

## Original Article

## Experiential avoidance and the misinterpretation of intrusions as prospective predictors of postpartum obsessive-compulsive symptoms in first-time parents

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## ABSTRACT

It is well established that the transition to new parenthood is associated with the onset or worsening of obsessive-compulsive symptoms (OCS); however, less is known regarding specific risk factors associated with the development of postpartum OCS. The present prospective study examined experiential avoidance and interpretations of intrusive thoughts as predictors of the development of postpartum OCS in first-time mothers and fathers. Participants were 64 expecting parents (33 mothers and 31 partners—all fathers) who were followed from the 2nd or 3rd trimester of pregnancy into the postpartum. All completed measures of postpartum OCS, experiential avoidance, and interpretations of intrusive thoughts. Experiential avoidance and the pre-existing tendency to misinterpret intrusive thoughts were predictors of infant-related OCS in the early postpartum, but not at six months postpartum. These findings provide support for particular psychological risk factors in the development of infant-related OCS among first-time mothers and fathers. Implications for prevention and intervention are discussed.

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Obsessive-compulsive disorder (OCD) is characterized by persistent intrusive thoughts, images, or doubts that evoke anxiety (i.e., obsessions) and behavioral or mental acts that are performed to control intrusive thoughts or neutralize the associated distress (i.e., compulsions). It is among the most common psychological disorders, affecting 1–3% of the general population (Ruscio et al., 2010) and is associated with significant distress and functional impairment, as the 10th leading cause of disability worldwide (Adam et al., 2012).

Numerous studies have established that the transition to new parenthood is a risk factor for the development of OCD in both mothers and fathers (Abramowitz et al., 2003, 2006; Fairbrother & Abramowitz, 2007). Up to 6.5% of first-time mothers meet diagnostic criteria for OCD

shortly after giving birth, and many more experience subthreshold obsessive-compulsive symptoms (OCS; Abramowitz et al., 2003; Miller et al., 2015). While less research has been conducted in paternal samples, data indicate OCS are also relatively common among fathers in postpartum (Abramowitz et al., 2003, 2006; Coelho et al., 2014). Among both new mothers and fathers, postpartum OCS tend to focus on the newborn, and may involve obsessions about accidental harm befalling the child, sexual or aggressive intrusive thoughts centered on the baby, or contamination obsessions (Buchholz et al., 2020). Compulsive rituals and other anxiety-reduction strategies often include excessive checking, reassurance-seeking, cleaning, mental rituals, and avoidance. Postpartum OCS not only cause individual distress but may also interfere with family functioning and parent-infant bonding, with downstream negative consequences for the health and development of the child (Blair et al., 2011; Talge et al., 2007). Despite these short- and long-term detrimental effects, postpartum OCS have received relatively little attention in the literature and associated risk factors are largely unknown. Accordingly, it is important to identify malleable risk factors in order to guide prevention and intervention efforts.

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One potential risk factor is the tendency to overestimate the importance of intrusive thoughts, a key tenet of the cognitive-behavioral model of OCD, including postpartum OCS (Fairbrother & Abramowitz, 2007). According to this model, clinical obsessions develop when normally occurring intrusive thoughts are misinterpreted as threatening or significant. Indeed, at least 90% of the general population experiences intrusive thoughts that are similar to obsessions in terms of their form and content (Rachman & de Silva, 1978). Similarly, most parents of infants experience unpleasant intrusive thoughts pertaining to their babies, such as images of accidental or deliberate harm befalling the infant (Abramowitz et al., 2006). Among individuals not at risk for OCD, such thoughts are recognized as mental noise and accordingly elicit minimal distress. However, if intrusive thoughts about the infant are misinterpreted as significant or threatening (e.g., “The thought means that I want this to occur”), anxiety and distress are elicited, along with efforts to avoid or neutralize the intrusive thought with compulsive rituals. The tendency to misappraise intrusive thoughts as significant or threatening arises from pan-situational “obsessive beliefs” that fall into three dimensions: (a) the tendency to overestimate threat and responsibility, (b) the tendency to view unwanted thoughts as important and needing to be controlled, and (c) the belief that perfection and certainty are necessary and possible. Thus, such beliefs and misinterpretations may be risk factors in the development of postpartum OCS, given the unique and sudden onset of stress and responsibility (e.g., for a vulnerable newborn) encountered in the transition to parenthood (Fairbrother & Abramowitz, 2007).

To date, only two studies have addressed this question. In both studies, biased beliefs about the meaning of intrusive thoughts before childbirth prospectively predicted greater severity of postpartum OCS among new parents (Abramowitz et al., 2006; Fairbrother et al., 2018). While this evidence indicates that exaggerated and mistaken beliefs about the importance of thoughts confers risk for postpartum OCS, such cognitive biases explain only a portion of the variance and thus fail to fully account for the development of postpartum OCS. Thus, it is important to identify additional factors likely that contribute to the onset or worsening of postpartum obsessions and compulsions.

