

## Interoceptive Exposure: An Overlooked Modality in the Cognitive-Behavioral Treatment of OCD

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*Accumulated research implicates anxiety sensitivity (AS) as a transdiagnostic construct important to the maintenance of OCD. Yet despite the clinical implications of targeting fears of body-related sensations during treatment, interoceptive exposure (IE) is an often-overlooked therapeutic procedure in the cognitive-behavioral treatment of OCD. In this article, we discuss the rationale for—and procedures of—addressing AS during treatment for OCD. We provide two case examples, illustrating how a clinician might approach clinical assessment, case formulation, and treatment planning with each of these patients. We conclude by discussing future research directions to better understand if (and how) targeting AS during therapy might enhance OCD treatment outcome.*

### The Nature and Treatment of OCD

Obsessive-compulsive disorder (OCD) is a psychological condition that is characterized by obsessions (i.e., unwanted, intrusive, and anxiety-provoking, thoughts, images, impulses, or doubts) and/or compulsions (i.e., urges to perform repetitive, deliberate rituals and other anxiety-reduction strategies to offset feared consequences and/or neutralize obsessional fear; [American Psychiatric Association \[APA\], 2013](#)). Obsessions, compulsions, and other avoidance strategies are idiosyncratic and tend to fall along one of four empirically established domains: contamination, responsibility for harm, unacceptable (“taboo”) thoughts, and symmetry (i.e., “not just right experiences”) ([Abramowitz et al., 2010](#)). Obsessive-compulsive (OC) symptoms cause considerable distress and functional impairment among the 2-3% of the population that experiences OCD at some point in their lifetime ([Kessler et al., 2005](#)).

Although OC symptoms are topographically heterogeneous across individuals diagnosed with OCD, it is nevertheless understood that similar cognitive-behavioral processes are involved in its maintenance and treatment ([Frost & Steketee, 2002](#)). The general cognitive-behavioral model of OC symptoms proposes that obsessions and compulsions arise from dysfunctional (“obsessive”) beliefs (e.g., the tendency to exaggerate one’s responsibility for

causing or preventing harm; [OCCWG; 1997, 2001, 2003, 2005](#)). Specifically, obsessions are thought to develop when normally occurring unwanted intrusive thoughts (i.e., thoughts, images, and impulses that intrude into consciousness) are (mis)appraised as significant and harmful based on obsessive beliefs. Compulsive rituals and avoidance subsequently develop as efforts to remove intrusions and prevent feared consequences, yet are negatively reinforced by their ability to reduce distress. Rituals also prevent the person from learning that their appraisals of intrusions are exaggerated and unrealistic ([Blakey & Abramowitz, 2016](#)).

Although once deemed an untreatable condition with poor prognosis (e.g., [Kringlen, 1965](#); [Rasmussen & Eisen, 2002](#)), OCD is now considered highly manageable. The most effective treatment is cognitive-behavioral therapy (CBT; e.g., [Olatunji, Cisler, & Deacon, 2010](#)) using the procedures of exposure and response prevention (ERP): the repeated, systematic confrontation with obsessional stimuli while simultaneously resisting urges to perform rituals and other anxiety-reduction strategies during and after exposure trials (e.g., [Abramowitz & Jacoby, 2015](#); [Foa, Yadin, & Lichner, 2012](#)). The general aim of CBT is to provide patients with experiential evidence that (a) dysfunctional beliefs are unfounded and (b) fear and anxiety decline naturally over time, even if rituals are not performed. As applied in the treatment of a multitude of anxiety-related conditions, exposure may involve systematic confrontation with (a) feared external stimuli or situations (i.e., *in vivo* exposure), (b) anxiety-provoking thoughts or memories (i.e., imaginal exposure), or (c) feared body sensations (i.e., interoceptive exposure [IE]). Although ERP-based CBT is recommended as the first-line intervention for OCD (e.g., [APA, 2013](#); [NICE,](#)

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2005), response to this intervention varies widely and some individuals are not able to adhere or respond (e.g., Franklin & Foa, 1998).

Although most clinicians working with individuals affected by OCD will be familiar with the implementation of *in vivo* and imaginal exposure for this population, the use of IE has been relatively neglected in the clinical literature, including in treatment manuals for OCD (Clark, 2004). However, as we will discuss, there is often the need to use this technique to enhance OCD treatment outcome. Accordingly, the present article describes the conceptual rationale and implementation of IE in the treatment of OCD. We conclude with two case illustrations to show how clinicians might apply this technique.

