# Adherence to exposure and response prevention as a predictor of improvement in obsessive-compulsive symptom dimensions

Heidi J. Ojalehto[a], Jonathan S. Abramowitz[a,*], Samantha N. Hellberg[a], Jennifer L. Buchholz[a], Michael P. Twohig[b]

[a] *University of North Carolina at Chapel Hill, United States*
[b] *Utah State University, United States*

### ABSTRACT

Exposure and response prevention (ERP) is an effective treatment for obsessive compulsive disorder (OCD); yet, improvement rates vary and it is therefore important to examine potential predictors of outcome. The present study examined adherence with ERP homework as a predictor of (a) treatment response across OCD symptom dimensions and (b) reductions in psychological factors implicated in the maintenance of OCD. Fifty adults with OCD received manualized twice-weekly ERP as part of a treatment trial. Results indicated that treatment was effective for all OCD symptom dimensions and that greater adherence with ERP homework predicted post-treatment (but not follow-up) improvements in OCD symptoms pertaining to responsibility for harm, un-acceptable obsessional thoughts, and symmetry. Adherence did not predict outcomes for contamination symptoms, however. Adherence also predicted improvement in psychological maintenance factors such as obsessive beliefs and experiential avoidance. Implications of the findings include the importance of emphasizing adherence to homework instructions, as well as the importance of considering OCD symptoms dimensionally as opposed to globally in examining predictors of treatment response.

## 1. Introduction

Obsessive-compulsive disorder (OCD) affects 1–3 % of the population and is associated with significant distress and functional impairment (Adam, Meinlschmidt, Gloster, & Lieb, 2012; Ruscio, Stein, Chiu, & Kessler, 2010). Substantial evidence supports the effectiveness of exposure and response prevention (ERP) for the treatment of OCD (Olatunji, Davis, Powers, & Smits, 2013). ERP is a cognitive-behavioral intervention that involves repeated exposure to obsessional cues (*e.g.,* restroom floors) without performing compulsive rituals (*e.g.,* resisting the urge to wash one's hand). The aim of ERP is to foster opportunities to learn that fear stimuli are generally safe and extinguish obsessional fears. While meta-analytic findings (Olatunji et al., 2013) indicate that ERP outperforms other treatments for OCD (*e.g.,* medication, relaxation, anxiety management training), approximately 50 % of individuals do not respond optimally (*e.g.,* Loerinc et al., 2015). Accordingly, it is important to identify factors associated with both successful and unsuccessful outcomes to guide efforts to tailor treatments and, in turn, improve response rates.

Researchers have investigated the prognostic value of various clinical factors, such as the severity of obsessions and compulsions, co-occurring depression, and the patient's insight into the senselessness of obsessional fear (Abramowitz, 2004; Himle, Van Etten, Janeck, & Fischer, 2006; Kishore, Samar, Janardhan Reddy, Chandrasekhar, & Thennarasu, 2004; Overbeek, Schruers, Vermetten, & Griez, 2002; Steketee, Siev, Yovel, Lit, & Wilhelm, 2018). Less work, however, has examined the predictive value of process variables, such as the extent to which patients complete the homework assignments they are given (*i.e.,* adherence). ERP is a skills-based treatment that involves in-session, therapist-guided exposure trials. Yet, the majority of ERP practice actually occurs *between* sessions in the form of prescribed daily exposure and ritual abstinence, which the client performs independently with varied fear stimuli in diverse contexts. Due to the inherent challenges of facing one's fears, many patients have difficulty with between-session homework adherence. For example, patients may often only partially adhere to homework instructions, and continue to engage in compulsive rituals while confronting feared stimuli. Accordingly, it is important to study homework adherence as a predictor of ERP outcomes, especially as out-of-session practice facilitates the application of skills taught in therapy and promotes generalization of learning across contexts.

A few studies have found that adherence is positively associated with response to ERP (Simpson, Marcus, Zuckoff, Franklin, & Foa, 2012; Abramowitz, Franklin, Zoellner, & DiBernardo, 2002; De Araujo, Ito, & Marks, 1996; Simpson et al., 2011; Wheaton et al., 2016). Notably, however, all of the investigations to date have used *global* measures of OCD to quantify treatment response (*e.g.*, the Yale-Brown Obsessive Compulsive Scale). Although this approach provides valuable information, OCD is a heterogeneous condition that can be distilled into four symptom dimensions: contamination, symmetry, responsibility for harm, and unacceptable thoughts (*e.g.*, Abramowitz et al., 2010; for a review see McKay et al., 2004). These symptom dimensions were derived from empirical research on the phenomenology and mechanisms of OCD and have been shown to have unique clinical correlates (Hellberg, Buchholz, Twohig, & Abramowitz, 2019; Reuman, Buchholz, & Abramowitz, 2018; Wheaton, Abramowitz, Berman, Riemann, & Hale, 2010). To this effect, taking a dimensional approach to identifying predictors of outcome may be particularly important, as these different presentations of OCD respond differentially to ERP (*e.g.*, Williams et al., 2014; for a review see Williams, Mugno, Franklin, & Faber, 2013). For example, previous work suggests that contamination symptoms respond better than other symptom domains (Buchanan, Meng, & Marks, 1996).

Another reason to account for the dimensionality of OCD in examining the impact of homework adherence on ERP outcomes is that the delivery of this treatment differs substantially across symptom dimensions (*e.g.*, Abramowitz, Deacon, & Whiteside, 2019). ERP for contamination fears, for example, is often a straightforward process involving exposure to feared contaminants along with the elimination of compensatory washing or cleaning behaviors until the individual learns that contamination cues are generally safe. Symmetry and ordering symptoms are similarly addressed with exposure to external sources of asymmetry in the absence of ordering/arranging rituals to help the individual learn that "not just right" experiences are manageable. On the other hand, effective ERP for obsessions concerning responsibility for harm and unacceptable thoughts (*e.g.*, sexual, violence, and religious obsessions) is often more challenging to implement because it requires both exposure to external cues (*e.g.*, knives), as well as engagement with highly distressing internal thoughts, images, and doubts (*i.e.*, imaginal exposure to unwanted thoughts about harm and violence). Individuals must also refrain from checking, reassurance-seeking, and mental rituals—the latter of which can be especially challenging to limit (*e.g.*, Abramowitz & Jacoby, 2015). Thus, the degree to which adherence predicts outcome for different OCD symptom presentations might vary.

Recent conceptualizations of exposure-based therapy view the mechanism of change as a cognitive one in which new safety-based information (*e.g.*, floors are safe) is acquired to compete with and inhibit existing fear-based associations (*e.g.*, floors are dangerous) leading to fear extinction (Sewart & Craske, 2020). Cognitive models of OCD posit that obsessional fear develops from and is maintained by "obsessive beliefs" belonging to three domains: (a) the tendency to overestimate threat and responsibility, (b) the idea that unwanted thoughts are meaningful and should be controlled, and (c) the belief that imperfection and uncertainty are intolerable (Obsessive Compulsive Cognitions Working Group, 2005). Research indicates that individuals with OCD experience changes in these cognitions following ERP (Sewart & Craske, 2020), yet no studies to date have examined adherence as a predictor of such cognitive change.

