Table 1. Demographic data across the three groups.

Variable	Category	Group		
		OCD-C (*n* = 63)	OCD-NC (*n* = 113)	NCP (*n* = 86)
Gender (P)	Female	.48	.35	.59
	Male	.52	.65	.41
Age (M±SD)		34.54±10.06	32.06±9.92	35.99±13.64
Years of education (M±SD)		14.67±4.04	14.08±3.14	14.41±3.80
Marital Status (P)	Single	.62	.68	.55
	Married	.33	.26	.38
	Divorced	.05	.06	.07
Occupation (P)	Housemaker	.05	.07	.02
	Employee	.27	.25	.34
	Professional	.19	.19	.15
	Unoccupied	.06	.09	.01
	Student	.21	.27	.26
	Other	.22	.13	.22

Note: OCD-C = Contamination-related Obsessive-Compulsive Disorder; OCD-NC = Non contamination-related Obsessive-Compulsive Disorder; NCP = Non clinical participants; P = proportion; M = Mean; SD = Standard Deviation.

Table 2. Factor loadings based on the two-factor solution from the confirmatory factor analysis in the OCD sample (n = 176).

Item	**Harm avoidance**	**Disgust avoidance**
1. I often worry that I could accidentally be infected by septic blood, abandoned needles or syringes, or with other used medical supplies (e.g., bandages, gauzes, cotton, needles, etc.).	1.24	
2. Contact or closeness with certain people (e.g., homeless, immigrants, immoral or perverse people) makes me feel disgusted.		1.01
3. I often worry that I could be contaminated by or can contaminate others with toxic or harmful substances (e.g., poisons, detergents, gasoline, asbestos, radioactive substances, etc.).	.82	
4. When I feel dirty, I perform excessive or ritualized washing to reduce feelings of disgust.		1.42
5. I worry that contamination with bodily secretions (e.g., blood, sperm, saliva of others,	1.14	

vaginal secretions, etc.) could cause disease or other specific harmful consequences (e.g., unwanted pregnancy).		
6. I am rather worried to touch or to get close to certain animals or certain objects (e.g., garbage), because they make me feel disgusted.		1.19
7. I often worry about getting sick, or infecting others, after contact with germs or bacteria.	1.21	
8. I am very careful to keep certain objects perfectly clean (e.g., linens, clothing, accessories or personal effects) or personal environments (e.g., bed, closet, bathroom, etc.), because otherwise I would be disgusted to use them.		1.20

Table 3. Distribution and item analyses of FOCS scales in OCD (n = 176) and non-clinical (n = 86) samples.

Statistic	Group	FOCS-HA	FOCS-DA
M±SD (range)	OCD	5.84±4.82 (0-16)	7.22±5.19 (0-16)
	NCP	4.00±3.94 (0-15)	4.67±3.94 (0-16)
SK and KU	OCD	0.41 -1.00	0.18 -1.16
	NCP	0.85 -0.14	0.84 0.36
α	OCD	.83	.87
	NCP	.83	.77
M_{rii} (range)	OCD	.55 (.41-.71)	.62 (.58-.67)
	NCP	.56 (.43-.65)	.46 (.40-.52)
M_{rit} (range)	OCD	.71 (.53-.76)	.70 (.67-.74)
	NCP	.65 (.56-.72)	.55 (.53-.62)
SMC (range)	OCD	.52 (.31-.59)	.50 (.45-.56)
	NCP	.45 (.33-.52)	.35 (.31-.40)
Max(α w/o)	OCD	.83	.85
	NCP	.83	.74

Note: FOCS = Fear of Contamination Scale; OCD = Obsessive Compulsive Disorder; HA = Harm Avoidance; DA = Disgust Avoidance; NCP = Non clinical participants; M = Mean; SD = Standard Deviation; SK = Skewness; KU = Kurtosis; α = Cronbach's Alpha; M_{rii} = Mean inter-item correlation; M_{rit} = Mean corrected item-total correlation; SMC = Squared Multiple Correlation; Max(α w/o) = Highest alpha-if-item-deleted value.

Table 4. Construct validity of the FOCS. Pearson's correlations between FOCS scores and scores on other measures in the OCD group (n = 176).

	FOCS-HA	FOCS-DA
Measures for convergent validity		
1. DOCS-CNT	.47**	.81**
2. VOCI-MC	.33**	.66**
3. OCI-WAS	.46**	.76**
4. DPQ	.41**	.69**
Measures for discriminant validity		
5. DOCS-RSP	.27**	.06
6. DOCS-UNT	.02	-.07
7. DOCS-SYM	.17*	.15
8. OCI-HOA	.14	.16*
9. OCI-CHK	.32**	.22**
10. OCI-ORD	.25**	.36**
11. OCI-MNT	.17*	.21**
12. OCI-OBS	.23**	.13
13. BDI	.12	.11
14. BAI	.26**	.21**

Note: *p < .05; **p < .01; FOCS-HA = Fear of Contamination Scale-Harm avoidance; FOCS-DA = Fear of Contamination Scale-Disgust avoidance; DOCS-CNT = Dimensional Obsessive-Compulsive Scale (DOCS) - Contamination; VOCI-MC= Vancouver Obsessional Compulsive Inventory-Mental Contamination Scale; OCI-WAS = Obsessive-Compulsive Inventory-Revised (OCI-R) - Washing; DPQ = Disgust Propensity Questionnaire; DOCS-RSP = DOCS – Responsibility for harm; DOCS-UNT = DOCS – Unacceptable thoughts; DOCS-SYM = DOCS - Symmetry; OCI-HOA= OCI-R - Hoarding; OCI-CHK= OCI-R - Checking; OCI-ORD = OCI-R - Ordering; OCI-MNT = OCI-R – Mental neutralizing; OCI-OBS = OCI-R - Obsessing; BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory.

RUNNING HEAD: Harm avoidance and disgust avoidance in contamination fear

The two dimensions of contamination fear in obsessive-compulsive disorder:

Harm avoidance and disgust avoidance

Gabriele Melli[1], Carlo Chiorri[2], Claudia Carraresi[1],

Eleonora Stopani[1], Francesco Bulli[1]

[1] Institute of Behavioral and Cognitive Psychology and Psychotherapy, Florence, Italy

[2] Department of Educational Sciences, Psychology Unit, University of Genoa, Italy

Correspondence to:

Gabriele Melli, PhD

Via Mannelli, 139 - 50132 Firenze – Italy

E-mail address: g.melli@ipsico.it

Telephone: +39 055 2466460

Fax: +39 055 2008414

Abstract

Contamination fear is the most common manifestation of obsessive-compulsive disorder (OCD) and it has always been considered a homogeneous symptom dimension. Compensatory behaviors (e.g., washing) associated with contamination-related obsessions are considered attempts to remove the contagion and to protect the individual from threats of illness; however, they may also be motivated by feelings of distress that are unrelated to any perceived harmful outcome, such as the feeling of disgust. Our hypothesis was that OCD patients with fear of harm resulting from contamination (harm avoidance [HA]) and OCD patients with fear of disgusting substances/persons (disgust

avoidance [DA]) could be distinguished. To test this hypothesis, the Fear of Contamination Scale (FOCS), an 8-item self-report measure aimed at operazionalizing the two facets of contamination fear, was developed. The scale was administered to 176 OCD patients, together with a series of other self-report measures, and to 86 non-clinical participants. Confirmatory factor analyses supported the hypothesized two-correlated-factor structure in the clinical sample. The FOCS also showed adequate reliability, construct and criterion-related validity. Results suggested that: (1) DA scores were more strongly associated with mental contamination and disgust propensity than HA scores; (2) contamination-related OCD symptoms based upon HA overlapped more than those based on DA with other dimensions of OCD symptoms. In conclusion, this study provides preliminary evidence of the separability of two motivational dimensions of contamination fear and of specific associations between these and other relevant constructs. Theoretical and clinical implications are discussed.

Keywords: obsessive-compulsive disorder, contamination fear, harm avoidance, disgust avoidance, disgust propensity

Introduction

Obsessive compulsive disorder (OCD) is characterized by the occurrence of persistent thoughts, urges, or images that are experienced as intrusive and unwanted (obsessions); and compulsive actions that the individual feels driven to perform in response to an obsession, which are aimed at preventing or reducing anxiety or distress, or preventing some dreaded event or situation from occurring (American Psychiatric Association [APA], 2013). Compulsive washing and contamination fear are among the most common manifestations of OCD (Rassmussen & Tsuang, 1986; Summerfeldt, Antony, Downie, Richter, & Swinson, 1997). Studies showed that 50% of OCD patients have intrusive thoughts related to contamination (e.g., Rachman & Hodgson, 1980;

Rassmussen & Eisen, 1992). While the ability to identify potential contaminants and avoid contamination serves an evolutionarily adaptive function, for some individuals these attempts result in functional impairment.

Most, if not all, existing literature on the classification of OCD subtypes (for a review, see McKay et al., 2004) considers contamination obsessions and washing/cleaning compulsions to be a homogeneous symptom dimension. Traditionally, compensatory behaviors (e.g., washing, cleaning) associated with contamination-related obsessions are considered attempts to remove the contagion and to protect the individual from threats of illness. Accordingly, cognitive-behavioral models propose that contamination fear is motivated by harm avoidance and its associated features that include threat-related dysfunctional beliefs (e.g., overestimation of threat, beliefs that uncertainty is intolerable, beliefs that one is personally responsible for anticipating and preventing harm, etc.; Frost & Steketee, 2002). However, some empirical results question the relevance of these beliefs for all OCD symptom subtypes (Calamari et al., 2006; Taylor et al., 2006) and their specificity to OCD (Julien, O'Connor, Aardema, & Todorow, 2006; Tolin, Worhunskym, & Maltby, 2006; Viar, Bilsky, Armstrong, & Olatunji, 2011). Thus, if these obsessive beliefs are not relevant for all OCD subtypes, then other motivations for contamination fear need to be explored.

Consistent with the above mentioned DSM-5 definition, washing/cleaning compulsions may also be motivated by feelings of distress that are unrelated to any perceived harmful outcome. The main form of distress that has been associated with washing compulsions is the feeling of disgust. Indeed, disgust propensity (DP), defined as an individual's tendency to experience disgust, has been posited as contributing to the aetiology and phenomenology of contamination-related obsessive compulsive symptoms (Phillips, Fahy, David, & Senior, 1998; Power & Dalgleish, 1997).

A number of empirical studies support the role of the general tendency to feel disgust in contamination-related OCD (Mancini, Gragnani, & D'Olimpio, 2001; Olatunji, Williams, Lohr, & Sawchuk, 2005; Tolin, Woods, & Abramowitz, 2006; Woody & Tolin, 2002). Support for this association has been provided across methodologies. Correlational studies have shown positive and

significant associations between measures of DP and measures of contamination fear (David et al., 2009; Olatunji et al., 2010; Olatunji, Ebesutani, Haidt, & Sawchuck, 2014; Olatunji, Sawchuk, Lohr, & de Jong, 2004; Sawchuk, Lohr, Tolin, Lee, & Kleinknecht, 2000; Schienle, Stark, Walter, & Vaitl, 2003); longitudinal studies supported the association between DP and contamination concerns (Olatunji, 2010); structural equation modeling showed a linear relationship between high DP and contamination fear in OCD (Moretz & McKay, 2008); behavioral studies found that disgust proneness mediates the association between contamination fear and avoidance of repulsive stimuli (Deacon & Olatunji, 2007; Olatunji, Lohr, Sawchuk, & Tolin, 2007); implicit measures of DP have predicted obsessive-compulsive symptoms (Nicholson & Barnes-Holmes, 2012).

High DP may increase contamination avoidance as much as a high perception of the risk of being harmed by contaminants or to harm someone else contaminating him/her, especially when the so called "contamination disgust" is involved (Olatunji et al., 2014). Some patients may avoid potential contaminants or clean to remove them motivated by the need to eliminate germs and prevent harm (harm avoidance, HA). Others may do this just to avoid intense feelings of disgust (disgust avoidance, DA), although they do not fear that contamination will cause serious harm to them or to someone else. Hence, we hypothesized that two distinct affective-motivational themes could be identified in contamination-related OCD symptoms. This should overcome the seemingly simplistic homogeneous symptom-based classification that exclusively focuses on the topographic aspects of these manifestations and ignores potentially more important underlying features.

However, before advancing any substantive inferences about the explanatory value of this model, it is necessary to establish its structural validity and develop a valid and reliable measure to assess HA and DA as motivators for contamination fears and washing/cleaning rituals, which, to the best of our knowledge, is currently missing. The current study aimed at operationalizing the model and providing evidence of its structural validity in a large clinical OCD sample. Therefore, a new self-report questionnaire, the Fear of Contamination Scale (FOCS), was developed and its factor structure and other psychometric properties were tested.

Specifically, the aims of this study were as follows. (1) Evaluating the fit of the hypothesized two-correlated-factor measurement model through confirmatory factor analysis. (2) Provide evidence of the internal consistency and construct validity of the FOCS. In particular, FOCS scores were expected to be more strongly correlated with other measures of contamination-related OCD symptoms, mental contamination and disgust propensity than with measures of other OCD symptoms, depression and anxiety, and the two subscale scores were expected to show different patterns of association with all other measures. (3) Test the criterion validity of the FOCS, i.e., its ability to discriminate among OCD participants *with* and *without* contamination-related symptoms and community controls. In particular, OCD patients with contamination-related symptoms as a primary complaint were expected to obtain higher FOCS scores than other OCD patients and non-clinical participants when demographic variables were controlled; (4) Test the temporal stability of FOCS scores in a sample of non-clinical participants.

