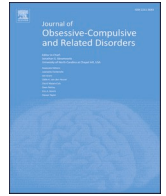




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The contribution of inferential confusion and fear of self to psychological models of obsessive-compulsive symptoms: A dimensional approach

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ABSTRACT

Current psychological models of obsessive-compulsive disorder account for a surprisingly small degree of variability in obsessive-compulsive (OC) symptoms in statistical models. The current study examined whether constructs from the inference-based approach to OCD (i.e., inferential confusion and fear of self) explain OC symptom dimensions above and beyond what is explained by the prevailing cognitive appraisal model. Undergraduate participants ($N = 339$) completed a battery of self-report questionnaires assessing OC symptoms, obsessive beliefs, inferential confusion, and fear of self. Results revealed that both psychological models together accounted for about one quarter of the variance in OC symptoms. The inference-based approach concepts most closely aligned with responsibility, symmetry, and unacceptable thoughts, and added explanatory value to appraisal models of these symptom domains. Limitations and future directions are discussed.

Obsessive-compulsive disorder (OCD) is a psychological condition affecting approximately 1% of the population (Fawcett et al., 2020) and causes impairment in various domains of functioning (Markarian et al., 2010). One of its cardinal features is *obsessions*—unwanted thoughts, images, and other mental experiences that are associated with anxiety and other forms of distress (e.g., disgust). The other is *compulsions*—overt behaviors (e.g., repetitive washing or checking) or mental acts (e.g., praying silently) which function to alleviate the distress associated with obsessions (American Psychiatric Association, 2013). Individuals with OCD may also engage in avoidance behavior to manage their obsessions. Importantly, OCD is a heterogeneous condition in that the themes of obsessions and compulsions vary from person to person, as well as within individuals over time. The disorder typically onsets in adolescence and young adulthood, although symptoms may appear at any time (Brakoulias et al., 2017). Without treatment, obsessions and compulsions tend to wax and wane over time, but generally follow a chronically worsening course (Eisen et al., 2013).

Studies on the structure of OCD symptoms suggest the presence of theme-based symptom dimensions that include both obsessions and compulsions (e.g., Mataix-Cols et al., 2005; McKay et al., 2004). Most commonly, research has identified four such domains, including (a)

contamination: obsessions related to contamination (e.g., thoughts of germs) with cleaning and washing compulsions; (b) responsibility for accidental harm: obsessions pertaining to accountability (e.g., “What if I hit a pedestrian with my car without realizing it?”) along with checking and reassurance-seeking compulsions; (c) unacceptable thoughts: obsessions about taboo topics such as blasphemy, violence, and inappropriate sexual acts, that often co-occur with mental rituals and other covert neutralizing strategies (e.g., thought replacement); and (d) symmetry: obsessional feelings of incompleteness or imbalance (e.g., “not just right” experiences) along with compulsions to arrange, order, or put things “just right.”

Over the last half-century, scholars have developed conceptual models of OCD, the most well-researched of which is the cognitive appraisal (cognitive-behavioral) model first described by Rachman (1997, 1998) and Salkovskis (1985). Derived from Beck's (1976) cognitive model of emotion, this perspective holds that obsessions arise from certain core beliefs, such as: the tendency to view the world as dangerous, inflated estimates of responsibility, beliefs that unwanted thoughts are meaningful and need to be controlled, and the need for certainty and perfection. Such *obsessive beliefs* (OCCWG, 1997) lead one to catastrophically misappraise universally occurring intrusive

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unwanted thoughts (e.g., the unwelcome idea of accidentally harming a vulnerable person) and other benign mental events (e.g., situationally incongruent feelings of sexual arousal) as threatening (e.g., “I am dangerous or immoral”). These appraisals lead people with OCD to experience intense anxiety and distress, along with urges to engage in compulsive behavior or avoidance to control the distress and dismiss the unwanted thought. Compulsions and avoidance provide negatively reinforcing temporary relief that (a) leads to recurring preoccupation with unwanted thoughts and (b) prevents the natural self-correction of inaccurate obsessive beliefs – thus completing a self-perpetuating cycle of unwanted thoughts and compulsive behaviors. This model is supported by a large body of correlational and experimental research, and it provides the basis for exposure and response prevention and other traditional cognitive-behavioral interventions for OCD (Clark, 2019).

