



## Seeking proxies for internal states (SPIS): Towards a novel model of obsessive-compulsive disorder

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### ARTICLE INFO

#### Keywords:

Obsessive-compulsive disorder  
Compulsions  
Doubt  
Internal states  
Proxies

### ABSTRACT

The Seeking Proxies for Internal States (SPIS) model of obsessive-compulsive disorder (OCD) proposes an account of OCD symptoms in terms of two core components: *attenuation of access to internal states* and *seeking proxies for internal states*. Specifically, the SPIS model posits that OCD is associated with difficulty in accessing various internal states, including feelings, preferences, memories, and even physiological states. This difficulty drives obsessive-compulsive individuals seek and rely on compensatory proxies, or substitutes, for their internal states. These proxies are perceived by the individual with OCD to be more easily discernible or less ambiguous compared to the internal states for which they substitute, and can take the form of fixed rules, rituals, or reliance on external sources of information. In the present article we first provide a detailed explanation of the SPIS model, and then review empirical studies that examined the model in a variety of domains, including bodily states, emotions, and decision-making. Next, we elaborate on the SPIS model's novel account of compulsive rituals, obsessions and doubt and relate them to extant theoretical accounts of OCD. To conclude, we highlight open questions that can guide future research and discuss the model's clinical implications.

Obsessive-compulsive disorder (OCD) is defined by the presence of obsessions and/or compulsions (American Psychiatric Association, 2013). In addition to these defining symptoms, OCD is also associated with a variety of other features, including doubt (Janet, 1903; Nestadt et al., 2016; Samuels et al., 2017), self-monitoring of thoughts and behaviors (Coles, Heimberg, Frost, & Steketee, 2005), difficulty in decision making (Cavedini, Gorini, & Bellodi, 2006; Nestadt et al., 2016), magical beliefs in the power of thoughts (Einstein & Menzies, 2004), and difficulty stopping actions once initiated (Rapoport, 1989; Szechtman and Woody, 2004). This complex phenomenology presents a challenge for any theory of OCD. Over the past several years we have developed and tested a novel model of OCD, named Seeking Proxies for Internal States (SPIS; Lazarov, Dar, Liberman, & Oded, 2012a; Lazarov, Liberman, Hermesh, & Dar, 2014; Liberman & Dar, 2009). In what follows we first describe the core components of the model and then present the current state of its empirical support, comprising a variety of laboratory and field studies with both analogue (i.e., non-clinical participants with high levels of OCD-related symptomology) and clinical samples. Next, we explicate how the SPIS model accounts for compulsive rituals, obsessions and doubt. Lastly, we highlight several open questions

regarding the SPIS model and discuss its clinical implications.

### 1. The Seeking Proxies for Internal States (SPIS) model of OCD

The process at the core of the SPIS theory is simple (Fig. 1): A person encounters a question about an internal state (see detailed definition on what constitutes an internal state below) which is important for them to answer accurately, such as “Do I love my partner?” “Do I understand what I just read?” “Do I feel satisfied that my house is secure?” To answer the question, they need to access the corresponding internal state. If this step supplies a clear enough answer, the process terminates; if it does not, the process continues with either attempting to read the internal state again or seeking compensatory proxies for it. If the proxy resolves the question, the process terminates; If not, the individual either searches for a different proxy, or, alternatively, tries again to access the internal state.

Importantly, the SPIS model does not assert that obsessive-compulsive (OC) individuals<sup>1</sup> encounter questions about internal states more often than do other people, as such questions are quite common in everyone's life. Rather, the SPIS model posits that when such

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<sup>1</sup> We use the expressions “OC person” or “OC individual” as convenient terms for a person with prominent OC symptoms or with OCD.

<https://doi.org/10.1016/j.brat.2021.103987>

Received 24 February 2021; Received in revised form 4 October 2021; Accepted 7 October 2021

Available online 8 October 2021

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questions arise and press for a clear answer, OC individuals have a harder time providing such an answer. As a result, they are more likely than others to seek proxies for their internal states, and to remain in an unanswered state, in which the process depicted in Fig. 1 (of repeated futile attempts to access one’s internal state) continues to reverberate. As we elaborate later, this continued reverberation represents the SPIS model’s conceptualization of obsessional doubt. Let us turn now to explain in more detail the two central components of the SPIS model: *internal states* and *proxies for internal states*.

1.1. What are internal states?

SPIS defines internal states as states that are within a person’s system and to which they have privileged access, that is, states that cannot be reliably assessed by outside observers. Internal states in this definition include physiological states (e.g., hunger, muscle tension) and emotions (e.g., love, pride, affection, satisfaction) as well as other “private” states

such as one’s motivations, wishes, and memories. These states are all considered internal because no person but I can know how hungry I feel, how much I love my partner, how enthusiastic I am about my job, or what I remember from my first day at school. Importantly, this conceptualization of internal states presumes that the individual believes that a person can be right or wrong about their own internal state. When someone ask themselves “do I feel hungry?” they assume that a state of hunger exists, and that one can err in identifying it (decide that they are hungry when in fact they are not, or fail to identify their hunger). To use another example, when someone asks themselves “did I understand what I have just read?” they assume that a state of understanding exists, that it is different than a state of lack of understanding, and that a person can erroneously think that they understood something when in fact they did not, as well as err in thinking that they lack understanding when in fact their understanding is intact.

