



Mental contamination obsessions: An examination across the obsessive-compulsive symptom dimensions



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ABSTRACT

Mental contamination (MC) is an experience in which individuals feel dirty or impure even though they have not come into direct contact with a contaminated object (e.g., merely *thinking* about something immoral or disgusting). Although limited research has examined MC in relation to contact contamination-relevant cognitions and symptoms, no studies to date have investigated the extent to which this construct is associated with the “unacceptable thoughts” obsessive-compulsive (OC) subtype. In our sample of unselected participants ($n = 304$) who completed a self-report battery we found: (a) as in previous studies, MC was related to contact contamination OC symptoms and relevant cognitive distortions (i.e., threat overestimation and contamination thought action fusion), and (b) as hypothesized, MC was also associated with unacceptable thoughts symptoms and relevant cognitive distortions (intolerance of uncertainty and experiential avoidance). However, contrary to hypotheses, MC was also related to the responsibility for harm and symmetry/incompleteness OC symptom dimensions. Accordingly, rather than being uniquely tied to specific dimensions, it appears that MC may be associated with more general latent vulnerability factors associated with OCD. Additional implications for the way MC is conceptualized and treated and directions for further study are also discussed.

1. Introduction

Mental contamination (MC; also termed “mental pollution”) is a dimensional (i.e., continuous) experience in which individuals feel dirty or impure even without having come into direct contact with a contaminated object (Rachman, 2006b). Unlike conventional contamination concerns (e.g., fears of contracting HIV from touching a public restroom doorknob) in which physical contact is made with a contaminated substance or surface (i.e., contact contamination), an individual who experiences MC may feel dirty and contaminated just from *imagining* a subjectively unpleasant, immoral, or disgusting stimulus or scenario (e.g., “What if I were to commit incest?”, images of feces). These thoughts/images/ideas result in feelings of discomfort, anxiety, and uncleanliness, as well as urges to wash, neutralize (e.g., replace a “dirty” thought with a “clean” thought), or avoid situations or thoughts that trigger MC (Coughtrey, Shafran, & Rachman, 2013; Elliott & Radomsky, 2013). However, despite the short-term success of these anxiety-reduction and neutralizing behaviors, they fuel the “vicious cycle” of intrusive contamination-related mental experiences in the long-run by serving as reminders of MC and preventing the natural extinction of obsessional distress.

Due to topographical similarities between MC and contact contamination and their co-occurrence (Coughtrey, Shafran, Knibbs, & Rachman, 2012; Study 2), the majority of research on MC to date has examined this construct in relation to contact contamination cognitions and symptoms in both clinical and non-clinical samples. For instance, MC symptoms have been associated with elevated washing/cleaning obsessive-compulsive (OC) symptoms in a number of studies (Carrarsi, Bulli, Melli, & Stopani, 2013; Coughtrey et al., 2012; Fergus, 2014; Melli, Bulli, Carrarsi, & Stopani, 2014; Radomsky, Rachman, Shafran, Coughtrey, & Barber, 2014). Furthermore, MC is correlated with a variety of contamination-relevant cognitions such as contamination sensitivity (i.e., distress from feelings of contamination; (Study 2; Radomsky et al., 2014), and disgust propensity (i.e., the tendency to respond to situations with the emotion of disgust or revulsion; Carrarsi et al., 2013; Melli et al., 2014; Radomsky et al., 2014). MC has also demonstrated associations with both general and contamination-specific thought-action fusion (TAF; Coughtrey et al., 2012; Fergus, 2014; Radomsky et al., 2014), which refers to a set of faulty beliefs about the relationship between contamination-related mental events and outcomes, such as the belief that having an image of dirtiness results in an increased risk of contamination (Rachman,

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2006a). Finally, contamination-related threat overestimation, the tendency to overrate the likelihood and severity of contamination resulting from contact with a variety of commonplace objects (Deacon & Maack, 2008), is another contamination-related cognition conceptually related to MC (Deacon & Olatunji, 2007).

Despite the conceptual overlap between MC and contact contamination, investigators argue that they are nevertheless independent constructs (Coughtrey et al., 2012; Rachman, 2006b). Rachman (2006b), for example, described MC as an obscure, unlocalized, and intangible feeling of dirtiness. Contact contamination, in contrast, involves *tangible* feelings of uncleanliness and *easily identifiable* triggers. MC is not only associated with anxiety about oneself or others contracting an illness (as in contact contamination), but also strongly linked with feelings of immorality, disgust, and shame (Carrarese et al., 2013; Lee et al., 2013; Melli et al., 2014; Rachman, 2006b; Radomsky & Elliott, 2009). Finally, unlike contact contamination in which washing/cleaning rituals can typically relieve feelings of external dirtiness (even if only temporarily), such rituals often do not ameliorate perceived internal dirtiness as seen in MC (Coughtrey, Shafran, & Rachman, 2014a). Thus, additional research is needed to further delineate the correlates of MC and the extent to which this understudied construct overlaps with the other non-contamination-based OC symptom dimensions.