Another conceptual model that has gained increased attention is the inference-based approach to OCD (IBA; Aardema & O'Connor, 2003; 2007; Julien et al., 2016). From this perspective obsessions arise through a faulty reasoning process in which an internal narrative and a distrust of the senses conflate improbable outcomes with reality. As an example, consider obsessional thoughts of deliberately harming one's child. The IBA would explain this symptom as a process resulting from a narrative that is influenced by an over-emphasis on what *could* be true (e.g., “I could be dangerous”) without considering information from the senses and other types of real-world evidence concerning what is *likely* true (e.g., “I love my child and have no intention of harming her”).

Two IBA processes are linked to OCD: *inferential confusion* and the *fear of self*. IC refers to a form of reasoning characterized by a distrust of the senses and an overreliance on possibility or imagination (Aardema et al., 2010). FOS refers to the tendency to be afraid of and distrust aspects of oneself (Aardema et al., 2013). According to the IBA, inferential confusion and fear of self contribute to a narrative that activates negative self-relevant beliefs (i.e., vulnerable self-themes) and distorted reasoning processes giving credibility to irrational intrusive obsessive thoughts that touch on areas of life where the person feels most vulnerable (O'Connor et al., 2005a). A growing literature of correlational and experimental research supports the IBA, and there is evidence that an intervention based on this approach—inference-based cognitive-behavioral therapy (I-CBT)—is efficacious in significantly reducing OCD symptoms (Aardema et al., 2017; 2022; O'Connor et al., 2005b; Visser et al., 2015).

Although the appraisal model and IBA both fall broadly within a cognitive or cognitive-behavioral framework, their unique features distinguish them from one another. This raises key theoretical questions about how each contributes to our understanding of OCD symptoms. Yet to date, only a small number of studies have looked at the relative and combined contributions of these concepts and specifically examined the relative contributions of the IBA. Moreover, the studies that do exist report inconsistent findings, leaving important gaps in the literature.

In one study examining the relative contributions of the appraisal and IBA models, Aardema and colleagues (2006), found that inferential confusion remained a significant predictor of contamination/washing symptoms after controlling for obsessive beliefs; yet this was not the case in two other studies (Aardema et al., 2018; Wu et al., 2009). Furthermore, inferential confusion was a stronger predictor of checking symptoms in some studies (and only using some dependent measures; Aardema et al., 2018; Wu et al., 2009), whereas various obsessive beliefs were stronger predictors of these symptoms in other investigations (Aardema et al., 2006, 2018). Regarding unacceptable/taboo obsessive thoughts, findings vary widely with inferential confusion, obsessive beliefs, both, or neither predicting these symptoms depending on the study (Aardema et al., 2006, 2008, 2017, 2018; Wu et al., 2009). Finally, two studies found that both inferential confusion and the perfectionism/certainty domain of obsessive beliefs significantly predicted symmetry symptoms (Aardema et al., 2018; Wu et al., 2009).

Only three studies have examined the relative contributions of fear of self and obsessive beliefs, and all focused on the prediction of

unacceptable thoughts (Aardema et al., 2013, 2017; Melli et al., 2016). The findings of these studies are much more consistent: fear of self consistently predicted symptom severity even after controlling for obsessive beliefs.

In addition, there are limitations of the reviewed studies that make it difficult to draw firm conclusions about the relative contributions of the appraisal and IBA models. First, varying data analytic approaches across studies cloud the precise influence of each model. For example, only one study used hierarchical linear regression to isolate the effect of IBA constructs over obsessive beliefs. Second, many studies relied on outdated OC symptom measures, such as the Padua Inventory (Aardema et al., 2006) which does not assess the four most consistently identified OC symptom domains (Abramowitz et al., 2010). Indeed, the Padua Inventory combines unacceptable thoughts and responsibility obsessions on the same subscale and contains a separate checking subscale. More updated structural analyses of OC symptoms (e.g., Abramowitz et al., 2010), however, indicate that responsibility obsessions and checking rituals exist on the same factor, and are separate from unacceptable obsessional thoughts. Finally, most of the studies had at least one author involved in developing the IBA, increasing the risk of bias, and necessitating independent verification.