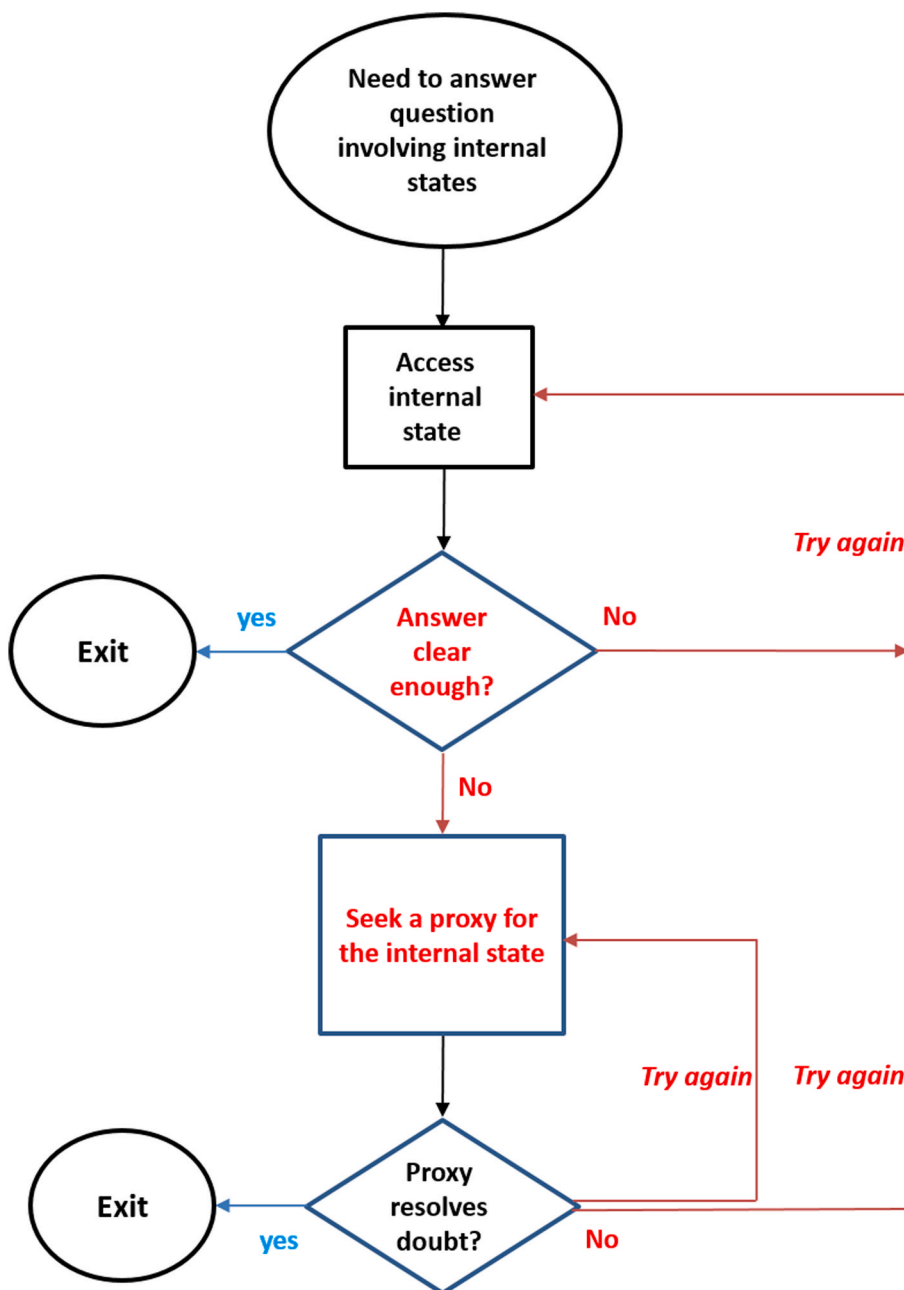


Fig. 1. The process at the core of the SPIS model starts when a person needs to answer a question involving an internal state. Accessing this internal state may or may not provide a clear answer. If the answer is clear the process terminates. If it’s not, the person may try to access the internal state again or seek a proxy for it. The proxy may or may not resolve the doubt, which is represented by continuous reverberation through the process. According to the SPIS model, such reverberation characterizes OCD due to attenuated access to internal states, which reduced the likelihood of receiving a clear answer from the relevant internal state. Repeated attempts at trying to access the internal state further diminish its clarity.

## 1.2. What are proxies for internal states?

When having to answer questions about their internal states, the difficulty OC individuals have in accessing these states may lead them to seek compensatory proxies for their internal states (Fig. 1). The essential feature of proxies is that compared to the internal states for which they substitute, they are perceived by the individual as more easily discernible or less ambiguous (Lazarov, Dar, Oded, & Liberman, 2010; Liberman & Dar, 2009).

Proxies may include, among others, rules, procedures, behaviors or environmental stimuli. For example, to find out whether they love their partner (an internal state), an OC person might attempt to monitor the number of times they call their partner, or the amount of money they spend on buying them presents. To compensate for diminished access to their academic interests, one might rely on vocational tests or statistical information in choosing their area of study. And to use a more classic example, attenuated access to one's memory might lead a person with OCD to demand reassurance from their spouse that they did not run over anyone while driving their car.<sup>2</sup> The idea that rules and rituals function as compensatory strategies for vague internal states builds on the classic description of Shapiro (1965), who likened OC individuals to pilots flying at night, who must rely on flight instruments for navigation instead of on their own vision. According to Shapiro, "nothing in the [OC person's] situation is experienced directly; only indicators are experienced, things that indicate other things (p. 50)."

A clinical example might help to illustrate the process postulated by the SPIS model. A young man with OCD began to worry that he did not fully understand the material he was learning in school. The more he questioned and attempted to monitor his own level of understanding, the more his uncertainty about his understanding grew. He therefore developed the rule that he should be able to recite the material by heart. In terms of the SPIS model, he compensated for attenuated access to his sense of understanding by developing a more easily discernible and "objective" proxy. As this example illustrates, the SPIS concept of proxies implies that rules and rituals in OCD have a function – they substitute for the deficiently accessible internal states. In this view, a fixed hand-washing ritual may function as an objectively verifiable indicator (i.e., a proxy) signaling to the individual that they have washed enough and that their hands are now clean, thereby compensating for their attenuated internal sense of cleanliness or of satisfaction with the act of washing. To use the words of another OCD client with cleaning rituals: "I don't really know if my hands are clean or not, but I do know that I've completed my ritual." Similarly, a fixed stove-checking ritual (e.g., "turn each knob on and off three times starting with the top left and going in a clockwise direction") may substitute for the normally accessible feeling that one has checked enough and that it is now safe to leave the kitchen.

Clearly, relying on and using proxies as compensatory indicators of internal states has several inherent limitations. First, while some proxies are valid indices of specific internal states (e.g., free time spent solving math problems is a good indicator of how much one likes math), other proxies may be poor indicators of the relevant internal states (e.g., knowing something by heart is not a good indicator of understanding), and focusing on a poor proxy may distance one even further from the relevant internal state (e.g., focusing on learning the material by heart may divert one's effort from trying to understand it). Second, at close examination, proxies may lose their apparent clarity and engender further substitution. For example, a client with OCD who was unsure

<sup>2</sup> While many of us consult others when we do not fully trust our own memory or judgment (for example, we may ask our partner for their opinion on what we should wear for a dinner party, because we do not trust our own sense of fashion), people with OCD are particularly likely to prefer the judgement or memory of others over their own due to attenuated access to their own internal states.

about how happy she was with her partner turned to assessing the "happiness" of her facial expressions in 'selfies' she took with him. This proxy, however, proved just as tricky to detect with confidence, leading her to seek more tractable, but also more remote, proxies for the evasive feeling of love, such as the number of text messages she sent him each day.

Finally, while some proxies may "work" in the short term, they are unlikely to serve their function in the long run. For example, a man with OCD was obsessed with the possibility that he may be attracted to men. He developed a habit of watching gay porno movies and examining whether he was sexually aroused by them. This type of proxy (in this case, for the feeling of attraction) is necessarily short-lived, because not being aroused on one specific occasion does not guarantee a similar result in the future. In the long run, therefore, proxies may fail to provide the sought-after information on the relevant internal state, leaving the OC person gripped in a vicious cycle of self-tests and doubt.

## 2. Empirical support for the SPIS model

Our goal in the studies we are about to describe was to examine whether OCD and OCD symptoms are associated with attenuated access to internal states and reliance on proxies for these states. We used a variety of paradigms to examine two major predictions. First, that compared with non-OC participants, OC participants will show performance deficits on tasks that require accurate access to their internal states. And second, that compared with non-OC participants, OC participants will rely more on valid as well as invalid proxies when needing to access their internal states.

### 2.1. Biofeedback as a proxy for relaxation and muscle tension

The first set of studies used a biofeedback apparatus as a proxy for the internal states of relaxation or muscle tension. We developed two paradigms, one using genuine feedback and one using false feedback, as described in detail below. These paradigms were employed within two experimental designs: (a) comparing non-clinical participants with high vs. low OCD symptoms, as assessed by a continuous measure of OC symptoms; and (b) comparing participants with clinical OCD to both anxiety disorders and non-clinical control participants. Different combinations of these paradigms and experimental designs resulted in seven

**Table 1**  
Summary of biofeedback-aided SPIS studies.

Study	Internal State	Experimental Paradigm	Experimental Design
Lazarov et al. (2010) – Study 1	Relaxation	Genuine feedback paradigm	Analogue sample (high vs. low OCD symptoms)
Lazarov et al. (2010) – Study 2	Relaxation	False feedback paradigm	Analogue sample (high vs. low OCD symptoms)
Lazarov et al. (2012a) – Study 1	Muscle tension	False feedback paradigm	Analogue sample (high vs. low OCD symptoms)
Lazarov et al. (2012b)	Muscle tension	Genuine feedback paradigm	Analogue sample (high vs. low OCD symptoms)
Lazarov et al. (2014) – Task 1	Muscle tension	Genuine feedback paradigm	Clinical sample (OCD, AD, HC)
Lazarov et al. (2014) – Task 2	Muscle tension	False feedback paradigm	Clinical sample (OCD, AD, HC)
Zhang et al. (2017) – Study 1	Muscle tension	False feedback paradigm	Analogue sample (high vs. low OCD symptoms)

Note. SPIS = seeking proxies for internal states; OC = obsessive-compulsive; OCD = obsessive compulsive disorder; AD = anxiety disorders; HC = healthy controls.

studies (see Table 1). Below, we describe these studies and their implications for the SPIS model.

### 2.1.1. Genuine feedback paradigm

In this paradigm, participants were asked to achieve a certain internal state with and without the aid of a biofeedback apparatus, which displayed a physiological measure that was related to the internal state and therefore could be used as a proxy for it (see details below). The procedure of these studies comprised four phases. During Phase 1, participants were requested to try and achieve the designated internal state without viewing the biofeedback monitor, relying solely on their experiencing of the to-be-achieved internal state. They were subsequently given an explanation about the biofeedback apparatus, followed by a 2-min period in which they could familiarize themselves with the apparatus and its function. Next (Phase 2), participants were asked to achieve the same internal state as in Phase 1, this time while viewing the biofeedback monitor. Phase 3 repeated Phase 1, with participants again performing the task without the biofeedback monitor. In the fourth and final phase, participants could not view the biofeedback monitor continuously, but were given several opportunities to do so that were cued by the experimenter. They were forewarned, however, that viewing the monitor has a potential “cost,” as it might impair their performance in the task.