Specifically, OC symptoms are understood to occur along four empirically established dimensions, including contamination, responsibility for harm, symmetry/incompleteness concerns, and unacceptable thoughts (e.g., Abramowitz et al., 2010). Indeed, much of the research on MC and contact contamination has highlighted the relationship between these fears and the contamination OC symptom domain. To date, however, no studies have systematically investigated the extent to which MC is associated with the unacceptable thoughts dimension, which includes repugnant obsessions regarding sex, violence, immorality, and religiosity. We find this surprising in light of the theoretical links between MC and unacceptable thoughts symptoms. Specifically, if MC is defined as a feeling of contamination that “arises from a mental event” (Rachman, 2006b, p. 20), there may be associations between unwanted thoughts having to do with feeling dirty/contaminated and other types of unacceptable, immoral, repugnant, or “taboo” intrusive thoughts and related-cognitions. For instance, patients we have seen in our clinical practice have presented with thoughts they perceive to be repugnant (e.g., thoughts of incest with a family member), who report a distressing mental dirtiness that they feel compelled to cleanse from their minds.

Indeed, one previous study demonstrated relationships between MC symptoms and scrupulosity (i.e., religious obsessions and compulsions) in a religious sample (Fergus, 2014). These results provide preliminary evidence that religious individuals who experience an immoral, blasphemous, or sinful thought or urge feel physically contaminated and experience the urge to cleanse themselves; however, the extent to which these associations generalize to other types of “taboo” intrusions in more broad (i.e., non-religious) samples is unknown. The few studies that have reported associations between MC and obsessional symptoms (Coughtrey et al., 2012; Radomsky et al., 2014) did not use more recent dimensional measures of OC symptoms in which theme-based symptom profiles include both obsessions and functionally linked compulsions (e.g., repugnant, “taboo” thoughts and mental neutralizing rituals; Abramowitz et al., 2010), nor did they include *a priori* hypotheses regarding this relationship.

Moreover, research has not sufficiently explored the extent to which cognitive variables conceptually relevant to unacceptable thoughts, such as the intolerance of uncertainty (IU) and experiential avoidance (EA) are also associated with MC symptoms. IU is a set of maladaptive beliefs about the necessity of having guarantees in life and one's inability to cope with unpredictability or ambiguity (Carleton et al., 2012; Dugas, Schwartz, & Francis, 2004; Obsessive Compulsive Cognitions Working Group, 1997). IU has demonstrated robust associations with

the unacceptable thoughts OC symptom dimension in previous research (Abramowitz & Deacon, 2006; Holaway, Heimberg, & Coles, 2006; Jacoby, Fabricant, Leonard, Riemann, & Abramowitz, 2013; Tolin, Brady, & Hannan, 2008), as individuals with unacceptable, repugnant thoughts often struggle with uncertainty over what these thoughts mean (e.g., needing to be certain that having an unwanted sexual thought while playing with children doesn't mean one is a pedophile). In relation to MC more specifically, considering that there is no way to objectively cleanse one's mind from dirtiness or impurity, individuals with MC symptoms may grapple with uncertainty regarding the purity of their thoughts.

Second, EA (i.e., psychological inflexibility) refers to the unwillingness to remain in contact with unwanted internal experiences such as thoughts, feelings, or physical sensations that are perceived to be negative (Bond et al., 2011; Hayes et al., 2004). Not only does EA have clear conceptual relevance to the unwillingness to experience repugnant, “taboo” obsessional thoughts, but it has also demonstrated empirical associations with unacceptable thoughts symptoms in previous empirical work (Blakey, Jacoby, Reuman, & Abramowitz, 2016; Wetterneck, Steinberg, & Hart, 2014). Specifically individuals with MC may hold inflexible beliefs about physical and mental cleanliness, such that they are unwilling to come in contact with images, thoughts, sensations, or urges that they perceive to be dirty and unwanted. Thus, cognitive distortions associated with “taboo” thoughts such as IU and EA may be especially relevant to the experience of MC; however no studies have empirically examined this question to date.

