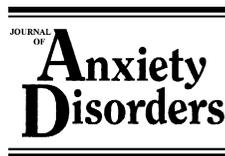




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Psychometric properties and construct validity of the Obsessive–Compulsive Inventory—Revised: Replication and extension with a clinical sample

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Abstract

The present study examined the psychometric properties and construct validity of the Obsessive–Compulsive Inventory—Revised (OCI-R) with the aim of replicating and extending previous findings, and addressing limitations of previous investigations. Individuals with OCD ($n = 167$) and other anxiety disorders ($n = 155$) completed the OCI-R, measures of OCD and related symptom severity, and measures of cognitive variables associated with OCD symptoms. Results indicate that the OCI-R is a psychometrically sound and valid measure of OCD and its various symptom presentations. Confirmatory factor analysis confirmed a six-factor solution. The instrument also evidenced good convergent validity, and performed well in discriminating OCD from other anxiety disorders. Theoretically consistent patterns of associations between OCI-R symptom-based subscales and OCD-related cognitive variables were found, and five of the six OCI-R subscales corresponded closely to identified OCD symptom dimensions. The OCI-R is recommended as an empirically validated instrument that can be used in a range of clinical and research settings for research on OCD.

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Keywords: OCI-R; OCD; Confirmatory factor analysis; Assessment

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The *DSM-IV-TR* (American Psychiatric Association, 2000) defines obsessive-compulsive disorder (OCD) as an anxiety disorder characterized by (a) persistent, intrusive thoughts that produce distress (obsessions) and (b) urges to repeatedly perform senseless and excessive behaviors to reduce this distress (compulsions). Yet, despite the intuitive appeal of diagnostic criteria which differentiate between apparent cognitive and behavioral components of the disorder, empirical research suggests that OCD psychopathology does not distill neatly into this type of two-dimensional model. Instead, studies on the structure of OCD symptoms have identified a number of replicable dimensions and “subtypes” (e.g., harming, contamination) that consist of both obsessions *and* compulsions (e.g., obsessions about disasters with checking compulsions, contamination obsessions with decontamination compulsions). For instance, Abramowitz, Franklin, Schwartz, and Furr (2003) found five symptom clusters: (a) harming, (b) contamination, (c) symmetry, (d) hoarding, and (e) unacceptable thoughts with mental rituals that are closely in line with findings from other studies (e.g., Leckman et al., 1997; Summerfeldt, Richter, Antony, & Swinson, 1999). As McKay et al. (2004) have discussed, understanding and properly measuring the heterogeneity of OCD has important implications for researchers and clinicians. For example, Steketee, Grayson, and Foa (1985) found that whereas patients with contamination fears benefit from in vivo exposure and response prevention, those with aggressive obsessions and checking rituals require the addition of imaginal exposure to their feared consequences.

The heterogeneity of OCD necessitates validation of instruments that assess the various empirically based symptom presentations. One measure that was designed to correspond with symptom-based structural models of OCD is the Obsessive Compulsive Inventory—Revised (OCI-R; Foa et al., 2002). The OCI-R is a brief (18-item) adaptation of the 42-item Obsessive Compulsive Inventory (OCI; Foa, Kozak, Salkovskis, Coles, & Amir, 1998) that assesses distress associated with common OCD symptoms. In addition to yielding a total score, the OCI-R has six subscales: washing, checking, ordering, obsessing, hoarding, and neutralizing. Along with its brevity, the OCI-R has a number of practical advantages over the original OCI. For example, each of the six subscales contain three items, which makes them easy to score and compare (subscales on the original OCI contain varying numbers of items). The OCI-R is also an improvement over other self-report measures of OCD which do not fully assess the breadth of OCD symptoms; for example, neither the Maudsley Obsessive Compulsive Inventory (MOCI; Hodgson & Rachman, 1977) nor the Padua Inventory (Sanavio, 1988) include items measuring ordering/symmetry or hoarding symptoms.

To date, only two studies have examined the psychometric properties of the OCI-R. In their initial paper on the development of the scale, Foa et al. (2002) reported that the OCI-R total score and six subscales had good internal consistency and test–retest reliability in clinical groups (OCD, social phobia, and posttraumatic stress disorder [PTSD] patients); and confirmatory factor

analysis supported the hypothesized six-factor structure. In terms of validity, the total score showed moderate to strong correlations with other global measures of OCD and measures of depression. The washing, checking, and obsessing subscales also showed moderate to strong correlations with other measures of these particular OCD symptom presentations (e.g., the MOCI). The second study was conducted on a nonclinical (college) sample by [Hajcak, Huppert, Simons, and Foa \(2004\)](#). These authors also confirmed the six-factor solution described above and found that the hoarding and neutralizing subscales had weaker internal consistency as compared to the washing, checking, obsessing, and ordering scales. They also found adequate test–retest reliability and evidence of convergent and divergent validity (i.e., the OCI-R appears to measure a construct that is distinct from pathological worry in a nonclinical sample).

The ongoing shift in emphasis toward evidence-based practice within mental health has important implications for assessment. The use of empirically validated assessment instruments can facilitate the clinical tasks of identifying the parameters of a patient’s problem, selecting an effective treatment, and measuring the patient’s response to that treatment. Just as it is important to demonstrate that treatments work through controlled trials, it is equally important to demonstrate that assessment instruments are reliable and valid for measuring the relevant assessment parameters. The OCI-R is an excellent example of a brief and practical instrument that has potential for widespread use in basic and applied settings because it measures the full range of OCD symptoms. For example, this instrument could be used to identify homogeneous OCD patient samples for studies on the psychopathology of specific symptom dimensions (e.g., contamination fears, symmetry/ordering symptoms) that could refine our understanding and treatment of particular presentations of OCD. Therefore, it is important to clearly discern the psychometric properties of the OCI-R.