We employed this procedure in two studies that compared high vs. low OC participants, as determined by scores on the Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002). In the first study, participants were instructed to try to relax deeply (Lazarov et al., 2010, Study 1) and the biofeedback screen displayed their galvanic skin responses (GSR). In the second, they were required to produce four specific levels of muscle tone ranging from 1 to 4 with intervals of 1 (corresponding to 4–16  $\mu\text{V}$ , with intervals of 4) and the biofeedback screen displayed electromyography readings (Lazarov, Dar, Liberman, & Oded, 2012b). As predicted, in both studies the performance of high OC participants was inferior to that of low OC participants in the absence of biofeedback, but they performed equally well when the biofeedback was available (Fig. 2A). Also, as predicted, high OC participants requested to see the biofeedback monitor in Phase 4 more times than low OC participants, despite the potential cost in performance they were warned about.

A subsequent study aimed to examine whether these findings would generalize to clinical OCD, and whether they could be specifically attributed to OCD rather than to anxiety and depression, which commonly co-occur with OCD (Overbeek, Schruers, Vermetten, & Griez, 2002). We used the muscle tensing task described above with OCD participants, matched anxiety disorder participants and non-clinical controls (Lazarov et al., 2014). The findings replicated and reinforced those obtained with the earlier analog samples (Lazarov et al., 2012b); OCD participants were less accurate than both anxiety disorder and non-clinical participants in producing the designated muscle tension levels in the absence of feedback. When the biofeedback monitor was available, the performance of the OCD participants equaled that of the control participants (Fig. 2B). Crucially, the inferior performance of OCD participants (and that of high OC participants in the two studies

described above) in Phase 1 was evident in *actual behavioral deficits* rather than in self-reported performance, and hence does not simply reflect uncertainty or reduced confidence in performance on their part.<sup>3</sup> Further corroborating the SPIS model, OCD participants were much more likely than both anxiety disorder and non-clinical participants to request the biofeedback in the Phase 4, despite being warned of potential costs in performance. Of particular importance is the finding that anxiety disorder participants did not differ from the non-clinical participants on any of the dependent measures (Fig. 2), despite having equivalent anxiety and depression levels to the OCD participants. This pattern of results suggests that the processes hypothesized by the SPIS model are specific to OCD.

### 2.1.2. False feedback paradigm

Our hypothesis that OC individuals rely on proxies to infer their internal states resembles the principal tenet of self-perception theory, namely, that people learn about their attitudes and preferences by observing their own overt behavior (Bem, 1965). Bem further suggested that self-perception inferences are especially likely when “internal cues are weak, ambiguous, or uninterpretable” (Bem, 1965, p. 2). As these conditions are characteristic of OC individuals, according to the SPIS model, self-perception inferences should be particularly prominent in this population. One method to measure self-perception effects is to examine the extent to which participants are influenced by false feedbacks when judging their own internal states (Fazio, 1987; Olson & Hafer, 1990; Valins, 1966). Following this tradition, we conducted several studies in which participants were asked to assess their internal state after receiving relevant but false physiological feedback pertaining to that state. We predicted that OCD symptoms would be related to stronger reliance on this false feedback when judging one’s own internal states. The false feedback procedure comprised two counter-balanced phases, during which participants viewed pre-programmed “feedback” depicting their physiological state. During one phase, the biofeedback monitor showed a descending line graph indicating a decrease in the relevant physiological state, whereas during the other, it showed an ascending line graph indicating an increase in the same state. Following each phase, participants were requested to subjectively rate their physiological state. We examined the extent to which participants’ estimations of their internal states were affected by the false feedback.

In our first study (Lazarov et al., 2010), Study 2), high and low OC participants were asked to try to relax deeply and to rate how anxious (vs. relaxed) they felt following each false feedback phase. In our second study (Lazarov et al., 2012a, Study 1; see Zhang et al., 2017 for a replication), participants were asked to let go of any tension in their forearm muscle and then to evaluate how tense (vs. loose) their forearm muscle felt. As predicted, high OC participants, compared to low OC participants, were more affected by the false feedback in assessing the relevant internal states, with no differences between phases in the actual physiological measure. These findings were replicated in a clinical sample, where OCD participants, in contrast to both anxiety disorder and non-clinical control participants, were highly affected by false biofeedback when judging their own muscle tension (Lazarov et al., 2014). The results of this study demonstrated, once again, that the SPIS

<sup>3</sup> Note that the findings of the muscle tension studies cannot be explained merely by deficient memory, for two reasons. First, prior to Phase 1 of the procedure, the experimenter guided participants in producing two anchor tension levels, the level that was labeled 1 (4  $\mu\text{V}$ ) and the level that was labeled 4 (16  $\mu\text{V}$ ). These anchors were attained by instructing participants to contract their forearm muscle until they have achieved the designated muscle tension target. The experiment resumed only when participants were able to produce each of the two anchor levels twice, following a 2-min break. Thus, participants were only trained on levels 1 and 4 but tested on all four levels, including the intermediate levels of 2 and 3. Second, the interval between the training and the test phases was only 2 min.

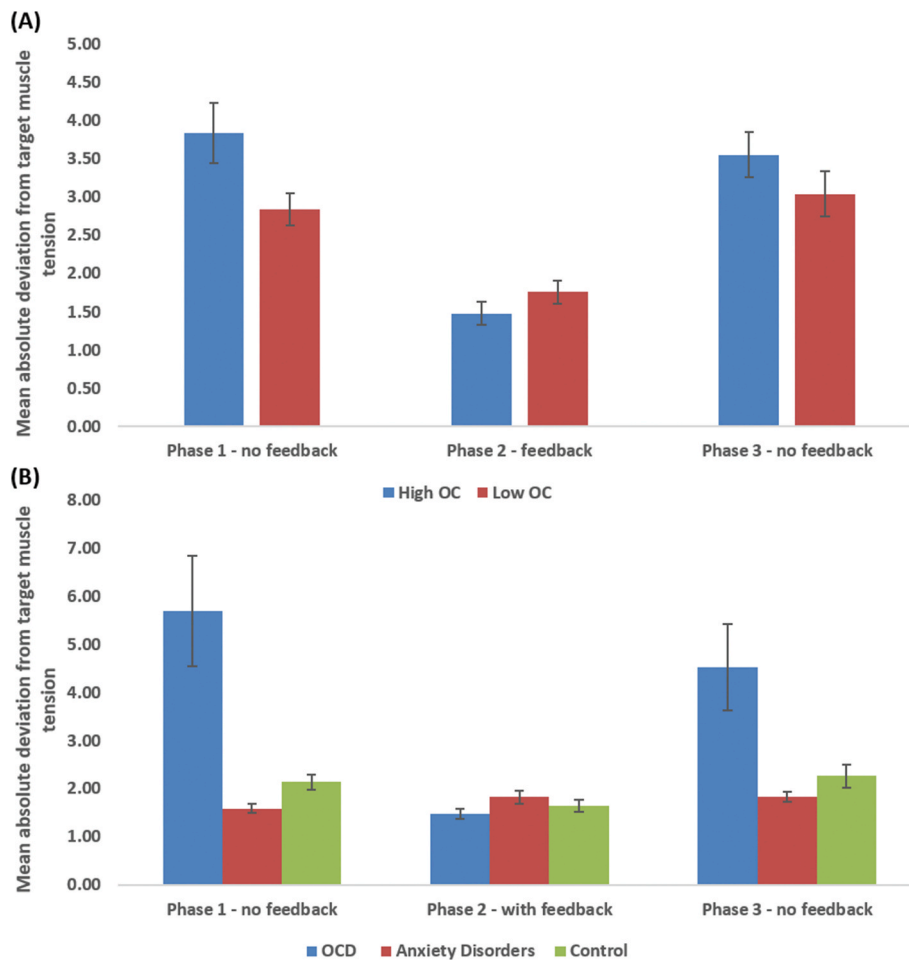


Fig. 2. Mean absolute deviations from target muscle tension by phase and group for (A) an analog sample of participants with high and low obsessive-compulsive tendencies; and (B) a clinical sample of OCD patients, anxiety disorders patients and healthy control participants.

model's predictions generalize to clinical OCD and are specific to OCD; Anxiety disorder participants, just like the non-clinical control participants, showed no effect of the false feedback on their judgments of muscle tension. Importantly, in none of these studies did the false feedback have a differential effect on the actual physiological state (i.e., relaxation, muscle tension).