Accordingly, the current study had two aims. The first was to examine IBA constructs (inferential confusion and fear of self) as predictors of OC symptom dimensions according to the most updated dimensional structure. Based on the research reviewed above, we hypothesized that these constructs would be significantly associated with all OC symptom dimensions: contamination, responsibility for harm, unacceptable thoughts, and symmetry. Our second aim was to assess the relative and unique contributions of inferential confusion, fear of self, and obsessive beliefs in predicting different dimensions of OC symptoms. On the basis of previous research, we hypothesized that obsessive beliefs would explain all OC symptom domains, and that the IBA constructs would increase the variance explained—specifically, inferential confusion would uniquely predict contamination, responsibility, and symmetry, while fear of self would uniquely predict unacceptable obsessions.

1. Method

1.1. Participants

We tested our hypotheses using an unselected sample given (a) the continuous (i.e. dimensional) expression of obsessive beliefs, IBA constructs, and OC symptomatology (e.g., Rachman & de Silva, 1978) across clinical and non-clinical individuals, and (b) the financial and temporal cost of recruiting clinical samples large enough for meaningful interpretation of statistical results. Research also indicates that associations between most OC-related phenomena are constant across clinical and nonclinical samples given that the main differences between such samples are quantitative, rather than qualitative (Abramowitz et al., 2014).

A total of 420 undergraduate psychology students from a large university in the southeastern United States participated in the study. Of these, 81 participants (19.2%) were removed from the analyses due to failing an attention check. This left 339 participants in the final sample. The average age of the sample was 19.37 years ($SD = 2.00$, Range: 18–48) and for gender, 61.4% identified as women, 37.8% identified as men, and 0.9% identified as a gender other than woman or man. With regard to race, 61.4% of the sample were White, 17.4% Asian or Pacific Islander, 11.5% Black or African American, 1.2% American Indian or Alaska Native, and 5.6% multiracial. An additional 2.8% reported being of another unspecified race. A portion of the sample (12.4%) were of Hispanic or Latino descent.

1.2. Procedure

All study procedures were approved by the university's Institutional Review Board. Participation was available to all undergraduate students enrolled in introductory psychology classes at the study site. These classes include a research participation requirement and all participants received course credit for their participation in the study. After providing informed consent, participants completed the study online via Qualtrics.

1.3. Measures

Obsessive Beliefs Questionnaire-Short Form (OBQ; Moulding et al., 2011). The short form of the OBQ is a 20-item self-report measure assessing beliefs related to OC symptoms from the perspective of the appraisal model, including threat overestimation, inflated responsibility, the importance of and need to control thoughts, perfectionism, and intolerance of uncertainty. The OBQ has excellent internal consistency (Cronbach's alpha was .94 in the present study) and mixed evidence for its criterion-related validity, as indicated by its subscales' ability to differentiate individuals with OCD from those without in some studies (OCCWG, 2003), but not in others (Tolin et al., 2006). In the present study, Cronbach's alpha was .94.

Inferential Confusion Questionnaire-Expanded Version (ICQ; Aardema et al., 2010). The ICQ is a 30-item questionnaire measuring a lack of trust of the senses and an overreliance on imagination over reality during reasoning processes. Items are rated on a six-point scale from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating greater inferential confusion. The ICQ has excellent reliability in non-clinical samples ($\alpha = .96 - .97$) and demonstrates good criterion-related validity, as evidenced by its ability to differentiate individuals with OCD from non-anxious individuals and individuals with various anxiety disorders (Aardema et al., 2010). Cronbach's alpha in the current sample was also excellent ($\alpha = .96$).

Fear of Self Questionnaire (FSQ; Aardema et al., 2013). The FSQ is an eight-item questionnaire developed to assess distrust in oneself based on beliefs that there are negative, hidden aspects of one's personality. Items (e.g., "I worry about being the sort of person who might do very immoral things") are rated on a 6-point scale ranging from 1 (strongly disagree) to 6 (strongly agree), with higher scores indicating greater fear of self. The FSQ demonstrates good psychometric properties including excellent internal consistency ($\alpha = .93$; Aardema et al., 2013). Additionally, the FSQ exhibits strong, positive correlations with measures of related constructs, such as the Self-trust Questionnaire ($r = .67$). Internal consistency for the current sample was also excellent ($\alpha = .91$).