Accordingly, the present study examined the psychometric properties and construct validity of the OCI-R using a clinical sample of patients with OCD and those with other anxiety disorders. We aimed to replicate and extend previous research on the OCI-R, and address a number of limitations of previous investigations. First, because of the large overlap between OCD and other anxiety disorders (e.g., [Crino & Andrews, 1996](#)) we utilized a patient sample that included a more diverse range of anxiety disorder diagnoses than has been used in previous research on the OCI-R. Second, as recommended by [Foa et al. \(2002\)](#), we also examined “the performance of each subscale using samples of OCD patients with clinical presentations that match each subscale (e.g., orderers, hoarders)” (p. 494). Third, in addition to assessing the construct validity of the OCI-R subscales by correlating them with other symptom measures, we examined how these subscales were related to measures of cognitive phenomena thought to underlie OCD symptoms. Fourth, as did [Foa et al. \(2002\)](#), we examined the sensitivity and specificity of the OCI-R as a diagnostic instrument. However, we extended

this previous work by including examination of positive and negative predictive power in a heterogeneous patient sample. Fifth and finally, whereas Foa et al. (2002) evaluated the psychometric properties of the OCI-R by extracting the 18 OCI-R items from responses to the 42-item OCI, the data in the present study were collected via administration of the actual 18-item scale and, therefore, were not subject to order effects or context effects.

1. Method

1.1. Participants

Participants in the present study were 322 adult patients (185 women [57.5%] and 137 men [42.5%]) who were consecutively evaluated and given a primary (principal) anxiety disorder diagnosis within an outpatient anxiety disorders clinic (diagnostic procedures are described further below). Patients with secondary comorbid Axis-I disorders were included, yet those with Axis-II (personality) disorders were excluded. The mean age of the sample was 36.5 (S.D. = 13.0; range = 18–72), 95% was Caucasian, 3% was African American and 2% was Asian. The frequency of each principal anxiety disorder diagnosis was as follows: OCD = 167 (51.9%), panic disorder (PD) with or without agoraphobia = 55 (17.1%), social phobia (SoP) = 35 (10.9%), severe health anxiety (hypochondriasis; HC) = 24 (7.5%), generalized anxiety disorder (GAD) = 23 (7.1%), and specific phobia (SpP) = 18 (5.6%). None of the patients with other anxiety disorders had a secondary comorbid diagnosis of OCD.

1.2. Measures

1.2.1. *Obsessive–Compulsive Inventory—Revised (OCI-R; Foa et al., 2002)*

The OCI-R is an 18-item questionnaire based on the earlier 84-item OCI (Foa et al., 1998). Participants rate the degree to which they are bothered or distressed by OCD symptoms in the past month on a 5-point scale from 0 (not at all) to 4 (extremely). The OCI-R assesses OCD symptoms across six factors: (1) washing, (2) checking, (3) obsessions, (4) mental neutralizing, (5) ordering, and (6) hoarding. Each of these subscales includes three scale items. The psychometric properties of the OCI-R are described above.

1.2.2. *Beck Depression Inventory (BDI; Beck & Steer, 1987)*

The BDI is a 21-item self-report scale that assesses the severity of affective, cognitive, motivational, vegetative, and psychomotor components of depression. Scores of 10 or less are considered normal; scores of 20 or greater suggest the presence of clinical depression. The BDI has excellent reliability and validity and is widely used in clinical research (Beck, Steer, & Garbin, 1988).

1.2.3. State-Trait Anxiety Inventory—Trait version (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983)

The STAI-T is a 20-item scale that measures the stable propensity to experience anxiety and the tendency to perceive stressful situations as threatening. The STAI-T has demonstrated high test–retest reliability, internal consistency, and concurrent validity with other anxiety questionnaires (Spielberger et al., 1983).

1.2.4. Responsibility Attitudes Scale (RAS; Salkovskis et al., 2000)

This is a 26-item self-report measure designed to assess beliefs about responsibility that are characteristic of people with OCD. Sample items include “If I don’t act when I can foresee danger, then I am to blame for any consequences if it happens,” and “I should never cause even the slightest harm to others.” Items are rated on a scale from 1 (totally agree) to 7 (totally disagree) and the participant’s mean response across all 26 items is reported as the RAS score. The psychometric properties of the scale are described in Salkovskis et al. (2000).

1.2.5. Intolerance of Uncertainty Scale (IUS; Freeston, Rheaume, Letarte, & Dugas, 1994)

The IUS is a 27-item self-report measure of beliefs about the unacceptability of uncertainty and doubt (sample items: “uncertainty makes life intolerable”; “I always want to know what the future has in store for me”; “when I am uncertain I can’t go forward”). Each item is rated on a 5-point scale from 1 (“Not at all characteristic of me”) to 5 (“Entirely characteristic of me”). Scores on the IUS range from 27 to 135 and the scale has good psychometric properties (Freeston et al., 1994).