### 2.1.3. Summary

The above-described series of studies with the two biofeedback paradigms provided initial support for the main tenets of the SPIS model. Specifically, OCD symptoms and clinical OCD were related to deficient functioning in tasks that require individuals to access their internal states and to greater reliance on proxies for these states. Notably, the internal states we examined with the biofeedback paradigm (i.e., relaxation and muscle tension) are not the typical internal states that concern OC individuals. We believe that applying our model to internal states that are not the "traditional" OCD concerns lends strong support for our model, which explicitly does not restrict itself to internal states of specific content (see below for an elaborated discussion of this claim).

## 2.2. Attenuated access to emotional states

In agreement with the SPIS model, various lines of research seem to suggest that OC individuals have attenuated access to their own emotions. The most direct support for this hypothesis comes from the finding that OCD is associated with alexithymia, defined as a difficulty to identify and describe emotions and to discriminate them from other

bodily states (for a review see Robinson & Freeston, 2014). These findings are difficult to interpret, however, as alexithymia in these studies was measured using self-reports (the Toronto Alexithymia Scale, TAS-20; Bagby, Parker, & Taylor, 1994; Bagby, Taylor, & Parker, 1994; Taylor, Bagby, & Parker, 2003) rather than actual performance. These two ways of measuring ability often diverge, as self-reports might reflect confidence rather than actual ability (Brackett, Rivers, Shiffman, Lerner, & Salovey, 2006). Specifically, low self-reported ability to understand emotions on the part of high OC participants could reflect lack of confidence rather than an actual deficit (Cougale, Salkovskis, & Wahl, 2007; Dar, Rish, Hermesh, Taub, & Fux, 2000). Other studies reported deficient ability to recognize emotional facial expressions among people with OCD, particularly for negative emotions (for review see Daros, Zakzanis, & Rector, 2014). Yet, these studies did not control for coexisting symptoms, particularly anxiety and depression, making it impossible to determine the extent to which this deficit in emotion recognition is specific to OCD. Moreover, the ability to recognize others' emotional expressions is not necessarily equivalent to the ability to access one's own emotional states.

To measure access to emotional states more directly, Dar, Lazarov, and Liberman (2016), relied on the construct of emotional intelligence (EI) as conceptualized by Mayer and colleagues (Mayer & Salovey, 1997; Mayer et al., 2002, 2004) and assessed by the Mayer Salovey Caruso Emotional Intelligence Test (MSCEIT). The MSCEIT yields performance scores in two domains, Experiential and Strategic EI. Critically for our purpose, Experiential EI reflects the ability to perceive, generate, and feel emotions, while Strategic EI reflects a more cognitive aspect of EI, comprised of understanding and managing emotions. As the SPIS model



postulates an attenuation of emotional states in OCD, it predicts that OCD symptoms would be specifically related to deficient performance on Experiential EI, but not on Strategic EI. We reasoned that if OC individuals have attenuated access to their own affective states, then they should demonstrate difficulties on the Experiential area of the MSCEIT, which requires accurate identification of one's emotional reactions to perform well. Conversely, for the Strategic EI, OC individuals may rely on their semantic knowledge and on rules regarding how one *should* feel in certain situations and respond accurately based on such "theoretical" semantic knowledge about emotional responses (see Itkes, Kimchi, Haj-Ali, Shapiro, & Kron, 2017; Itkes & Kron, 2019 for the distinction between affective and semantic representation of emotions). As the SPIS model postulates that OC individuals turn to rules and norms (i.e., proxies) to compensate for the attenuation in perceiving their own internal states, we predicted that high OCD symptoms would not be related to deficient performance on the Strategic area of the MSCEIT.

The first study using this approach (Dar et al., 2016, Study 1) compared the performance of high and low OC participants on the MSCEIT. As predicted, high OC participants performed more poorly than low OC participants on the Experiential, but not on the Strategic part of the test. The second study examined the relationship between OCD symptoms and the two EI areas across the full range of OCD symptoms, and the specificity of this relationship to OCD (Dar et al., 2016, Study 2). We administered the OCI-R and the MSCEIT to a sample of 120 unselected participants together with the Depression, Anxiety and Stress Scales-21 (DASS-21; Lovibond & Lovibond, 1995), in order to control for levels of depression and anxiety, which tend to co-occur with OCD symptoms (Overbeek et al., 2002; Ruscio, Stein, Chiu, & Kessler, 2010). As expected, OCD symptoms were negatively correlated with Experiential EI scores, but not with Strategic EI scores, and these correlations remained statistically significant after controlling for anxiety and depression.

Recently, we replicated these findings and extended them to clinical OCD (Lazarov et al., submitted for publication). Participants were 20 patients with OCD, 24 patients with anxiety disorders (AD), and 26 non-clinical (NC) participants with no psychiatric history, all matched in terms of age, gender, and years of education. A significant group (OCD, AD, NC) by MSCEIT area (Experiential and Strategic) interaction effect emerged,  $F(2, 67) = 4.73, p = .01, \eta^2_p = .12, CI = .02-.023$ . Separate one-way ANOVAs on the Experiential and Strategic EI areas scores revealed a significant difference between the groups on the Experiential area,  $F(2, 69) = 6.89, p = .002, \eta^2_p = .17, CI = .04-.28$ , but not on the Strategic area,  $F(2, 69) = 1.53, p = .22$ . As predicted, participants with OCD had lower scores ( $M = 23.94, SD = 22.20$ ) compared to the AD group ( $M = 50.90, SD = 28.49$ ),  $F(1, 43) = 11.88, p = .001, \eta^2_p = .22, CI = .06-.037$ , and the NC group ( $M = 41.68, SD = 21.21$ ),  $F(1, 45) = 7.60, p = .008, \eta^2_p = .14, CI = .02-.030$ , with no significant differences between the AD and the NC groups,  $F(1, 49) = 1.70, p = .20$  (Fig. 3). As in our previous studies with OCD patients and AD controls (Lazarov et al., 2014), results not only extended our findings with analogue participants to clinical OCD, but also indicated that the difficulty in accessing emotional states is specific to OCD and not attributable to anxiety or depression. It is also worth reiterating that the observed lower scores of OCD participants on the experiential area of the MSCEIT do not reflect merely reduced confidence in one's emotional intelligence, as the test does not rely on self-report; Rather, these findings mean that OCD is related to *poorer performance* in this area of emotional intelligence, as judged by comparison to established norms.

The studies on emotional intelligence suggest that OCD symptoms are related to reduced clarity of experiencing one's emotional states. In two more recent studies, Lazarov et al. (Lazarov, Friedman, Comay, Liberman, & Dar, 2020) examined a more basic dimension of emotional experience, namely the valence (on a positive-negative dimension) of one's emotional reactions. They presented participants with pictures taken from affective picture systems (IAPS; Lang, Bradley, & Cuthbert, 2008 and NAPS-BE; Riegel et al., 2016) and asked them to rate how

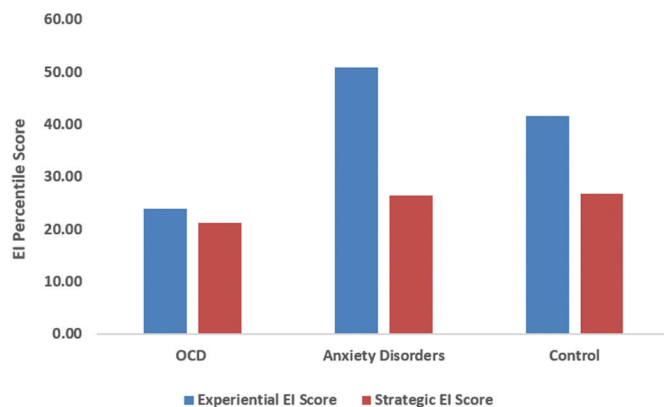


Fig. 3. Mean EI Percentile Scores by EI Area (Experiential, Strategic) and Group. Note: AD = Anxiety Disorders, NC = Non-clinical control. Higher values indicate higher mean score. Error bars denote standard error of the mean.

these pictures made them feel. As predicted, OCD symptoms were related in both studies to larger deviations from the valence norms of these pictures and to larger variances of the ratings. These results remained significant in both studies after controlling for anxiety and depression. These findings indicate that high OC individuals are less accurate in assessing their own emotional responses, which may be relatively "noisy" and difficult to discern clearly.