Experiential avoidance (EA; Hayes, Luoma, Bond, Masuda, & Lillis, 2006), defined as the unwillingness to remain in contact with unwanted internal experiences that are perceived as negative, is also associated with OCD symptom maintenance. According to acceptance and commitment therapy (ACT), which is derived from relational frame theory (RFT; Hayes et al., 2006), a large reason OCD persists because the individual tries to control or reduce unwanted intrusive thoughts via avoidance and compulsive rituals. From this perspective, treatment aims to help the person learn to interact in more functional ways with unwanted internal experiences so that meaningful life activities can be pursued. There is evidence that ERP leads to reductions in EA (Solem, Håland, Vogel, Hansen, & Wells, 2009; Twohig et al., 2018; Whittal, Thordarson, & McLean, 2005), yet no studies have examined the extent to which adherence predicts decreases in EA.

Because ERP is an empirically supported skills-based intervention, research on adherence with between-session practice can yield useful findings for clinicians. Accordingly, the aim of the present study was to further elucidate the role of adherence to ERP homework. Data were drawn from a randomized controlled trial (Twohig et al., 2018) in which adult patients all received forms of ERP for OCD. In accord with previous research and clinical observations, we hypothesized that after controlling for baseline OCD severity and depression, adherence would be predictive of improvement in global OCD severity at both post-treatment and at 6-month follow-up. We also predicted that adherence would be predictive of improvement in each of the four OCD symptom presentations at both time points. Finally, we predicted that adherence would predict changes in obsessive beliefs and EA at post-treatment and at follow-up.

## 2. Method

### 2.1. Participants

Participants were 50 adults (32 female) between the ages of 18 and 56 ($M = 27.27$, $SD = 8.38$) who completed a 16-session trial of manualized ERP treatment for OCD (described further below). Fifty-eight adults enrolled in the parent trial (Twohig et al., 2018), three dropped out before beginning treatment, and five dropped out before starting exposure sessions. The sample was 76 % ($n = 38$) White, 8% ($n = 4$) Hispanic, 4% ($n = 2$) African American, 4% ($n = 2$) Asian American, 2% ($n = 1$) Native American, 2% ($n = 1$) other, and 4% ($n = 2$) unknown. All participants received a DSM-5 diagnosis of OCD according to the Mini International Neuropsychiatric Interview 5.0 (MINI 5.0). More than half of the sample had at least one secondary DSM diagnosis (58 %; $n = 29$), the most common being mood ($n = 16$) and anxiety disorders ($n = 12$). Approximately half of the sample also reported taking psychotropic medication during treatment (46 %), which was admissible in the parent trial as long as doses remained stable from at least one month before starting treatment through study completion. Of the 23 participants using medication, the majority reported taking selective serotonin reuptake inhibitors ($n = 13$).

### 2.2. Procedure

#### 2.2.1. Treatment

Data for this investigation were drawn from an OCD treatment study examining the effects of adding components of Acceptance and Commitment Therapy (ACT) to ERP (Twohig et al., 2018). Participants completed 16 twice-weekly, 2 h sessions of individualized treatment at one of two sites: University of North Carolina at Chapel Hill and Utah State University and were randomly assigned (at each site) to receive either traditional ERP or ERP + ACT. The number of in-session therapist-supervised exposure trials was equal across both conditions. Treatment was delivered by doctoral level therapists and advanced clinical psychology doctoral students who received training in the treatment protocols, adhered to detailed treatment manuals, and received supervision from doctoral-level clinical psychologists with expertise in the treatment of OCD. Daily exposure homework assignments were prescribed for practice between sessions, and patients were instructed to refrain from compulsive rituals between sessions.

Sessions 1–2 in both treatment conditions included information gathering, psychoeducation, and treatment planning. Sessions 3–16 involved exposure exercises with instructions to practice exposures out-of-session ("homework") and refrain from rituals. Homework exposure

was given following each exposure session and usually involved repetition of that day's exposure independently and in different settings. Session 16 also addressed treatment termination and relapse prevention. The centerpiece of both treatment conditions was ERP; and in the ACT + ERP condition, metaphors drawn from ACT were included before, during and after each exposure trial to reinforce the concepts central to this approach (*e.g.*, acceptance of obsessional thoughts and the importance of ERP to one's values). Analyses indicated no between-group differences in outcome for OCD symptoms, obsessive beliefs, or experiential avoidance (Twohig et al., 2018). Therefore, all treatment completers were included in the present study as a single group, regardless of study condition.

### 2.2.2. Assessment

Administration of the YBOCS interview and self-report measures occurred at pretest, post-treatment, and 6 months follow-up. The PEAS was administered at sessions 4 through 16, which corresponded to each session at which patients were expected to have completed ERP homework assignments.

## 3. Measures

**Yale-Brown Obsessive Compulsive Scale** (YBOCS; Goodman, Price, Rasmussen, Mazure, Delgado et al., 1989; Goodman, Price, Rasmussen, Mazure, Fleischmann et al., 1989). Global OCD severity was measured using the YBOCS, a semi-structured interview that includes a symptom checklist and 10-item severity scale. The checklist is first used to identify the participant's particular obsessions and compulsions. The severity scale then assesses the main obsessions (items 1–5) and compulsions (items 6–10) on the following five parameters: (a) time, (b) interference, (c) distress, (d) resistance, and (e) degree of control. The clinician rates each item from 0 (*no symptoms*) to 4 (*extreme*) based on the past week. The 10 items are summed to produce a total severity score that ranges from 0 to 40. The YBOCS is the most widely used measure of global OCD severity and has satisfactory psychometric properties (Goodman, Price, Rasmussen, Mazure, Delgado et al., 1989; Goodman, Price, Rasmussen, Mazure, Fleischmann et al., 1989; Storch et al., 2005).

**Dimensional Obsessive-Compulsive Scale** (DOCS; Abramowitz et al., 2010). The 20-item self-report DOCS assesses the severity of the four empirically supported OCD symptom dimensions: contamination, responsibility for harm, symmetry/ordering, and unacceptable thoughts. Each dimension has its own subscale containing 5 items (rated 0–4) which assess the following severity parameters: time occupied by obsessions and rituals, avoidance behavior, associated distress, functional interference, and difficulty disregarding the obsessions and refraining from the compulsions. DOCS subscale scores range from 0 to 20, have shown excellent reliability and sensitivity to the effects of treatment in clinical samples, and demonstrate good convergent validity with other measures of OCD symptoms (Abramowitz et al., 2010).

**Beck Depression Inventory-II (BDI;** Beck, Steer, & Brown, 1996). The BDI is a 21-item, widely-used, self-report inventory that assesses the severity of cognitive, affective, and physiological symptoms of depression. Each item is rated on a four-point scale (0–3) with summation sores ranging between 0 and 63. The BDI-II has been shown to have high internal consistency, validity, and excellent sensitivity to the effects of treatment (Beck et al., 1996).