Accordingly, the present study was designed to specifically investigate the extent to which experiences of MC are associated with theoretically relevant cognitive variables and the most up to date conceptualization of OC symptom dimensions (the unacceptable thoughts symptom dimension in particular). First, we hypothesized that MC would be related to contact contamination symptoms and two contact contamination-relevant cognitive distortions: contamination-related threat overestimation, and contamination TAF. Second, we also predicted that MC would be associated with unacceptable thoughts symptoms, as well as the two unacceptable thoughts-relevant cognitive distortions: IU and EA. We also examined exploratory associations between MC symptoms and the other OC symptom dimensions (i.e., responsibility for harm and symmetry concerns). We hypothesized that the contamination and unacceptable thoughts OC dimensions would remain uniquely associated with MC symptoms after accounting for the other dimensions. Finally, we aimed to explore the extent to which the cognitive predictors (contamination-related threat overestimation, contamination TAF, IU, and EA) uniquely predict MC symptoms. Since no previous studies had examined IU and EA in relation to MC, this analysis was exploratory.

2. Method

2.1. Participants

Participants were 340 undergraduates recruited from Introduction to Psychology classes at a large university in the southeastern United States. Following data screening (described further in the “Data analytic plan” section below), the final sample size was 304 participants. The sample was primarily female (69.4%, $n = 211$), Caucasian (69.7%, $n = 212$); 12.5% African American, 8.9% Asian, 4.6% multi-racial, 3.9% other), non-Latino (92.1%, $n = 280$), and first-year students (66.1%, $n = 201$); $M_{\text{age}} = 18.61$ years old ($SD = 1.33$; range 17–29).

3. Measures

3.1. Vancouver Obsessive Compulsive Inventory - Mental Contamination Subscale (VOCI-MC; Rachman, 2006a, 2006b)

The VOCI-MC is a 20-item self-report questionnaire designed to

assess the severity of mental contamination symptoms. Items assess the extent to which participants agree with a series of statements about MC (e.g. “I often look clean but feel dirty”, “I often feel the need to cleanse my mind”) on a scale from 0 (*Not at all*) to 4 (*Very much*); total scores range from 0 to 80. The VOCI-MC demonstrated excellent internal consistency as well as convergent, divergent, and discriminate validity in previous studies (e.g., Radomsky et al., 2014). Internal consistency of the VOCI-MC in the present sample was excellent ($\alpha = .93$).

3.2. Dimensional Obsessive-compulsive Scale (DOCS; Abramowitz et al., 2010)

The DOCS is a 20-item self-report measure assessing the severity of four OCD symptom dimensions: (a) concerns about germs and contamination (DOCS-C), (b) concerns about being responsible for harm, injury, or bad luck (DOCS-RH), (c) unacceptable thoughts (DOCS-UT), and (d) concerns about symmetry, completeness, and the need for things to be “just right” (DOCS-S). Within each symptom dimension, five items (rated 0–4) assess the following aspects of severity over the past month: (a) time, (b) avoidance, (c) distress, (d) interference, and (e) difficulty disregarding obsessions and refraining from compulsions. The DOCS subscales have shown good to excellent reliability, as well as good convergent, discriminant, and known groups validity. Internal consistency of the DOCS subscales in the present sample was good to excellent ($\alpha = .83$ –.91).

3.3. Contamination Cognitions Scale (CCS; Deacon & Maack, 2008)

The CCS is a measure of one's tendency to overestimate contamination-related threat from coming into contact with a variety of commonplace objects (e.g., stairway railing, toilet seat in a public restroom, raw meat). Participants separately rate the likelihood (CCS-L) and severity (CCS-S) of contamination for each item on scale from 0 (*Not at all*) to 100 (*Extremely*). The CCS has demonstrated excellent internal consistency and test-retest reliability (Deacon & Olatunji, 2007). The internal consistency was also excellent for the CCS subscales in the current sample ($\alpha = .94$ –.95).

3.4. Contamination thought-Action Thought-action Fusion Scale (CTAF; Rachman, 2006a)

The CTAF is a 9-item self-report questionnaire that was developed to assess a contamination-specific version of thought-action fusion (TAF; Shafran, Thordarson, & Rachman, 1996). Items (e.g., “If I get an image of myself being contaminated, it will make me feel contaminated”) are rated on a 5-point Likert-type scale from 0 (*Strongly disagree*) to 4 (*Strongly agree*), such that higher scores indicate higher levels of contamination TAF; total scores range from 0 to 36. The CTAF scale has demonstrated excellent internal consistency in previous research (Rachman, 2006a) and in the current sample ($\alpha = .93$).