Dimensional Obsessive-Compulsive Scale (DOCS; Abramowitz et al., 2010). The DOCS is a 20-item self-report measure of OC symptom severity that includes 4 subscales assessing the four empirically supported symptom dimensions: contamination, responsibility for harm, unacceptable thoughts, and symmetry. Each subscale includes a description of symptoms associated with that dimension along with items assessing: 1) time devoted to obsessions and compulsions, 2) avoidance, 3) distress, 4) functional impairment, and 5) difficulty disregarding the obsessions and resisting compulsions. The DOCS has good psychometric properties in undergraduate samples as evidenced by strong correlations with other self-report and clinician-rated measures of OC symptoms (r 's = .54-.69) and weaker correlations with measures of general distress (r 's = .33-.38), as well as good to excellent reliability ($\alpha = .83-.93$). Similar reliability was found in the current study (α = .84-.92).

1.4. Data analytic plan

We examined data for patterns of missingness and discovered that data were missing completely at random. Accordingly, we imputed missing values using the expectation maximization algorithm.

Our data analytic approach included four steps. First, we calculated descriptive statistics for all study variables. Second, we computed zero-order correlations to assess relationships among the OBQ, ICQ, FSQ, and DOCS subscales. We applied a Benjamini-Hochberg correction (BH; Benjamini & Hochberg, 1995) to control the rate of false discovery. Third, we computed a set of linear regressions in which the four OBQ subscales were entered as simultaneous predictors of each DOCS subscale. This allowed us to identify the particular obsessive belief domain (s) that significantly predicted each OC symptom dimension. Fourth, we examined the relative and combined contributions of obsessive beliefs, inferential confusion, and fear of self in predicting each DOCS subscale. Specifically, we computed four hierarchical regressions in which the first step included the OBQ subscale(s) that significantly predicted that particular OC symptom dimension. In step 2, the ICQ and FSQ were included together as additional predictors. We assessed regression diagnostics to verify that all models met the assumptions of linear regression (e.g., lack of multicollinearity, homoscedasticity).

2. Results

2.1. Sample characteristics

Descriptive statistics for all study measures are presented in Table 1. As expected, scores fell within the range reported in other undergraduate samples (e.g., Aardema et al., 2008; Abramowitz et al., 2010). Moreover, inspection of DOCS scores indicated that the sample included individuals with a range of symptom severity.

2.2. Correlation analyses

Table 1 also presents the zero-order Pearson correlation coefficients between study measures. All correlations were statistically significant (likely due to sample size). As can be seen in the table, the magnitude of correlations ranged from .17 (between DOCS-Contamination and OBQ-Perfectionism/Intolerance of Uncertainty) to .71 (between OBQ-Threat and FSQ). In general, OBQ subscales and IBA constructs both exhibited small-to-medium associations with each of the DOCS dimensions.

2.3. Regression analyses

Regression diagnostics were run for all models to verify that the assumptions of a linear regression were met. VIF and Tolerance values were all within acceptable limits (i.e., VIF <5, Tolerance >0.2), indicating low multicollinearity among predictors. Visual inspection of residual plots revealed acceptable homoscedasticity for the models.

2.4. OBQ subscales predicting DOCS dimensions

Table 2 presents summary statistics for the regression models using OBQ subscale scores to predict each of the DOCS dimensions. For the first model, OBQ subscales together accounted for 9% of the variance in DOCS-Contamination scores, and OBQ-Threat scores emerged as the only significant predictor. For the second model, OBQ subscales together accounted for 20% of the variance in DOCS-Responsibility scores, again with OBQ-Threat emerging as the only significant predictor. In the third model, OBQ subscales together accounted for 19% of the variance in DOCS-Symmetry scores. This time, OBQ-Importance/control of thoughts scores emerged as the only significant predictor. For the final model, OBQ subscales together accounted for 16% of the variance in DOCS-Unacceptable thoughts scores, with OBQ-Threat scores again emerging as the only significant predictor.

2.5. Hierarchical regressions predicting DOCS dimensions

Table 3 presents summary statistics for the final step in each regression model.

Table 1
Mean scores and Pearson correlation coefficients among study measures.