Method

Item development

A preliminary version of the FOCS designed according to recommendations for scale development (Furr, 2011) consisted of 18 items generated by the authors of this paper on the basis of their expert knowledge and practical experience of assessment and treatment of OCD. Nine of the items were worded to assess specific facets of contamination concerns based on HA (i.e., the need to eliminate germs and prevent harm; e.g., "I often worry about getting sick, or infecting others, after contact with germs or bacteria"); the remaining nine were worded to assess contamination concerns based on DA (i.e,, the need to avoid intense feelings of disgust; e.g., "Contact or closeness of certain people (e.g., homeless, immigrants, immoral or perverse people) makes me feel disgusted"). These initial items were then sent to a group of experts on OCD and psychometricians not otherwise involved in the study; they were asked to evaluate the relevance and representativeness of the draft items to the fear of contamination construct and to suggest amendments which would improve the content and face validity of the items. Several individuals with OCD provided feedback on the

readability, comprehensibility and relevance of the items. Following the feedbacks 10 items were removed (five from each subscale) and others were amended to improve clarity, specificity and relevance. The final FOCS consisted of eight items: four assessing HA and four assessing DA (see Table 2)[1]. No reverse-scored items were included. Participants are asked to rate each item on a 5-point Likert-type intensity scale from 0 ("Strongly disagree") to 4 ("Strongly agree"). The scale took 1 to 2 minutes to complete.

Participants

The total study sample consisted of 262 adults, including 176 diagnosed with OCD and 86 non-clinical participants (NCP) recruited from the general population.

OCD participants were referred to an Italian private center for adult psychotherapy for evaluation and treatment. Participants were excluded if they were under 18 years old. The presence of psychosis, current mania, and/or substance dependence were other exclusionary criteria. During the routine assessment phase, clinical participants were interviewed by one of the members of our research team (all are doctoral-level psychologists experienced in diagnosing psychiatric disorders) using the Anxiety Disorder Interview Schedule IV (ADIS-IV; Brown, Di Nardo, & Barlow, 1994) to establish diagnoses. Each case was audio-recorded and carefully reviewed in supervisory meetings with a licensed psychologist or psychiatrist, and all diagnoses were confirmed by second-rater consensus (inter-rater reliability was .96). Some participants had one or more secondary diagnoses, including anxiety disorders (social phobia [n = 4], panic disorder [n = 6] and generalized anxiety disorder [n = 13]) and mood disorders (major depressive disorder [n = 24]). Potential participants with a secondary or tertiary diagnosis of OCD were excluded. Participants who met the diagnostic criteria for OCD as a primary diagnosis were divided into two subgroups for the purposes of determining the criterion validity of the scale. Those who reported contamination-related symptoms or concerns as a primary complaint, as determined by the ADIS-IV (n = 63), were assigned to the OCD Contamination (OCD-C) sub-group; participants who met the diagnostic

[1] The scale has been translated into English through a mixed forward- and back-translation procedure. It is available for further validation studies free of charge from any of the authors;.

criteria for primary OCD, but who did not report contamination-related symptoms or concerns as a primary complaint (n = 113) were assigned to the OCD Non-Contamination (OCD-NC) sub-group.

Non-clinical participants lived in Florence urban and suburban areas and responded to advertisements requesting potential volunteers for psychological studies. To be included in the study, they had to be at least 18 years old, have at least a primary school education, and report having never received a diagnosis or treatment for a psychiatric disorder. Demographic information about the samples are reported in Table 1.

[Table 1]

Measures

Fear of Contamination Scale (FOCS). This 8-item scale was developed as described above. The two subscale scores (HA and DA) were computed.

Vancouver Obsessional Compulsive Inventory – Mental Contamination Scale (VOCI-MC; Radomsky et al., 2014). This 20-item scale assesses aspects of mental contamination. Participants are asked to rate each item (e.g., "I often feel dirty under my skin") on a 5-point Likert-type intensity scale from 0 ("not at all") to 4 ("very much"). The Italian version of the VOCI-MC (Melli, Carraresi, Stopani, Radomsky, & Bulli, submitted) has been shown to be a unidimensional and reliable scale (internal consistency and test-retest reliability coefficients higher than .84).

Commentato [AA1]: ma quetso paper non te lo avevao accettato?

Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002). The OCI-R is a brief 18-item self-report questionnaire designed to assess obsessive-compulsive symptom presence and distress. Participants are asked to rate each item on a 5-point Likert-type scale, from 0 ("not at all disturbed") to 4 ("extremely disturbed"). The OCI-R provides a total score and scores in six different subscales: washing (WAS), checking (CHK), ordering (ORD), obsessing (OBS), hoarding (HOA), and mental neutralizing (MNT). The Italian version of the OCI-R has replicated the six-factor structure of the original version and demonstrated good internal consistency (α = .85) and excellent test-retest reliability (r = .93) for the total score, and adequate internal consistency (α's = .60-.80) and test-retest reliability (r's = .76-.99) for each subscale (Sica et al., 2008).

Dimensional Obsessive-Compulsive Scale (DOCS; Abramowitz et al., 2010). The DOCS is a 20-item scale that assesses the main obsessive-compulsive symptom dimensions of OCD, namely contamination obsessions and washing/cleaning compulsions (CNT); obsessions about responsibility for causing harm and checking compulsions (RSP); obsessions about order and symmetry and ordering/arranging compulsions (SYM); repugnant obsessional thoughts and mental compulsive rituals or other covert neutralizing strategies (UNT). Within each symptom dimension, items are rated on a 5-point Likert-type scale ranging from 0 ("no symptoms") to 4 ("extreme symptoms"). The Italian version of the DOCS (Melli et al., 2014) has replicated the four-factor structure of the original version in both clinical and non-clinical samples and showed adequate internal consistency ($\alpha > .80$ in all subscales), temporal stability (ICC > .75 in all scales), and construct validity.

Disgust Propensity Questionnaire (DPQ; Melli, Chiorri, Bulli, Stopani, & Carraresi, 2012). This 9-item scale was developed recently to improve the assessment of individual DP in Italian samples, as the Italian version (Melli, Chiorri, & Smurra, 2013) of the Disgust Scale-Revised (DS-R; Olatunji et al., 2007) - the best-known scale for the assessment of DP - has shown satisfactory, but not excellent psychometric properties, and some of the items of this scale are not appropriate to the Italian cultural context. Participants are asked to rate each item on a five-point Likert scale from 0 ("not at all") to 4 ("very much"). This questionnaire was found to have a one-factor structure, excellent internal consistency ($\alpha = .95$), very good test-retest reliability ($r = .87$) and construct validity (i.e., high convergence with the DS-R)

Commentato [AA2]: ce l'hai il valore della correlazione con DS-R?

Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II is a 21-item self-report questionnaire designed to assess the presence and severity of the affective, cognitive, motivational, psychomotor, and vegetative components of depression. Each item presents four statements about a specific symptom of depression arranged in order of severity. Participants are asked to choose the statement that most closely matches how they have felt in the last two weeks. Statement choices are scored from 0 ("absent") to 3 ("severe"). The Italian version of the BDI-II

(Sica & Ghisi, 2007) has been found to have a one-factor structure, good internal consistency (α = .87) and test-retest reliability (*r* = .76).

Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988). The BAI is a 21-item self-report inventory that assesses the severity of state anxiety. Participants are asked to rate how much they have been bothered by the symptom described by each item during the past month on a 4-point Likert-type severity scale (from 0 = "not at all" to 3 = "severely"). A series of studies has shown that the Italian version of the BAI has a one-factor structure, good internal consistency (α > .80), adequate test-retest reliability (*r* > .62), and good construct validity (Sica, Coradeschi, Ghisi, & Sanavio, 2006; Sica & Ghisi, 2007).

Procedure

All participants volunteered to take part in the study after being presented with a detailed description of the procedure, provided a written informed consent and were treated in accordance with the *Ethical Principles of Psychologists and Code of Conduct* (American Psychological Association, 2010).

Administrations took place at the premises of a private center for adult psychotherapy for evaluation and treatment and were supervised by trainee psychologists. All OCD participants completed the measures described in the previous section. The scales used for testing construct validity were administered in a counterbalanced fashion to control for order and sequence effects, and batteries took between 20 and 30 minutes to be completed. Non-clinical participants completed only the FOCS; 71 of them completed the scale twice at a 4-week interval and their data were used to test temporal stability of scores.

Results

Confirmatory factor analysis

In the OCD sample, a substantial number of items had skewness and kurtosis values that fell outside the [−1;+1] range recommended by Muthén and Kaplan (1985) for using maximum likelihood estimator in factor analyses. Hence, a confirmatory factor analysis (CFA) was performed

in Mplus 6.1 using the *Robust Maximum Likelihood* (MLR) estimator. Following Marsh, Hau, and Wen (2004), values ≥ .95 were considered as optimal for the *Tucker-Lewis Index* (TLI) and the *Comparative Fit Index* (CFI), and values ≤ .06 were considered as optimal for the *Root Mean Square Error of Approximation* (RMSEA). The use of multiple indices provides a conservative and reliable evaluation of model fit relative to the use of a single-fit index.

Given the relatively low sample size in the OCD group, the Monte Carlo procedure described in Muthén and Muthén (2002) was used to verify whether the available 176 cases provided sufficient statistical power to test a two-correlated-factor CFA model. Starting values were .50 for factor loadings, .40 for factor correlation, .20 for error variances, 2.0 for intercepts, while factor means and variances were fixed to 0 and 1, respectively. Results showed that even with 150 cases parameter and standard error biases did not exceed 10 percent for any parameter in the model, and coverage ranged between .93 and .98, suggesting that the available sample size allowed to keep power close to 0.80 (Muthén & Muthén, 2002).

The hypothesized two-correlated-factor model was then tested performing a CFA. Results showed both a pattern of salient loadings (see Table 2), a significant factor correlation (r = .62) and optimal fit ($X^2(19) = 32.13$, p = .03, scaling correction factor [SCF] = 1.27, CFI = .97, TLI = .96, RMSEA = .06). This model showed a better fit than both a two-independent-factor model ($X^2(20) = 82.16$, $p < .001$, SCF = 1.24, CFI = .88, TLI = .83, RMSEA = .13) and a one-factor model ($X^2(20) = 139.43$, $p < .001$, SCF = 1.28, CFI = .77, TLI = .67, RMSEA = .18). In summary, the results of the CFA showed that the hypothesized two-correlated-factor solution was supported.

Item analyses and reliability

Distribution and item analyses were carried out in both groups. As displayed in Table 3, Cronbach's alpha showed adequate values both in OCD (α ≥ .83) and NCP (α ≥ .77) groups.

[Table 3]

Mean inter-item correlations were always higher than .40. Consistent with the definitions of the constructs, this results suggests that the items map narrow constructs and not wide dimensions

(Clark & Watson, 1995). Corrected item-total correlations and squared multiple correlations were always higher than .49 and .31, respectively, indicating that item scores are consistent with the averaged behavior of the others and that items share a substantial proportion of variance. In no case was the alpha-if-item-deleted higher than the computed alpha, suggesting that all items contribute to the internal consistency of the scales.

As reported above, 71 non-clinical participants completed the retest after a 4-week interval. At the first administration, the HA scale score ranged from 0 to 15 (M = 3.97; SD = 3.76), and the DA scale score ranged from 0 to 13 (M = 4.44; SD = 3.12). At the retest, HA scores ranged from 0 to 14 (M = 3.39; SD = 3.59), and DA scores ranged from 0 to 11 (M = 3.97; SD = 3.03). Test-retest reliability was also good (HA: r = .77, p < .001; DA: r = .83, p < .001). Scores from the first and second administration were compared with paired-samples t-tests and no significant differences were found, supporting the temporal stability of the scores.

Construct validity

It was predicted that the FOCS scores would be more strongly correlated with other measures of contamination-related OCD symptoms (DOCS-CNT; OCI-WAS) and with mental contamination (VOCI-MC) and disgust propensity (DPQ) measures, than with measures of other dimensions of OCD symptoms (other DOCS subscales; other OCI-R subscales), depression (BDI-II) and anxiety (BAI). To test this hypothesis, the $Z_{contrast}$ test (Westen & Rosenthal, 2003) was used. For HA scores convergent correlations ranged from .33 to .47 (see Table 4) and discriminant correlations from .02 to .32; the $Z_{contrast}$ test was significant (z = 6.28, p < .001). For DA scores convergent correlations ranged from .66 to .81 and discriminant correlations from -.07 to .36; the $Z_{contrast}$ test was significant (z = 19.00, p < .001).

[Table 4]

If HA and DA are distinct, albeit correlated, facets of contamination fear, they should show different patterns of association with other measures of OCD symptoms, mental contamination, disgust propensity, depression and anxiety. $Z_{contrast}$ tests were therefore used to assess whether the

associations between HA or DA and the other measures were different. Fourteen tests were performed so the increase in the probability of Type I errors due to multiple comparisons was controlled using the adaptive linear step-up procedure (Benjamini, Krieger, & Yekutieli, 2006).

DA scores were more strongly correlated with other measures of contamination-related OCD symptoms, mental contamination and disgust propensity than HA scores (DOCS-CNT: $z = 7.20$, adj-$p < .001$; VOCI-MC: $z = 5.64$, adj-$p < .001$; OCI-WAS: $z = 5.90$, adj-$p < .001$; DPQ: $z = 5.02$, adj-$p < .001$), whereas HA scores were more strongly associated with DOCS-RSP than DA scores ($z = 2.95$, adj-$p = .007$). These results supported the discriminant validity of the DA and HA scales.