3.5. Intolerance of Uncertainty Scale (IUS-12; IUS-12; Carleton, Norton, and Asmundson, 2007)

The IUS-12 is a shortened version of the original 27-item IUS (Freeston, Rhéaume, Letarte, & Dugas, 1994) that measures reactions to uncertainty, ambiguous situations, and the future (e.g., “Uncertain events upset me greatly”). Participants rate each item from 1 (*Not at all characteristic of me*) to 5 (*Entirely characteristic of me*). The measure consists of two subscales: (a) Prospective IU, which measures approach responses to managing uncertainty including the desire for predictability, preferences for knowing what the future holds, anxiety about future uncertain events, and active engagement in seeking information to increase certainty, and (b) Inhibitory IU, which measures avoidant responses to uncertainty and paralysis in the face of ambiguity (Birrell, Meares, Wilkinson, & Freeston, 2011). The IUS-12 has good

psychometric properties in both clinical and non-clinical samples (Carleton et al., 2012, 2007; Helsen, Van, den, Vlaeyen, & Goubert, 2013; Jacoby et al., 2013; Khawaja & Yu, 2010; McEvoy & Mahoney, 2011). Internal consistency of the IUS-12 subscales in the present sample was good ($\alpha = .84$ –.88).

3.6. Acceptance and Action Questionnaire (AAQ-II; Bond et al., 2011)

The AAQ-II is a 10-item revision of the original AAQ (Hayes et al., 2004). The scale assesses experiential avoidance (EA; i.e., psychological inflexibility), which is the core construct of acceptance-based models of psychopathology (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Participants rate their agreement with each of the statements (e.g. “I'm afraid of my feelings”) on a scale from 1 (*Never true*) to 7 (*Always true*), such that higher scores indicate more pathological EA (i.e., less psychological flexibility). The AAQ-II has been shown to have a single factor and has previously demonstrated good psychometric properties as well as convergent, discriminant, and incremental validity (Bond et al., 2011). The internal consistency for the AAQ-II was good in the current sample ($\alpha = .87$).

3.7. Procedure

The University's Institutional Review Board approved all measures and procedures, and participants provided online informed consent prior to beginning the study. Participants completed the online battery of self-report measures using Qualtrics, a secure online web survey platform.¹ In addition, participants were given a definition of MC (see Appendix A) and asked to describe two specific examples of MC thoughts they experience. Participants then were asked to report: (a) how long ago they last experienced an intrusion about MC, (b) how frequently they experienced an intrusion about MC in the last six months, and (c) their average level of distress when experiencing an intrusion on a scale from 0 (*None*) to 5 (*Extreme*). These items were adapted from the Interpretations of Intrusions Inventory (III-31; Obsessive Compulsive Cognitions Working Group, 2005). Three distractor items (i.e., “Please answer ‘Some’ for this item,” “While watching television, I frequently have fatal heart attacks,” and “Please select ‘Agree’ for this item”) were included throughout the survey to improve data quality (Oppenheimer, Meyvis, & Davidenko, 2009).

3.8. Data analytic plan

Examination of responses indicated that 36 participants did not pass all three distractor items; consequently, these cases were excluded from the analyses reported below, resulting in a final sample size of 304. Following the computation of descriptive statistics on study measures, Pearson's correlations were first computed to examine zero-order associations among the VOCI-MC, DOCS subscales, and cognitive measures (i.e., CCS subscales, CTAF, IUS-12 subscales, and AAQ-II). Next, to examine the relative contributions of the OC symptom dimensions in predicting MC symptoms, we computed a simultaneous multivariate regression using the DOCS Contamination (DOCS-C), Responsibility for Harm (DOCS-RH), Unacceptable Thoughts (DOCS-UT), and Symmetry (DOCS-S) subscales to predict the VOCI-MC. Finally, to examine the relative contributions of the cognitive measures in predicting MC symptoms, we computed a simultaneous multivariate regression using the CCS subscales, CTAF, IUS-12 subscales, and AAQ-II to predict the VOCI-MC.

¹ Coles, Cook, and Blake (2007) demonstrated that the administration of anxiety-related self-report measures using internet vs. paper-and-pencil formats resulted in comparable results.

Table 1
Means and standard deviations on study measures ($n = 304$).