Variable	M	(SD)	1	2	3	4	5	6	7	8	9
1. DOCS-Cont	4.28	(3.22)	–								
2. DOCS-Resp	4.49	(3.67)	.47	–							
3. DOCS-Symmetry	3.67	(3.89)	.45	.40	–						
4. DOCS-Unaccept	4.39	(3.91)	.30	.44	.32	–					
5. FSQ	21.65	(9.27)	.20	.34	.20	.45	–				
6. ICQ	94.96	(27.18)	.26	.47	.34	.45	.59	–			
7. OBQ-Threat	15.12	(6.71)	.28	.43	.29	.40	.71	.66	–		
8. OBQ-Resp	17.52	(6.70)	.25	.37	.26	.28	.54	.53	.73	–	
9. OBQ-IC	17.44	(7.13)	.24	.35	.43	.32	.51	.53	.70	.64	–
10. OBQ-Perf/IU	13.14	(6.55)	.17	.35	.29	.32	.57	.48	.70	.70	.66

Note. All BH-adjusted $p \leq .001$. DOCS = Dimensional Obsessive-Compulsive Scale, Cont = Contamination, Resp = Responsibility, Unaccept = unacceptable thoughts, FSQ = Fear of Self Questionnaire, ICQ = Inferential Confusion Questionnaire, OBQ = Obsessive Beliefs Questionnaire, IC = Importance/Control of thoughts, Perf/IU = Perfectionism and Intolerance of Uncertainty.

Table 2
Regression Models Predicting DOCS dimensions with OBQ subscales.

Variable	β	t	p	sr ²
Predicting DOCS-Contamination ($R^2 = .09, p < .001$)				
OBQ-Threat	0.22	2.45	.015	.13
OBQ-Responsibility	0.10	1.24	.216	.07
OBQ-IC	0.09	1.17	.243	.06
OBQ-Perf/IU	-0.11	-1.35	.178	-.07
Predicting DOCS-Responsibility ($R^2 = .20, p < .001$)				
OBQ-Threat	0.30	3.55	<.001	.17
OBQ-Responsibility	0.08	1.03	.303	.05
OBQ-IC	0.04	0.60	.551	.03
OBQ-Perf/IU	0.06	0.85	.395	.04
Predicting DOCS-Symmetry ($R^2 = .19, p < .001$)				
OBQ-Threat	-0.02	-0.23	.821	-.01
OBQ-Responsibility	-0.03	-0.33	.743	-.01
OBQ-IC	0.44	5.81	<.001	.29
OBQ-Perf/IU	0.04	0.47	.640	.02
Predicting DOCS-Unacceptable thoughts ($R^2 = .09, p < .001$)				
OBQ-Threat	0.33	3.84	<.001	.19
OBQ-Responsibility	-0.06	-0.79	.432	-.04
OBQ-IC	0.07	0.96	.337	.05
OBQ-Perf/IU	0.09	1.12	.263	.06

Note. DOCS = Dimensional Obsessive-Compulsive Scale, OBQ = Obsessive Beliefs Questionnaire, IC = Importance/Control of Thoughts, Perf/IU = Perfectionism/Intolerance of Uncertainty.

Table 3
Summary statistics for regression models predicting DOCS subscale scores.

Variable	β	t	p	sr ²
Predicting DOCS-Contamination ($R^2 = .09, p < .001$)				
OBQ-Threat	0.21	2.56	.011	.13
ICQ	0.14	1.96	.051	.10
FSQ	-0.03	-0.38	.707	-.02
Predicting DOCS-Responsibility ($R^2 = .25, p < .001$)				
OBQ-Threat	0.22	2.97	.003	.14
ICQ	0.33	5.16	<.001	.26
FSQ	-0.01	-0.19	.847	-.01
Predicting DOCS-Symmetry ($R^2 = .21, p < .001$)				
OBQ-IC	0.38	6.33	<.001	.31
ICQ	0.20	3.15	.002	.15
FSQ	-0.11	-1.70	.090	-.08
Predicting DOCS-Unacceptable thoughts ($R^2 = .25, p < .001$)				
OBQ-Threat	0.02	0.03	.802	.01
ICQ	0.29	4.48	<.001	.21
FSQ	0.26	3.84	<.001	.18

Note. DOCS = Dimensional Obsessive-Compulsive Scale, FSQ = Fear of Self Questionnaire, ICQ = Inferential Confusion Questionnaire, OBQ = Obsessive Beliefs Questionnaire, IC = Importance/Control of Thoughts.

Predicting DOCS-Contamination. In step 1, OBQ-Threat scores alone significantly predicted DOCS-Contamination scores, accounting for 8% of the variance, $F(1, 337) = 28.85, p < .001$. In step 2, adding the

ICQ and FSQ increased the variance explained by an additional 1%, which was not a significant increase, $F(2, 335) = 1.93, p = .147$. The final model accounted for a total of 9% of the variance in DOCS-Contamination scores, which was significant, $F(3, 335) = 10.95, p < .001$, with OBQ-Threat scores emerging as the only significant predictor in the final model.