### Explanatory models of ERP

Despite its established efficacy (e.g., Olatunji, Davis, Powers, & Smits, 2013), ERP's underlying mechanisms of change are not fully understood. A recently proposed explanatory model for ERP's effectiveness is inhibitory learning theory (Craske et al., 2008). In contrast to previous explanatory models of ERP (e.g., emotional processing theory; Foa & Kozak, 1986; Foa & McNally, 1996; Rachman, 1980), inhibitory learning theory pulls from basic learning research and posits that during exposure, fear-based associations (e.g., "having violent thoughts means I will commit violent actions") are forced to compete with newly acquired safety-based associations (e.g., "thoughts are merely thoughts, which are safe and tolerable"). Following inhibitory learning via ERP, a feared stimulus—such as a thought, contaminated object, or other obsessional cue—is then associated with both its original (fear-based) meaning and its new inhibitory (safety-based) meaning. Fear extinction is demonstrated by superior recall of the inhibitory association when later encountering a previously feared obsessional cue. The aim of ERP-based CBT for OCD from an inhibitory learning perspective, therefore, is to help anxious individuals generate and strengthen inhibitory associations relative to older, fear-based associations (e.g., Abramowitz & Arch, 2014; Arch & Abramowitz, 2015; Jacoby & Abramowitz, 2016).

### Anxiety Sensitivity

Anxiety sensitivity (AS) refers to the fear of anxious arousal (e.g., rapid heart rate, dizziness) that results from mistaken beliefs about the dangerousness of anxiety-related body sensations (e.g., Reiss & McNally, 1985; Taylor, 1995). Individuals with high levels of AS are hypervigilant to ambiguous body sensations and (mis)appraise these sensations as particularly threatening along physical, cognitive, and social domains. Examples include misinterpreting an increased heart rate as a sign of a heart *attack*, dizziness as an omen of "losing control," or racing thoughts

as an indicator that one is "going crazy" and about do something embarrassing or harmful. Anxious arousal may also be interpreted as an indication of a threatening situation more generally (i.e., "If I feel anxious, there must be danger"; Arntz, Rauner, & van den Hout, 1995).

Although often associated with panic disorder, AS is a multidimensional construct (Taylor, 1999) relevant to many anxiety-related disorders, including OCD (for a review, see Robinson & Freeston, 2014). Specifically, research has shown that greater AS is associated with greater OC symptom severity in nonclinical individuals (David et al., 2009; Keough et al., 2010; Sexton et al., 2003; Wheaton, Mahaffey, Timpano, Berman, & Abramowitz, 2012) as well as individuals with a clinical diagnosis of OCD (Blakey, Abramowitz, Reuman, Leonard, & Riemann, 2016; Deacon & Abramowitz, 2006; Laposa et al., 2015; Norton et al., 2005; Raines, Oglesby, Capron, & Schmidt, 2014; Taylor, Koch, & McNally, 1992; Wheaton, Deacon, McGrath, Berman, & Abramowitz, 2012; Zinbarg et al., 1997).

Although research examining the relationship between AS and OCD dimensions is mixed, emerging literature indicates relationships between specific domains of AS and OCD symptoms (e.g., Calamari et al., 2008; Wheaton, Mahaffey, et al., 2012). For example, it has been suggested that the AS-associated fear of cognitive dyscontrol is particularly pertinent to OC concerns related to the importance of (and need to control) thoughts (e.g., Cox, Borger, & Enns, 1999; Sexton et al., 2003; Wheaton, Mahaffey, et al., 2012). To illustrate, an OCD patient who believes that intrusive thoughts signal abnormality or forecast acting on an impulse to harm (OCCWG, 2005) may interpret racing thoughts as a sign that he or she is "going crazy" (Taylor et al., 2007). It is also possible that health concerns endorsed by many OCD patients also contribute to the fear of somatic sensations for their potential physical implications (e.g., Deacon & Abramowitz, 2006). That is, a patient who reports concerns with illness or disease (Goodman, Price, Rasmussen, & Mazure, 1989a, 1989b) may be prone to worry that gastrointestinal distress signals a serious illness (Taylor et al., 2007). Finally, research has also indicated that concerns for symmetry (i.e., "not just right" experiences) may be particularly related to both cognitive and physical dimensions of AS (Wheaton, Mahaffey, et al., 2012). For example, a patient whose obsessions concern symmetry might experience the physiological arousal triggered by a crookedly hung picture as dangerous or intolerable.