	Mean (SD)	Range	Skewness	Kurtosis
VOCI-MC	13.46 (11.63)	0–57	1.20	.94
DOCS	15.92 (9.61)	0–46	.77	.28
DOCS-C	3.91 (2.95)	0–15	.84	.74
DOCS-RH	3.86 (3.02)	0–13	.70	–.10
DOCS-UT	4.65 (3.55)	0–16	.81	.09
DOCS-S	3.50 (3.58)	0–17	1.08	.57
CCS	37.92 (20.65)	0–91.15	.32	–.68
CCS-L	40.00 (23.67)	0–100	.39	–.55
CCS-S	35.84 (22.31)	0–100	.53	–.38
CTAF	5.70 (6.73)	0–30	1.23	.83
IUS-12	28.68 (8.87)	12–54	.44	–.28
IUS-P	18.65 (5.57)	7–34	.17	–.39
IUS-I	10.03 (4.18)	5–22	.76	–.15
AAQ-II	32.54 (10.38)	12–65	.51	.10

Note. VOCI-MC = Vancouver Obsessional Compulsive Inventory – Mental Contamination; DOCS = Dimensional Obsessive Compulsive Scale, Contamination (C), Responsibility for Harm (RH), Unacceptable Thoughts (UT), and Symmetry (S) subscales; CCS = Contamination Cognitions Scale, Likelihood (L) and Severity (S) subscales; CTAF = Contamination Thought Action Fusion Scale; IUS-12 = Intolerance of Uncertainty Scale – 12, Prospective (P) and Inhibitory (I) subscales; AAQ-II = Acceptance and Action Questionnaire-II.

4. Results

4.1. Descriptive Statistics

Means and standard deviations for all study measures appear in Table 1. The sample's mean VOCI-MC score was in line with previous research using nonclinical samples (Coughtrey et al., 2014a; Radomsky et al., 2014). Sample distributions were free of significant skew and kurtosis (all absolute values ≤ 1.2), suggesting that the distributions were approximately normal.

4.2. Characteristics of mental contamination thoughts

Participants reported a variety of different MC thoughts. In addition to thoughts about germ or contaminated surfaces (e.g., thinking about touching trash) and being around people considered to be “dirty”, common themes of MC thoughts were thoughts regarding sex (e.g., unintentionally mentally undressing someone, images of incest), immorality or betrayal (e.g., thoughts about being unfaithful to a significant other), and violent or gruesome thoughts or images (e.g., thoughts of hitting someone). Thirty-five percent of the sample ($n = 106$) reported experiencing a thought related to MC in the past week (25% in the last month; 40% in the last year). When asked how often they experienced an intrusion about MC in the last six months, 9% said once or more per day, 28% once or more per week, and 63% once a month or less. On average, participants reported that experiencing an intrusion was “a little” distressing ($M = 1.76$, $SD = 1.23$); distress levels covered the entire range of the scale (range = 0–5).

4.3. Zero-Order correlations

Zero-order bivariate (i.e., Pearson's) correlations among the study measures appear in Table 2. As can be seen, the OC symptom dimensions and related cognitive variables were each significantly correlated with the VOCI-MC in the expected directions ($ps < .001$). Specifically, the VOCI-MC was moderately positively associated with each of the DOCS symptom dimensions, the CTAF, both IUS-12 subscales, and the AAQ-II; it was also weakly, positively associated with both CCS subscales.

We used Steiger's equation to compare the strength of the correlations between the DOCS subscales and the VOCI-MC (Steiger, 1980). Results indicated that there was no significant difference between the

Table 2
Associations among cognitive and symptom study measures.

Measure	1	2	3	4	5	6	7	8	9	10	11
1. DOCS-C	–	.48*	.32*	.37*	.43*	.44*	.29*	.24*	.18	.19	.47*
2. DOCS-RH		–	.40*	.43*	.24*	.24*	.41*	.36*	.43*	.29*	.49*
3. DOCS-UT			–	.32*	.27*	.23	.35*	.27*	.44*	.58*	.48*
4. DOCS-S				–	.22*	.27*	.32*	.40*	.35*	.31*	.43*
5. CCS-L					–	.61*	.24*	.18	.19	.18	.33*
6. CCS-S						–	.27*	.23*	.25*	.16	.37*
7. CTAF							–	.29*	.40*	.42*	.54*
8. IUS-P								–	.65*	.51*	.39*
9. IUS-I									–	.64*	.50*
10. AAQ-II										–	.51*
11. VOCI-MC											–

Note. VOCI-MC = Vancouver Obsessional Compulsive Inventory – Mental Contamination; DOCS = Dimensional Obsessive Compulsive Scale, Contamination (C), Responsibility for Harm (RH), Unacceptable Thoughts (UT), and Symmetry (S) subscales; CCS = Contamination Cognitions Scale, Likelihood (L) and Severity (S) subscales; CTAF = Contamination Thought Action Fusion Scale; IUS-12 = Intolerance of Uncertainty Scale – 12, Prospective (P) and Inhibitory (I) subscales; AAQ-II = Acceptance and Action Questionnaire-II; $n = 304$.