**Obsessive Beliefs Questionnaire** (Obsessive Compulsive Cognitions Working Group, 2005). The OBQ, a 44-item self-report instrument, measures dysfunctional beliefs (*i.e.*, obsessive beliefs) thought to maintain OCD symptoms. It contains three subscales: (a) threat overestimation and responsibility (OBQ-RT), (b) importance and control of intrusive thoughts (OBQ-ICT), and (c) perfectionism and need for certainty (OBQ-PC). The instrument has good validity, internal consistency, and test-retest reliability (Obsessive Compulsive Cognitions Working Group, 2005).

**Acceptance and Action Questionnaire-II (AAQ-II;** Bond et al.,

2011). The AAQ-II is a 7-item self-report measure of EA. The items are rated on a 7-point Likert scale and reflect: (a) the unwillingness to experience unwanted emotions and thoughts, and (b) the inability to be in the present moment and behave in accordance with one's values or goals when experiencing unwanted psychological events. The AAQ-II has sound psychometric properties as well as convergent, discriminant, and incremental validity (Bond et al., 2011).

**Patient ERP Adherence Scale** (PEAS; Simpson et al., 2011). The PEAS is a semi-structured therapist-rated scale of patient adherence to between-session ERP homework assignments. After a thorough review and discussion of the previously assigned homework, the therapist rates adherence along three parameters: (a) the quantity of exposures attempted (*i.e.*, percent of assigned exposures that were attempted; PEAS A), (b) the quality of the attempted exposures (*e.g.*, how closely did the patient follow the homework instructions given by the therapist; PEAS B), and (c) the degree of success with response prevention (*i.e.*, percent of urges to ritualize that were successfully resisted; PEAS C). Each item is rated on a 7-point Likert scale, ranging from 1 (0% adherence) to 7 (100 % adherence). In the parent trial for the current study, the PEAS was administered at sessions 4 through 16; *i.e.*, each treatment session at which patients were expected to complete ERP homework assignments. To create a mean PEAS score for each component of patient adherence, scores for each item were averaged across all 13 administrations of the scale. The PEAS total score was created by taking the mean of the three PEAS items at each administration, and then averaging across all 13 administrations of the scale.

### 3.1. Data analytic strategy

Our approach to data analysis proceeded as follows: First, we computed group mean scores at pretest, post-treatment and follow-up for all clinical measures. We also computed group mean scores for each PEAS item at each of the 13 assessment points to determine whether there were differences across sessions with regard to adherence. Second, correlation coefficients were computed to examine relationships among the three PEAS items. Third, to test our hypotheses, a series of hierarchical linear regression analyses were performed to predict the measures of OCD severity (YBOCS and DOCS subscales) and psychological maintenance factors (AAQ-II and OBQ subscales) at both post-treatment and follow-up. To control for treatment condition, this variable was entered in Step 1 of each regression model. Next, in Step 2, the corresponding pretest measure of OCD severity or maintenance factor, the pretest BDI, and the PEAS were entered simultaneously.

## 4. Results

### 4.1. Mean scores on clinical measures

Table 1 presents the group's mean scores on measures of OCD and depressive symptoms, as well as on the OBQ and AAQ-II, at baseline, post-treatment, and follow-up. As can be seen, the average individual in this study had baseline OCD symptoms within the moderate to severe range as measured by the YBOCS (Storch et al., 2015) and depressive symptoms within the mild to moderate range of the BDI-II (Smarr & Keefer, 2011). A series of paired-samples *t*-tests revealed both OCD and depressive symptoms were substantially reduced immediately following treatment and remained improved at follow-up. Similarly, paired samples *t*-tests showed that obsessive beliefs and EA were reduced following treatment, with the OBQ-ICT subscale continuing to improve from post-treatment to follow-up.

### 4.2. Mean PEAS scores

The group's mean PEAS A, PEAS B, and PEAS C scores were 5.83 (SD = 0.84), 5.39 (SD = 0.74), and 5.28 (SD = 0.84) respectively, indicating that overall, patients adhered quite well to their assigned

**Table 1**
Means (Standard Deviations) on Clinical Measures at Each Assessment.

| Variable | Baseline | Post-Treatment | Follow-Up |
|---|---|---|---|
| YBOCS total | 24.91 (4.20)[a] | 11.29 (4.83)[b] | 11.38 (6.84)[b] |
| DOCS-Contamination | 8.00 (6.32)[a] | 4.00 (3.84)[b] | 3.49 (3.62)[b] |
| DOCS-Responsibility | 8.34 (5.47)[a] | 4.71 (3.94)[b] | 4.61 (4.08)[b] |
| DOCS-Unacceptable thoughts | 9.29 (5.14)[a] | 5.02 (3.56)[b] | 4.63 (4.10)[b] |
| DOCS-Symmetry | 6.80 (5.19)[a] | 3.65 (3.38)[b] | 2.86 (3.96)[b] |
| BDI | 16.00 (9.95)[a] | 7.92 (6.96)[b] | 8.07 (7.35)[b] |
| OBQ-RT | 72.45 (22.79)[a] | 52.74 (23.50)[b] | 48.42 (24.32)[b] |
| OBQ-PC | 78.62 (20.56)[a] | 59.33 (23.43)[b] | 55.51 (22.35)[b] |
| OBQ-ICT | 47.44 (17.12)[a] | 30.43 (14.26)[b] | 25.54 (12.35)[c] |
| AAQ-II | 29.60 (8.35)[a] | 24.16 (8.51)[b] | 22.21 (8.43)[b] |

*Note*: Means with different superscripts are significantly different from one another ($p < .05$).
YBOCS = Yale-Brown obsessive-compulsive scale; DOCS = Dimensional obsessive-compulsive scale; BDI = Beck depression inventory; OBQ = obsessive beliefs questionnaire; RT = responsibility/threat estimation subscale; PC = perfectionism/certainty subscale; ICT = importance and control of thoughts subscale; AAQ-II = Acceptance and action questionnaire-II.

homework. A series of paired samples *t*-tests indicated that scores on PEAS A were greater than those on the other two PEAS items ($ps < .001$). There were no significant correlations between scores on the PEAS and baseline scores on any of the DOCS subscales ($rs$ ranged from −.03 to .25; all $ps > .05$).

Across treatment sessions, scores on PEAS A ranged from 5.49 (session 10) to 6.20 (session 9); scores on PEAS B ranged from 5.11 (session 8) to 5.91 (session 16); and scores on PEAS C ranged from 4.81 (session 5) to 5.74 (session 9). Paired samples *t* tests revealed that within each item, the highest and lowest scores were significantly different from one another ($p < .005$). This indicates the presence of variability in PEAS ratings.

One previous study revealed that the three PEAS items differentially predicted outcome. Specifically, Wheaton et al. (2016) found that success with response prevention most strongly predicted ERP outcome. Accordingly, we hoped to examine the three items as individual predictors in our regression analyses. Correlations among these items, however, indicated substantial overlap among the components of

adherence and ranged from .58 (item A with item C, $p < .001$) to .80 (item B with item C, $p < .001$). Moreover, when we tested regression models with the three PEAS items as individual predictors, tolerance and variance inflation factor coefficients indicated unacceptably high levels of multicollinearity. Therefore, we included the PEAS total score as our measure of adherence in the analyses that follow.