### AS and OCD treatment

There is preliminary empirical support for the hypothesis that AS influences OCD treatment outcome, as there is a dearth of research examining the relationship

between AS and ERP using clinical samples. One study (Blakey et al., 2016), however, did find that in a sample of OCD patients receiving treatment at a residential program specializing in CBT for OCD, AS predicted poorer treatment outcome, even after controlling for pretreatment OCD and depressive symptom severity. Although not directly addressed in the study, the authors suggested that greater AS interferes with CBT for OCD, given that anxious arousal might (a) directly relate to an OCD patient's primary fear and/or (b) threaten adherence to ERP procedures. Each of these possibilities is discussed next.

**AS Serves to Reinforce Obsessive Beliefs**

One way that misinterpretations of anxious arousal (i.e., AS) might complicate OCD treatment is that AS has the potential to reinforce obsessive beliefs. To illustrate, consider a woman with OCD whose obsessional fears center around the possibility that she will perish from a fatal eye aneurism (i.e., a benign swelling of blood vessels in the eye). When conducting imaginal exposure to the possibility that she might develop an aneurism that leads to blindness and death, she may be especially hypervigilant for (and anxious in response to) certain anxiety-related sensations that, to her, support her obsessional predictions. For example, she may swiftly notice exposure-related dizziness or headache and mistake them for evidence that eye aneurisms are extremely likely and catastrophic. Such an AS-exacerbated response to the exposure task might consolidate her worries and urges to engage in compulsive rituals (e.g., giving herself facial/cranial massages, scheduling frequent and unnecessary appointments with a neurologist), which maintain her OCD symptoms long-term (Salkovskis, 1991). Examples of other ways in which misinterpretations of ambiguous physical sensations may “confirm” obsessive beliefs is presented in Table 1.

**AS Threatens Adherence to ERP**

Anxious arousal (e.g., pounding heart, feeling flushed) is often elicited during confrontation with exposure

stimuli. Accordingly, AS might serve to amplify imaginal and/or *in vivo* exposure difficulty, above and beyond obsessive beliefs. This is because OCD patients with higher levels of AS are apt to respond fearfully not only in response to exposure stimuli (e.g., a knife that engenders obsessional urges to stab a loved one), but also to the exposure-induced physiological arousal (e.g., “a pounding heart means I am more likely to act on my violent obsessions”). In effect, OCD patients with high AS are simultaneously confronting two conditioned fear stimuli during exposures, which might understandably lead to reluctance to engage in challenging (or any) exposure tasks.

Physiological responding to anxiety-provoking cues in high-AS OCD patients may also cause them to become alarmed about their arousal-related sensations, which may intensify their anxiety even more. Furthermore, because AS is an established predictor of experiencing panic attacks (e.g., Schmidt, Zvolensky, & Maner, 2006), patients with greater AS might suffer injured confidence in their ability to confront feared stimuli, which could dampen prognostic optimism or confidence in treatment techniques. Such avoidance and resistance to fully engage in exposure trials is likely to attenuate treatment outcome among high-AS OCD patients.

**IE: The Overlooked Modality in CBT for OCD**

It is our observation that given the emphasis on *in vivo* and imaginal exposure, IE to anxiety-related body sensations is an often-overlooked strategy in the treatment of OCD. In striving to optimize evidence-based practice, it is important for treatment approaches to mirror relevant empirical and conceptual advances. The literature on AS and OCD (as described above) indicates that IE would be an important component of CBT for many individuals with obsessions and compulsions that in one way or another involve the fear of bodily sensations and perturbations. Although the role of AS in OCD treatment outcome is largely ignored in the literature, we speculate that discounting AS during CBT contributes to the relapse

Table 1  
Examples of How AS-Related Misinterpretations Serve to Reinforce Obsessive Beliefs

AS domain	Clinical example
Physical	If I'm nauseous, then I might have Ebola
	If my lymph node is swollen, I might have HIV/AIDS
Mental	If my heart starts pounding around children, it means I'm sexually aroused and may be a child molester
	If my thoughts are racing, I might lose control and harm someone
	If I'm dizzy while driving, I could hit a pedestrian without knowing it
Social	If I can't concentrate, it means I'm developing schizophrenia
	If I get anxious during an exposure, people around me will think I'm stupid
	If my mind goes blank during an exposure, people will think that I'm crazy
	If I tremble while holding a knife, others will think that I'm dangerous

or poor treatment response observed among some OCD patients. Specifically, taking OCD-related AS concerns into account during assessment may improve case conceptualization and highlight additional maladaptive beliefs (e.g., mistaken beliefs about anxiety-related body sensations) that should be challenged during the course of CBT. In the following sections, we propose the clinical utility of incorporating IE into OCD treatment plans. We also provide two case illustrations of how this procedure may be applied to target OCD-related AS and improve treatment outcome.