* $p < .001$.

magnitude of the correlations between the VOCI-MC and the hypothesized DOCS subscales (DOCS-C and DOCS-UT) versus the other subscales (DOCS-H and DOCS-S); all $z < .81$, $ps > .42$.

4.4. Simultaneous regression analyses

Finally, two simultaneous regression analyses were conducted to determine the joint contributions of the (a) OC symptom dimensions and (b) cognitive variables in predicting VOCI-MC symptoms. Regression diagnostics identified no violations of normality or homoscedasticity, and no outliers were identified as problematic. Analyses revealed that the tolerance statistics ($\geq .44$) and variation inflation factors (VIF; ≤ 2.30) were adequate to satisfy the condition of independent predictors (Tabachnick & Fidell, 2013), indicating that multicollinearity was within acceptable ranges. Thus, the assumptions for our regression analyses were met.

In the first simultaneous multivariate regression model (Table 3), the DOCS subscales jointly accounted for 41% of the variance in VOCI-MC scores, $F(4, 299) = 51.27$, $p < .001$. Furthermore, each DOCS subscale accounted for significant unique variance ($ps \leq .001$).

In the second simultaneous multivariate regression model (Table 4), the cognitive predictors (i.e., CCS-L, CCS-S, AAQ-II, IUS-P, IUS-I, and CTAF) jointly accounted for 46% of the variance in VOCI-MC scores, $F(6, 297) = 41.56$, $p < .001$. Only the CCS-S, CTAF, IUS-I, and AAQ-II (but not the CCS-L or IUS-P) accounted for significant unique variance in VOCI-MC scores.

5. Discussion

Although feelings of contact contamination have long been understood to play a role in the experience of obsessions and compulsions, investigators have recently begun to integrate MC into conceptual

Table 3
Simultaneous linear regression predicting VOCI-MC scores from DOCS subscales.

Predictor	B	SE (B)	β	t	p	sr^2
DOCS-C	.90	.21	.23	4.38	< .001	.20
DOCS-RH	.75	.21	.19	3.52	< .001	.16
DOCS-UT	.88	.16	.27	5.40	< .001	.24
DOCS-S	.57	.17	.18	3.44	.001	.15

Note. VOCI-MC = Vancouver Obsessional Compulsive Inventory – Mental Contamination; DOCS = Dimensional Obsessive Compulsive Scale, Contamination (C), Responsibility for Harm (RH), Unacceptable Thoughts (UT), and Symmetry (S) subscales; $n = 304$.

Table 4
Simultaneous linear regression predicting VOICI-MC scores from cognitive measures.

Predictor	B	SE (B)	β	t	p	r^2
CCS-L	.04	.03	.09	1.56	.121	.07
CCS-S	.08	.03	.15	2.77	.006	.12
CTAF	.53	.09	.30	6.19	< .001	.27
IUS-P	.08	.12	.04	.70	.487	.03
IUS-I	.44	.18	.16	2.42	.016	.10
AAQ-II	.25	.07	.22	3.84	< .001	.16

Note. VOICI-MC = Vancouver Obsessional Compulsive Inventory – Mental Contamination; CCS = Contamination Cognitions Scale, Likelihood (L) and Severity (S) subscales; CTAF = Contamination Thought Action Fusion Scale; IUS-12 = Intolerance of Uncertainty Scale – 12, Prospective (P) and Inhibitory (I) subscales; AAQ-II = Acceptance and Action Questionnaire-II; $n = 304$.

models of OCD (e.g., Coughtrey et al., 2012). The present study aimed to build upon previous research by examining the extent to which OC symptom domains and other theoretically related cognitive variables relate to MC symptoms.

First, consistent with previous research (Coughtrey et al., 2012; Fergus, 2014; Melli et al., 2014; Radomsky et al., 2014), we found that MC was significantly correlated with contamination-related OC symptoms, and this association held even after accounting for the other OC symptom dimensions. This finding adds to accumulating evidence for an association between symptoms of feeling dirty both with (i.e., contact contamination) and without (i.e., MC) coming in to contact with a physical contaminant. Moreover, endorsing maladaptive beliefs about the relationship between contamination-related internal experiences (e.g., having an immoral or dirty image) and unwanted outcomes (e.g., being physically dirty; i.e., contamination TAF) was associated with elevated MC symptoms, even after accounting for other putatively related cognitive variables.

However, when examining contamination-related threat overestimations after all cognitive predictors were included in a model predicting MC symptoms, only the overestimation of the severity of contamination (i.e., “how bad would it be”) emerged as a significant unique predictor of MC in our sample. Our findings therefore suggest that MC is less related to overestimations of the likelihood of becoming contaminated than it is to the catastrophic perception of how aversive and unpleasant contamination would be. Although the CCS does not specify the precise meaning of “how bad it would be” when asking respondents to consider coming into contact with various contaminants, it is possible that MC is associated with the way individuals anticipate contacting a dirty stimulus would make them feel, which is in line with the conceptualization of MC (Rachman, 2006b).