### 4.3. Adherence predicting OCD severity at post-treatment

Table 2 shows the summary statistics for the final step of the linear regressions predicting the various measures of OCD severity at post-treatment. As expected, in no instance did treatment condition account for significant variance in Step 1.

#### 4.3.1. YBOCS total score

The overall model predicting post-treatment YBOCS scores was significant and accounted for approximately 52.9 % of the variance, $F(4, 42) = 11.78$, $p < .001$. Within the full model, baseline YBOCS and PEAS emerged as significant individual predictors. As can be seen in Table 2, baseline YBOCS was a significant positive predictor, while PEAS was a significant negative predictor—*i.e.*, greater adherence was associated with lower YBOCS severity at post-treatment.

#### 4.3.2. DOCS-Contamination

The overall model predicting post-treatment DOCS-Contamination scores was significant and accounted for 57 % of the variance, $F(4, 42) = 13.92$, $p < .001$. However, only baseline DOCS-Contamination emerged as a significant (positive) individual predictor.

#### 4.3.3. DOCS-responsibility for harm

The overall model predicting post-treatment DOCS-Responsibility for Harm scores was significant and accounted for 40.7 % of the variance, $F(4, 41) = 7.04$, $p < .001$. In addition, baseline DOCS-Responsibility for Harm emerged as a significant positive predictor, whereas PEAS emerged as a significant negative predictor.

#### 4.3.4. DOCS-unacceptable thoughts

The overall model predicting post-treatment DOCS-Unacceptable Thoughts scores was significant and accounted for 32.1 % of the

**Table 2**
Final Step of the Linear Regressions Predicting OCD Symptoms at Post-Treatment.

| Variable | $R^2$ | $B$ | $SE_B$ | $\beta$ | $t$ | $p$ | $sr^2$ |
|---|---|---|---|---|---|---|---|
| Predicting YBOCS total | .529 | | | | | < .001 | |
| Treatment Condition | | 1.17 | 1.04 | .12 | 1.13 | .27 | .12 |
| Baseline YBOCS | | .36 | .14 | .30 | 2.49 | .02 | .26 |
| Baseline BDI-II | | .01 | .06 | .01 | .10 | .92 | .01 |
| PEAS | | −4.31 | .73 | −.64 | −5.91 | < .001 | −.63 |
| Predicting DOCS-Contamination | .570 | | | | | < .001 | |
| Treatment Condition | | 1.45 | .84 | .19 | 1.72 | .09 | .17 |
| Baseline DOCS-Contamination | | .47 | .07 | .76 | 6.96 | < .001 | .70 |
| Baseline BDI-II | | .03 | .04 | .09 | .82 | .42 | .08 |
| PEAS | | −.98 | .56 | −.18 | −1.75 | .09 | −.18 |
| Predicting DOCS-Responsibility | .407 | | | | | < .001 | |
| Treatment Condition | | −.08 | .97 | −.01 | −.08 | .94 | −.01 |
| Baseline DOCS-Responsibility | | .45 | .09 | .63 | 4.97 | < .001 | .60 |
| Baseline BDI-II | | .04 | .05 | .10 | .79 | .43 | .10 |
| PEAS | | −2.01 | .71 | −.36 | −2.84 | .01 | −.34 |
| Predicting DOCS-Unacceptable thts | .321 | | | | | .003 | |
| Treatment Condition | | .03 | .92 | .01 | .04 | .97 | .01 |
| Baseline DOCS- Unacceptable thts | | .29 | .11 | .39 | 2.72 | .01 | .35 |
| Baseline BDI-II | | .04 | .05 | .10 | .69 | .50 | .09 |
| PEAS | | −1.81 | .66 | −.37 | −2.73 | .01 | −.35 |
| Predicting DOCS-Symmetry | .709 | | | | | < .001 | |
| Treatment Condition | | 1.06 | .60 | .16 | 1.78 | .08 | .15 |
| Baseline DOCS-Symmetry | | .54 | .06 | .85 | 9.34 | < .001 | .79 |
| Baseline BDI-II | | .01 | .03 | .02 | .24 | .82 | .02 |
| PEAS | | −1.67 | .43 | −.35 | −3.88 | < .001 | −.33 |

**Table 3**

Final Step of the Linear Regressions Predicting OCD Symptoms at Follow-Up.

| Variable | $R^2$ | B | $SE_B$ | β | t | p | $sr^2$ |
|---|---|---|---|---|---|---|---|
| Predicting YBOCS total | .346 | | | | | .002 | |
| Treatment Condition | | 1.81 | 1.79 | .13 | 1.01 | .32 | .13 |
| Baseline YBOCS | | .81 | .24 | .49 | 3.36 | .002 | .43 |
| Baseline BDI-II | | .03 | .10 | .04 | .28 | .78 | .04 |
| PEAS | | −2.44 | 1.24 | −.26 | −1.97 | .06 | −.25 |
| Predicting DOCS-Contamination | .533 | | | | | < .001 | |
| Treatment Condition | | 1.43 | .99 | .20 | 1.45 | .16 | .17 |
| Baseline DOCS-Contamination | | .45 | .08 | .78 | 5.90 | < .001 | .67 |
| Baseline BDI-II | | .02 | .04 | .07 | .52 | .61 | .06 |
| PEAS | | −.70 | .67 | −.14 | −1.05 | .30 | −.12 |
| Predicting DOCS-Responsibility | .251 | | | | | .03 | |
| Treatment Condition | | −.34 | 1.30 | −.04 | −.26 | .80 | −.04 |
| Baseline DOCS-Responsibility | | .32 | .12 | .41 | 2.61 | .01 | .38 |
| Baseline BDI-II | | .11 | .06 | .27 | 1.76 | .09 | .26 |
| PEAS | | −1.31 | 1.00 | −.22 | −1.31 | .20 | −.19 |
| Predicting DOCS-Unacceptable thts | .311 | | | | | .01 | |
| Treatment Condition | | 1.55 | 1.22 | .19 | 1.28 | .21 | .18 |
| Baseline DOCS- Unacceptable thts | | .34 | .14 | .39 | 2.47 | .02 | .35 |
| Baseline BDI-II | | .06 | .07 | .15 | .93 | .36 | .13 |
| PEAS | | −1.30 | .91 | −.22 | −1.43 | .16 | −.20 |
| Predicting DOCS-Symmetry | .576 | | | | | < .001 | |
| Treatment Condition | | 1.13 | .95 | .14 | 1.19 | .24 | .13 |
| Baseline DOCS-Symmetry | | .55 | .09 | .74 | 6.16 | < .001 | .68 |
| Baseline BDI-II | | .05 | .05 | .13 | 1.02 | .31 | .11 |
| PEAS | | −.35 | .72 | −.06 | −.49 | .63 | −.05 |

variance, $F$ (4, 41) = 4.84, $p$ = .003. In addition, baseline DOCS-Unacceptable Thoughts emerged as a significant positive predictor, whereas PEAS emerged as a significant negative predictor.

### 4.3.5. DOCS-Symmetry

The overall model predicting post-treatment DOCS-Symmetry scores was significant and accounted for 70.9 % of the variance, $F$ (4, 41) = 24.96, $p$ < .001. Moreover, baseline DOCS-Symmetry emerged as a significant positive predictor, whereas PEAS emerged as a significant negative predictor.