### Utility of Incorporating IE Into the Treatment of OCD

#### Assessment and Case Formulation

For some patients with OCD, fear is triggered by the perception of body sensations (e.g., awareness of blood flow to the genital area) as well as by mental stimuli (e.g., intrusive thoughts of committing molestation) and external cues (e.g., a child). Changes in skin, hair, or the color, odor, or form of bodily secretions may also trigger obsessional fear (i.e., somatic obsessions; “I might have Ebola”). As discussed above (and shown in [Table 1](#)), patients high in AS may be especially prone to misinterpret such noticeable (yet benign) body-related cues as serious or especially meaningful and ominous (e.g., “the feeling in my groin when I see a child means I must be a child molester”). Therefore, it is critical for clinicians treating OCD patients to assess for AS and other catastrophic misinterpretations of body sensations, and consider how such mistaken beliefs serve to maintain OC symptoms. Although described in greater detail elsewhere (e.g., [Abramowitz, Deacon, & Whiteside, 2011](#)), questions that can help to elicit AS-related beliefs include:

- Which sensations in your body trigger you to feel fearful?
- What goes through your mind if you notice these body sensations?
- Are you worried that unexplained or unexpected body sensations mean that something is medically wrong with you?
- Which body sensations make you think that you are losing control of your mind or likely to do something awful?
- How often do you feel that certain body sensations are proof that your OCD fears are true (or will come true)?
- How closely do you pay attention to changes in body sensations?
- What checking rituals do you have that are related to your body or particular body sensations?
- How frequently do you ask doctors, family members, or research online about certain body sensations?

- What do you do (or what do you avoid) to prevent feeling certain body sensations in the first place?

Supplementary objective assessment of AS (e.g., the Anxiety Sensitivity Index-3 [ASI-3]; [Taylor et al., 2007](#)) and related constructs (e.g., health anxiety [[Salkovskis, Rimes, Warwick, & Clark, 2002](#)], body vigilance [[Schmidt, Lerew, & Trakowski, 1997](#)]) using available self-report measures may also be useful.

#### Psychoeducation and Presenting the Treatment Rationale

Once the clinician understands the patient’s fear triggers, cognitive basis for the obsessional fears related to obsessional cues and anxious arousal, and safety behaviors (i.e., avoidance and compulsive rituals), the clinician may intervene with psychoeducation about anxiety and OCD. Psychoeducation would entail providing accurate information about the nature of anxiety, normalizing a patient’s experiences with intrusive thoughts, and explaining how rituals and anxiety-reduction strategies counterintuitively maintain OCD (for general guidance on presenting a compelling rationale for CBT with ERP, see [Abramowitz et al., 2011](#)).

Anxious arousal, for patients whose obsessional triggers include anxiety-related body sensations, should be described as a natural response to perceived threat. OCD patients should be helped to understand that the problem is not that they experience anxiety per se, but that they frequently experience anxiety “false alarms” and respond as if actual danger is present when it is not. Accordingly, we recommend providing high-AS OCD patients with psychoeducation about the physiology of fear (i.e., the “fight-or-flight” system) akin to what is done in the treatment of panic disorder (e.g., [Barlow & Craske, 2007](#)). Information important to communicate includes: (a) we all have “noisy bodies,” in that we all experience physical sensations as a result of the body’s tendency to maintain a relatively constant internal state (i.e., homeostasis), (b) threat detection stimulates the sympathetic nervous system, which results in a variety of physiological changes (e.g., blurred vision, nausea), (c) physiological fear responding is time-limited and not harmful, and (d) such symptoms are often exacerbated and/or prolonged when misinterpreted as dangerous or intolerable. Normalizing the multiple dimensions of AS (i.e., mistaken beliefs that body sensations are dangerous along physical, cognitive, or social domains) as common “thinking errors” may also be helpful. Clinicians working with patients who mistake anxious arousal for sexual arousal should also provide education about these experiences’ overlapping somatic sensations. For many patients, learning that the experience of unwanted or unexplained body sensations is universal may be therapeutic in itself.



### Developing an Exposure “To-Do List” and Conducting Exposures

An exposure to-do list<sup>1</sup> is a written record of feared stimuli and situations to be confronted during CBT. For patients who fear interoceptive cues (or who mistake body sensations to mean that their OCD concerns are accurate), IE tasks should be included on the list. Given that anxious arousal is likely to arise during imaginal or *in vivo* exposures, conducting IE tasks prior to exposures to other OCD-related stimuli may extinguish the fear of arousal-related sensations, thereby increasing willingness to comply with other CBT procedures (e.g., Blakey et al., 2016; Taylor et al., 2007). In our own clinical experience, introducing IE during the initial exposure sessions (before *in vivo* or imaginal exposure) helps patients with high levels of AS learn that they can “stick with” CBT even when these tasks provoke higher levels of anxiety and arousal.