1.2.6. Interpretation of Intrusions Inventory (III; Obsessive Compulsive Cognitions Working Group [OCCWG], 2003)

The III is a semi-ideographic questionnaire composed of 31 items that measures immediate appraisals or interpretations of unwanted, distressing intrusive thoughts, images or impulses. Respondents are first given a definition of unwanted ego-dystonic mental intrusions, as well as examples of obsessive themes and content, and are asked to write in the space provided two intrusive thoughts, images or impulses they had recently experienced. They then complete ratings of recency, frequency, and distress of these intrusions. Respondents then rate their level of belief (from 0 = “I did not believe this idea at all” to 100 “completely convinced this idea was true”) within the past 2 weeks for each of the 31 statements as they related to the two intrusive thoughts they recorded on the questionnaire. Although three subscales were initially described (OCCWG, 2003), factor analysis yielded a single factor, suggesting that the total score be used in lieu of subscale scores (OCCWG, 2003, 2005). To facilitate interpretation, the 100-point scale was transformed into a 10-point scale. The psychometric properties of the III are described by the OCCWG (2003, 2005).

1.2.7. *Thought–Action Fusion Scale (TAF; Shafran, Thordarson, & Rachman, 1996)*

This is a 19-item self-report measure of the tendency to believe that thoughts are equivalent to actions. Twelve items assess *moral* TAF (e.g., “Having a blasphemous thought is almost as sinful to me as a blasphemous action”), three assess *likelihood-self* TAF (e.g., “If I think of myself being in a car accident this increases the risk that I will have a car accident”), and four items assess *likelihood-other* TAF (e.g., “If I think of a relative/friend losing their job, this increases the risk that they will lose their job). Agreement with each item (statement) is rated on a scale from 0 (disagree strongly) to 4 (agree strongly). The psychometric properties have been described by Shafran et al. (1996).

1.2.8. *Yale–Brown Obsessive Compulsive Scale (Y-BOCS; Goodman, Price, Rasmussen, Mazure, Delgado, et al., 1989; Goodman, Price, Rasmussen, Mazure, Fleischmann, et al., 1989)*

The Y-BOCS is a semi-structured interview that consists of a symptom checklist and severity scale. The first part of the symptom checklist provides definitions and examples of obsessions and compulsions that the clinician reads to the patient. Next, the clinician reviews a list of over 50 specific obsessions (e.g., violent images) and compulsions (e.g., checking appliances) and asks the patient whether each symptom is currently present or has occurred in the past. These items are categorized into 15 more general categories of types of obsessions (e.g., contamination) and compulsions (e.g., checking). Finally, the most prominent obsessions and compulsions identified from the checklist are rated on the severity scale. The Y-BOCS severity scale contains 10 items and assesses (1) time spent, (2) interference, (3) distress, (4) resistance, and (5) control for obsessions and compulsions separately. Items (scored 0–4) are summed to yield a total score ranging from 0 (no symptoms) to 40 (very severe).

1.2.9. *Brown Assessment of Beliefs Scale (BABS; Eisen et al., 1998)*

Insight into the senselessness of OCD symptoms was assessed with the BABS, a 6-item semi-structured interview that measures conviction in obsessional fears during the past week. One or two specific obsessional beliefs (e.g., “I will get AIDS from flushing a public toilet”) are identified and rated for the following: (a) conviction in the belief, (b) perception of others’ views, (c) explanation of differing views, (d) fixity of beliefs, (e) attempts to disprove beliefs, and (f) insight (recognition of a psychiatric etiology). Item scores range from 0 (normal) to 4 (pathological) and are summed to produce a total score ranging from 0 to 24. The scale has good psychometric properties as reported by Eisen et al. (1998).

1.3. *Procedure*

A packet containing the OCI-R and BDI was mailed to each patient in advance of his or her initial clinic appointment. Patients completed and returned these

questionnaires at their appointment. Diagnostic evaluations took place in an anxiety disorders specialty clinic housed within a large academic medical center. Each patient received a 1.5- to 2-hour diagnostic assessment performed by a trained masters or doctoral level psychologist who administered the anxiety and mood disorders sections of the Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998), a structured diagnostic interview that correlates highly with the SCID-IV. Axis-II psychopathology was assessed by means of a semi-structured interview that was based on DSM criteria. Interviewers were trained in the administration of the Y-BOCS and MINI by attending a didactic seminar on these instruments, observing the administration of the measures by an experienced clinician, and then administering the measure under observation by a more experienced interviewer who provided constructive feedback.

For individuals assigned a diagnosis of OCD, the Y-BOCS and BABS were subsequently administered and the remaining (OCD-specific) self-report measures were completed. On the basis of the primary symptoms identified on the Y-BOCS checklist, two clinicians independently classified each of these patients according to the five-cluster model of OCD symptom presentation identified by Abramowitz et al. (2003). Thus, OCD patients were classified as belonging to one of the following five groups: harming ($n = 46$), contamination ($n = 40$), hoarding ($n = 17$), unacceptable thoughts ($n = 46$), or symmetry ($n = 18$). To eliminate bias, OCI-R results were not used when making this classification. Only patients for whom the two clinicians agreed on this classification were included in the study.

2. Results

2.1. Analytic strategy

First, we computed means and standard deviations on all study measures and examined differences between OCD patients and those with other anxiety disorders. Second, we performed psychometric analyses and conducted a confirmatory factor analysis to examine the hypothesized latent structure of the OCI-R. Third, we examined the construct validity of the OCI-R subscales by (a) computing correlations with symptom and cognition measures, and (b) comparing scores on each subscale across the anxiety disorder and OCD symptom-based groups. Finally, we investigated the diagnostic utility of the OCI-R by examining the accuracy of different cutoff scores in discriminating between patients with a principal diagnosis of OCD and those with other anxiety disorders.