Criterion validity

A multinomial logistic regression model with group membership as the criterion and demographical variables as the predictors revealed that there were significant group differences on some demographic variables. For instance, after controlling for all other demographical variables, OCD-NC participants were more likely to be male, single and young than non-clinical participants. This indicates that the effect on FOCS score of being in a specific diagnostic group cannot be disentangled from that of being, for example, older, thus undermining the possibility of drawing conclusions about the criterion validity of the scale, i.e., that differences in scale scores can be uniquely ascribed to group membership.

In view of this finding a propensity score approach for polytomous categorical grouping variables - marginal mean weighting through stratification (MMW-S; Hong, 2012) - was used. It allowed to adjust the estimate of the effect of group membership according to demographical variables and thus to control for these potentially confounding covariates. This approach combines the advantages of conventional propensity score-based methods, such as the explicit test of covariate balance, objective modeling or an adjustment model *without* knowledge of the outcome variable (see e.g. Schafer & Kang, 2008), with the flexibility of conventional ANCOVA-based approaches to modeling the effects of covariates.

The procedure described in Hong (2012) was used to obtain weights for each participant. These weights were then used to carry out ANCOVA analyses that specified group as the focal variable and demographical variables as covariates. Box's test for the homogeneity of variance/covariance matrixes across groups was not significant (Box's M = 96.56, F(66,5627.99) = 1.27, p = .073), so a multivariate ANCOVA with HA and DA as dependent variables was performed. The only significant multivariate effects were those of group (Pillai's Trace = .475, F(4,476) = 37.08, p < .001) and of gender (Pillai's Trace = .052, F(2,237) = 6.47, p = .002). At the univariate level we found a significant effect of group for both HA (F(2,238) = 35.31, p < .001, r = .47) and DA (F(2,238) = 106.01, p < .001, r = .67). Sidak-corrected post-hoc comparisons of HA scores revealed that the OCD-C group obtained significantly higher scores (Estimated Marginal Mean; EMM = 8.27, Standard Error; SE = 0.75) than OCD-NC group (EMM = 3.27, SE = 0.72, t(238) = 7.40, adj-p < .001, r = .43) and the NCP group (EMM = 2.99, SE = 0.77, t(238) = 7.56, adj-p < .001, r = .44). There was no difference between the HA scores of the OCD-NC group and the NCP group (t(238) = 0.43, adj-p = .964, r = .03). The same pattern of results was observed for DA scores: the OCD-C group obtained significantly higher scores (EMM = 11.57, SE = 0.64) than the OCD-NC group (EMM = 4.09, SE = 0.61, t(238) = 13.08, adj-p < .001, r = .65) and the NCP group (EMM = 3.99, SE = 0.65, t(238) = 12.83, adj-p < .001, r = .64); the DA scores of the OCD-NC group and the NCP group did not differ (t(238) = 0.19, adj-p = .997, r = .01). Women (EMM = 7.19, SE = 0.55) had higher DA scores than men (EMM = 5.92, SE = 0.63, F(1,238) = 6.94, p = .009, r = .12). In summary, both HA and DA clearly discriminated between OCD-C, on the one hand , and OCD-NC and NCP, on the other, but not between OCD-NC and NCP. A gender difference was observed only in DA, were women obtained significantly higher scores than men.

Discussion

This study at testing the validity of a bi-dimensional model of contamination-related OCD symptoms, which is traditionally considered a homogenous dimension. In order to provide supporting empirical evidence for this model, we developed and validated a new measure to assess

contamination fear that could clearly distinguish OCD patients in which washing/cleaning compulsions were motivated by either HA or DA.

CFA supported our hypothesis, as the two-correlated-factor measurement model adequately fitted the data, better than the two-independent-factor and the one-factor models. Nonetheless, the two factors were strongly correlated (r = .62). This correlation might be due to the effect of the shared method variance, due to the coexistence of items for the two dimensions on the same self-report questionnaire, administered at the same time (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Method variance between items or scales is increased when items have the same type of wording, response instructions, response format, and when items on a given scale are intermixed with items of other scales (as in the FOCS), as compared to when the items are presented in their own separate scale (Schwarz, 1999). However, the analysis of the convergent and discriminant correlations revealed that the two subscales showed different patterns of association with other measures of OCD symptoms, mental contamination and disgust propensity. In particular, the DA scores were more strongly correlated with other measures of contamination-related OCD symptoms, mental contamination and DP than HA scores, whereas HA scores were more strongly associated with DOCS-RSP than DA scores. These results provided further evidence that HA and DA are distinct, albeit correlated, dimensions of contamination fear. The correlation between HA and DA, rather than being problematic, may indicate that although the two motivational dimensions are distinct, they may co-exist. The strength of the correlation between FOCS subscale scores and the underlying reasons for this correlation should be evaluated in future research.

The FOCS scales showed adequate levels of reliability, both as internal consistency (α's > .77 in both scales in all groups) and as temporal stability in non-clinical participants (r > .77 in both scales, non-significant mean score differences between the first and the second administration). The relatively high (> .40) inter-item correlations suggested that the items measure specific facets of the contamination-related OCD symptomatology (Clark & Watson 1995), and corrected item-total correlations were far higher than the .20 threshold recommended by Nunnally and Bernstein (1994)

in both groups. The substantial (>30%) amount of shared variance among the items and the lack of items whose removal from the scale would improve Cronbach's alpha also supported the internal consistency of the scales.

In addition, when the convergent and discriminant correlations of the two subscales were examined, the DA scale showed a higher discriminant validity than the HA scale with respect to measures of constructs which are not related to contamination fears but are clinically relevant in the assessment of OCD symptoms. For instance, DA scores were more strongly associated with VOCI-MC and DPQ scores than HA scores. These results are consistent with recent studies (Carraresi, Bulli, Melli, & Stopani, 2013; Melli, Bulli, Carraresi, & Stopani, 2014) that have shown that mental contamination plays an important mediating role between disgust propensity and contamination-related OCD symptoms. As it is well known that mental contamination is linked with previous traumatic experiences, such as victimization, humiliation, and betrayal (Rachman, 2010; Warnock-Parks, Salkovskis, & Rachman, 2012), it is possible that these past events, and the consequent feeling of internal dirtiness, play a specific role in the aetiology of contamination-related OCD symptoms based upon DA. However, further studies addressing this issue are needed.

Finally, the FOCS scores adequately discriminated between OCD patients with contamination related symptoms and other participants, including OCD patients who did not report contamination-related symptoms or concerns as a primary complaint. In particular, considering the DA mean scores, the effect size of the differences between the OCD-C group and the OCD-NC and NCP were large (r = .64 and r = .65, respectively), whereas it was only moderate (r = .43 and r = .44, respectively) in the case of HA mean scores. This result may suggest that the HA dimension is less specific than DA, and that there can be an overlap between contamination-related OCD symptoms based upon HA and other dimensions of OCD symptoms, while contamination fear motivated by DA might be a “pure contamination” dimension. Consistent with previous studies on disgust propensity, women endorsed higher scores than men on DA (e.g., Olatunji et al. 2007).