Predicting DOCS-Responsibility. In step 1, OBQ-Threat scores alone significantly predicted DOCS-Responsibility scores, accounting for 19% of the variance, $F(1, 337) = 76.86, p < .001$. In step 2, adding the ICQ and FSQ increased the variance explained by an additional 6%, which was a significant increase, $F(2, 335) = 13.80, p < .001$. In total, the final model accounted for 25% of the variance in DOCS-Responsibility scores, which was significant, $F(3, 335) = 36.77, p < .001$, with OBQ-Threat scores and ICQ scores both emerging as significant predictors.

Predicting DOCS-Symmetry. In step 1, OBQ-Importance/control of thoughts scores alone significantly predicted DOCS-Symmetry scores, accounting for 18% of the variance, $F(1, 337) = 76.07, p < .001$. In step 2, adding the ICQ and FSQ increased the variance explained by an additional 2%, which was a significant increase, $F(2, 335) = 5.02, p = .007$. In total, the final model accounted for 21% of the variance in DOCS-Symmetry scores, which was significant, $F(3, 335) = 29.31, p < .001$, with OBQ-IC scores and ICQ scores both emerging as significant predictors.

Predicting DOCS-Unacceptable Thoughts. In step 1, OBQ-Threat scores alone significantly predicted DOCS-Unacceptable Thoughts scores, accounting for 16% of the variance, $F(1, 337) = 62.36, p < .001$. In step 2, adding the ICQ and FSQ increased the variance explained by an additional 10%, which was a significant increase, $F(2, 335) = 22.32, p < .001$. In total, the final model accounted for 26% of the variance in DOCS-Symmetry scores, which was significant, $F(3, 335) = 38.30, p < .001$, with ICQ scores and FSQ scores (but not OBQ-Threat) emerging as significant predictors.

3. Discussion

The overall aim of the present study was to better understand the relative contributions of the IBA and the cognitive appraisal model in predicting OC symptoms. We examined the relationship between IBA concepts and the severity of OC symptom domains, as well as the extent to which the more novel IBA approach adds to the predictive value of the more longstanding appraisal model. In accordance with the currently accepted dimensional model of OC symptoms, we interpret our findings specific to each symptom dimension.

We found that although the IBA constructs and the tendency to overestimate threat were significantly related to contamination symptoms, none of these variables individually explained a remarkable degree of variability in contamination. Collectively, they accounted for only 9% of the variance in DOCS contamination scores, with the

overestimate of threat emerging as the lone significant individual predictor. Contrary to our hypothesis, IBA constructs did not add to the prediction of contamination over and above obsessive beliefs.

These findings suggest that our understanding of the factors contributing to contamination-related OC symptoms requires further refinement. Indeed, contamination fears are highly heterogeneous and may present as a fear of harm (i.e., illness or disease), concerns about disgust (Olatunji et al., 2007; Rachman, 2004), fears of contact contamination, feelings of mental (or moral) contamination (Coughtrey et al., 2012; Radomsky et al., 2014), and the fear of being contaminated versus spreading contamination to others. These presentations likely have different (yet overlapping) sets of predictors that may impact the applicability of explanatory models. Some authors, for example, have suggested that the self-relevant themes emphasized in the IBA fit well with the feelings of internal uncleanness experienced with mental contamination (Aardema et al., 2019; Üzümcü et al., 2021), and perhaps less so for other presentations of contamination (Aardema et al., 2006; Wu et al., 2009a). The present study's use of the DOCS Contamination subscale, which does not distinguish between these various manifestations, likely obfuscates these relationships. Future studies should seek to evaluate the predictive value of the IBA and appraisal models within each of these different manifestations of contamination.

OC symptoms related to responsibility were significantly associated with obsessive beliefs (i.e., overestimates of threat) and both IBA constructs; and the IBA constructs added predictive value over and above overestimates of threat in our regression model. That overestimates of threat and inferential confusion made unique contributions to explaining responsibility symptoms aligns with previous studies finding that both cognitive appraisals (e.g., Wheaton et al., 2010) and inferential confusion (e.g., Aardema et al., 2018; Wu et al., 2009) are relevant to obsessions related to responsibility for harm and checking compulsions. Specifically, the IBA model posits that obsessions about responsibility for harm arise from inductive thinking in which conclusions about possible states of affairs (e.g., "I could have hit someone with my car") are given priority over direct sensory evidence (e.g., "I am a careful driver and don't remember hitting anyone").