One promising and under-researched candidate is experiential avoidance (Hayes et al., 2006), defined as the unwillingness to engage with unwanted internal experiences, such as negative intrusive thoughts. According to relational frame theory, which serves as the basis for acceptance and commitment therapy (ACT; Hayes et al., 2013), OCS develop and persist because the individual attempts to resist and escape from unwanted intrusive thoughts via compulsive rituals, subtle neutralizing strategies, and avoidance. While these behaviors may reduce distress in the short-term, they ultimately maintain OCS by preventing the person from learning to see such unwanted thoughts for what they really are: mental noise. Correlational research has consistently demonstrated that experiential avoidance is associated with non-postpartum OCS (Reuman et al., 2016, 2018) and that treatment-related decreases in OCS are associated with reductions in experiential avoidance (Solem et al., 2009; Twohig et al., 2018; Whittall et al., 2005). No research, however, has prospectively examined experiential avoidance as a risk factor in the development of OCS (postpartum or non-postpartum).

Given that only two previous studies have prospectively examined predictors of OCS in new parents (Abramowitz et al., 2006; Fairbrother et al., 2018), and that neither of these investigations included experiential avoidance as a predictor, the present longitudinal study aimed to replicate and extend previous work by examining both of these factors as predictors of postpartum OCS in first-time mothers and fathers. In line with previous research, we hypothesized that when measured before childbirth, both (a) the tendency to misinterpret intrusive thoughts and (b) experiential avoidance would prospectively predict the severity of infant-related OCS at 1 month, 3 months, and 6 months postpartum even after controlling for baseline (pre-childbirth) levels of OCS.

## 1. Method

### 1.1. Participants

Participants were 64 expecting parents (33 expecting mothers and 31 partners—all fathers) who were followed from the 2nd or 3rd trimester of pregnancy into the postpartum. The sample was recruited from local OB/Gyn clinics and print and online advertisements at two sites: The University of North Carolina at Chapel Hill and Florida State University. The entire sample’s mean age was 29.22 years ( $SD = 5.58$ ), and 75% ( $n = 48$ ) identified as White, 18.8% ( $n = 12$ ) identified as Black or African American, 4.68% ( $n = 3$ ) identified as mixed race or “other”, and 1.56% ( $n = 1$ ) did not provide information regarding their racial identity. In terms of ethnicity, 3.1% ( $n = 2$ ) of the sample identified as Hispanic or Latin/x. The mean household income was \$71,000. To be eligible to participate in the study, expecting mothers first had to score 139 or greater (1.25 SD above the community mean) on the Obsessive Beliefs Questionnaire (OBQ; Obsessive Compulsive Cognitions Working Group, 2005).<sup>1</sup> Previous research has found elevated scores on the OBQ are associated with increased vulnerability to postpartum OCD (Abramowitz et al., 2006). In order to maintain control over extraneous family and relationship variables, participants also had to be married or living with their partner and expecting their first child. Participants were excluded if they had a current or lifetime diagnosis of OCD, bipolar disorder, any psychotic disorder, or a current substance use disorder, as these conditions can complicate both OCD symptoms as well as relationship/family functioning.

Although only mothers needed to meet the above criteria to participate, their partners were also assessed on the constructs of interests. All fathers indicated that they were also expecting their first child. Fathers were assessed for current and past psychiatric disorders, with one father reporting a previous diagnosis of OCD and two fathers meeting criteria for current alcohol use disorder. Given the differential inclusion criteria for mothers and fathers, a dummy coded variable for “parent” was included in all analyses to control for any potential differences between mothers and fathers.

### 1.2. Procedure

Data for this investigation were drawn from a previously conducted randomized controlled trial evaluating the efficacy of a prevention program for postpartum OCD (Timpano et al., 2011). In the larger trial, expecting mothers and their partners were randomly assigned to receive either a prevention or control program delivered within a traditional childbirth education (CBE) program. The CBE program consisted of 6 weekly group sessions (1.5 h each) that covered a range of topics related to childbirth and caring for newborns. Classes were led by registered nurses certified in CBE. Each class included an additional 30-min session with material relevant to either the prevention or control program, both of which were delivered by trained study personnel at each site. The prevention program included CBT skills and techniques designed to prevent postpartum OCD, whereas the control program provided psychoeducation on the emotional transition to new parenthood and information on different anxiety symptoms (see Timpano et al., 2011 for a more detailed description). Because the prevention program was specifically targeted to reduce postpartum OCS, and the control condition never discussed the conceptual model of postpartum OCD or presented any CBT techniques, the current investigation only included data collected from mothers and fathers in the control group.

<sup>1</sup> Data from the present study were collected as part of trial examining a prevention program for postpartum OCS among at risk expecting mothers and their partners (see Procedure section below and Timpano et al., 2011). Because only mothers were screened with the OBQ for inclusion in this study, partner scores on the OBQ were unavailable.

### 1.3. Assessment

The majority of participants (72%) completed the baseline assessment visit during the mother's 2nd trimester—the remainder were assessed during the 3rd trimester. As described below, the baseline assessment included self-report measures of our hypothesized predictors: existing levels of OCS, the tendency to misinterpret intrusive thoughts, and experiential avoidance (measures are described below). Follow-up assessments occurred at 1, 3, and 6 months postpartum and included a measurement of the severity of infant-related postpartum OCS (see Fig. 1 for the assessment schedule). The following measures were used:

#### 1.3.1. Dimensional obsessive-compulsive scale

(DOCS; Abramowitz et al., 2010). Baseline OCS were assessed using the 20-item self-report DOCS, which measures the severity of the four most robust OCD symptom dimensions: contamination, responsibility for harm, symmetry/ordering, and unacceptable thoughts. Each dimension has its own subscale containing 5 items (rated 0 to 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 in clinical and nonclinical samples (Abramowitz et al., 2010). In the present study, the Cronbach's alpha for the DOCS was 0.92.