Some limitations of the current study need to be pointed out. First of all, only two "core dimensions" underlying contamination-related OCD symptoms were considered, but it is possible that they can be necessary but not sufficient to characterize all motivational factors involved in these symptoms. In particular, "incompleteness" (INC) has been proposed as an important affective-motivational factor driving compulsive behavior, distinct from HA (Ecker & Gönner, 2008; Ecker, Kupfer, & Gönner, 2014; Pietrefresa & Coles, 2008, 2009; Summerfeldt, Kloosterman, Antony, Richter, & Swinson, 2004; Summerfeldt, Kloosterman, Antony, & Swinson, 2014; Taylor et al., 2014). Nevertheless, Ball, Baer, and Otto (1996) noted that compulsions not related to cleaning, such as checking, hoarding, symmetry and counting rituals, are those most characterized by incompleteness, and Summerfeldt (2007) noted that "only compulsions not related to cleaning," "e.g. checking, hoarding, symmetry and counting rituals," may be "plausibly those most characterized by incompleteness." Accordingly, Ecker and Gonner (2008) rejected their hypothesis that contamination/washing symptoms were associated with INC. Clarification of the hierarchical relationship between HA, DA and other salient motivations (e.g., INC) will help inform this stance. Moreover, although the results of the current study provide valuable information regarding the validity of the hypothesized motivational dimensions in contamination-related OCD symptoms, additional research testing the separability of these constructs in the context of neuroimaging studies, family/genetic analyses, and other sources of data (e.g., clinician-rated interviews) would provide further validation. This study assessed test-retest reliability of the FOCS only in non-clinical participants, and therefore evidence for sensitivity to change in treated patients and for temporal stability in non-treated patients is yet to be provided. Finally, factor structure and construct validity has been explored only in OCD patients, and replication using large non-clinical samples is thus needed.

Despite these limitations, our results suggest that, as hypothesized, HA and DA may be distinct motivational "core dimensions" contributing to a better understanding of the heterogeneity of contamination-related OCD symptoms in patients. In addition, we present here a new valid and

reliable measure of contamination fear, the FOCS, that has the additional strength of being very quick to administer: thus, it that can be confidently employed in clinical and research settings without substantially extending assessment time. These findings are expected to provide a basis for classifying and explaining the heterogeneous phenomena of contamination fear in OCD. Differentiation between the two motivational factors underlying OCD symptoms (DA and HA) may have important implications for therapeutic interventions as well as future investigations on subtypes of OCD. Indeed, given the considerable motivational heterogeneity within the contamination-related symptom dimension, even patients apparently sharing the same subtype of OCD may need different treatment focuses. In particular, Foa, Abramowitz, Franklin and Kozak (1999) reported a trend toward poorer behavior therapy outcomes for OCD symptoms without a harm-avoidant component; a series of studies also demonstrated that contamination-related OCD symptoms connected with feelings of disgust, rather than anxiety or fear, are less responsive to traditional cognitive behavioral therapy (CBT) techniques (Mason & Richardson, 2010; Olatunji, Wolitzky-Taylor, Willems, Lohr, & Armstrong, 2009). Hence, it is important to assess motivational factors underlying contamination-related symptoms and plan specific treatments that consider these and related constructs. In particular, it is possible that threat-related dysfunctional beliefs (e.g., overestimation of threat, beliefs that uncertainty is intolerable, beliefs that one is personally responsible for anticipating and preventing harm, etc.; Frost & Steketee, 2002) are important in contamination fear based upon HA, while they are not as relevant in contamination fear based upon DA. Therefore, alternative constructs that can contribute to the etiology and phenomenology of this subtype of contamination-related obsessive compulsive symptoms (e.g., mental contamination) should be considered.

References

Abramowitz, J. S., Deacon, B. J., Olatunji, B. O., Wheaton, M. G., Berman, N. C., & Losardo, D. (2010). Assessment of obsessive-compulsive symptom dimensions: development and evaluation of the Dimensional Obsessive-Compulsive Scale. *Psychological Assessment, 22,* 180-198.

American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders (5th ed.)*. Washington, DC: Author.

American Psychological Association (2010). *Ethical principles of psychologists and code of conduct.* http://www.apa.org/ethics/code/principles.pdf

Ball, S. G., Baer, L., & Otto, M. W. (1996). Symptom subtypes of obsessive-compulsive disorder in behavioral treatment studies: A quantitative review. *Behaviour Research and Therapy, 47*, 47-51.

Beck, J. S., & Steer, R. A. (1990). *Beck anxiety inventory manual.* San Antonio, TX: Psychological Corporation.

Beck, J. S., Steer, R. A., & Brown, G. K. (1996). *Manual for the beck depression inventory-II*. San Antonio,TX: Psychological Corporation.

Benjamini, Y., Krieger, A. M., & Yekutieli, D. (2006). Adaptive linear step-up procedures that control the false discovery rate. Biometrika, *93*, 491-507.

Brown, T. A., Di Nardo, P. A., & Barlow, D. H. (1994). *Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV)*. San Antonio, TX: Psychological Corporation/Graywind Publications Incorporated.

Calamari, J. E., Cohen, R. J., Rector, N. A., Szacun-Shimizu, K., Riemann, B. C., & Norberg, M. N. (2006). Dysfunctional belief-based obsessive–compulsive disorder subgroups. *Behaviour Research and Therapy, 44*, 1347–1360.

Carraresi, C., Bulli, F., Melli, G., & Stopani, E. (2013). Mental contamination in OCD: its role in the relationship between disgust propensity and fear of contamination. *Clinical Neuropsychiatry, 10 (suppl. 1)*, 13-19.

Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in scale development. *Psychological Assessment, 7*, 309–319.

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd Ed). NewYork: Lawrence Erlbaum Associates.

David, B., Olatunji, B. O., Armstrong, T., Ciesielski, B. G., Bondy, C. L., & Broman-Fulks, J. (2009). Incremental specificity of disgust sensitivity in the prediction of obsessive-compulsive disorder symptoms: cross-sectional and prospective approaches. *Journal of behavior therapy and experimental psychiatry, 40*, 533-543.

Deacon, B., & Olatunji, B. O. (2007). Specificity of disgust sensitivity in the prediction of behavioural avoidance in contamination fear. *Behaviour Research and Therapy, 45*, 2110-2120.

Ecker, W., & Gönner, S. (2008). Incompleteness and harm avoidance in OCD symptom dimensions. *Behaviour Research and Therapy, 46*, 895–904.