### 2.3. Proxies for the sense of understanding

While a difficulty in achieving a sense of understanding is not included in the formal list of OCD symptoms, it appears to be quite familiar to individual with OCD. Here, for example, is how a person suffering from OCD describes their experience of reading in an OCD internet forum: "With each sentence the tightness in my chest grew stronger, alongside the growing panic that **I had not understood it properly or read it correctly**" (Lucy, 2013; emphasis in the original). Despite such reports, and the recognition of this problem in treatment-oriented texts on OCD (Grayson, 2014), a recent study from our lab appears to be the first to systematically address the sense of understanding in relation to OCD (Dar, Eden, van Dongen, Hauschildt, & Liberman, 2019). Specifically, the study tested the prediction that OCD symptoms would be related to seeking proxies for understanding, particularly when no objective feedback on the level of understanding is available.

The study examined this prediction using a novel task that required participants to read and understand a relatively complex text presented in several segments on a computer screen. While reading the text, participants were presented with a set of four proxies labeled "Learning Aids," which had been pre-tested and found to be unhelpful for understanding the text. For example, one such "Learning Aid," labeled "Statistics," provided the participant with the number of appearances of certain words, digits or linguistic structures (e.g., the number of verbs) in a particular segment of the text. Participants were divided to high vs. low OC groups based on their OCI-R scores. Half of participants in each group received ongoing feedback on their level of understanding, which was provided by introducing several comprehension questions after each text segment. After answering each question, participants were provided with the correct answer, thereby receiving valid ongoing feedback regarding their level of understanding. Participants in the no-feedback condition answered the same comprehension questions only after reading the entire text, and hence did not have external indication of their understanding as they were reading the text. The dependent measure was the number of "Learning Aids" (in SPIS terms, proxies for understanding) that each participant requested while reading the text.

Not surprisingly, participants in the no-feedback condition used

more “Learning Aids” than those in the ongoing feedback condition. More germane to the SPIS model, high OC participants used more “Learning Aids” than did low OC participants in the no-feedback condition, while no such difference emerged in the ongoing feedback condition. Importantly, high OC participants showed intact understanding of the text across feedback conditions, as shown by equivalent scores on the comprehension questions to those of low OC participants. In the SPIS model’s terminology, high OC participants resorted more to reliance on (unhelpful) proxies to determine how well they understood the text because they had deficient access to their sense of understanding.

#### 2.4. Difficulties in decision-making: preferences and satisfaction as internal states

Clinical observation suggests that OCD is associated with a marked difficulty in making decisions. In fact, decisions often constitute the major content of obsessions. For example, research on people struggling with relationship-focused obsessive-compulsive disorder (ROCD; for review see Doron, Derby, & Szepeswol, 2014) has documented that these individuals may experience difficulty committing to a romantic partner because they cannot decide whether their partner is ‘the right one.’ Other OC individuals may obsessively search the internet for the best product, feeling compelled to compare ever more brands on ever more attributes.

Despite the ubiquity of decision-making difficulties in OCD, relatively few studies empirically examined indecisiveness in OC individuals. The few studies that did, found that OCD symptoms were associated with higher levels of indecisiveness (Frost & Shows, 1993). The SPIS model affords a more nuanced prediction, namely, that indecisiveness on the part of people with OCD symptoms is due to a difficulty to access a sense of satisfaction with any chosen alternative (e.g., difficulty to feel that they like an alternative or feel that it is right for them) and/or with the search process itself (e.g., difficulty to feel that they are satisfied with how much they searched for the right alternative). The construct of “a maximizing decision style,” which is often contrasted with a “satisficing decision style” (Schwartz, 2000; Schwartz et al., 2002), captures precisely this difficulty. Specifically, whereas “maximization” is marked by endlessly, and most often futilely, looking for the best possible alternative, “satisficing” terminates the search when a satisfactory result has been achieved.

The SPIS model predicts that people high in OCD symptoms would experience difficulty in accessing an internal state of satisfaction, and therefore would score highly on measures of maximization. This prediction is also consistent with the notion that people with OCD experience difficulty in achieving the “just right” feeling that for many individuals often serves as a criterion to stop actions (Wahl, Salkovskis, & Cotter, 2008). Two studies (Oren, Dar, & Liberman, 2018; Study 1 with an online representative sample of 201 Israeli participants, Study 2 with an online sample of 240 British students) supported this prediction, showing that OCD symptoms (as measured by the OCI-R) were related to maximization, as measured by the Maximization Scale (Nenkov, Morrin, Ward, Schwartz, & Hulland, 2008). This relationship remained significant after controlling for levels of depression and anxiety.

Related to the difficulty of OC individuals experience in making decisions is the widely documented relation between OCD symptoms and perfectionism (Coles, Frost, Heimberg, & Rheume, 2003; Frost & Steketee, 1997; Moretz & McKay, 2009). Of note, the SPIS model implies that OC individuals continue to search for a better alternative because they cannot access their feelings of satisfaction, rather than because they have particularly high standards or aspirations. On this view, they exhibit perfectionistic behavior not for the sake of perfection per se, but due to an attenuated access to the internal state of satisfaction or the sense of “just right” (Wahl et al., 2008). This prediction awaits testing in future studies.

#### 2.5. Seeking proxies for internal states in everyday life

The aforementioned results support the SPIS model and hypotheses, but do not provide insight into how and whether seeking proxies is expressed in daily life. In a recent series of studies, Liberman and Dar (2018) examined whether the use of proxies for internal states in everyday life is more prevalent in people with higher OCD symptoms and whether it characterizes people with clinical OCD. Based on clinical experience and research findings, the authors developed an inventory of items that assess seeking proxies for internal states in everyday life (SPISI; Seeking Proxies for Internal States Inventory Liberman & Dar, 2018). Internal states included, among others, hunger, interpersonal closeness, preferences, and a sense of understanding, while proxies included one’s own behavior, the opinion of others, and objective indices such as grades and the passage of time. Some items referred to specific states and proxies (e.g., “To know how hungry I am, I consider what and when I’ve eaten today”; “I would prefer to use a formula to solve a math problem even if I think I know the answer”) whereas others tapped more general tendencies (e.g., “I look for rules that would tell me what I’m supposed to do”; “Sometimes I have to infer my feelings from my own actions”).

In two separate studies, the SPISI was administered to representative samples of the Israeli population (Study 1;  $N = 241$ ) and the Dutch population (Study 2;  $N = 1253$ ). Participants in both samples also completed the OCI-R and the anxiety and depression scales from the DASS-21. The SPISI showed good internal consistency in both studies (Cronbach alpha of 0.87 and 0.86 in Studies 1 and 2, respectively). The Pearson correlation coefficient between the SPISI and the OCI-R in these two samples was identical ( $r = .56$ ), despite the different languages, and remained highly significant after controlling for anxiety, depression and stress scores on the DASS-21. Fig. 4 presents the relation between the SPISI scores and the percentiles of the OCI-R in the combined sample; note that the SPISI scores were especially high in the top 20% of the OCI-R scorers, which suggests that sub-clinical or clinical OCD is related to particularly strong tendencies to use proxies for internal states. In a third study (unpublished data), we examined whether individuals with clinical OCD, compared to healthy controls, would report relying more on proxies for their internal states. The sample consisted of 28 participants with a clinical diagnosis of OCD and 29 control participants with no psychopathology. As predicted, OCD participants scored higher on the SPISI ( $M = 45.82$ ,  $SD = 9.27$ ) than did the control participant ( $M = 39.27$ ,  $SD = 8.81$ ),  $t(55) = 2.73$ ,  $p = .008$ , *Cohen’s d* = 0.72.

Taken together, these studies demonstrate that OC individuals report difficulty in assessing their internal states in many real-life situations, such as knowing how hungry they are, or how much they have enjoyed their vacation. Presumably in response to these difficulties, OC individuals tend to rely on a variety of external proxies for those states, which assist them, at least in the short term, in directing their own behavior.