2.2. Sample characteristics

Table 1 presents the means and standard deviations on all study measures for (a) the entire sample, (b) the OCD patients, and (c) patients with other anxiety

Table 1
Mean (standard deviation) on study measures

Measure	Entire sample (<i>N</i> = 322)		OCD patients (<i>n</i> = 167)		Other disorders (<i>n</i> = 155)	
	<i>M</i>	S.D.	<i>M</i>	S.D.	<i>M</i>	S.D.
OCI-R total score	19.78	13.82	27.02	13.22	12.43	10.42
OCI-R—washing	3.23	3.93	5.04	4.32	1.39	2.31
OCI-R—checking	3.53	3.56	4.98	3.74	2.12	2.64
OCI-R—ordering	3.88	3.74	4.88	4.04	2.81	3.16
OCI-R—obsessions	4.70	3.97	6.40	4.05	2.93	2.97
OCI-R—hoarding	2.69	3.21	3.19	3.70	2.26	2.70
OCI-R—neutralizing	1.74	2.90	2.62	3.42	0.94	1.95
BDI	16.54	10.55	16.84	10.83	16.23	10.23
STAI-T			54.38	11.55		
RAS			4.53	1.016		
TAF-moral			19.93	12.17		
TAF-likelihood			5.69	6.15		
III			146.67	70.98		
IUS			72.63	23.62		
Y-BOCS			23.80	5.25		
BABS			7.86	4.53		

Note. Y-BOCS: Yale–Brown Obsessive Compulsive Scale; BDI: Beck Depression Inventory; STAI-T: State-Trait Anxiety Inventory—Trait version; RAS: Responsibility Attitudes Scale; IUS: Intolerance for Uncertainty Scale; III: Interpretation of Intrusions Inventory; TAF-M: Thought–Action Fusion—Moral; TAF-L: Thought–Action Fusion—Likelihood; BABS: Brown Assessment of Beliefs Scale.

disorders. A series of *t*-tests indicated that patients with OCD had higher OCI-R total and subscale scores (for all six subscales) than did patients with other anxiety disorders (all *P*s \leq .01). However, there was no between-group difference on the BDI, $t(320) = 0.51$, $P = .61$). As indicated by the mean Y-BOCS score, the average OCD patient presented with symptoms of moderate severity.

2.3. Psychometric properties and factor structure

The OCI-R demonstrated good internal consistency among patients with OCD ($\alpha = .83$), patients with other anxiety disorders ($\alpha = .88$), and in the combined sample ($\alpha = .89$). All 18 items evidenced an acceptable corrected item-total correlation ($M = .51$, range = .37–.65) based on the criterion of .30 recommended by Nunnally and Bernstein (1994). Each of the six OCI-R subscales demonstrated adequate internal consistency among patients with OCD (α s ranged from .83 to .92) and patients with other anxiety disorders (α s ranged from .80 to .92). OCI-R subscale intercorrelations for the entire sample, shown in Table 2, ranged in magnitude from weak to moderate. The pattern of correlations was similar in both the OCD and other anxiety disorder samples and indicates relatively little overlap in what the various subscales purport to measure.

Table 2

Intercorrelations between the OCI-R subscales for the entire sample ($N = 322$)

OCI-R subscale	Washing	Checking	Ordering	Obsessions	Hoarding
Checking	.27				
Ordering	.34	.52			
Obsessions	.32	.42	.26		
Hoarding	.17	.26	.25	.15	
Neutralizing	.26	.41	.38	.33	.23

Note. OCI-R: Obsessive Compulsive Inventory—Revised. All correlations significant at $P < .01$.

Using AMOS 5.0 (Arbuckle, 2003) we conducted a confirmatory factor analysis to test the goodness-of-fit of the hypothesized latent structure of the OCI-R (i.e., six correlated factors, each comprised of three items). The analysis was conducted using maximum likelihood estimation and was computed from the covariance matrix among the OCI-R items. The residuals of the three items loading on each factor were correlated in the model. We estimated model fit via five commonly used indices: (a) chi-square, (b) adjusted goodness of fit index, (c) root mean square error of approximation, (d) comparative fit index, and (e) normed fit index. The model had a significant chi-square, $\chi^2(108) = 339.6$, $P < .001$, an adjusted goodness of fit index of .86, a root mean square error of approximation of .08, a comparative fit index of .94, and a normed fit index of .92. These results replicate those reported by Foa et al. (2002) and indicate an adequate fit for the six-factor model of the OCI-R.

2.4. Correlations with related constructs

To examine the construct validity of the OCI-R and its subscales, we computed correlations between OCI-R scores and the additional symptom and cognition measures included in the study. The results of this analysis, which was conducted only on the data from the 167 patients with OCD, are presented in Table 3 and described below.

2.4.1. OCD, anxiety, and depressive symptoms

The pattern of correlations reveals weak to moderate relationships between OCI-R subscales and global OCD symptom severity as assessed by the Y-BOCS total score and the obsessions and compulsions subscale scores. The lone exception was the OCI-R hoarding subscale, which demonstrated no association with global OCD symptoms. Only checking and ordering were significantly correlated with insight into the senselessness of OCD symptoms; higher checking and ordering scores were associated with poorer insight.