#### 1.3.2. Acceptance and action Questionnaire-II

(AAQ-II; Bond et al., 2011). We assessed experiential avoidance using the AAQ-II, a 10-item self-report measure. 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. Higher scores indicate greater psychological inflexibility or experiential avoidance. The AAQ-II has sound psychometric properties as well as convergent, discriminant, and incremental validity (Bond et al., 2011). In the present study, the Cronbach's alpha for the AAQ-II was 0.81.

#### 1.3.3. Interpretation of intrusions inventory

(III; Obsessive Compulsive Cognitions Working Group, 2001). The tendency to misinterpret unwanted intrusive thoughts was assessed using the 31-item III. Respondents are first provided with a definition of unwanted intrusions and illustrative examples, and then prompted to identify two of their own recent intrusive thoughts, images or impulses. They then record the recency, frequency, and distress associated with these intrusions before indicating their agreement with 31 statements as they pertain to these intrusive thoughts (e.g., "Having this thought means I'm a terrible person") using a scale from 0 ("I did not believe this idea at all") to 100 ("I was completely convinced this idea was true"); total scores range from 0 to 3100. The instrument has demonstrated good validity, internal consistency, and reliability (Obsessive Compulsive Cognitions Working Group, 2001). In the present study, Cronbach's alpha for the III was 0.90.

#### 1.3.4. Postpartum OCS

The severity of postpartum OCS at 1-, 3-, and 6-months following delivery was examined using a semi-structured clinical interview, which included the Postpartum Thoughts and Behaviors Checklist (PTBC) and the Yale-Brown Obsessive-Compulsive Scale (YBOCS). The PTBC (Abramowitz et al., 2006) is a checklist of 32 common postpartum intrusive thoughts (obsessions; e.g., thoughts about harming the baby) and 14 behavioral and mental acts (compulsions; e.g., frequently checking on the baby). The symptoms are grouped into 8 categories (suffocation, violence, accidents, losing the baby, contamination, sexual, illness, and compulsions) and the interviewer assesses the presence or absence of each category. The obsessions and compulsions endorsed on the PTBC are then rated for their severity using the 10-item YBOCS (Goodman et al., 1989a,b), which yields a total score ranging from 0 to 40. Trained evaluators blind to treatment condition administered the PTBC and YBOCS at all three postpartum assessments. The psychometric properties of the YBOCS severity measure are well-known to be adequate (Goodman et al., 1989; Storch et al., 2005). Cronbach's alpha for the three time points ranged from 0.92 to 0.95.

### 1.4. Data analytic strategy

Our approach to data analysis proceeded as follows: First, we computed mean scores on all study measures and conducted a series of independent-samples *t*-tests to examine potential differences between mothers and fathers on baseline measures and follow-up YBOCS scores. Next, correlation coefficients were computed to examine relationships among all study variables. To test our hypotheses, a series of hierarchical linear regression analyses were performed to predict postpartum OCS severity (YBOCS) at 1 month, 3 months, and 6 months postpartum. To control for baseline OCS severity, baseline DOCS scores were entered in Step 1 of each regression model. In addition, to control for any differences between mothers and fathers, the dummy coded variable for parent was also entered in Step 1 of each model. Next, in Step 2, the baseline III and AAQ-II were entered simultaneously. Tolerance and variance inflation factor statistics were calculated to examine the presence of multicollinearity between predictors in each regression model.

## 2. Results

### 2.1. Descriptive statistics

Table 1 presents the mean scores on all study measures for mothers and fathers, including independent samples *t*-tests. At a Bonferroni corrected alpha level of  $p < .008$ , mothers and fathers did not differ in mean DOCS, AAQ-II, or III scores at baseline, nor did they index significantly different Y-BOCS scores at any of the follow-up assessments. Regardless of parent, mean YBOCS scores at all three postpartum assessments indicated mild OCS on average (Storch et al., 2015). However, mothers' scores on the YBOCS ranged from 0 to 29 and fathers'

### Assessment Schedule

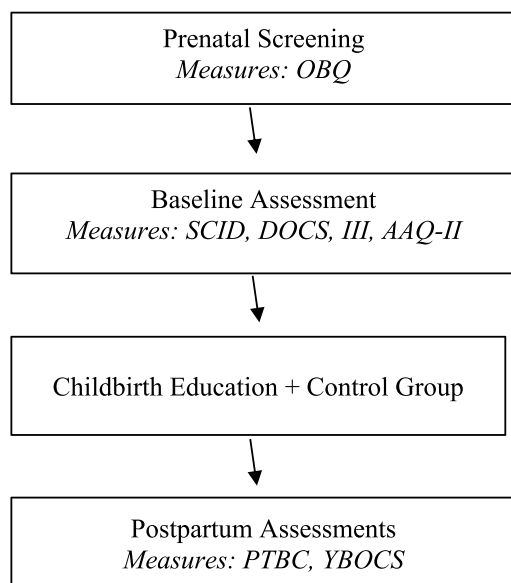


Fig. 1. Assessment schedule.