As with all exposure lists, items planned for IE should relate to a patient’s specific obsessive and/or AS beliefs. Information gathered during the functional assessment can be used to guide the selection of IE exercises, but clinicians might also consider conducting an IE task assessment to identify other therapeutic exercises that elicit feared somatic sensations. This IE assessment involves having the patient conduct a number of brief exercises, each of which induces a unique set of body sensations. After each exercise, patients are asked to (a) identify and rate the intensity of elicited body sensations, (b) report the feared consequences of the sensations, (c) rate their overall level of anxiety, and (d) rate the similarity of the sensations induced by the exercise to the feared symptoms that occur naturally in “real life.” Exercises commonly used for the IE assessment are described in greater detail elsewhere (e.g., Abramowitz et al., 2011).

In order to get the most accurate ratings during the assessment, it is suggested that clinicians allow for the patient’s elicited sensations to subside before beginning the next assessment exercise. (During actual IE trials, however, patients are encouraged to conduct IE tasks in a prolonged and intense manner without breaks or prolonged inter-trial rest periods; Deacon, Kemp, Dixon, Sy, Farrell & Zhang, 2013). Patients should also be encouraged to fully engage in the exercises without distracting themselves, minimizing their sensations, or

engaging in other covert rituals or distress reduction strategies. By inducing somatic sensations, the IE assessment may serve as an exposure in itself, causing some patients to experience high anxiety during the session. IE exercises that activate AS-related beliefs are then added to the patient’s exposure list.

As with imaginal and *in vivo* exposure, extinction learning may be enhanced by varying the duration, task difficulty, and other aspects of the exposure (e.g., Golkar, Bellander, & Ohman, 2013; Hermans, Craske, Mineka, & Lovibond, 2006; Laborda & Miller, 2012; Lang & Craske, 2000) and practicing them in a variety of contexts (e.g., alone, with a therapist). IE tasks may serve as “stand-alone” exposures or be combined with *in vivo* and/or imaginal exposures later in treatment. Importantly, there is reason to believe that CBT for OCD should involve the simultaneous (compound) use of IE and *in vivo* exposures to optimize the consolidation of long-term inhibitory learning (e.g., Arch & Abramowitz, 2015; Craske et al., 2008, 2014). For example, a patient who interprets her trembling hands as indication that she is highly likely to act on her unwanted obsessional thoughts of drowning her newborn baby might conduct IE exercises (e.g., holding a pushup position to induce trembling) immediately prior to bathing her newborn unsupervised. This procedure is consistent with the principle of *deepened extinction*, in which multiple fear cues are combined during exposure (Rescorla, 2006). Readers are referred to Abramowitz and colleagues (2011) for additional resources related to conducting IE.

### Modification of IE Tasks for Medical Reasons

Many therapists hold explicit reservations against eliciting emotional and/or physiological arousal in pregnant women (Meyer, Farrell, Kemp, Blakey, & Deacon, 2014). Although IE entails the deliberate induction of prolonged and intense physical sensations, there is insufficient evidence to believe that IE (or CBT more broadly) is contraindicated for pregnant women (e.g., Arch, Dimidjian, & Chessick, 2012). Arch and colleagues (2012) offer therapeutic strategies for modifying IE tasks to accommodate pregnancy, such as sitting down to prevent the risk of a fall and monitoring a pregnant patient’s heart rate in relation to a maximal threshold recommended by the pregnant patient’s physician.

Therapists might also be concerned that other medical conditions could contraindicate the use of IE within the context of treatment for OCD (Meyer et al., 2014). However, such medical conditions are often unlikely to be exacerbated by IE tasks—especially if a patient engages in regular physical exercise without issue. For instance, a recent review found no ill effects of IE exercises on patients with chronic obstructive pulmonary

<sup>1</sup>To be consistent with emerging research on maximizing inhibitory learning during exposure therapy for OCD (e.g., Jacoby & Abramowitz, 2016), we have chosen to avoid the term “exposure hierarchy” in this article. The term “to-do list” is instead used to indicate that one need not gradually confront exposure stimuli; in fact, variability and unpredictability of fear during exposure might optimize extinction (e.g., Craske et al., 2008).

disease (COPD), even though cardinal symptoms of COPD include shortness of breath, wheezing, and fatigue (Barrera, Grubbs, Kunik, & Teng, 2014). Similarly, other researchers have reported that IE was not associated with more negative outcomes relative to relaxation/distraction breathing techniques in a cross-over design study of six patients with chronic back pain (Flink, Nicholas, Boersma, & Linton, 2009).