### 4.4. Adherence predicting OCD severity at follow-up

Table 3 shows the summary statistics for the final step of the linear regressions predicting the various measures of OCD severity at follow-up. As expected, in no instance did treatment condition account for significant variance in Step 1.

### 4.4.1. YBOCS total score

The overall model predicting follow-up YBOCS scores was significant and accounted for approximately 34.6 % of the variance, $F$ (4, 40) = 5.30, $p$ = .002. However, as can be seen in Table 3, only baseline YBOCS emerged as a significant (positive) individual predictor.

### 4.4.2. DOCS-Contamination

The overall model predicting follow-up DOCS-Contamination scores was significant and accounted for 53.3 % of the variance, $F$ (4, 36) = 10.29, $p$ < .001. However, as can be seen in the table, only baseline DOCS-Contamination emerged as a significant (positive) individual predictor.

### 4.4.3. DOCS-responsibility for harm

The overall model predicting follow-up DOCS-Responsibility for Harm scores was significant and accounted for 25.1 % of the variance, $F$ (4, 35) = 2.93, $p$ = .03. However, only baseline DOCS-Responsibility for Harm emerged as a significant (positive) individual predictor.

### 4.4.4. DOCS-unacceptable thoughts

The overall model predicting follow-up DOCS-Unacceptable

Thoughts scores was significant and accounted for 31.1 % of the variance, $F$ (4, 35) = 3.96, $p$ = .01. However, only baseline DOCS-Unacceptable Thoughts emerged as a significant (positive) individual predictor.

### 4.4.5. DOCS-Symmetry

The overall model predicting follow-up DOCS-Symmetry scores was significant and accounted for 57.6 % of the variance, $F$ (4, 35) = 11.87, $p$ < .001. However, only baseline DOCS-Unacceptable Thoughts emerged as a significant (positive) individual predictor.

### 4.5. Adherence predicting obsessive beliefs and experiential avoidance at post-treatment

Table 4 shows the summary statistics for the final step of the linear

**Table 4**

Final Step of the Linear Regressions Predicting Obsessive Beliefs and Experiential Avoidance at Post-Treatment.

| Variable | $R^2$ | B | $SE_B$ | β | t | p | $sr^2$ |
|---|---|---|---|---|---|---|---|
| Predicting OBQ-RT | .273 | | | | | .02 | |
| Treatment Condition | | 2.79 | 6.71 | .06 | .42 | .68 | .06 |
| Baseline OBQ-RT | | .55 | .15 | .52 | 3.63 | .001 | .50 |
| Baseline BDI-II | | .22 | .34 | .10 | .66 | .51 | .09 |
| PEAS | | −6.79 | 4.79 | −.21 | −1.42 | .16 | −.20 |
| Predicting OBQ-PC | .390 | | | | | .001 | |
| Treatment Condition | | 4.56 | 5.62 | .10 | .81 | .42 | .10 |
| Baseline OBQ-PC | | .75 | .16 | .70 | 4.62 | < .001 | .59 |
| Baseline BDI-II | | −.58 | .33 | −.27 | −1.75 | .09 | −.22 |
| PEAS | | −10.17 | 4.08 | −.34 | −2.49 | .02 | −.32 |
| Predicting OBQ-ICT | .382 | | | | | .001 | |
| Treatment Condition | | −1.55 | 3.49 | −.06 | −.44 | .66 | −.06 |
| Baseline OBQ-ICT | | .37 | .11 | .47 | 3.53 | .001 | .45 |
| Baseline BDI-II | | .19 | .19 | .14 | 1.02 | .31 | .13 |
| PEAS | | −5.38 | 2.48 | −.28 | −2.17 | .04 | −.27 |
| Predicting AAQ-II | .360 | | | | | .001 | |
| Treatment Condition | | 1.51 | 2.13 | .09 | .71 | .48 | .09 |
| Baseline AAQ-II | | .25 | .16 | .24 | 1.53 | .13 | .19 |
| Baseline BDI-II | | .11 | .13 | .14 | .88 | .38 | .11 |
| PEAS | | −5.17 | 1.51 | −.43 | −3.42 | .001 | −.42 |

**Table 5**
Final Step of the Linear Regressions Predicting Obsessive Beliefs and Experiential Avoidance at Follow-Up.

| Variable | $R^2$ | $B$ | $SE_B$ | $\beta$ | $t$ | $p$ | $sr^2$ |
|---|---|---|---|---|---|---|---|
| Predicting OBQ-RT | .321 | | | | | .02 | |
| Treatment Condition | | −2.15 | 8.38 | −.05 | −.26 | .80 | −.04 |
| Baseline OBQ-RT | | .46 | .17 | .48 | 2.71 | .01 | .42 |
| Baseline BDI-II | | .26 | .47 | .11 | .57 | .58 | .09 |
| PEAS | | −11.36 | 6.60 | −.35 | −1.72 | .10 | −.27 |
| Predicting OBQ-PC | .448 | | | | | .002 | |
| Treatment Condition | | 2.09 | 6.63 | .05 | .32 | .76 | .04 |
| Baseline OBQ-PC | | .55 | .18 | .58 | 3.12 | .004 | .44 |
| Baseline BDI-II | | .18 | .46 | .08 | .39 | .70 | .05 |
| PEAS | | −8.25 | 5.45 | −.28 | −1.51 | .14 | −.21 |
| Predicting OBQ-ICT | .418 | | | | | .003 | |
| Treatment Condition | | −2.23 | 3.70 | −.09 | −.60 | .55 | −.09 |
| Baseline OBQ-ICT | | .29 | .10 | .42 | 2.84 | .01 | .40 |
| Baseline BDI-II | | .18 | .22 | .14 | .84 | .41 | .12 |
| PEAS | | −5.42 | 2.83 | −.32 | −1.92 | .07 | −.27 |
| Predicting AAQ-II | .268 | | | | | .02 | |
| Treatment Condition | | −2.26 | 2.54 | −.13 | −.89 | .38 | −.13 |
| Baseline AAQ-II | | .15 | .18 | .15 | .79 | .43 | .11 |
| Baseline BDI-II | | .28 | .15 | .34 | 1.79 | .08 | .26 |
| PEAS | | −1.79 | 1.88 | −.15 | −.96 | .35 | −.14 |

regressions predicting the three OBQ subscales and AAQ-II at post-treatment. As expected, in no instance did treatment condition account for significant variance in Step 1.

### 4.5.1. OBQ-Responsibility and threat overestimation

The overall model predicting post-treatment OBQ-RT was significant and accounted for approximately 27.3 % of the variance, $F$ (4, 38) = 3.56, $p$ = .02. Yet as can be seen in Table 4, only baseline OBQ-RT emerged as a significant (positive) individual predictor.

### 4.5.2. OBQ-Perfectionism and certainty

The overall model predicting post-treatment OBQ-PC was significant and accounted for approximately 39 % of the variance, $F$ (4, 38) = 6.07, $p$ = .001. In addition, baseline OBQ-PC emerged as a significant positive predictor, whereas PEAS emerged as a significant negative predictor.