**Table 1**  
Means (Standard Deviations) for mothers and fathers on study measures.

Variable	Mothers (n = 33)		Fathers (n = 31)		t	p
	M (SD)	Range	M (SD)	Range		
Baseline						
DOCS	6.59 (6.00)	0–27	5.10 (6.48)	0–24	0.94	.35
III	325.63 (316.80)	0–1340	333.10 (304.68)	0–1250	−0.09	.93
AAQ-II	24.25 (9.19)	10–50	20.52 (7.26)	10–37	−1.75	.09
Postpartum						
YBOCS 1 month	9.68 (6.74)	0–22	6.40 (5.26)	0–16	1.78	.08
YBOCS 3 months	10.42 (8.03)	0–29	5.35 (4.39)	0–12	2.43	.02
YBOCS 6 months	8.65 (6.93)	0–23	6.69 (5.63)	0–16	0.92	.37

\*Bonferroni corrected alpha  $p < .008$ .

scores ranged from 0 to 16 across the three postpartum assessments, indicating that some parents, particularly some mothers, evidenced clinically significant OCS (using the common YBOCS cutoff score of  $\geq 16$ ). At 1-month postpartum, 28% ( $n = 7$ ) of mothers and 5% ( $n = 1$ ) of fathers scored above the clinical cutoff on the YBOCS. At 3-months postpartum, 31.62% ( $n = 6$ ) of mothers (and no fathers) scored above the clinical cutoff on the YBOCS. At 6-months postpartum, 20% ( $n = 4$ ) of mothers and 6.67% ( $n = 1$ ) of fathers scored above the clinical cutoff on the YBOCS. The types of intrusive thoughts and compulsive behaviors endorsed on the PTBC are listed in Timpano et al. (2011; p. 1514, Table 2).

2.2. Correlations among study measures

Table 2 presents zero-order correlations between the baseline (prenatal) measures and postpartum YBOCS scores. As can be seen, greater baseline OCS was associated with higher postpartum OCS at all three follow-up assessments. A greater tendency to misinterpret intrusive thoughts at baseline was also associated with postpartum OCS severity at each follow-up. Greater experiential avoidance at baseline was associated with 1- and 3-month postpartum OCS severity, but not 6-month postpartum OCS severity.

2.3. Predicting OCS severity at 1, 3, and 6 Months postpartum

Table 3 shows the summary statistics for the final step of the linear regressions predicting OCS severity (YBOCS) at 1 month, 3 months, and 6 months postpartum. Tolerance and variance inflation factor (VIF) coefficients indicated no reason to be concerned about multicollinearity between predictors in the regression models, given that all tolerance coefficients were above the threshold of 0.20 and all VIF coefficients were below the threshold of 5.0.

2.3.1. 1-Month postpartum

The overall model predicting YBOCS scores at 1-month postpartum was significant and accounted for 54.1% of the variance,  $F(4, 38) = 11.20, p < .001$ . Within the full model, both the baseline III and AAQ-II

**Table 2**  
Zero-order correlations between baseline measures and YBOCS at 1, 3, and 6 Months postpartum.

Baseline measure	Postpartum		
	YBOCS 1 month	YBOCS 3 months	YBOCS 6 months
DOCS	.56*	.46*	.46*
III	.55*	.48*	.57*
AAQ-II	.58*	.58*	.39

\*\* Bonferroni corrected  $p < .01$ .

**Table 3**  
Final step of linear regressions predicting YBOCS at 1 month, 3 months, and 6 Months postpartum.

Variable	R <sup>2</sup>	B	SE <sub>B</sub>	β	t	p	sr <sup>2</sup>
Predicting YBOCS at 1 month pp	.541					<.001	
Parent		−2.77	1.42	−.22	−1.95	.06	−.21
DOCS		.17	.15	.18	1.13	.26	.13
III		.01	.00	.31	2.14	.04	.24
AAQ-II		.23	.09	.33	2.53	.02	.28
Predicting YBOCS at 3 months pp	.501					<.001	
Parent		−3.51	1.77	−.26	−1.98	.06	−.25
DOCS		.03	.20	.03	.17	.87	.02
III		.01	.00	.32	1.94	.06	.24
AAQ-II		.32	.11	.41	2.79	.01	.35
Predicting YBOCS at 6 months pp	.377					.01	
Parent		−1.45	1.92	−.11	−.75	.46	−.11
DOCS		.02	.20	.02	.09	.93	.01
III		.01	.00	.49	2.48	.02	.36
AAQ-II		.13	.12	.20	1.08	.29	.16

Note. pp = postpartum.

emerged as significant individual predictors. As can be seen in Table 3, the III and was a significant positive predictor, while the AAQ-II was a significant negative predictor—which was expected given that lower scores on the AAQ-II indicate greater experiential avoidance.

2.3.2. 3-Months postpartum

The overall model predicting YBOCS scores at 3-months postpartum was also significant, and accounted for approximately 50.1% of the variance,  $F(4, 32) = 8.04, p < .001$ . Within the full model, only the baseline AAQ-II emerged as a significant individual (negative) predictor.

2.3.3. 6-Months postpartum

The overall model predicting 6-month postpartum YBOCS scores was also significant and accounted for approximately 37.7% of the variance,  $F(4, 29) = 4.39, p = .007$ . Within the full model, only the baseline III emerged as a significant individual (positive) predictor.