Certainly, if a patient reports physical pain when conducting IE, modifications should be made to allow for IE delivery at the appropriate intensity. For example, patients might use lighter weights, conduct IE exercises at a slower pace (e.g., turn the head from the side at the rate of *one* turn per second), or substitute strenuous activities with functionally equivalent exercises (e.g., spin a patient around in a swivel chair instead of having him or her rapidly turn their head side to side). Clinicians are advised to obtain consent and consult with a patient's physician if a patient reports a concurrent medical/physical condition that might seem to interfere with effective IE and/or be aggravated by IE tasks.

### Tips and Troubleshooting

Clinicians should be flexible in their delivery, tailoring IE exercises to match patients' maladaptive and mistaken beliefs about the importance and meaning of feared body sensations (those that might be related to OCD symptoms as well as those which might provoke the fear of doing exposures). In order to maximally violate negative predictions for harm and foster greater distress tolerance, patients should conduct IE exercises in a prolonged and intense manner (Abramowitz & Arch, 2014). This is because inhibitory learning is optimized by minimizing inter-trial breaks, extending the number of IE trials *past* the point at which the patient believes his or her feared outcome will occur, and encouraging patients to elicit as intense sensations as possible (Deacon et al., 2013).

Clinicians should also provide adequate psychoeducation without reassuring clients. When offering psychoeducation about the nature of OCD/somatic sensations and rationale for ERP, clinicians provide patients with *new* information. Yet clinical experience suggests that patients occasionally seek reassurance from their therapist during CBT (e.g., "Will I pass out if we continue this exercise?" or "you won't let me act on my impulses to do something terrible, will you?"). Discussing the long-term maladaptiveness of reassurance-seeking as a safety behavior early in treatment might (a) minimize patient reassurance-seeking during exposure trials and/or (b) allow for clinicians to provide a sympathetic response that does not serve to reinforce OCD-related beliefs (e.g., "I don't want to be insensitive, but it sounds like you're looking for reassurance...we've already discussed this, and I think you know the answer").

Some OCD patients report that whereas physical sensations that arise "out of the blue" are highly-anxiety provoking, somatic sensations induced by IE tasks (and therefore have a known source) are not distressing. In these instances, we recommend that clinicians emphasize the advantage of still including IE into the patient's CBT treatment plan. That is, by devoting time in session to practicing tolerating OCD-related physical sensations (even if they are considered nonthreatening in the moment), patients may be better able to employ learned CBT skills (e.g., reappraising the meaning of physical sensations; tolerating discomfort and distress) in naturalistic settings where feared sensations come on unexpectedly. Combining IE tasks with imaginal and *in vivo* exposure tasks during sessions may be *especially* helpful for these patients, given that the cause of somatic arousal is more ambiguous when patients are simultaneously confronting a feared situation (e.g., hyperventilating for 90 seconds before imagining kissing a relative).

Finally, it is possible that high-AS patients may experience a panic attack during an exposure task. If this occurs, clinicians are encouraged to act consistently with the psychoeducational information and rationale of exposure therapy by empathizing with the patient's distress, normalizing the experience of anxiety, and demonstrating confidence in the patient's ability to continue with the exposure task. Although this might seem challenging (or even counterintuitive) when a patient demonstrates intense anxious arousal and distress, it is important not to provide reassurance or help the patient to avoid or escape from panic-related sensations, as such accommodation serves to maintain OCD and AS long-term (Farrell, Deacon, Kemp, Dixon, & Sy, 2013). Moreover, clinicians may capitalize on the opportunity to help patients appreciate their ability to continue their exposure task *despite* intense body sensations, uncertainty, and psychological distress. In our own clinical experience, some of the most powerful learning and development of self-efficacy occurs when patients persist through an exposure task that they had predicted to be especially challenging. In these instances, clinicians should reinforce patients' willingness to face their fears despite experiencing concurrent panic symptoms by providing verbal praise and encouragement.

### Case examples

In the following section, we present two illustrations of how AS influenced the conceptualization and treatment of patients with OCD. We describe how a clinician might approach assessment, case formulation, and treatment planning with each of these patients.

#### Megan

Megan is a 24-year-old woman who sought therapy for OCD symptoms related to "not just right" experiences.