### 4.5.3. OBQ-Importance and control of thoughts

The overall model predicting post-treatment OBQ-ICT was significant and accounted for approximately 38.2 % of the variance, $F$ (4, 39) = 6.03, $p$ = .001. In addition, baseline OBQ-ICT emerged as a significant positive predictor, whereas PEAS emerged as a significant negative predictor.

### 4.5.4. AAQ-II

The overall model predicting post-treatment AAQ was significant and accounted for approximately 36 % of the variance, $F$ (4, 42) = 5.92, $p$ = .001. However, only the PEAS emerged as a significant (negative) individual predictor.

### 4.6. Adherence predicting obsessive beliefs and experiential avoidance at follow-up

Table 5 shows the summary statistics for the final step of the linear regressions predicting the three OBQ subscales and AAQ-II at follow-up. As expected, in no instance did treatment condition account for significant variance in Step 1.

### 4.6.1. OBQ-Responsibility and threat overestimation

The overall model predicting follow-up OBQ-RT was significant and accounted for approximately 32.1 % of the variance, $F$ (4, 28) = 3.31, $p$ = .02. However, as can be seen in Table 5, only baseline OBQ-RT

emerged as a significant (positive) individual predictor.

### 4.6.2. OBQ-Perfectionism and certainty

The overall model predicting follow-up OBQ-PC was significant and accounted for approximately 44.8 % of the variance, $F$ (3, 28) = 5.68, $p$ = .002. However, only baseline OBQ-PC emerged as a significant (positive) individual predicto.

### 4.6.3. OBQ-Importance and control of thoughts

The overall model predicting follow-up OBQ-ICT was significant and accounted for approximately 41.8 % of the variance, $F$ (4, 29) = 5.22, $p$ = .003. However, only baseline OBQ-ICT emerged as a significant (positive) individual predictor.

### 4.6.4. AAQ-II

The overall model predicting follow-up AAQ was significant and accounted for approximately 26.8 % of the variance, $F$ (4, 36) = 3.29, $p$ = .02. However, none of the variables emerged as significant individual predictors.

## 5. Discussion

Given the considerable functional impairment associated with OCD (*e.g.*, Adam et al., 2012), it is important to understand why some individuals do not respond to ERP, the gold-standard intervention for this condition. In this vein, adherence to instructions to practice ERP between sessions represents a relevant and promising predictor of treatment outcome. Accordingly, the current study aimed to replicate and extend previous work examining patient adherence to ERP homework assignments as a predictor of OCD symptom improvement. In concert with previous research (*e.g.*, Abramowitz et al., 2002; Simpson et al., 2011, 2012; Wheaton et al., 2016), and in support of our first hypothesis, greater adherence was indeed a robust predictor of reduced global OCD severity at post-treatment, even after accounting for baseline global OCD and depression severity. Although this has long been clinically (*i.e.*, anecdotally) observed, this finding adds to the growing body of empirical evidence supporting the importance of repeated, high quality exposure homework practice, along with abstaining from compulsive rituals, in optimizing ERP outcomes. At follow-up, however, adherence did not predict global OCD improvement in the present study, which is contrary to the only other existing study to examine this predictor at follow-up (Simpson et al., 2012). Thus, future research is necessary before confident claims can be made about the extent to which homework adherence during the treatment trial predicts long term outcome.

Important phenomenological differences across OCD symptom presentations suggest limits to relying solely on unidimensional (*i.e.*, global) measures of OCD (*e.g.*, Abramowitz et al., 2010; McKay et al., 2004). This is especially true in treatment studies, because the implementation of ERP and its outcome varies systematically depending on symptom presentation (*e.g.*, Abramowitz et al., 2019). Consistent with the idea that a dimensional view of OCD provides incrementally more information, and in partial support of our second hypothesis, we observed that homework adherence (over and above baseline OCD and depression) predicted post-treatment outcomes for some OCD symptom dimensions, but not others. Specifically, greater adherence predicted improvement in responsibility for harm, unacceptable thoughts, and symmetry symptom OCD domains, but not contamination symptoms.

One explanation for this particular pattern of findings is that implementing ERP for contamination-related obsessions and compulsions is often uncomplicated. In most instances, patients can directly confront their feared contaminants using *in vivo* exposure within and between sessions (although a noteworthy exception is the phenomenon of mental contamination, which also tends to be a less common OCD presentation) and refrain from washing and cleaning rituals for response prevention. It is also possible (perhaps because of the

straightforward implementation) that safety learning within the domain of contamination fears occurs readily during ERP and is less dependent on the frequency or technique of between session practice, nor the complete cessation of rituals. Thus, the quantity and quality of contamination ERP tasks might not be so important in determining outcome.

On the other hand, the implementation of ERP for the other three OCD symptom domains can be more complex. For example, imaginal exposure is typically required along with *in vivo* exposure in the treatment of obsessions about responsibility and those focused on sex, violence, and religion. Given the challenge of disconfirming beliefs about the impact of intrusive thoughts, treatment of such symptoms must often focus on violating expectations related to uncertainty (Abramowitz & Jacoby, 2015). Similarly, response prevention often entails abstaining from a wider range of rituals, including checking, reassurance-seeking, repeating behaviors, and mental rituals. As with responsibility obsessions, ERP for symmetry might also involve imaginal exposure to the feared consequences of imperfection or asymmetry (*e.g.*, bad luck), or the induction of "not just right" feelings, which can be similarly complicated for patients. In other words, in order to benefit from such treatment procedures, patients have to be taught how to complete them well, and how to abstain from a wider and more nuanced (in the case of mental compulsions) array of rituals; and this might require more practice and precision. In addition, given the complexity just discussed, these three symptom dimensions might be characterized by a more intricate fear structure in which unwanted thoughts, images, and doubts, as well as unwanted feelings (*i.e.*, not just right feelings) are the primary danger cues (as opposed to external stimuli in most contamination fears). Thus, perhaps safety learning in these contexts is contingent on higher quality and quantity of between session ERP practice.

We found that adherence did not predict outcome at follow-up among the four individual OCD dimensions. Although consistent with our analogous finding for global OCD symptoms, this was inconsistent with our prediction and might be the result of factors taking place between the end of treatment and evaluation at six months. Unfortunately, although patients were encouraged to continue ERP practice during the follow-up period, we did not assess the quality or quantity of such practice. Yet, surprisingly, our findings do not support the idea that adherence to ERP homework during active treatment predicts longer-term outcome across OCD symptom domains.

In partial support of our third hypothesis, greater ERP homework adherence predicted reductions in two of the three obsessive belief domains, and in EA, at post-treatment but not at follow-up. Thus, the extent to which one complies with ERP homework was associated with beneficial changes in empirically supported OCD maintenance factors. It was particularly interesting to observe that this was the case for obsessive beliefs about the importance and need to control thoughts and the need for perfectionism and certainty, as these belief domains are consistently associated with the responsibility for harm, unacceptable thoughts, and symmetry domains of OCD symptoms (*e.g.*, Tolin, Woods, & Abramowitz, 2003; Wheaton et al., 2010), which were also predicted by homework adherence, on the one hand. On the other hand, overestimates of threat and responsibility, which are often associated with contamination symptoms (Tolin et al., 2003; Wheaton et al., 2010), were not predicted by homework adherence. We believe that the conceptual consistency in findings across symptoms and maintenance factors lends additional strength to our findings.