2.4. Non-independence of observations

Given that participants in the study were partners (e.g., married to, or living with, each other), we considered that data from individual members of such dyads may not represent statistically independent observations, violating an assumption of the regression models. To assess the issue of nonindependence in our data, we computed correlations between scores for males and females within dyads ( $n = 31$ ) on each study measure. Significant correlations ( $p < .05$ ) were obtained for partners' scores on the AAQ-II ( $r = 0.62$ ), and the YBOCS at 1-month ( $r = 0.64$ ), 3-months ( $r = 0.68$ ) and 6-months postpartum ( $r = 0.56$ ).

Given these findings, we re-computed all of our regression analyses using the effective sample size (Faes et al., 2009).<sup>2</sup> As a conservative approach, we used the largest observed correlation to compute the effective sample size for each model. We then computed the  $p$ -value for the overall regression model, as well as the  $p$ -values for each regression coefficient. This did not affect the significance of the overall models, nor the individual predictor variables in the models predicting YBOCS scores at 1 month postpartum and 3 months postpartum. However, the overall

<sup>2</sup> Effective sample size is a way of quantifying the amount of information in data when the observations are correlated, defined as the sample size one would need in an independent sample to equal the amount of information in the actual (correlated) sample (see Faes et al., 2009 for more detail). The effective sample size is calculated by weighting the actual sample size by the correlation ( $\rho$ ) between observations using the following equation.  $n_{eff} = \frac{n}{1+(n-1)\rho}$



model predicting YBOCS scores at 6 months postpartum no longer reached statistical significance using the effective sample size.

### 3. Discussion

Although it is well-established that the transition to new parenthood is associated with the development or worsening of OCS in both mothers and fathers (Forray et al., 2010), little research has prospectively examined what predicts OCS in new parents. Accordingly, the present study aimed to examine putative risk factors measured in the prenatal period as predictors of OCS at one, three, and six months postpartum. The key findings can be summarized as follows: the tendency of participants, while still expecting the birth of their child, to (a) misinterpret intrusive thoughts as significant or threatening and (b) try to resist such thoughts and other unwanted private experiences (i.e., experiential avoidance) predicted the severity of infant-related OCS one month after becoming new parents; even after controlling for pre-existing OCS. At three months postpartum, experiential avoidance, but not misinterpretations of intrusions, remained as a predictor. Finally, after adjusting for the non-independence of observations, neither misinterpretations nor experiential avoidance predicted infant-related OCS at six months postpartum.

Threat-related appraisals of intrusive thoughts are thought to derive from “obsessive beliefs;” a set of relatively enduring trait-like cognitive biases pertaining to (a) the overestimation of threat and responsibility, (b) need for certainty and perfection, and (c) the importance of thoughts. In concert with previous research (Abramowitz et al., 2006; Fairbrother et al., 2018), and as we hypothesized, such misappraisals prospectively predicted OCS severity at one month postpartum, providing further evidence for existing appraisal (cognitive-behavioral) models of OCS, and postpartum OCS in particular (e.g., Fairbrother & Abramowitz, 2007). Our study, however, is the first to prospectively examine experiential avoidance as a risk factor for OCS; and this construct accounted for additional unique variance in OCS severity. This finding is consistent with relational frame theory as it applies to understanding OCS (Twohig et al., 2015), which posits that how one interacts with unwanted internal experiences plays a role in the development of OCS. It also suggests the importance of incorporating experiential avoidance within explanatory models of postpartum OCS.

At three months postpartum, experiential avoidance predicted OCS, while the tendency to misinterpret intrusive thoughts did not. In fact, from one to three months postpartum, the variance in OCS that was explained by baseline experiential avoidance increased, while the variance accounted for by the tendency to misinterpret intrusive thoughts remained similar. Thus, over the first 3 months of the postpartum period, the severity of postpartum OCS became more strongly associated with how a new parent tries to resist postpartum intrusive thoughts, rather than how they interpret such thoughts. Perhaps the *development* of postpartum OCS is more strongly related to the tendency to misinterpret intrusive thoughts, while the *maintenance* of OCS over time is more related to how one relates and responds to such thoughts. Indeed, similar to trajectories seen with other anxiety-based disorders such as posttraumatic stress disorder (e.g., Ehlers & Clark, 2000), the maintenance of OCS over time may be more related to avoidance of and resistance to these distressing internal experiences, rather than the internal experiences themselves. Another potential explanation for this pattern of results is that misinterpretations of intrusive thoughts as personally significant or threatening lead to increased experiential avoidance. If this is the case, the tendency to misinterpret intrusive thoughts related to the infant might serve as an initial risk factor for postpartum OCS that then has cascading effects on other factors, such as experiential avoidance. Future research might more closely examine the longitudinal relationship between misinterpretations of intrusive thoughts and experiential avoidance to learn more about how these two distinctive, yet overlapping constructs relate to one another.