Specifically, Megan feared that harm would befall her mother if she did not completely “balance” her left and right side (e.g., by making sure her shoes were tied equally tight). She quickly mastered a few exposure tasks (e.g., carry a heavy bag on one shoulder, wear different socks on each foot, wear a watch on the “bad” wrist), but reported distress when she attempted to go jogging with her left shoe tied much tighter than her right shoe. She was willing to try the exposure, but experienced an increase in anxious arousal that culminated in a panic attack after 10 minutes. Her self-reported distress was “100 percent,” and she reported sensations common during panic attacks, such as nausea, tingling in her extremities, and trouble catching her breath. Megan interpreted her sensations to mean that (a) her mother was surely in harm’s way and (b) she did not have the “mental strength to overcome OCD.” Megan refused to continue the exposure and re-tied both shoes to balanced tightness before walking back to the clinician’s office. She was considering dropping out of treatment altogether given that exposure was “obviously too anxiety-provoking” for her.

At the next session, Megan’s therapist conducted a theory-driven functional assessment of Megan’s arousal-related fears. This revealed that Megan was using *ex-consequentia* reasoning (e.g., Arntz et al., 1995), misinterpreting her signs of anxious arousal as (a) indication that her mother’s physical/medical catastrophe was imminent, as well as (b) “proof” that she could not tolerate anxiety or the associated physiological sensations. An interview also revealed previously unassessed avoidance of situations that might precipitate anxious arousal (drinking caffeine, intense exercise) even though such behaviors had the potential to worsen her symptoms long-term (e.g., Deacon & Maack, 2008; Olatunji, Etzel, Tomarken, Ciesielski, & Deacon, 2011).

With a better understanding of how Megan’s AS related to her OCD symptoms, Megan’s therapist was able to amend the treatment plan to better address Megan’s OCD-related concerns. This treatment plan included (a) providing psychoeducation regarding the nature of anxious arousal, (b) offering a rationale for why IE might be incorporated into her OCD treatment to fully address the psychological processes maintaining her symptoms, (c) conducting an IE assessment in order to identify which IE tasks effectively targeted clinically relevant beliefs about the dangerousness and tolerability of anxiety and related arousal, (d) incorporating the appropriate IE tasks into a comprehensive treatment plan to improve Megan’s short- and long-term treatment outcome, and (e) using cognitive therapy to target the *ex-consequentia* reasoning.

In Megan’s case, IE involved inducing uncomfortable physical sensations (e.g., doing one-handed pushups;

doing one-legged squats) and reattempting exposures, being sure to observe and therapeutically evaluate the somatic sensations accompanying her obsessional fears. Megan’s therapist also explicitly discouraged AS-related safety behaviors such as reassurance-seeking (e.g., calling her mom to make sure she was alright) or escaping exposures altogether (e.g., early discontinuation of exposures, alternating which foot wore the tighter shoe to “balance” out the bad luck). Importantly, Megan’s therapist was deliberate in how she framed Megan’s performance during exposures that elicited physiological arousal. For example, Megan’s therapist would challenge Megan’s interpretations of exposure-generated somatic sensations, saying, “Wow, you’re continuing the exposure *despite* intense body sensations. What does this say about your ability to face your fears versus being too weak to face them?” Nonjudgmental and encouraging statements such as these helped Megan to develop self-efficacy in her ability to experience anxiety-related body sensations, rather than (mis)interpret her somatic anxiety response to mean that she was responsible for her mother’s harm and/or unable to benefit from ERP.

## David

David is a 38-year-old father who sought therapy for intrusive thoughts regarding the possibility that he might be a child molester. He denied any desire whatsoever for sexual contact with children and became tearful when telling his therapist about his unwanted, intrusive thoughts and images of a sexual nature involving children that he knew. He was primarily distressed by obsessional thoughts about molesting his 7-year-old son. During the assessment, David explained that these obsessions were triggered by certain physical sensations that he experienced when around children; namely, increased heart rate, feeling hot or flushed, and muscle tension. He was particularly concerned about an instance during which he thought he felt a “twinge” of sexual excitement when his son crawled up to sit on his lap after dinner one night. David worried that these sensations meant that “deep down,” he really did have sexual interest in children. As a result, David tried to avoid physical activity that elicited these sensations (e.g., avoided playing with his son or tucking him in at night), was acutely aware of any physical sensations that occurred in the presence of children, and removed himself from the presence of children when he had these sensations. He was also spending more and more time on the internet seeking reassurance that it is “normal” to have these sorts of experiences.

When assessing David’s concerns at intake, his therapist determined that David was quick to notice physiological arousal and misinterpret such sensations as sexual arousal (rather than anxious arousal or random

“body noise”). Furthermore, David reported high levels of intolerance of uncertainty (i.e., the need to be certain as well as difficulty coping with ambiguity; OCCWG, 1997) that exacerbated his OCD symptoms. Accordingly, David’s therapist began by providing him with educational handouts about “body noise,” described the physiological sensations inherent to the “fight or flight” response, discussed the overlap between anxious and sexual arousal, and offered a rationale for combining IE with imaginal and *in vivo* exposures for his obsessional fears related to possibly being a child molester.