Symmetry OC symptoms were also associated with obsessive beliefs (i.e., importance and control of thoughts), and both IBA constructs; the latter increasing the variance accounted for by 2%. However, in the final model, symmetry symptoms were only explained by inferential confusion and beliefs about the importance and need to control unwanted thoughts. The finding that inferential confusion was a significant predictor is consistent with previous findings that this construct is generally associated with the symmetry domain of OC symptoms (Aardema et al., 2018; Wu et al., 2009). Similar to contamination, symmetry OC symptoms are heterogeneous (Tolin, 2023). One presentation concerns a general sense of "incompleteness" or feeling "not just right" accompanied by ordering and arranging rituals. Another involves superstitious thinking that negative events will occur if things are not properly arranged (e.g., if I don't align the pictures properly, a loved one will have an accident). The faulty reasoning processes addressed in the IBA seem better aligned with the latter than the former variation; perhaps our findings are driven by a preponderance of such concerns in our sample. As with contamination fears, we suggest that future research differentiate the two types of symmetry symptoms to better understand how they relate to inferential confusion.

Although unacceptable thoughts were associated with all of the theoretical constructs, in partial support of our hypothesis, fear of self and inferential confusion (but not the tendency to overestimate threat) were significant individual predictors, suggesting that these IBA constructs tap into unique aspects of the unacceptable thoughts domain not captured by the appraisal model. Fear of self concerns beliefs that one has precarious traits that need to be controlled. With respect to inferential confusion, the IBA proposes that unacceptable obsessional thoughts are the result of flawed reasoning in which the plausibility of these thoughts is privileged over concrete experiential evidence. Our

data suggest that these IBA constructs contribute to our understanding of obsessions about taboo topics over and above the contribution of obsessional beliefs.

Taken together, our findings indicate that the applicability of both the appraisal model and IBA vary across OC symptom domains. They also suggest the need for a more nuanced approach to understanding the factors involved in different presentations of contamination and symmetry. This aligns with a contemporary understanding of OCD as a multi-dimensional condition (e.g., Abramowitz et al., 2010), and highlights the importance of conducting research that addresses individual symptom manifestations, rather than treating OCD as a single, uniform disorder. Our findings also suggest that the IBA offers valuable insights into certain OC symptom dimensions, indicating the need for an integrated approach incorporating both IBA and appraisal models to best explain the diverse presentations of OCD.

Our results should be interpreted with some caution due to several limitations. First, the cross-sectional nature of our data limits our ability to make causal claims. While our findings align with a theory that specific psychological factors contribute to OC symptoms, it is equally possible that OC symptoms themselves lead to phenomena such as obsessive beliefs, inferential confusion, and fear of self. Additionally, unmeasured third variables may account for the observed associations. Second, the sole use of self-report measures might have inflated the relationships between variables, potentially due to methodological biases. Finally, data were obtained from an unscreened nonclinical sample. Although previous research suggests that results obtained from such samples are relevant to the study of OCD (Abramowitz et al., 2014), future studies should include a sample with greater symptom severity to examine whether certain constructs are differentially predictive of OC dimensions at various levels of symptomatology.

Ethics approval

Any aspect of the work covered in this manuscript that has involved human subjects has been conducted with the ethical approval of our university's Institutional Review Board and that such approval is acknowledged within the manuscript.

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CRedit authorship contribution statement

Nicholas S. Myers: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Emily K. Juel:** Writing – review & editing, Writing – original draft, Conceptualization. **Joseph B. Friedman:** Writing – review & editing, Writing – original draft, Conceptualization. **Heidi J. Ojalehto:** Writing – review & editing, Writing – original draft, Conceptualization. **Maya E. Tadross:** Writing – review & editing, Writing – original draft, Conceptualization. **Chase M. DuBois:** Writing – review & editing, Writing – original draft, Conceptualization. **Amitai Abramovitch:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Dean McKay:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Jonathan S. Abramowitz:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. Given their role as an associate editor,

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Data availability

Data will be made available on request.

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