The preceding sections summarize the empirical paradigms used to examine the SPIS model and the accumulated evidence supporting its basic assertions. Before moving on to explicate the model’s account of compulsive rituals, obsessions and obsessional doubt, we would like to acknowledge a major limitation of current empirical support for the SPIS model. While we cite studies conducted by many researchers that are consistent with the SPIS model, most of the work that directly tested the model has been conducted in our own labs (but see Jokić & Purić, 2021; Zhang et al., 2017). We hope that the present article would stimulate other researchers in the field to examine the SPIS model’s predictions using a larger variety of experimental paradigms.

### 3. The SPIS accounts of compulsive rituals

Any model of OCD must account for compulsive rituals. In DSM-5 these are defined as “repetitive behaviors or mental acts that the individual feels driven to perform in response to an obsession or according to

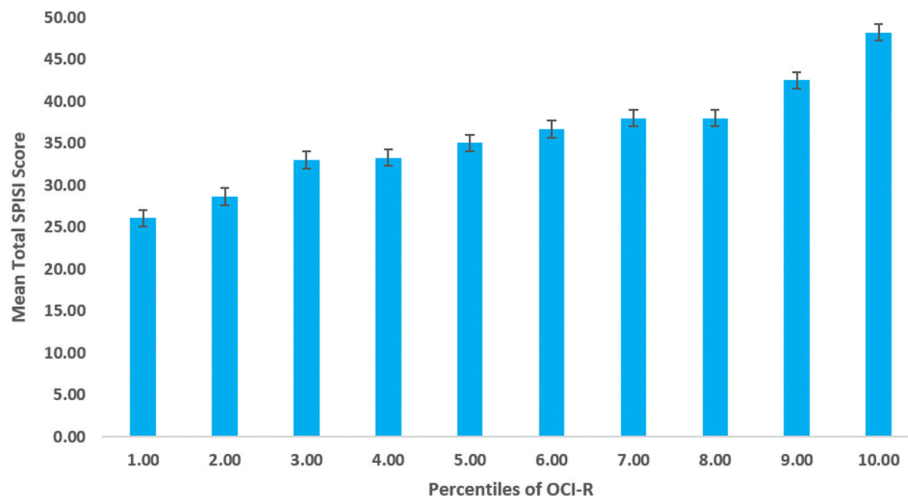


Fig. 4. SPISI score by percentile score on the OCI-R in the combines sample of Studies 1 and 2 (total N = 1494). Error bars represent standard errors of the mean.

rules that must be applied rigidly. These behaviors or mental acts are aimed at preventing or reducing anxiety or distress, or preventing some dreaded event or situation; however, they are not connected in a realistic way with what they are designed to neutralize or prevent, or are clearly excessive” (American Psychiatric Association, 2013). Two aspects of this definition are critical for understanding compulsions within the SPIS model: First, compulsions are aimed to achieve a goal; Second, the rules that govern their performance and/or termination appear to be dissociated from those goals (see Boyer & Lienard, 2006 for a discussion of “goal demotion” in rituals).

As Liberman and Dar (2009) noted, the explicit goals of compulsions (e.g., checking that the house is secure, avoiding disease by cleaning one’s hands) typically do not have clear end-states. In pursuing this type of goals, the feeling of having done enough often serves as a stopping rule (Martin et al., 1993, 2008). For example, a person who cleans the house would typically stop when they feel satisfied with how much they have invested in the task (thinking, for example, “I feel I have done as much as I could, given the circumstances”). Hence, a person who finds it difficult to access their feeling of satisfaction with what they have done would be forced to seek other criteria for stopping, and according to the SPIS model, rituals can provide such a stopping criterion. For example, a hand-washing ritual is usually not conducted until one feels that their hands are clean nor until one feels that they have washed enough. Rather, it is governed by unequivocal rules that circumvent any reference to such feelings. These rules may include counting, such as “apply soap five times, rub each finger three times, repeat the process three times, wipe hands with two paper towels” or clear, objective stopping rules, such as “wash until you finish a new bar of soap.” According to the SPIS model, these rules serve as proxies that exempt the OC individual from relying on difficult-to-access internal states, such as the sense of cleanliness or satisfaction with one’s actions.

Our view of compulsions resonates with other OCD models that view compulsive rituals as by-products of a dysfunctional feedback system that normally affords a sense of completion (Summerfeldt, 2004, 2007), safety (Boyer & Lienard, 2006; Szechtman and Woody, 2004), certainty (O’Connor, Aardema, & Pelissier, 2005; Tolin, Abramowitz, Brigidi, & Foa, 2003) or a “just right” feeling (Coles et al., 2003, 2005; Wahl et al., 2008). For example, Szechtman and Woody (2004) suggested that OCD is related to a disturbance in the “feeling of knowing” that normally serves as a termination signal for a “security motivation system,” a system that undertakes action in response to specific threats in the environment. According to this model, in individuals with OCD, the system’s behavioral output is often unable to generate this feeling. As a result, OC individuals perform the security-related behavior repeatedly in a futile attempt to generate the missing feedback feeling that would

normally end the operation of the system. A similar model by Boyer and Lienard (2006) suggests that OCD rituals stem from a failure of precaution actions to trigger “satiety feedback feelings” that would terminate the operation of a “precaution system,” whose goal is to detect and react to threats. Finally, according to “just right” models (Coles et al., 2003, 2005; Wahl et al., 2008), people with OCD are characterized by a difficulty in achieving a “just right” feeling, which drives them to repetitive, compulsive behaviors.

While building on and sharing important tenets with these theoretical accounts, the SPIS model diverts from these accounts and goes beyond them in two essential aspects. First, some of these models are bound to typical OCD-related contents. Specifically, the dysfunctional feedback system in Szechtman and Woody (2004) and Boyer and Lienard’s (2006) theories is constrained to the domains of safety and security, while Summerfeldt (2004, 2007) focuses on incompleteness and the resultant compulsions of symmetry, counting and checking. In contrast, the SPIS model is not confined to specific content domains, and some of our findings were obtained in relation to internal states such as muscle tension, that have little to do with typical OC concerns (Lazarov et al., 2012a, 2012b, 2014, 2015). As we discuss later, however, we agree with other models that OCD symptoms would develop only when it is important to the individual to access the relevant internal state. More importantly, compulsions in these models (Boyer & Lienard, 2006; Summerfeldt, 2004, 2007; Szechtman and Woody, 2004) do not have a function but are rather understood as by-products of a malfunctioning goal-directed system that becomes locked in a continual, pointless cycle. As the DSM-5 definition underlines, however, compulsive rituals are not merely repetitive, but are governed by rigid rules for performance and/or termination, and often bring relief or reduce distress. The SPIS model explains these important aspects of compulsive rituals in postulating a functional role to compulsions – they are proxies used in lieu of relevant but vague internal states to signal goal progress and/or completion (Liberman & Dar, 2009).

Finally, Fradkin, Adams, Parr, Roiser, and Huppert (2020) have recently proposed a computational model of OCD, which, like the SPIS model, is content-free and postulates a general deficit underlying OCD symptomatology. Specifically, according to their model, a central impairment in OCD is “uncertainty regarding state transitions,” that is, difficulty in understanding and predicting changes from one state to the next. This hypothesized impairment is said to lead people with OCD to rely excessively on present sensory information instead of their past experience, leading to a range of OCD symptoms, including compulsive behavior. This model has been further used by the authors (Fradkin et al., 2020) to re-interpret some of the findings we describe above as being consistent with a state transition impairment. For example, they



interpret the results of the biofeedback studies (Lazarov et al., 2012a, 2012b, 2014; Zhang et al., 2017) as indicating “increased weighting of sensory feedback [–] even when the sensory feedback was false.” However, there are several critical disparities between the SPIS model and the new computational model proposed by Fradkin and colleagues. For example, it is unclear how the proposed state transition deficit can explain our findings regarding emotional states or the sense of understanding, which do not involve transition between states. We expect that future studies and theoretical developments will lead to modifications of both models and clarify the relationships between them.

#### 4. Obsessions and the centrality of thoughts

Obsessions are recurrent, persistent and repetitive thoughts, urges, or impulses that are experienced as intrusive and unwanted, causing marked anxiety or distress (American Psychiatric Association, 2013). While not being a part of the DSM-5 definition, research suggests that people with OCD assign particularly high importance to their own thoughts/obsessions (Bhar et al., 2003; Bouvard, Fournet, Denis, Sixdenier, & Clark, 2017; Brakoulias et al., 2014; Steketee et al., 2001). According to meta-cognitive theories of OCD (Clark & Rasmussen, 2014; Purdon & Clark, 1999; Rachman, 1997; Salkovskis, 1985), the belief in the importance of thoughts is a crucial factor in perpetuating the obsessional cycle, as it leads OC individuals to attempt to suppress or neutralize “bad” thoughts. When these attempts fail, they interpret this failure as further evidence that their thoughts really do reflect negative or unacceptable feelings and motivations (Magee & Teachman, 2007; see Forster & Liberman, 2001; Forster & Liberman, 2004; Liberman & Forster, 2000 for a general model of this process). Such interpretations, in turn, lead to further suppression attempts, perpetuating the obsessive cycle.