Our second hypothesis—that the unacceptable thoughts symptom domain, EA, and IU facets would all relate to MC—was partially supported. First, the unacceptable thoughts OC symptom dimension was significantly associated with MC symptoms (even after accounting for the other OC symptom dimensions). This suggests that individuals who experience unwanted contamination-related mental intrusions and associated urges to wash their body or cleanse their mind are also prone to experiencing other thoughts pertaining to immoral, unacceptable, and “taboo” topics (as well as associated neutralizing rituals). This result was further supported by the qualitative data collected from our participants, in which MC-related thoughts about themes of immorality, sex, and violence were commonly endorsed as triggers for the urge to cleanse.

Furthermore, both EA and IU were significantly correlated with MC severity, suggesting that the intolerance of unpleasant and uncertain internal states is generally related to MC experiences (e.g., worries about being able to control mental intrusions; needing to be certain about the cleanliness of one's mind). However, when all cognitive predictors were included in a model predicting MC symptoms, only EA and inhibitory IU emerged as significant unique predictors of MC.

Whereas prospective IU refers to an individual's tendency to actively approach ambiguous situations (presumably to gain more certainty and/or control), inhibitory IU represents one's avoidance and paralysis in the face of uncertainty (Birrell et al., 2011). Thus, within the context of the present study, it appears that MC is strongly related to one's general tendency to resist mental content perceived as abhorrent, unacceptable, and distressing (e.g., MC-related thoughts).

Our analyses additionally demonstrated that, contrary to hypotheses, the OC symptom domains of symmetry and responsibility for harm also predict MC symptom severity. Just as some patients report the need to wash or clean until doing so feels “just right” (Wahl, Salkovskis, & Cotter, 2008), it may be that this experience of incompleteness extends to MC. In terms of responsibility for harm, experimental research suggests that similar to contact contamination, MC can be spread and transmitted (even without physical contact; Coughtrey, Shafraan, & Rachman, 2014b). Thus, future research should further explore experiences of feeling responsible for contaminating others due to the content of one's thoughts. Furthermore, given that MC was moderately correlated with all four OC symptom dimensions in the present study (without any significant differences in magnitude among the correlations), it appears that rather than being uniquely associated with one or two specific OC symptom dimensions, that MC may instead be associated with the latent vulnerability factors or maintenance processes that underlie OCD as a whole. Indeed, whereas certain phenomena have demonstrated unique associations with certain OC subtypes (e.g., the organization dimension of perfectionism with order OCD symptoms; Martinelli, Chasson, Wetterneck, Hart, & Björgvinsson, 2014), others seem to traverse the symptom dimensions (e.g., distress tolerance; Blakey et al., 2016). Future research in clinical samples, however, is needed in order to determine the degree to which this observation holds in patient populations. Moreover, it is also possible that the observed associations could be the consequence of shared variance with general emotional distress (rather than a unique latent or maintenance factor of OCD). Accordingly, future studies should also include measures of general emotional distress (e.g., general mood or anxiety symptoms) in order to elucidate the specific relationship between MC, cognitive biases, and OCD symptom dimensions.

To the extent that our findings from a nonclinical sample inform clinical practice, these results carry several implications for the way that MC is conceptualized and treated. Specifically, practitioners should comprehensively assess contamination perceptions in patients presenting with contamination obsessions and/or washing compulsions. Given that one study found that 56% of OCD patients presenting with contamination fears reported contact contamination and MC concerns (Coughtrey et al., 2012, Study 2), practitioners should be mindful that fear cues may be internal (e.g., unacceptable thoughts, feelings of guilt or shame) as well as external (e.g., germs or toxins).

This careful functional assessment becomes especially important when planning for cognitive-behavioral treatment. Previous investigators have suggested that unaddressed MC symptoms might explain the finding that a subset of contamination-concerned patients do not fully improve following a course of exposure therapy for OCD and thus may be labeled as “treatment refractory” or “non-responders” (Berman, Wheaton, Fabricant, & Abramowitz, 2012; Cogle, Lee, Horowitz, Wolitzky-Taylor, & Telch, 2008; Elliott & Radomsky, 2009). That is, although in vivo exposure to contaminated objects can be helpful (i.e., similar to contact contamination-focused treatments; Rachman, 2004), patients with MC might not experience full amelioration of symptoms if treatment does not also address their unacceptable, MC-related thoughts. Thus, treatment for patients with MC concerns might also include imaginal exposures to an internal sense of dirtiness/impurity (i.e., a more cognitive-focused approach; Rachman, 2010). Future research should strive to determine how (and for whom) targeting MC enhances treatment response and outcome.