Although we initially found that the tendency to misappraise

intrusive thoughts, but not experiential avoidance, significantly predicted OCS severity at six months postpartum, this finding did not hold up once we accounted for the non-independence of observations within our data. One explanation for the failure of the overall regression model to explain significant variability in OCS is insufficient power resulting from the smaller sample size at this time point. Yet it is also possible that psychological predictors measured in the prenatal period lose predictive strength over time and do not explain OCS severity beyond the initial months following childbirth. In addition, as time progresses, OCS severity may be increasingly affected by other factors, such as trauma, mood symptoms, family accommodation; and functional outcomes such as poor parent-infant bonding, which may subsequently increase the distress associated with intrusive thoughts and maintain and/or worsen OCD symptoms over time. Future directions might include studies sufficiently powered for complex analytic approaches that permit the modeling of multiple contemporaneous and time-lagged effects, in order to more precisely probe the prospective, interrelationships among these processes.

It's also possible that longer-lasting OCS are determined by other factors not included in the present study. For example, several studies have identified biological correlates of postpartum OCS among mothers (Lord et al., 2011; Marta Serati et al., 2015), and a growing body of evidence points towards immune system dysregulation (Fluitman, Denys, Heijnen, & Westenberg, 2010; Fontenelle et al., 2012; Gray & Bloch, 2012; Leff-Gelman et al., 2016; Osborne & Monk, 2013; Rotge et al., 2010) and increased sensitivity to sex hormone transitions (Forray et al., 2010; House et al., 2016; Labad et al., 2011) as two potential risk factors for postpartum OCS. Future research aimed at understanding postpartum OCD would benefit from an examination of these and other factors as predictors of the development of lasting OCS among new parents. Importantly, these biological factors would most likely be relevant to childbearing *mothers*, rather than to their partners, and it is noteworthy that in our regression models, the parent variable did not explain any significant variance in OCS. Investigations are currently underway in our lab to further examine both psychosocial and biological variables as longitudinal predictors of postpartum OCS among new mothers.

Taken together, these results suggest the utility of assessing the tendency to misinterpret intrusive thoughts and experiential avoidance during the prenatal period, given that such tendencies are malleable (Ellis & Rufino, 2016; Rachman, 2003) and thus may represent important prevention targets. On a broader level, these results provide further support for the cognitive-behavioral model of OCS, in which the tendency to misinterpret intrusive thoughts is conceptualized as a mechanism of OCS and an important treatment target. These results similarly provide support for ACT-based approaches to understanding and treating OCS. Indeed, experiential avoidance uniquely predicted postpartum OCS above and beyond the tendency to misinterpret thoughts and explained more variance in OCS than did appraisals of intrusive thoughts at three months postpartum. Accordingly, integrating ACT with exposure and response prevention may represent a promising treatment avenue for new parents with postpartum OCD as it has with OCD in general (Twohig et al., 2018).

Several limitations should be noted with regard to the present study. First, there were relatively high rates of attrition at six months postpartum which may have influenced the pattern of results given that our analyses may have been underpowered at this timepoint. Another possible limitation is the representativeness of the current sample. Specifically, mothers were required to have elevated scores on the OBO to be eligible for the study, and thus represented a specific at-risk population for the development of postpartum OCS. Additionally, the sample was predominately white and entirely heterosexual, and thus not representative in terms of sociodemographic characteristics. Very little is known about the differential risk for and presentation of postpartum OCD in same-sex couples. Of note, although the sample was not representative of the entire US population, the number of participants

identifying as Black was fairly representative. The small sample size; however, precluded us from examining potential racial differences in risk factors for and severity of postpartum OCS. This is a critical focus for further study given evidence that new mothers of color are approximately twice as likely to experience postpartum depression and simultaneously significantly less likely to be screened or treated for perinatal mental health concerns (Keefe et al., 2016). Further, this was not a treatment-seeking sample and symptom scores were on average mild throughout the postpartum, and thus the extent to which these results might extend to patients with postpartum OCD is unclear.

The present study adds to the existing literature examining psychological constructs implicated in OCS during the prenatal period. Given the emerging body of evidence demonstrating that new parenthood is a time of increased susceptibility for the development of OCS, additional research is warranted to further understand the nature of, and psychological risk factors for, postpartum OCS. Future research may also examine the role that biological factors might play in the development of postpartum OCS, given research linking biological factors to both OCS and postpartum anxiety and mood disorders. Finally, further research is warranted to examine the concordance of postpartum OCS within couples, and if replicated, potential reasons for this concordance. Given the prevalence of postpartum OCS and the associated negative health consequences for parents and children, future work to identify malleable risk factors and mechanisms of recovery will be crucial to developing effective prevention and intervention methods.

#### Declaration of conflicts of interest

Authors Ojalehto, Hellberg, Butcher, Buchholz, Timpano, & Abramowitz have no conflicts of interest.