We also observed weak to moderate associations between the washing, ordering, and obsessions subscale, and measures of depression and trait anxiety

Table 3
Correlations between OCI-R subscales and other study measures among 167 patients with OCD

OCI-R scale	Measure										
	Y-BOCS total	Y-BOCS obsessions	Y-BOCS compulsions	BDI	STAI-T	RAS	IUS	III	TAF-M	TAF-L	BABS
OCI-R total	.41**	.37**	.35**	.41**	.47**	.29**	.39**	.38**	.26**	.21**	.26**
Washing	.35**	.42**	.21**	.35**	.41**	.26**	.28**	.16	.08	.14	.16
Checking	.25**	.23**	.22**	.19*	.31**	.37**	.34**	.27**	.15	.19*	.34**
Ordering	.29**	.24**	.27**	.35**	.34**	.08	.48**	.16	.14	.14	.35**
Obsessions	.24**	.22**	.20*	.30**	.43**	.34**	.24**	.50**	.30**	.08	-.07
Hoarding	-.03	-.11	.05	.18*	.05	.05	.03	.08	.10	-.01	.05
Neutralizing	.25**	.22**	.23**	.13	.18*	.04	.04	.16*	.08	.26*	-.13

Note. Y-BOCS: Yale–Brown Obsessive Compulsive Scale; BDI: Beck Depression Inventory; STAI-T: State-Trait Anxiety Inventory—Trait version; RAS: Responsibility Attitudes Scale; IUS: Intolerance for Uncertainty Scale; III: Interpretation of Intrusions Inventory; TAF-M: Thought–Action Fusion—Moral; TAF-L: Thought–Action Fusion—Likelihood; BABS: Brown Assessment of Beliefs Scale.

** $P < .01$.

(BDI and STAI-T). The hoarding and neutralizing subscales were only weakly associated with depression and trait anxiety, and the checking subscale was moderately associated with trait anxiety, but weakly associated with depressive symptoms.

2.4.2. *Cognitive variables*

Consistent with cognitive models of OCD (e.g., [Shafran, 2005](#)) and previous research on the relationship between OCD symptom dimensions and cognitive variables (for a review see [McKay et al., 2004](#)), we predicted the following relationships between the OCI-R subscales and cognitive variables: (a) the washing subscale would be significantly correlated with the RAS and the IUS, (b) the checking subscale would be correlated with the RAS, IUS, TAF-likelihood, (c) the ordering subscale would be correlated with the IUS, (d) the obsessions subscale would be correlated with the RAS, III, TAF-moral, and TAF-likelihood, and (e) the neutralizing subscale would be correlated with the RAS, III, and TAF subscales. We had no specific predictions for the hoarding subscale.

As indicated in [Table 3](#), the obsessions and the checking OCI-R subscales showed the most consistent patterns of relationships with measures of OCD-related cognitive phenomena. The strongest relationships were found between obsessions and the misinterpretation of intrusive thoughts, responsibility, and TAF-moral; and between checking and responsibility cognitions and intolerance of uncertainty. The ordering subscale was also moderately associated with intolerance of uncertainty. The washing subscale was weakly associated with responsibility and intolerance of uncertainty; and neutralizing subscale was only weakly associated with TAF-likelihood. The hoarding subscale was not significantly associated with any of the OCD cognition measures.

2.5. *Comparisons across patient groups*

To further examine the construct validity of the OCI-R subscales we compared scores on each subscale across the anxiety disorder groups and across the OCD symptom-based clusters. We hypothesized that (a) patients in the contamination group would evidence higher washing scores than the other OCD symptom-based clusters and patients with other anxiety disorders, (b) those in the harming group would have higher checking scores, (c) those in the symmetry group would have higher ordering scores, (d) those in the unacceptable thoughts group would have higher obsessions scores, (e) those in the hoarding group would have higher hoarding scores, and (f) those in the unacceptable thoughts group would have higher neutralizing scores.¹ [Fig. 1](#) graphically depicts the mean scores on each

¹ Although they do not correspond perfectly, our hypotheses represent the closest match between each OCD symptom-based group and the OCI-R subscales.

subscale by patient group. Between-group differences on each subscale were identified using one-way analyses of variance.

2.5.1. *Washing*

Significant between-group differences were detected on the washing subscale, $F(9, 312) = 30.32, P < .01$. Follow-up Tukey HSD tests indicated that the OCD contamination cluster evidenced higher scores on this subscale compared to each of the other nine patient groups (all P s $< .05$). Furthermore, paired samples t -tests indicated that patients categorized in the OCD contamination cluster had higher