After receiving this didactic information, David agreed to conduct an IE assessment at the next session, during which he and his therapist jointly determined that jogging, tensing and releasing groin muscles, and hyperventilation would be useful exercises to induce OCD-related body sensations. David was also encouraged to allow and observe groin sensations as they occurred naturally in order to consider alternative interpretations (e.g., body sensations are safe and tolerable, if unexpected and/or unpleasant). The first few therapist-guided exposures involved conducting IE trials while the therapist activated feelings of uncertainty (e.g., “maybe you are a child molester and you will never know for sure”). After practicing inducing and tolerating the arousal brought about by these exercises, David and his therapist combined these IE tasks with *in vivo* exposures. Particularly useful exposure tasks involved jogging to the playground where his wife and son were waiting to play together, and helping dress his son for school immediately after doing a series of leg squats. David was also encouraged to remain in the situation (i.e., not escape) if he were to notice physiological arousal sensations when around children. He was also discouraged from performing other rituals such as online checking or reassurance-seeking.

### Conclusions

Accumulated research (and clinical experience) implicates AS as a transdiagnostic construct important to the development, maintenance, and treatment of OCD. Yet despite the clinical implications of targeting fears of body-related sensations during treatment, IE is an often overlooked therapeutic procedure in exposure-based treatments for OCD. We emphasized the need for conceptually driven (rather than treatment manual-driven; see Abramowitz, 2013) assessment of AS in clients with OCD so that clinicians may (a) integrate the fear of anxious arousal into their patients’ case conceptualizations and (b) design appropriate exposure exercises to challenge these OCD-related beliefs about bodily sensations. The rationale for using IE tasks to modify AS among OCD patients is consistent with models of CBT (e.g., Abramowitz et al., 2011): prolonged, systematic exposure to interoceptive cues helps patients to

(a) correct their mistaken beliefs about the dangerousness and meaning of somatic sensations and (b) develop greater self-efficacy in their ability to tolerate anxious arousal. We concluded with two OCD case examples, illustrating how AS—which played a critical role in their OCD symptom presentation—was effectively targeted with IE.

### Directions for Future Research

Although our clinical recommendations are derived from theoretical and empirical work, there is still need for continued examination of AS in OCD patients. Importantly, the mechanisms for how unaddressed AS might interfere with treatment outcome are undetermined. We emphasized two plausible processes (i.e., AS reinforces obsessive beliefs and compromises patient adherence), but these hypothesized mechanisms deserve empirical attention. Similarly, although the inhibitory learning approach to ERP (Craske et al., 2008, 2014) is promising, most of the inhibitory learning-based research has focused on individuals with panic and specific phobias. Similarly, the incremental efficacy of deepened extinction of obsessional fear by combining interoceptive and *in vivo* exposures (Rescorla, 2006) is yet to be established. Clearly, more research testing learning theories of extinction in the context of OCD are needed. Study hypotheses involving arousal-related hypotheses should also include physiological indices (e.g., heart rate, skin conductance, stress hormone concentrations) as outcome measures.

Research on the additive utility of IE in OCD treatments would also be helpful. The Unified Protocol for Transdiagnostic Treatment of Emotional Disorders (UP; Barlow et al., 2011) includes an IE module to address the intolerance of anxious arousal sensations broadly, yet it remains unclear whether (a) the incorporation of AS psychoeducation directly causes AS reductions in OCD patients, (b) reductions in AS mediate OCD symptom improvement during a full course of CBT, and (c) whether general IE (versus conceptually driven and patient-specific) exercises are sufficient to improve AS in OCD patients. Furthermore, given that some researchers have speculated that different AS domains predict different OC symptom domains (e.g., Deacon & Abramowitz, 2006; Wheaton, Mahaffey, et al., 2012), future research elucidating the relationship between AS and OCD symptom dimensions is warranted. Finally, researchers should continue to examine the latent structure of AS. Some investigators (Bernstein, Zvolensky, Vujanovic, & Moos, 2009; Mitchell, Riccardi, Keough, Timpano, & Schmidt, 2013) have argued that AS is a subconstruct of distress tolerance, which is related to (yet distinct from) discomfort intolerance (i.e., the inability to withstand uncomfortable physical sensations; Schmidt &



Lerew, 1998). Development of parsimonious yet comprehensive theoretical models of these constructs—and how they relate to OCD symptom maintenance—would be useful. Additional work is needed to elucidate our understanding of these clinically relevant constructs in order to improve the assessment and treatment of OCD and related conditions.

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