#### References

- Abramowitz, J. S., Deacon, B. J., Olatunji, B. O., Wheaton, M. G., Berman, N. C., Losardo, D., Timpano, K. R., McGrath, P. B., Riemann, B. C., Adams, T., & others. (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., Khandker, M., Nelson, C. A., Deacon, B. J., & Ryggwall, R. (2006). The role of cognitive factors in the pathogenesis of obsessive-compulsive symptoms: A prospective study. *Behaviour Research and Therapy*, 44(9), 1361–1374. <https://doi.org/10.1016/j.brat.2005.09.011>
- Abramowitz, J. S., Schwartz, S. A., & Moore, K. M. (2003). Obsessional thoughts in postpartum females and their partners: Content, severity, and relationship with depression. *Journal of Clinical Psychology in Medical Settings*, 10(3), 157–164. <https://doi.org/10.1023/A:1025454627242>
- Adam, Y., Meinschmidt, 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>
- Blair, M. M., Glynn, L. M., Sandman, C. A., & Davis, E. P. (2011). Prenatal maternal anxiety and early childhood temperament. *Stress: The International Journal on the Biology of Stress*, 14(6), 644–651. <https://doi.org/10.3109/10253890.2011.594121>
- Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., Waltz, T., & Zettle, R. D. (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.
- Buchholz, J. L., Hellberg, S. N., & Abramowitz, J. S. (2020). Phenomenology of perinatal obsessive-compulsive disorder. In J. L. Payne, & L. M. Osborne (Eds.), *Biomarkers of postpartum psychiatric disorders* (pp. 79–93). Academic Press. <https://doi.org/10.1016/B978-0-12-815508-0.00006-0>
- Coelho, F. M., Silva, R. A. da, Quevedo, L. de A., Souza, L. D., Pinheiro, K. A., Pinheiro, R. T., Coelho, F. M., Silva, R. A. da, Quevedo, L. de A., Souza, L. D., Pinheiro, K. A., & Pinheiro, R. T. (2014). Obsessive-compulsive disorder in fathers during pregnancy and postpartum. *Brazilian Journal of Psychiatry*, 36(3). <https://doi.org/10.1590/1516-4446-2013-1312>, 272–272.
- Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy*, 38(4), 319–345.
- Ellis, T. E., & Rufino, K. A. (2016). Change in experiential avoidance is associated with reduced suicidal ideation over the course of psychiatric hospitalization. *Archives of Suicide Research*, 20(3), 426–437. <https://doi.org/10.1080/13811118.2015.1093983>
- Faest, C., Molenberghs, G., Aerts, M., Verbeke, G., & Kenward, M. G. (2009). The effective sample size and an alternative small-sample degrees-of-freedom method. *The American Statistician*, 63(4), 389–399. <https://doi.org/10.1198/tast.2009.08196>
- Fairbrother, N., & Abramowitz, J. S. (2007). New parenthood as a risk factor for the development of obsessional problems. *Behaviour Research and Therapy*, 45(9), 2155–2163. <https://doi.org/10.1016/j.brat.2006.09.019>
- Fairbrother, N., Thordarson, D. S., Challacombe, F. L., & Sakaluk, J. K. (2018). Correlates and predictors of new mothers' responses to postpartum thoughts of accidental and intentional harm and obsessive compulsive symptoms. *Behavioural and Cognitive Psychotherapy*, 46(4), 437–453. <https://doi.org/10.1017/S1352465817000765>
- Fluitman, S. B. A. H. A., Denys, D. A. J. P., Heijnen, C. J., & Westenberg, H. G. M. (2010). Disgust affects TNF- $\alpha$ , IL-6 and noradrenalin levels in patients with obsessive-compulsive disorder. *Psychoneuroendocrinology*, 35(6), 906–911. <https://doi.org/10.1016/j.psyneuen.2009.12.005>
- Fontenelle, L. F., Barbosa, I. G., Luna, J. V., de Sousa, L. P., Abreu, M. N. S., & Teixeira, A. L. (2012). A cytokine study of adult patients with obsessive-compulsive disorder. *Comprehensive Psychiatry*, 53(6), 797–804. <https://doi.org/10.1016/j.comppsy.2011.12.007>
- Forray, A., Focseanu, M., Pittman, B., McDougale, C. J., & Epperson, C. N. (2010). Onset and exacerbation of obsessive-compulsive disorder in pregnancy and the postpartum period. *Journal of Clinical Psychiatry*, 71(8), 1061–1068. <https://doi.org/10.4088/JCP.09m05381blu>
- Goodman, W. K., Price, L. H., Rasmussen, S. A., Mazure, C., Fleischmann, R. L., Hill, C. L., Heninger, G. R., & Charney, D. S. (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>
- Gray, S. M., & Bloch, M. H. (2012). Systematic review of proinflammatory cytokines in obsessive-compulsive disorder. *Current Psychiatry Reports*, 14(3), 220–228. <https://doi.org/10.1007/s11920-012-0272-0>
- Hayes, S. C., Levin, M. E., Plumb-Villardaga, J., Villatte, J. L., & Pistorello, J. (2013). Acceptance and commitment therapy and contextual behavioral science: Examining the progress of a distinctive model of behavioral and cognitive therapy. *Behavior Therapy*, 44(2), 180–198. <https://doi.org/10.1016/j.beth.2009.08.002>
- 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>
- House, S. J., Tripathi, S. P., Knight, B. T., Morris, N., Newport, D. J., & Stowe, Z. N. (2016). Obsessive-compulsive disorder in pregnancy and the postpartum period: Course of illness and obstetrical outcome. *Archives of Women's Mental Health*, 19(1), 3–10. <https://doi.org/10.1007/s00737-015-0542-z>
- Keefe, R. H., Brownstein-Evans, C., & Rouland Polmanteer, R. (2016). "I find peace there": How faith, church, and spirituality help mothers of colour cope with postpartum depression. *Mental Health, Religion & Culture*, 19(7), 722–733. <https://doi.org/10.1080/13674676.2016.1244663>
- Labad, J., Alonso, P., Segalàs, C., Real, E., & Menchón, J. M. (2011). Reproductive hormone sensitivity and obsessive-compulsive disorder: Are there differences in the genetic predisposition between symptom dimensions? *Journal of Clinical Psychiatry*, 72(3), 417–418. <https://doi.org/10.4088/JCP.10106481blu>
- Leff-Gelman, P., Mancilla-Herrera, I., Flores-Ramos, M., Cruz-Fuentes, C., Reyes-Grajeda, J. P., García-Cuéstara, M. del P., Bugnot-Pérez, M. D., & Pulido-Ascencio, D. E. (2016). The immune system and the role of inflammation in perinatal depression. *Neuroscience Bulletin*, 32(4), 398–420. <https://doi.org/10.1007/s12264-016-0048-3>
- Lord, C., Hall, G., Soares, C. N., & Steiner, M. (2011). Physiological stress response in postpartum women with obsessive-compulsive disorder: A pilot study. *Psychoneuroendocrinology*, 36(1), 133–138. <https://doi.org/10.1016/j.psyneuen.2010.04.014>
- Miller, E. S., Hoxha, D., Wisner, K. L., & Gossett, D. R. (2015). Obsessions and compulsions in postpartum women without obsessive compulsive disorder. *Journal of Women's Health*, 24(10), 825–830. <https://doi.org/10.1089/jwh.2014.5063>
- Obsessive Compulsive Cognitions Working Group. (2001). Development and initial validation of the obsessive beliefs questionnaire and the interpretation of intrusions inventory. *Behaviour Research and Therapy*, 39(8), 987–1006. [https://doi.org/10.1016/S0005-7967\(00\)00085-1](https://doi.org/10.1016/S0005-7967(00)00085-1)
- 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.
- Osborne, L. M., & Monk, C. (2013). Perinatal depression—the fourth inflammatory morbidity of pregnancy?: Theory and literature review. *Psychoneuroendocrinology*, 38(10), 1929–1952. <https://doi.org/10.1016/j.psyneuen.2013.03.019>
- Rachman, S. J. (2003). *The treatment of obsessions*. Oxford University Press.
- Rachman, S. J., & de Silva, P. (1978). Abnormal and normal obsessions. *Behaviour Research and Therapy*, 16(4), 233–248.
- 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>
- Reuman, L., Jacoby, R. J., & Abramowitz, J. S. (2016). Cognitive fusion, experiential avoidance, and obsessive beliefs as predictors of obsessive-compulsive symptom dimensions. *International Journal of Cognitive Therapy*, 9(4), 313–326. <https://doi.org/10.1521/ijct.2016.09.13>
- Rotge, J. Y., Auouizerate, B., Tignol, J., Bioulac, B., Burbaud, P., & Guehl, D. (2010). The glutamate-based genetic immune hypothesis in obsessive-compulsive disorder. An integrative approach from genes to symptoms. *Neuroscience*, 165(2), 408–417. <https://doi.org/10.1016/j.neuroscience.2009.10.043>
- 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>