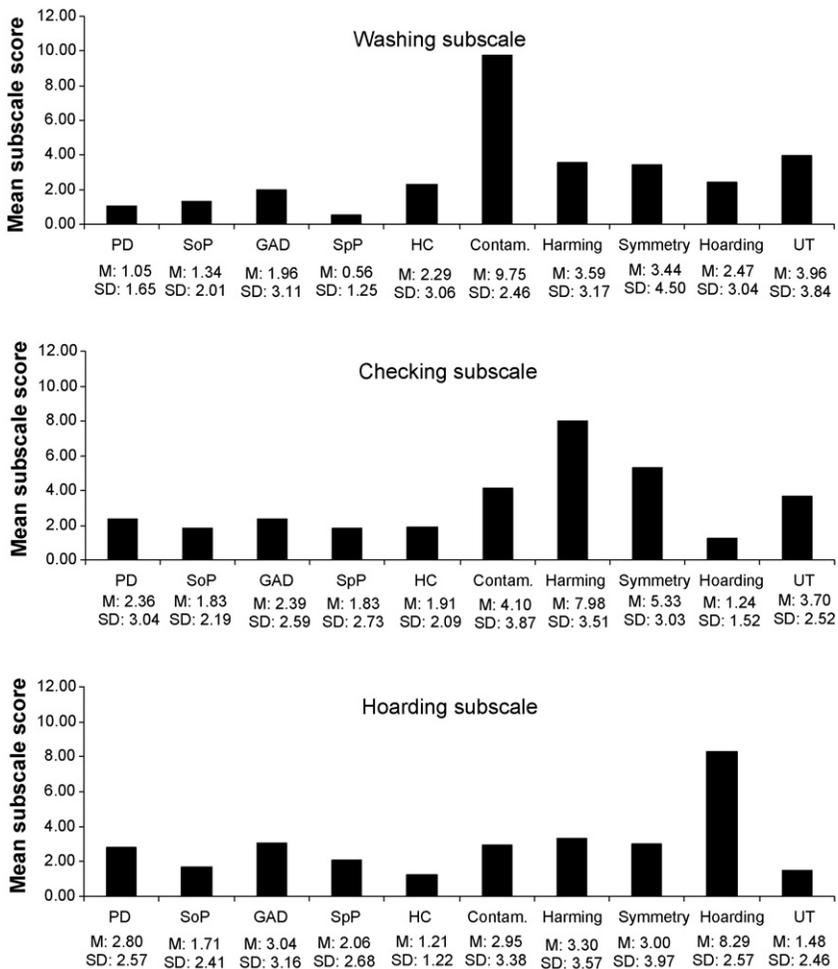


Fig. 1. Mean scores on each OCI-R subscale by patient group. PD: panic disorder; SoP: social phobia; GAD: generalized anxiety disorder; SpP: specific phobia; HC: hypochondriasis; Contam.: contamination; UT: unacceptable thoughts.

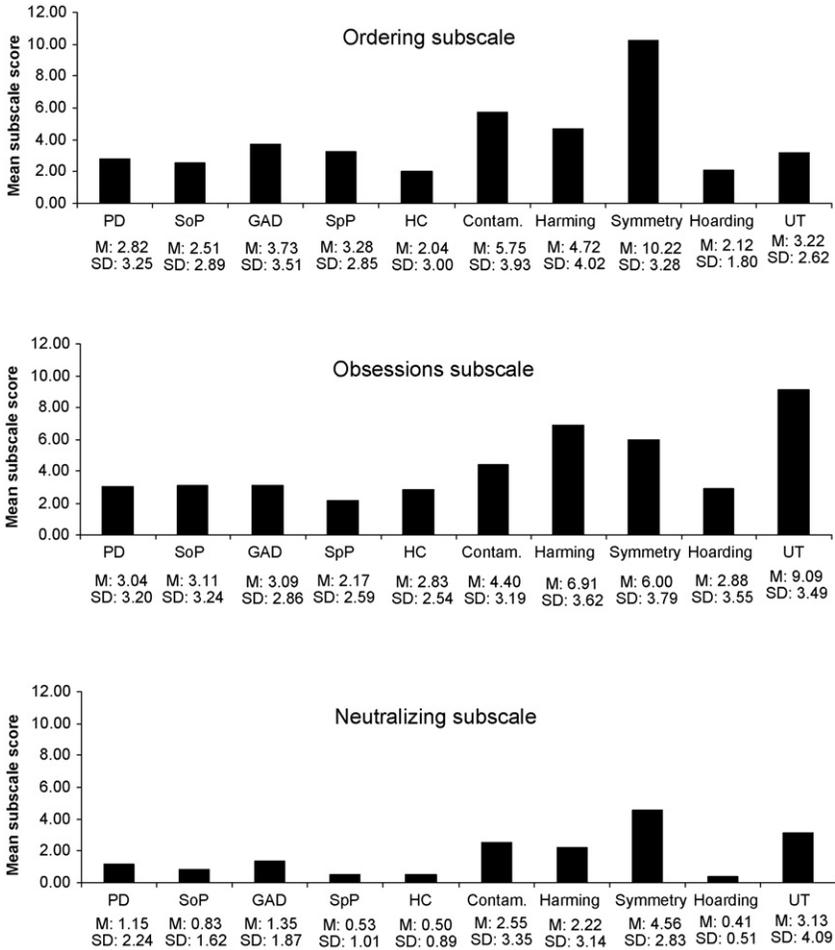


Fig. 1. (Continued).

scores on the washing subscale than on all of the other OCI-R subscales ($P_s < .01$).

2.5.2. Checking

Significant between-groups differences were detected on the checking subscale, $F(9, 312) = 18.18, P < .01$. Follow-up Tukey HSD tests indicated that the OCD harming cluster evidenced higher scores on this subscale than each of the other patient groups (all $P_s < .05$). Furthermore, paired samples t -tests indicated that patients categorized in the OCD harming cluster had higher scores on the checking subscale than on the washing, ordering, neutralizing, and hoarding, but not the obsessions, subscales ($P_s < .01$).

2.5.3. Ordering

Significant between-groups differences were detected on the ordering subscale, $F(9, 312) = 12.29, P < .01$. Follow-up Tukey HSD tests indicated that the OCD symmetry cluster evidenced higher scores on this subscale than each of the other nine patient groups (all P s $< .05$). Furthermore, paired samples t -tests indicated that patients identified in the OCD symmetry cluster evidenced higher scores on the ordering subscale than on all of the other subscales (P s $< .01$).