While meta-cognitive theories explain how the perceived importance of thoughts contributes to the persistence of obsessions, they do not explain *why* people with OCD attribute such high importance to their thoughts. The SPIS model may bridge this theoretical gap by suggesting that thoughts become a central source of information when access to other internal states, such as motivations and emotions, is attenuated. If I don't know what I feel towards an object, then my thoughts become a major source of information from which I can infer my feelings and motivations towards it. For example, a man with OCD might lack a clear sense of his level of affection towards his girlfriend. Because of this deficient access to his feelings, critical thoughts about some features of his girlfriend's physique may signal to him that he does not really love her. More generally, we suggest that the difficulty in accessing internal states can lead people with OCD to infer their own attitudes, preferences, morality, or feelings from their own thoughts and images. According to the SPIS account, this is the reason that OC individuals monitor their thoughts closely (Janeck, Calamari, Riemann, & Heffelfinger, 2003; Kikul, Vetter, Lincoln, & Exner, 2011; Wells & Papageorgiou, 1998) and assign such major importance to their content and recurrence.

A specific manifestation of assigning central importance to thoughts is the so-called thought-action fusion (Meyer & Brown, 2013; Shafran & Rachman, 2004; Shafran et al., 1996), defined as the tendency of people with OCD to believe that having a thought indicates that they are likely to act on it. We suggest that thought-action fusion is a special case of assigning importance to one's own thoughts and images, and likewise stems from lack of access to one's feelings and motivations. When people know what they want and feel, then thoughts that are inconsistent with these motivations and feelings can be more readily discounted as irrelevant. In contrast, when one's own motivations and feelings are less accessible, thoughts gain centrality as being, in one's own mind, predictive of one's action. Many of us experience intrusive violent thoughts and images (e.g., of strangling our boss, of throwing our screaming baby out of the window, of flipping over a family holiday dinner table, of slapping an officer; Rachman & Desilva, 1978). Typically, however, we can discard these images because they are not accompanied by matching

motivational states and emotions.

In this context, we would like to comment briefly on the association between OCD and impulsivity. An OC individual who is concerned that they might act on their thoughts/images might experience themselves as impulsive. There is indeed some evidence that people with OCD tend to score highly on self-reported impulsivity (Grassi et al., 2015). However, as Abramovitch and McKay (2016) have recently argued, OC individuals are not really impulsive. Impulsivity refers to acting on one's feelings or urges with little regard for the consequences. This is in stark contrast to what OC individuals might experience as impulsivity, which is *fear of acting on thoughts* in the absence of clearly experienced feelings and urges (for a discussion of “fear of impulsivity” in OCD, see Abramovitch, Dar, Hermesh, & Schweiger, 2012).

#### 5. The SPIS account of obsessional doubt

The central role of doubt in the phenomenology and etiology of OCD has been acknowledged in classical descriptions (Janet, 1903; Rapoport, 1989; Reed, 1985; Shapiro, 1965) as well as in more modern theoretical accounts of the disorder (Boyer & Lienard, 2006; Szechtman and Woody, 2004). Empirically, individuals with OCD have been found to doubt their decision-making and concentration (Nedeljkovic, Moulding, Kyrios, & Doron, 2009; Nedeljkovic & Kyrios, 2007), their attention and memory (Hermans et al., 2008; Hermans, Martens, De Cort, Pieters, & Eelen, 2003; O'Connor et al., 2005; Van Den Hout, Engelhard, de Boer, du Bois, & Dek, 2008; Van Den Hout et al., 2009), and their feelings towards intimate partners (Doron, Szepeswol, Karp, & Gal, 2013). Doubt in the context of OCD has been typically defined as “lack of subjective certainty about, and confidence in, one's perceptions and internal states” (Samuels et al., 2017, p. 118).

The SPIS conceptualization of doubt underlines not only the lack of confidence regarding one's internal states but also the repetitive nature of obsessional doubt. Specifically, we define obsessional doubt as the process of reverberating through the stages of Fig. 1: Attempting to access the relevant internal state, failing to receive a clear answer, trying to access the internal states again or seeking a proxy for that state, both of which may lead to further looping through these stages. In the SPIS model, therefore, obsessional doubt is the result of two necessary conditions: a need to access an internal state (a “query”) and attenuated access to that state. Because of the attenuated access, the query is not resolved quickly, setting in motion the process depicted in Fig. 1. Importantly, no doubt would arise if access to an internal state is not compromised, because any question regarding it would be easily resolved (Fig. 1). Also, no doubt would arise in the absence of a query, even if the person is unable to access the relevant internal state. For example, a person may have limited access to their own feelings of love, yet never ask themselves “do I love my partner?” (perhaps because they do not consider love an essential factor in a relationship) and thus never experience doubt (in our sense of this word) regarding that emotion.

According to the SPIS model, therefore, difficulty in accessing internal states and obsessional doubt are distinct theoretical constructs, where the former is necessary, but not sufficient, to cause the latter. At the same time, this causal chain is not simply linear (from lacking clarity about internal states to doubting them): obsessional doubt (i.e., reverberating through the steps depicted in Fig. 1) can end up diminishing the clarity of the very internal state that the person tries to access. This effect was demonstrated in several studies in which participants were given instructions designed to induce doubt in their ability to assess the relevant internal state. For example, prior to the muscle tensing procedure, participants were told that people often feel too confident about their ability to control their own muscle tension, and that they should therefore monitor themselves closely and repeatedly to make sure that they are correctly and accurately producing the required muscle tension levels (Lazarov et al., 2015). Relative to participants who did not receive doubt-inducing instructions, participants who received these instructions were less accurate and more likely to request biofeedback in

the muscle tensing task (Lazarov et al., 2015), were more influenced by false feedback in judging their own levels of relaxation (Lazarov et al., 2012a) and muscle tension (Zhang et al., 2017) and had lower scores on the Experiential area of the MSCET (Dar et al., 2016).

While the effect of diminished access to internal states on doubt is fairly obvious, accounting for the reverse effect, demonstrated by the finding described above, is less straightforward. One possibility is that the detrimental effect of doubt on access to internal states is attributable to the increased intensity and frequency of monitoring the target internal state (Lieberman & Dar, 2009). For example, repeatedly asking myself whether I am enjoying my coffee would likely dampen the sense of enjoyment that might have been there initially (see Shapira, Gundar-Goshen, Lieberman, & Dar, 2013 for an experimental demonstration of this effect on feelings of interpersonal closeness). This idea also resonates with the finding that repeated checking (e.g., Van Den Hout & Kindt, 2003; 2004) and even prolonged staring (e.g., Van Den Hout et al., 2008; Van Den Hout et al., 2009) lead to diminished quality of one's memory. At present, however, there is limited direct evidence for this hypothesis, and there may well be other mechanisms (e.g., involving attentional resources) by which doubt can diminish access to internal states.

## 6. Limitations and outstanding questions

While considerable research over the past decade has been conducted in an effort to develop and test the SPIS model, there are important aspects of OCD phenomenology that remain unaccounted for by the present version of the model. We hope that these outstanding questions will motivate further research.

### 6.1. Content specificity of OCD symptoms

A major limitation of the SPIS model is that in positing a general deficit in accessing internal states, it does not account for the predominance of specific concerns in OCD, such as fear of contamination and related washing compulsions, or fear of harming others and related checking rituals. We believe that at least two factors, external to the SPIS model, may account for the relative specificity of OCD symptoms.

Several authors have proposed that the primacy of some specific concerns in OCD can be understood from an evolutionary perspective (e.g., Boyer & Lienard, 2006; Marks & Nesse, 1994; Rapoport & Fiske, 1998; Szechtman & Woody, 2004). This perspective implies that the content of many OCD symptoms reflects responses to potential threats to survival. For example, cleaning and washing rituals may be driven by evolved concerns with disease-carrying pathogens (Eyal et al., 2021), while concerns about harming others may be driven by evolved concerns with social exclusion (Boyer & Lienard, 2006).