- Serati, M., Benatti, B., Buoli, M., & Carlo Altamura, A. (2015). Post-partum obsessive-compulsive disorder associated with 9q33.1 deletion. *Australian and New Zealand Journal of Psychiatry*, *49*(10), 943–944. <https://doi.org/10.1177/0004867415581668>
- Solem, S., Håland, Å. T., Vogel, P. A., Hansen, B., & Wells, A. (2009). Change in metacognitions 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>
- Storch, E. A., De Nadai, A. S., do Rosário, M. C., Shavitt, R. G., Torres, A. R., Ferrão, Y. A., Miguel, E. C., Lewin, A. B., & Fontenelle, L. F. (2015). Defining clinical severity in adults with obsessive-compulsive disorder. *Comprehensive Psychiatry*, *63*, 30–35. <https://doi.org/10.1016/j.comppsy.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>
- & the Early Stress, T. R. and P. S. N. F. and N. E. on C. and A. M. H Talge, N. M., Neal, C., & Glover, V. (2007). Antenatal maternal stress and long-term effects on child neurodevelopment: How and why?. *Journal of Child Psychology and Psychiatry*, *48* (3–4), 245–261. <https://doi.org/10.1111/j.1469-7610.2006.01714.x>
- Timpano, K. R., Abramowitz, J. S., Mahaffey, B. L., Mitchell, M. A., & Schmidt, N. B. (2011). Efficacy of a prevention program for postpartum obsessive-compulsive symptoms. *Journal of Psychiatric Research*, *45*(11), 1511–1517. <https://doi.org/10.1016/j.jpsychires.2011.06.015>
- Twohig, M. P., Abramowitz, J. S., Bluett, E. J., Fabricant, L. E., Jacoby, R. J., Morrison, K. L., & Smith, B. M. (2015). Exposure therapy for OCD from an acceptance and commitment therapy (ACT) framework. *Journal of Obsessive-Compulsive and Related Disorders*, *6*, 167–173.
- Twohig, M. P., Abramowitz, J. S., Smith, B. M., Fabricant, L. E., Jacoby, R. J., Morrison, K. L., Bluett, E. J., Reuman, L., Blakey, S. M., & Ledermann, T. (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>
- 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>