2.5.4. Obsessions

Significant between-groups differences were detected on the obsessions subscale, $F(9, 312) = 17.86, P < .01$. Follow-up Tukey HSD tests indicated that the OCD patients in the unacceptable thoughts cluster evidenced higher scores than each of the other patient groups. Patients in the OCD harming cluster also evidenced higher scores than each of the other patient groups, except for the symmetry group (all P s $< .05$). In the unacceptable thoughts cluster, paired samples t -tests indicated that scores on the obsessions subscale were higher than scores on all of the other OCI-R subscales (all P s $< .05$). In the OCD harming cluster, paired samples t -tests indicated that scores on the obsessions subscale were higher than scores on all of the other OCI-R subscales except for the checking subscale (P s $< .01$).

2.5.5. Hoarding

Significant between-groups differences were detected on the hoarding subscale, $F(9, 312) = 9.07, P < .01$. Follow-up Tukey HSD tests indicated that the OCD hoarding cluster evidenced higher scores on this subscale compared to all of the other patient groups (all P s $< .05$). Moreover, paired samples t -tests indicated that patients in the hoarding cluster had higher scores on the hoarding subscale than on each of the other subscales (P s $< .01$).

2.5.6. Neutralizing

Significant between-groups differences were detected on the neutralizing subscale, $F(9, 312) = 6.12, P < .01$. Follow-up Tukey HSD tests indicated that patients in the OCD symmetry group evidenced neutralizing scores that were significantly higher than scores of patients with other anxiety disorders and patients with OCD hoarding symptoms (P s $< .05$). There were no significant differences on this subscale between individuals with OCD contamination, harming, and hoarding symptoms, and those with other anxiety disorders. Elevated neutralizing subscale scores were not characteristic of any of the OCD symptom cluster groups.

2.6. Diagnostic accuracy

We examined the utility of the OCI-R as a diagnostic instrument by determining the accuracy of different cutoff scores in correctly classifying patients as having a primary diagnosis of OCD or a different anxiety disorder.

Following Foa et al. (2002), we conducted receiver operating characteristic (ROC) analyses using the Analyze-It add-in for Microsoft Excel. ROC analysis uses the association between sensitivity and specificity to estimate the area under the curve (AUC) to indicate how well a measure distinguishes between positive (i.e., a diagnosis of OCD) and negative (i.e., a different anxiety disorder diagnosis) cases. A value of 1.0 indicates perfect diagnostic prediction, whereas a value of .50 indicates the level of chance.

We conducted ROC analyses for the OCI-R total score and each OCI-R subscale to determine which scale best distinguished patients with OCD from those with other anxiety disorders. AUC estimates for the six OCI-R subscales ranged from .54 (hoarding) to .75 (obsessions). OCI-R total scores evidenced the highest AUC (.81, 95% confidence interval = .77–.86). These results indicate excellent discriminatory power for the OCI-R total scale. Accordingly, we elected to use total scores to examine the diagnostic accuracy of the OCI-R.

Diagnostic accuracy was evaluated by calculating the sensitivity, specificity, positive predictive power, negative predictive power, and overall hit rate of various OCI-R total scores. Sensitivity refers to the percentage of patients correctly classified as having OCD (i.e., true positives), while specificity refers to the percentage of patients correctly classified as having a different anxiety disorder (i.e., true negatives). Because sensitivity and specificity are independent of the base rate of the condition of interest, they cannot directly address the issue of whether or not a particular patient with a known test score has the condition

Table 4
Predictive accuracy of the OCI-R at selected cutoff scores

OCI-R cutoff score	Sensitivity (%)	Specificity (%)	Positive predictive power (%)	Negative predictive power (%)	Hit rate (%)
5	26.1	100	100.0	63.5	67.8
10	47.9	94.5	87.2	70.0	74.2
11	51.4	91.3	82.0	70.8	73.8
12	57.7	86.9	77.4	72.6	74.2
13	62.0	83.6	74.6	73.9	74.2
14	64.1	82.5	74.0	74.8	74.5
15	67.6	80.3	72.7	76.2	74.8
16	69.7	79.2	72.3	77.1	75.1
17	71.1	73.8	67.8	76.7	72.6
18	73.9	70.5	66.0	77.7	72.0
19	75.4	69.4	65.6	78.4	72.0
20	78.2	65.0	63.4	79.3	70.8
25	87.3	53.0	59.0	84.3	68.0
30	90.1	43.2	55.2	84.9	63.7
35	95.8	21.9	48.7	87.0	54.2
40	98.6	13.1	46.8	92.3	50.5

Note. Calculations of positive predictive power and negative predictive power were based on an OCD diagnosis base rate of 51.9%.

(Elwood, 1994). Accordingly, we calculated estimates of positive and negative predictive power to take into account the base rate of OCD in our sample (56.1%). In the present study, positive predictive power refers to the probability that an individual with a score at or above a given cutoff has a diagnosis of OCD, while negative predictive power refers to the probability that an individual with a score below a given cutoff does not have a different anxiety disorder. Finally, hit rate refers to the percentage of all patients correctly classified by a given cutoff score.

Table 4 presents diagnostic accuracy figures for selected OCI-R total scores. A cutoff score of 14 provided the best balance between positive and negative predictive power in our sample. This cutoff score correctly classified 64.1% of OCD patients and 82.5% of patients with other anxiety disorders. Given an OCI-R total score of 14 or higher, the probability of having OCD was 74.0%, while the probability of having a different anxiety disorder when the score was below 14 was 74.8%.