Other OCD symptoms may be explained in terms of social norms that assign importance to certain internal states, thereby motivating people to try to access these states. For example, people with relationship-focused OCD (ROCD; Doron et al., 2014; Doron et al., 2013) monitor and question their feelings towards their partner. We would speculate that ROCD symptoms are most likely to occur in societies that expect people to feel love, attraction and excitement towards the partner they intend to marry, and less likely to occur in societies that treat marriage as a functional arrangement in which objective factors are more important than subjective feelings. The domain of religion is another example of how norms may define important internal states, which might facilitate the development of OCD symptoms in particular domains. Some religions might require a person to feel a sense of devotion or love toward the Lord, or that one prays with "full intent." For believers who may have difficulty knowing whether they experience enough devotion or whether their intent is in fact "full," these kinds of directives provide fertile ground for OCD symptoms. As research on "scrupulosity OCD" has documented (Abramowitz & Jacoby, 2014; Siev, Baer, & Minichiello, 2011), such symptoms can include lack of clarity about one's

relevant internal state (e.g., am I feeling genuine love for the Lord?) as well as rituals (e.g., repeating prayers, designing tests for one's devotion).

Future research could examine whether cultural variations in the contents of OCD symptoms can be traced to culture-specific emphases on particular internal states. For example, researchers can identify religious denominations that vary in the extent to which they mandate "true intent." Based on the SPIS model, we would predict that scrupulosity OCD would co-vary with this factor. In a similar vein, we would predict that ROCD would be less frequent in cultures that practice arranged marriages, and more frequent in cultures that idolize "true love."

### 6.2. How do people learn to access internal states?

How people learn to access internal states is another question in regards to which the present SPIS model is still silent. How does a child know that the slight shiver of their body and the excess saliva in their mouth mean excitement? How do they know, when experiencing a biting cold and a sinking heart that it is loneliness they feel? How do infants learn to recognize their experiences as hunger vs. fatigue? Both classic (Sullivan, 1953) and recent (Higgins, 2016; Tomasello, 2014) theories of social-emotional development acknowledge these as major developmental challenges. While it is beyond the scope of this paper to review them in detail, these theories seem to agree that empathic sharing with, and reflection of, experiences by other people are key to learning to access, correctly label and understand one's own internal states (Fonagy, 2002; Fonagy, Steele, Steele, Moran, & Higitt, 1991; Slade, 2005). If a child consistently has experiences that are not shared by others, and/or lacks the ability to share experiences and receive empathy, then the process of learning to access internal states might be disrupted. Would it be the case, as the SPIS model should predict, that such circumstances would increase one's likelihood to develop OCD symptoms? This question calls for much further research, but the results of extant studies appear to support this prediction, as we now turn to elaborate.

**Sensory Dysregulation.** One condition in which children's experiences might not be shared by others is atypical sensory responsiveness. A child who experiences a wide range of stimuli as aversive (e.g., cannot tolerate walking barefoot or being in a noisy environment) lives in a social situation in which their inner experiences may not be shared by others, which can lead to a disruption in the normal process of learning to access and label sensations. The SPIS model would predict, therefore, that children with sensory hypersensitivity would be at higher risk to develop OCD. Supporting this prediction, Dar, Kahn, and Carmeli (2012) found that sensory hypersensitivity was positively correlated with the frequency of rituals in kindergarten children and with OCI-R scores in adults. In another study (Bart, Bar-Shalita, Mansour, & Dar, 2017), children with atypical sensory responsiveness demonstrated higher frequency of ritualistic behaviors than children with normal sensory responsiveness.

**Impaired Social Communication.** Accessing one's internal states often involves labeling them, which in turn develops through a process of empathizing and sharing experiences with others. A child who is not exposed to sharing and empathizing with emotions, either because of their environment or because of their personal limitations, would likely fail to learn to access their own internal states. The SPIS model would predict that people with disorders from the autistic spectrum, who have deficits in empathy and social communication, would also show deficient access to internal states and heightened OCD symptoms. Supporting this reasoning, several studies reported ritualistic behaviors in children and adults with autistic spectrum disorders (Matson & Dempsey, 2009; McDougle et al., 1995; Russell, Mataix-Cols, Anson, & Murphy, 2005; Zandt, Prior, & Kyrios, 2007), and autistic spectrum disorders traits frequently co-occur with OCD (Ivarsson & Melin, 2008; LaSalle et al., 2004; Leyfer et al., 2006; Meier et al., 2015).

## 7. Clinical implications of the SPIS model

Developing the SPIS model involved a continuous dialogue between theoretical thinking and clinical interactions with clients suffering from OCD. Owing to this dialogue, we believe that the SPIS model not only provides a theoretical framework for understanding the disorder, but can also be fruitfully integrated into existing cognitive-behavioral therapy (CBT) for OCD. We suggest that using SPIS conceptualizations in treatment offers patients a way to understand their own symptoms that is both functional and empathic, and hence less threatening and more helpful than the interpretations these clients typically endorse.

First, the SPIS model's conceptualization of compulsive rituals as proxies can be gainfully adapted in CBT for OCD. Therapist can explain to their clients how doubts and attenuated access to internal states lead to compensatory behaviors (i.e., seeking and relying on proxies), including excessive reliance on norms, rules, rituals and requesting external validation from others. This reframing could help clients make sense of their rituals and ameliorate negative feelings and self-criticism that might accompany their performance. In addition, the drawbacks of relying on proxies can be explicitly recognized, including how it may lead to vicious cycles that end up further reducing one's own access to their internal states.

Second, our clinical experience suggests that discussing with clients the SPIS perspective on doubt as emanating from diminished access to their internal states, rather than as indicating real danger or catastrophic mistakes, can reduce anxiety. For example, a woman with OCD was tormented by the need to repeatedly check that she has locked all the doors and windows in her home, never being able to feel secure and satisfied with the actions she performed. Using the SPIS framework, the therapist helped her to accept that her inability to feel secure does not indicate that her house is any more likely to be at risk for burglary; what it means is that she has difficulty accessing her internal states of security and the satisfaction that she has done enough to secure her house. In illustrating this point, therapists might borrow the metaphor of near-sightedness: the deficit hypothesized by the SPIS model can be figuratively understood as myopia for internal states.

Second, the SPIS model can be also used to help therapists provide their clients with a non-threatening interpretation of their obsessions. The importance clients place on their intrusive thoughts can be understood within the SPIS framework as a consequence of limited access to alternative sources of information, such as feelings and motivations, that could contradict these thoughts. For example, a client with obsessional thoughts of smothering their crying baby could learn that their fear of these thoughts stems from their difficulty to access their feelings of love and care towards their baby. The client could thus learn that the thoughts do not reflect "true" or "deep seated" aggressive impulses. This perspective could also help the client cease the attempts to neutralize these thoughts or to use various "safety behaviors" against them (Deacon & Maack, 2008; Helbig-Lang & Petermann, 2010).

Finally, on a more speculative note, therapists may be able to use various procedures to help OCD clients improve their ability to access and label their own internal states. For example, research could examine the efficacy of mentalization-based techniques (Bateman & Fonagy, 2004; Fonagy, 1991, 2002; Fonagy, Target, & Bateman, 2010) aimed at achieving greater awareness of internal experiences through integrating multiple representations of these experiences (Choi-Kain & Gunderson, 2008). Future research could also investigate whether lessening proxy-related behaviors, as required in exposure and response prevention protocols for OCD (i.e., refraining from performing rituals), would lead to an improvement in clients' ability to perceive the relevant internal signals. For example, an individual with OCD could be encouraged to replace monitoring efforts and reliance on proxies with "the first thing that comes to mind." Research can then examine the effect of such interventions on performance in tasks (e.g., the muscle tensing task, Experiential EI) that were previously shown to be deficient in OCD individuals.

## CRediT authorship contribution statement

**Reuven Dar:** Formal analysis, Writing – review & editing, responsible for the conceptualization of the SPIS model. **Amit Lazarov:** Formal analysis, Writing – review & editing, responsible for the conceptualization of the SPIS model. **Nira Liberman:** Formal analysis, Writing – review & editing, responsible for the conceptualization of the SPIS model.

## Declaration of competing interest

None.

## Acknowledgment

The research reported in this review was supported by a grant from the Israel Science foundation 1279/20 to Reuven Dar.

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