Although we did not use time-lagged analyses to directly examine temporal relationships, it is possible that better adherence to ERP homework leads to changes in certain beliefs and in EA, which are reflected in the corresponding OCD symptom domains. Perhaps adherence is less critical for reductions in the tendency to overestimate threat and responsibility, which might explain why scores on the PEAS did not predict improvement in contamination symptoms.

Regarding the clinical implications of our findings, practitioners

implementing ERP with individuals affected by OCD are advised to assess adherence with instructions to practice exposure and response prevention between sessions. Our results suggest that simply using the three PEAS items is sufficient for such an assessment. It may be particularly important to ensure that ERP procedures for presentations of OCD other than contamination, and especially those that require a multifaceted approach (*e.g.*, using imaginal exposure along with *in vivo* exposure), are clearly explained and demonstrated during treatment sessions so that patients are well-prepared to practice these techniques on their own.

Strengths of the present study included the use of a large clinical sample as well as the variability of patient symptomatology. There are also a number of limitations to consider. First, it may be conceptually difficult to disentangle homework adherence from treatment outcome. In fact, adherence with ERP between sessions could be considered a behavioral measure of improvement (*i.e.*, behavioral avoidance test). This overlap may account for the associations we observed between adherence and improvement. Our results may also have been influenced by the methods used for assessing adherence. Although the PEAS has demonstrated reliability and validity in measuring ERP homework adherence, the patient's report of use of ERP between sessions may be subject to social desirability bias. Moreover, even though therapists were not involved in the formal assessment of patient progress during the treatment study, their ratings of adherence may still have been affected by their perceptions of patient improvement. Finally, therapist ratings on the PEAS may have been affected by therapist-patient alliance.

The present study adds to the existing literature on the relevance of homework adherence to ERP outcome. Given the emerging body of consistent evidence that adherence with ERP is predictive of changes in OCD symptoms and maintenance factors, additional research is warranted to further understand these associations. In particular, suggestions for further study include examining these associations on a session-by-session basis and using time-lagged analyses. This might help to better understand the extent to which adherence influences psychological maintenance factors, which in turn result in OCD symptom reduction. Examining the association between adherence and other processes in ERP, such as session-by-session changes in threat expectation, is another potentially fruitful direction. Finally, we believe the availability of new technology (*e.g.*, ecological momentary assessment) can improve the assessment of homework adherence in skills-based interventions such as ERP. We recommend the use of real-time assessment tools in future research. Given the important clinical implications of ERP process and outcome research, future work to identify modifiable mechanisms of change can lead to more substantial and durable improvements for individuals with OCD.

## Acknowledgement

## References

Abramowitz, J. S. (2004). Treatment of obsessive-compulsive disorder in patients who have comorbid major depression. *Journal of Clinical Psychology, 60*(11), 1133–1141.

Abramowitz, J. S., & Jacoby, R. J. (2015). *Obsessive-compulsive disorder in adults* (1 edition). Hogrefe Publishing.

Abramowitz, J. S., Deacon, B. J., Olatunji, B. O., Wheaton, M. G., Berman, N. C., Losardo, D., et al. (2010). Assessment of obsessive-compulsive symptom dimensions: Development and evaluation of the dimensional obsessive-compulsive scale. *Psychological Assessment, 22*(1), 180. https://doi.org/10.1037/a0018260.

Abramowitz, J. S., Deacon, B. J., & Whiteside, S. P. H. (2019). *Exposure therapy for anxiety, second edition: Principles and practice.* Guilford Publications.

Abramowitz, J. S., Franklin, M. E., Zoellner, L. A., & DiBernardo, C. L. (2002). Treatment compliance and outcome in obsessive-compulsive disorder. *Behavior Modification, 26*(4), 447–463. https://doi.org/10.1177/0145445502026004001.

Adam, Y., Meinlschmidt, G., Gloster, A. T., & Lieb, R. (2012). Obsessive-compulsive disorder in the community: 12-month prevalence, comorbidity and impairment. *Social Psychiatry and Psychiatric Epidemiology, 47*(3), 339–349. https://doi.org/10.

1007/s00127-010-0337-5.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the beck depression Inventory-II.* Psychological Corporation.

Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., et al. (2011). Preliminary psychometric properties of the acceptance and action questionnaire-II: A revised measure of psychological inflexibility and experiential avoidance. *Behavior Therapy, 42*(4), 676–688.

Buchanan, A. W., Meng, K. S., & Marks, I. M. (1996). What predicts improvement and compliance during the behavioral treatment of obsessive compulsive disorder? *Anxiety, 2*(1), 22–27. https://doi.org/10.1002/(SICI)1522-7154(1996)2:1 < 22::AID-ANXI3 > 3.0.CO;2-F.

De Araujo, L. A., Ito, L. M., & Marks, I. M. (1996). Early compliance and other factors predicting outcome of exposure for obsessive-compulsive disorder. *The British Journal of Psychiatry; London, 169*(6), 747.

Goodman, W. K., Price, L. H., Rasmussen, S. A., Mazure, C., Delgado, P., Heninger, G. R., et al. (1989). The yale-brown obsessive compulsive scale: II. Validity. *Archives of General Psychiatry, 46*(11), 1012–1016. https://doi.org/10.1001/archpsyc.1989. 01810110054008.

Goodman, W. K., Price, L. H., Rasmussen, S. A., Mazure, C., Fleischmann, R. L., Hill, C. L., et al. (1989). The yale-brown obsessive compulsive scale: I. Development, use, and reliability. *Archives of General Psychiatry, 46*(11), 1006–1011. https://doi.org/10. 1001/archpsyc.1989.01810110048007.

Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes and outcomes. *Behaviour Research and Therapy, 44*(1), 1–25. https://doi.org/10.1016/j.brat.2005.06.006.

Hellberg, S. N., Buchholz, J. L., Twohig, M. P., & Abramowitz, J. S. (2019). Not just thinking, but believing: Obsessive beliefs and domains of cognitive fusion in the prediction of OCD symptom dimensions. *Clinical Psychology & Psychotherapy*. https:// doi.org/10.1002/cpp.2409.

Himle, J. A., Van Etten, M. L., Janeck, A. S., & Fischer, D. J. (2006). Insight as a predictor of treatment outcome in behavioral group treatment for obsessive–compulsive disorder. *Cognitive Therapy and Research, 30*(5), 661–666. https://doi.org/10.1007/ s10608-006-9079-9.

Kishore, V. R., Samar, R., Janardhan Reddy, Y. C., Chandrasekhar, C. R., & Thennarasu, K. (2004). Clinical characteristics and treatment response in poor and good insight obsessive–compulsive disorder. *European Psychiatry, 19*(4), 202–208. https://doi.org/ 10.1016/j.eurpsy.2003.12.005.