The present study had a number of strengths, including a large sample and dimensional assessment of constructs of interest. Our results

showed that MC was not only related to contact contamination-related symptoms and cognitions, but also to unacceptable thoughts symptoms, EA, and IU. Our findings are consistent with accumulating research implicating the importance of MC within the context OC experiences. Nevertheless, a number of limitations should be noted. First, as would be expected in our non-clinical sample, the frequency of MC intrusions and degree of consequent distress observed was relatively low; as such, the degree to which our findings might generalize to individuals with a clinical diagnosis of OCD is unknown. Although substantial research indicates that the differences in OC experiences between clinical and nonclinical samples are quantitative rather than qualitative (Abramowitz et al., 2014), future research using samples with clinically significant OC symptoms would be illustrative. Similarly, our sample was mostly young, female, and Caucasian. Future research should examine the degree to which our findings apply to samples from more diverse demographic and personal backgrounds.

Second, our study's reliance on self-report methodology might have inflated associations among study measures; future research should strive for multi-method assessment, which might also include established in vivo measures of MC (Coughtrey et al., 2014a, 2014b; Elliott & Radomsky, 2009; Fairbrother, Newth, & Rachman, 2005; Herba & Rachman, 2007; Lee et al., 2013; Radomsky & Elliott, 2009). Such investigations not only would allow for the examination of trait-level MC symptoms, but also could aim to better understand *state* MC-related distress by experimentally inducing MC in a laboratory-based setting. Certain provocation procedures (e.g., the “dirty kiss” paradigm) have traditionally been used, but also could be expanded to further examine the heterogeneity of MC. Specifically, questions could be investigated such as: are there associations between the thematic content of in vivo MC-related triggers (e.g., an unacceptable sexual vs. violent intrusive thought) and associated cognitions, OC symptom variables, and de-contamination rituals (e.g., hand washing vs. mental neutralizing)?

Third, the correlational nature of the present study design prevents drawing causal conclusions. Although our findings are consistent with theoretical developments in conceptual models of OCD that acknowledge the importance of MC, additional replication studies are needed. Fourth, considering that only a moderate percentage of the variance in MC was accounted for by the measures included in the current study, it is important to consider other constructs that may also be associated with MC symptoms in future studies. Several examples of MC thoughts provided by participants related to memories of past traumatic experiences or sexual assaults (e.g., memory of a nonconsensual sexual encounter). Accordingly, future studies could expand to include transdiagnostic constructs from the trauma literature (e.g., intrusive memories, disgust sensitivity; as is included in this special issue) in order to better understand their contribution to MC experiences.

Finally, as previously mentioned, our study did not include other conceptually related variables that could help to explain MC-related distress (e.g., general mood or anxiety symptoms); nor did we include measures hypothesized to be *unrelated* to MC (e.g., social anxiety symptoms). Studies including measures of general emotional distress and OCD-related constructs would help to elucidate the *specific* relationship between MC, contact contamination-related cognitive biases, MC-related cognitive biases, and OCD symptom dimensions. Other studies included in this special issue (e.g., Coughtrey, Shafran, & Bennett, *this issue*) more directly address this question in attempts to clarify the degree to which mental contamination is specific to OCD or whether it is a transdiagnostic construct. Overall, therefore, future research using diverse clinical samples, longitudinal design, and expanded multi-method assessment would further inform the understanding and treatment of MC.

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Contributors

Ryan Jacoby designed the study with the assistance of the other co-authors and conducted the data analysis. Ryan Jacoby and Shannon Blakey wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest.

Appendix A

We are interested in your experiences with unpleasant and unwanted thoughts or images or impulses that pop into your mind unexpectedly and that you experience as intrusive and inappropriate. Nearly everyone has such experiences, but people vary in how frequently these occur and how distressing they are.

We are particularly interested in your experiences with “mental contamination,” which means feeling dirty or contaminated even though you haven’t touched anything dirty. This type of contamination sometimes occurs if you’ve been thinking about something immoral (for example, thinking about being intimate with someone you find disgusting) or after experiences with emotional and/or physical violations, such as betrayal or abuse. It can also occur when experiencing unwanted images or memories. Thoughts that provoke moral contamination might make you may feel uncomfortable or anxious, sometimes even lead to the feeling like you want to wash yourself (for example, hands), replace the “dirty” thought with a “clean” thought, or avoid certain situations or thoughts.

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