Ecker, W., Kupfer, J., & Gönner, S. (2014). Incompleteness and harm avoidance in OCD, anxiety and depressive disorders, and non-clinical controls. *Journal of Obsessive-Compulsive and Related Disorders, 3*, 46-51.

Foa, E. B., Abramowitz, J. S., Franklin, M. E., & Kozak, M. J. (1999). Feared consequences, fixity of belief, and treatment outcome in patients with obsessive-compulsive disorder. *Behavior Therapy, 30*, 717–724.

Foa, E. B., Huppert, J. D., Leiberg, S., Langner, R., Kichic, R., Hajcak, G., & Salkovskis, P. M. (2002). The obsessive-compulsive inventory: development and validation of a short version. *Psychological Assessment, 14*, 485-496.

Frost, R. O., & Steketee, G. (2002). *Cognitive approaches to obsessions and compulsions: Theory, assessment and treatment.* Oxford: Elsevier.

Furr, R. M. (2011). *Scale Construction and Psychometrics for Social and Personality Psychology*. London, UK: Sage Publications.

Hong, G. (2012). Marginal mean weighting through stratification: A generalized method for evaluating multivalued and multiple treatments with non-experimental data. *Psychological Methods, 17,* 44-60.

Julien, D., O'Connor, K. P., Aardema, F., & Todorov, C. (2006). The specificity of belief domains in obsessive–compulsive symptom subtypes. *Personality and Individual Differences, 41*, 1205–1216.

Mancini, F., Gragnani, A., & D'Olimpio, F. (2001). The connection between disgust and obsessions and compulsions in a non- clinical sample. *Personality and individual Differences, 31*, 1173-1180.

Marsh, H. W., Hau, K. T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis testing approaches to setting cutoff values for fit indexes and dangers in overgeneralising Hu & Bentler's (1999) findings. *Structural Equation Modeling, 11*, 320–341.

Mason, E. C., & Richardson, R. (2010). Looking beyond fear: the extinction of other emotions implicated in anxiety disorders. *Journal of anxiety disorders, 24*, 63-70.

McKay, D., Abramowitz, J. S., Calamari, J. E., Kyrios, M., Radomsky, A., Sookman, D., Taylor, S., & Wilhelm, S. (2004). A critical evaluation of obsessive-compulsive disorder subtypes: symptoms versus mechanisms. *Clinical Psychology Review, 24*, 283–313.

Melli, G., Bulli, F., Carraresi, C., & Stopani, E. (2014). Disgust propensity and contamination-related OCD symptoms: The mediating role of mental contamination. *Journal of Obsessive-Compulsive and Related Disorders, 3*, 77-82.

Melli, G., Carraresi, C., Stopani, E., Radomsky, A. S., & Bulli, F. (submitted). Factor structure and temporal stability of the Vancouver Obsessional Compulsive Inventory – Mental Contamination Scale (VOCI-MC) and psychometric properties of its Italian version.

Melli, G., Chiorri, C., Bulli, F., Carraresi, C., Stopani, E., & Abramowitz, J. S. (2014). Psychometric properties of the Italian version of the Dimensional Obsessive-Compulsive Scale (DOCS) across non-clinical and clinical samples. *Journal of Psychopathology and Behavioral Assessment*. DOI 10.1007/s10862-014-9450-1

Melli, G., Chiorri, C., Bulli, F., Stopani, E., & Carraresi, C. (2012). *Una misura della tendenza a sperimentare disgusto: costruzione e validazione del Disgust Propensity Questionnaire*. [A measure of the tendecy to experience disgust: Development and validation of the *Disgust Propensity Questionnaire*]. Paper presented at the XVI conference of the Italian Association of

Behavior Analysis and Modification and Cognitive and Behavioral Therapy. Montesilvano (PE), 25-28 october.

Melli, G., Chiorri, C. and Smurra, R. (2013). Further revision and psychometric properties of an Italian version of the «Disgust Scale-Revised». *Italian Journal of Cognitive and Behavioral Psychotherapy, 19*, 63-93.

Moretz, M. W., & McKay, D. (2008). Disgust sensitivity as a predictor of obsessive-compulsive contamination symptoms and associated cognitions. *Journal of anxiety disorders, 22*, 707-715.

Muthén, B., & Kaplan, D. (1985). A comparison of some methodologies for the factor analysis of non-normal Likert variables. *British Journal of Mathematical and Statistical Psychology, 38*, 171–189.

Muthén, L. K., & Muthén, B. O. (2002). How to use a Monte Carlo study to decide on sample size and determine power. *Structural Equation Modeling, 4*, 599-620.

Nicholson, E., & Barnes-Holmes, D. (2012). Developing an implicit measure of disgust propensity and disgust sensitivity: Examining the role of implicit disgust propensity and sensitivity in obsessive-compulsive tendencies. *Journal of Behavior Therapy and Experimental Psychiatry, 43*, 922-930.

Nunnally, J. C., & Bernstein I. H. (1994). *Psychometric Theory, 3rd Edition*. New York: McGraw-Hill.

Olatunji, B. O. (2010). Changes in disgust correspond with changes in symptoms of contamination-based OCD: A prospective examination of specificity. *Journal of Anxiety Disorders, 24*, 313-317.

Olatunji, B. O., Ebesutani, C., Haidt, J., & Sawchuk, C. N. (2014). Specificity of disgust domains in the prediction of contamination anxiety and avoidance: A multimodal examination. *Behavior Therapy, 45*, 469-481.

Olatunji, B. O., Lohr, J. M., Sawchuk, C. N., & Tolin, D. F. (2007). Multimodal assessment of disgust in contamination-related obsessive-compulsive disorder. *Behaviour Research and Therapy, 45*, 263-276.

Olatunji, B. O., Moretz, M. W., Wolitzky-Taylor, K. B., McKay, D., McGrath, P. B., & Ciesielski, B. G. (2010). Disgust vulnerability and symptoms of contamination-based OCD: Descriptive tests of incremental specificity. *Behavior Therapy, 41*, 475-490.

Olatunji, B. O., Sawchuk, C. N., Lohr, J. M., & de Jong, P. J. (2004). Disgust domains in the prediction of contamination fear. *Behaviour Research and Therapy, 42*, 93-104.

Olatunji, B. O., Williams, N. L., Lohr, J. M., & Sawchuk, C. N. (2005). The structure of disgust: domain specificity in relation to contamination ideation and excessive washing. *Behaviour Research and Therapy, 43*, 1069-1086.

Olatunji, B. O., Williams, N. L., Tolin, D. F., Abramowitz, J. S., Sawchuk, C. N., Lohr, J. M., & Elwood, L. S. (2007). The Disgust Scale: Item analysis, factor structure, and suggestions for refinement. *Psychological Assessment, 19*, 281-297.

