Lazarov et al., 2014). Importantly, the AD and NA groups did not differ in their accuracy in producing the different muscle tension levels or the number of requests to view the biofeedback monitor, thus eliminating anxiety as a possible alternative explanation of the results.

The results of our studies with the magnitude production task, combined with previous findings from our lab using other paradigms (Lazarov et al., 2010, 2012a, 2012b, 2014), lend preliminary support to the SPIS postulation that OC individuals are characterized by attenuated access to their own internal states. However, because OC participants are also characterized by elevated levels of doubt, our studies to date could not elucidate the relationship between doubt regarding internal states and accurate perception of these states. Attenuated access could naturally give rise to elevated levels of doubt regarding internal states – a person who cannot determine whether s/he feels tense or not, would naturally doubt

that any specific level of tension applies to her/him. Alternatively, it is also possible that attenuated access is the result rather than the cause of elevated levels of doubt regarding these states. In other words doubt, in and of itself, may be sufficient to weaken access to internal states. In a previous study we examined the effects of undermining participants' confidence on their susceptibility to false pre-programmed feedback which served as a proxy for the feeling of relaxation (Lazarov et al., 2012a). Specifically, we presented non-selected participants, half of whom received instructions that undermined their confidence in their ability to assess their own level of relaxation, with pre-programmed false feedback showing either increasing or decreasing levels of relaxation. We found that undermined confidence participants were more affected by the false biofeedback when judging their own level of relaxation as compared to control participants. Thus, inducing doubts regarding internal states was causally related to relying on and using proxies. Nevertheless, that study did not allow us to determine whether experimentally induced doubt regarding internal states is sufficient to also impair perception of these states.

The present study was the first to experimentally examine whether doubt regarding internal states can interfere with accurate perception of these states. We administered the magnitude production task to a non-clinical non-selected sample of students, half of which underwent an experimental manipulation designed to undermine their confidence in their ability to accurately produce their own level of muscle tension. Based on the reasoning explained above, we predicted that in the absence of biofeedback, participants whose confidence was undermined, as compared with the control participants, would perform more poorly on Phase 1 of the magnitude production task, which relies solely on subjective internal cues. We also predicted that viewing the biofeedback monitor during Phase 2 would improve the performance of participants whose confidence was undermined more than that of control participants. Finally, we predicted that when given the opportunity, participants whose confidence was undermined would be more inclined than the control participants to seek the biofeedback monitor.

2. Method

2.1. Participants

Thirty seven psychology students at Tel-Aviv University participated in the study. One participant was excluded from the analysis due to technical problems with the biofeedback apparatus during the experiment. The final sample included 36 participants, 27 women and 9 men (M age = 23, SD = 2.12, range = 19–28). This sample size is similar to our previous study with the same experimental procedure (Lazarov et al., 2012b). Participants signed an informed consent and received course credit for participation. None of the participants had prior experience with biofeedback.

2.2. Apparatus

Physiological data regarding muscle activity was measured with the Procomp Infiniti hardware and Biograph Infinity software from Thought Technologies, Montreal, Canada, used by Lazarov et al. (2012a, 2012b, 2014) in their previous work examining the ability to accurately produce different levels of muscle tension. This biofeedback apparatus, as well as other versions of it, were shown in previous studies to provide a reliable measure of muscle activity in a wide range of clinical contexts and at different muscle sites (e.g., Bravo, Coffin, & Murphey, 2005; Jantos, 2008; Mandryk & Atkins, 2007; Mandryk, Inkpen, & Calvert, 2006; Noe, Amarantini, & Paillard, 2009; Reissing, Binik, Khalife, Cohen, & Amsel, 2004).

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