Loerinc, A. G., Meuret, A. E., Twohig, M. P., Rosenfield, D., Bluett, E. J., & Craske, M. G. (2015). Response rates for CBT for anxiety disorders: Need for standardized criteria. *Clinical Psychology Review, 42*, 72–82. https://doi.org/10.1016/j.cpr.2015.08.004.

McKay, D., Abramowitz, J. S., Calamari, J. E., Kyrios, M., Radomsky, A. S., Sookman, D., et al. (2004). A critical evaluation of obsessive-compulsive disorder subtypes: Symptoms versus mechanisms. *Clinical Psychology Review, 24*(3), 283–313. https:// doi.org/10.1016/j.cpr.2004.04.003.

Obsessive Compulsive Cognitions Working Group (2005). Psychometric validation of the obsessive belief questionnaire and Interpretation of Intrusions Inventory—Part 2: Factor analyses and testing of a brief version. *Behaviour Research and Therapy, 43*(11), 1527–1542.

Olatunji, B. O., Davis, M. L., Powers, M. B., & Smits, J. A. J. (2013). Cognitive-behavioral therapy for obsessive-compulsive disorder: A meta-analysis of treatment outcome and moderators. *Journal of Psychiatric Research, 47*(1), 33–41. https://doi.org/10.1016/j. jpsychires.2012.08.020.

Overbeek, T., Schruers, K., Vermetten, E., & Griez, E. (2002). Comorbidity of obsessive-compulsive disorder and depression: Prevalence, symptom severity, and treatment effect. *The Journal of Clinical Psychiatry, 63*(12), 1106–1112.

Reuman, L., Buchholz, J., & Abramowitz, J. S. (2018). Obsessive beliefs, experiential avoidance, and cognitive fusion as predictors of obsessive-compulsive disorder symptom dimensions. *Journal of Contextual Behavioral Science, 9*, 15–20. https://doi. org/10.1016/j.jcbs.2018.06.001.

Ruscio, A. M., Stein, D. J., Chiu, W. T., & Kessler, R. C. (2010). The epidemiology of

obsessive-compulsive disorder in the national comorbidity survey replication. *Molecular Psychiatry, 15*(1), 53–63. https://doi.org/10.1038/mp.2008.94.

Sewart, A. R., & Craske, M. G. (2020). *Inhibitory learning. Clinical handbook of fear and anxiety: Maintenance processes and treatment mechanisms.* American Psychological Association265–285. https://doi.org/10.1037/0000150-015.

Simpson, H. B., Maher, M. J., Wang, Y., Bao, Y., Foa, E. B., & Franklin, M. (2011). Patient adherence predicts outcome from cognitive-behavioral therapy in obsessive-compulsive disorder. *Journal of Consulting and Clinical Psychology, 79*(2), 247–252. https://doi.org/10.1037/a0022659.

Simpson, H. B., Marcus, S. M., Zuckoff, A., Franklin, M., & Foa, E. B. (2012). Patient adherence to cognitive-behavioral therapy predicts long-term outcome in obsessive-compulsive disorder. *The Journal of Clinical Psychiatry, 73*(9), 1265–1266. https:// doi.org/10.4088/JCP.12l07879.

Smarr, K. L., & Keefer, A. L. (2011). Measures of depression and depressive symptoms: Beck depression Inventory-II (BDI-II), center for epidemiologic studies depression scale (CES-D), geriatric depression scale (GDS), hospital anxiety and depression scale (HADS), and patient health questionnaire-9 (PHQ-9). *Arthritis Care & Research, 63*(S11), S454–S466. https://doi.org/10.1002/acr.20556.

Solem, S., Håland, Å. T., Vogel, P. A., Hansen, B., & Wells, A. (2009). Change in meta-cognitions predicts outcome in obsessive–compulsive disorder patients undergoing treatment with exposure and response prevention. *Behaviour Research and Therapy, 47*(4), 301–307. https://doi.org/10.1016/j.brat.2009.01.003.

Steketee, G., Siev, J., Yovel, I., Lit, K., & Wilhelm, S. (2018). Predictors and moderators of cognitive and behavioral therapy outcomes for ocd: A patient-level mega-analysis of eight sites. *Behavior Therapy*. https://doi.org/10.1016/j.beth.2018.04.004.

Storch, E. A., De Nadai, A. S., do Rosário, M. C., Shavitt, R. G., Torres, A. R., Ferrão, Y. A., et al. (2015). Defining clinical severity in adults with obsessive-compulsive disorder. *Comprehensive Psychiatry, 63*, 30–35. https://doi.org/10.1016/j.comppsych.2015.08. 007.

Storch, E. A., Shapira, N. A., Dimoulas, E., Geffken, G. R., Murphy, T. K., & Goodman, W. K. (2005). Yale-brown obsessive compulsive scale: The dimensional structure revisited. *Depression and Anxiety, 22*(1), 28–35. https://doi.org/10.1002/da.20088.

Tolin, D. F., Woods, C. M., & Abramowitz, J. S. (2003). Relationship between obsessive beliefs and obsessive–compulsive symptoms. *Cognitive Therapy and Research, 27*(6), 657–669. https://doi.org/10.1023/A:1026351711837.

Twohig, M. P., Abramowitz, J. S., Smith, B. M., Fabricant, L. E., Jacoby, R. J., Morrison, K. L., et al. (2018). Adding acceptance and commitment therapy to exposure and response prevention for obsessive-compulsive disorder: A randomized controlled trial. *Behaviour Research and Therapy, 108*, 1–9. https://doi.org/10.1016/j.brat.2018.06. 005.

Wheaton, M. G., Abramowitz, J. S., Berman, N. C., Riemann, B. C., & Hale, L. R. (2010). The relationship between obsessive beliefs and symptom dimensions in obsessive-compulsive disorder. *Behaviour Research and Therapy, 48*(10), 949–954.

Wheaton, M. G., Galfalvy, H., Steinman, S. A., Wall, M. M., Foa, E. B., & Simpson, H. B. (2016). Patient adherence and treatment outcome with exposure and response prevention for OCD: Which components of adherence matter and who becomes well? *Behaviour Research and Therapy, 85*, 6–12. https://doi.org/10.1016/j.brat.2016.07. 010.

Whittal, M. L., Thordarson, D. S., & McLean, P. D. (2005). Treatment of obsessive–compulsive disorder: Cognitive behavior therapy vs. exposure and response prevention. *Behaviour Research and Therapy, 43*(12), 1559–1576. https://doi.org/10. 1016/j.brat.2004.11.012.

Williams, M. T., Farris, S. G., Turkheimer, E. N., Franklin, M. E., Simpson, H. B., Liebowitz, M., et al. (2014). The impact of symptom dimensions on outcome for exposure and ritual prevention therapy in obsessive-compulsive disorder. *Journal of Anxiety Disorders, 28*(6), 553–558. https://doi.org/10.1016/j.janxdis.2014.06.001.

Williams, M. T., Mugno, B., Franklin, M., & Faber, S. (2013). Symptom dimensions in obsessive-compulsive disorder: Phenomenology and treatment outcomes with exposure and ritual prevention. *Psychopathology, 46*(6), 365–376. https://doi.org/10. 1159/000348582.