Olatunji, B. O., Wolitzky-Taylor, K. B., Willems, J., Lohr, J. M., & Armstrong, T. (2009). Differential habituation of fear and disgust during repeated exposure to threat-relevant stimuli in contamination-based OCD: An analogue study. *Journal of Anxiety Disorders, 23*, 118-123.

Phillips, M. L., Fahy, T., David, A. S., & Senior, C. (1998). Disgust: The forgotten emotion of psychiatry. *The British Journal of Psychiatry, 172*, 373-375.

Pietrefesa, A. S., & Coles, M. E. (2008). Moving beyond an exclusive focus on harm avoidance in obsessive-compulsive disorder: Considering the role of incompleteness. *Behavior Therapy, 39*, 224–231.

Pietrefesa, A. S., & Coles, M. E. (2009). Moving beyond an exclusive focus on harm avoidance in obsessive-compulsive disorder: Behavioral validation for the separability of harm avoidance and incompleteness. *Behavior Therapy, 40*, 251–259.

Podsakoff, P. M., MacKenzie, S. B., Lee, J., & Podsakoff, N. P. (2003). Common method biases in behavioural research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*, 879–903.

Power, M., & Dalgleish, T. (1997). *Cognition and emotion: From order to disorder*. East Sussex, UK: Psychology Press.

Rachman, S. J. (2010). Betrayal: A psychological analysis. *Behaviour Research and Therapy, 48*, 304-311.

Rachman, S., & Hodgson, R. L. (1980). *Obsession and compulsions*. Englewood Cliffs, NJ: Prentice-Hall.

Radomsky, A., Rachman, S. J., Shafran, R., Coughtrey, A. E., & Barber, K. C. (2014). The nature and assessment of mental contamination: A psychometric analysis. *Journal of Obsessive-Compulsive and Related Disorders, 3*, 181-187.

Rasmussen, S. A., & Eisen, J. (1992). *The epidemiology and clinic features of obsessive-compulsive disorder*. In R. P. Swinson, M. M. Antony, S. J. Rachman, & M. A. Richer (Eds.). *Obsessive-compulsive disorder: Theory, research, and treatment*. New York: Guilford Press.

Rassmussen, S. A., & Tsuang, M. T. (1986). Clinical characteristics and family history in DSM III obsessive-compulsive disorder. *American Journal of Psychiatry, 143*, 317-322.

Sawchuk, C. N., Lohr, J. M., Tolin, D. F., Lee, T. C., & Kleinknecht, R. A. (2000). Disgust sensitivity and contamination fear in spider and blood- injection-injury phobias. *Behaviour Research and Therapy, 38*, 753-762.

Schafer, J. L., & Kang, J. D. Y. (2008). Average causal effects from nonrandomized studies: A practical guide and simulated example. *Psychological Methods, 13*, 279–313.

Schienle, A., Stark, R., Walter, B., & Vaitl, D. (2003). The connection between disgust sensitivity and blood related fears, faintness symptoms, and obsessive-compulsiveness in a non clinical sample. *Anxiety, Stress, and Coping, 16*, 185-193.

Schwarz, N. (1999). Self-reports: How the questions shape the answers. *American Psychologist, 54*, 93-105.

Sica, C., Coradeschi, D., Ghisi, M., & Sanavio, E. (2006). *Beck Anxiety Inventory – BAI. Manuale*. Firenze: O.S. Organizzazioni Speciali.

Sica, C., & Ghisi, M. (2007). The Italian versions of the Beck Anxiety Inventory and the Beck Depression Inventory-II: Psychometric properties and discriminant power. In M. A. Lange (Ed.), *Leading-Edge Psychological Tests and Testing Research* (pp. 27–50). Hauppauge, New York: NOVA Publishers.

Sica, C., Ghisi, M., Altoè, G., Chiri, L.R., Franceschini, S., Coradeschi, D., & Melli, G. (2008). The Italian version of the Obsessive Compulsive Inventory: Its psychometric properties on community and clinical samples. *Journal of Anxiety Disorders, 23*, 204-211.

Summerfeldt, L. J. (2007). Treating incompleteness, ordering, and arranging concerns. In: M. M. Antony, C. Purdon, & L. J. Summerfeldt (Eds.), *Psychological treatment of obsessive–compulsive disorder: Fundamentals and beyond* (pp. 187–207). Washington, DC: American Psychological Association.

Summerfeldt, L., Antony, M. M., Downie, F., Richter, M. A., & Swinson, R. P. (1997). *Prevalence of particular obsession and compulsions in a clinic sample*. Unpublished manuscript.

Summerfeldt, L. J., Kloosterman, P. H., Antony, M. M., Richter, M. A., & Swinson, R. P. (2004). The relationship between miscellaneous symptoms and major symptom factors in obsessive–compulsive disorder. *Behaviour Research and Therapy, 42*, 1453–1467.

Summerfeldt, L. J., Kloosterman, P. H., Antony, M. M., & Swinson, R. P. (2014). Examining an obsessive-compulsive core dimensions model: Structural validity of harm avoidance and incompleteness. *Journal of Obsessive-Compulsive and Related Disorders, 3*, 83-94.

Taylor, S., Abramowitz, J. S., McKay, D., Calamari, J., Sookman, D., Kyrios, M., et al. (2006). Do dysfunctional beliefs play a role in all types of obsessive–compulsive disorder? *Journal of Anxiety Disorders, 20*, 85–97.

Taylor, S., McKay, D., Crowe, K. B., Abramowitz, J. S., Conelea, C. A., Calamari, J. E., & Sica, C. (2014). The sense of incompleteness as a motivator of obsessive-compulsive symptoms: An empirical analysis of concepts and correlates. *Behavior Therapy, 45*, 254-262.

Tolin, D. F., Woods, C. M., & Abramowitz, J. S. (2006). Disgust sensitivity and obsessive-compulsive symptoms in a non clinical sample. *Journal of Behaviour Therapy and Experimental Psychiatry, 37*, 30-40.

Tolin, D. F., Worshunsky, P., & Maltby, N. (2006). Are "obsessive" beliefs specific to OCD? A comparison across anxiety disorders. *Behaviour Research and Therapy, 44*, 469–480.

Viar, M. A., Bilsky, S. A., Armstrong, T., & Olatunji, B. O. (2011). Dimensions of obsessive–compulsive disorder: an examination of specific associations. *Cognitive Therapy and Research, 35*, 108–117.

Warnock-Parks, E., Salkovskis, P. M., & Rachman, J. (2012). When problem is beneath the surface in OCD: The cognitive treatment of a case of pure mental contamination. *Behavioural and Cognitive Psychotherapy, 40*, 383-399.

Westen, D., & Rosenthal, R. (2003). Quantifying construct validity: Two simple measures. *Journal of Personality and Social Psychology, 84*, 608-618.

Woody, S. R., Tolin, D. F. (2002). The relationship between disgust sensitivity and avoidant behaviour: Studies of clinical and non clinical samples. *Journal of Anxiety Disorder, 16*, 543-559.