3. Discussion

The present study was conducted to examine the psychometric properties and construct validity of the OCI-R in a heterogeneous sample of patients with anxiety disorders. Our factor analytic findings closely replicated those reported in previous studies (Foa et al., 2002; Hajcak et al., 2004) and indicate that the OCI-R consists of six internally consistent subscales assessing washing, checking, ordering, obsessing, hoarding, and neutralizing symptoms. The OCI-R demonstrated adequate convergent validity with measures of related symptoms and cognitions. OCI-R total and subscale scores discriminated patients with OCD from those with other anxiety disorders, and the OCI-R subscale scores demonstrated a pattern of theoretically consistent associations with OCD symptom clusters (e.g., contamination, ordering). Overall, our findings support the reliability, validity, and clinical utility of the OCI-R.

With respect to psychometric properties, we found that the OCI-R total score and the subscales possess satisfactory internal consistency among patients with OCD and other anxiety disorders. Confirmatory factor analysis indicated an adequate fit for the six-factor solution originally reported by Foa et al. (2002). The pattern of correlations among the subscales reveals that among patients with OCD and other anxiety disorders, there is relatively little overlap in what the various symptom-based subscales measure.

The OCI-R scales demonstrated mild-to-moderate correlations with the Y-BOCS, another measure of OCD symptom severity. These correlations were likely attenuated by the fact that the OCI-R subscales measure the distress associated with specific OCD complaints, whereas the Y-BOCS is a global measure of severity that incorporates five parameters (time, interference, distress, resistance, and control). This difference in focus, combined with the inherent method variance (the OCI-R is a self-report measure whereas the Y-BOCS is a

semi-structured interview), might account for the lower than expected correlation coefficients we observed.

The washing, checking, obsessing, and ordering subscales also evidenced mild-to-moderate correlations with measures of depression and trait anxiety. In this respect, the OCI-R, like the Y-BOCS (e.g., Deacon & Abramowitz, 2005), appears to exhibit good convergent validity but weak divergent validity. The OCI-R hoarding subscale was correlated weakly with other OCI-R subscales and was not significantly associated with the Y-BOCS or most other study measures. Moreover, when examining diagnostic accuracy, the AUC for hoarding was .54, which is close to chance. These findings are consistent with recent research that raises questions about whether hoarding symptoms in fact represent a dimension of OCD (Grisham, Brown, Liverant, & Campbell-Sills, 2005; Wu & Watson, 2005). Specifically, research and clinical observations suggest that hoarding itself is heterogeneous with some patients reporting hoarding along with other types of OCD symptoms (e.g., checking, ordering) and others reporting only hoarding symptoms. Grisham et al. (2005) found evidence that in the absence of other obsessions and compulsions, hoarding is likely distinct from OCD. An alternative explanation for our findings in the present study is that our sample contained a relatively small number of patients with primary hoarding symptoms.

To our knowledge, this study is the first to examine correlations between OCI-R subscales and cognitive variables proposed to underlie OCD symptoms in a clinical sample. Our findings were generally consistent with theoretical hypotheses and empirical findings on the cognitive underpinnings of various OCD symptom presentations (e.g., McKay et al., 2004; Tolin, Woods, & Abramowitz, 2003). For example, inflated responsibility was moderately associated with checking and obsessional symptoms, but not with hoarding or ordering. The tendency to misinterpret intrusive thoughts as threatening was moderately associated with obsessional symptoms, but weakly correlated with washing, ordering, and hoarding. Moral TAF was associated only with obsessing, whereas likelihood TAF was associated with neutralizing symptoms. The correspondence between our findings and the relevant cognitive-behavioral theory (see McKay et al., 2004) provides indirect evidence of the construct validity of the washing, checking, ordering, obsessing, and hoarding subscales. In contrast, results for the neutralizing subscale were unexpected. Only the tendency to believe that thinking bad thoughts increases the probability of unfortunate outcomes (i.e., likelihood TAF) was at least mildly correlated with the Neutralizing subscale.

The OCI-R and its subscales differentiated patients with OCD from those with other anxiety disorders. We also found evidence of excellent discriminative validity for the washing, checking, ordering, hoarding, and obsessing subscales. For each of these subscales, OCD patients with the corresponding clinical complaint obtained significantly higher scores than patients with other types of OCD symptoms as well as those with other anxiety disorders. In contrast, the neutralizing subscale did not show known groups validity. Specifically, we expected that patients with severe obsessional thoughts, who tend to engage in mental rituals and other neutralizing

strategies, would score most highly on this subscale. Instead, there were few differences between OCD patient groups, and this subscale did not distinguish patients with other anxiety disorders from OCD patients with contamination, harming, or hoarding symptoms. A likely explanation for this finding is that all three items on the neutralizing subscale of the OCI-R relate to numbers and counting—complaints that are observed across the various presentations of OCD (e.g., Calamari et al., 2004), but that are most prominent in patients with symmetry, ordering, and incompleteness symptoms (e.g., Leckman et al., 1997). These findings suggest that the neutralizing subscale is misnamed and possesses weaker construct validity than the other OCI-R subscales.

Our ROC analyses suggest that OCI-R total scores are useful for diagnostic purposes. In our sample, approximately three-fourths of individuals with scores ≥ 14 had a principal diagnosis of OCD, whereas approximately three-fourths of patients with scores ≤ 14 had a different anxiety disorder diagnosis. Thus, the OCI-R appears to be a useful screening measure and diagnostic aid for detecting OCD when administered to a heterogeneous group of anxiety disorder patients. It is important to note that our findings regarding the predictive accuracy of the OCI-R were influenced by the relatively high base rate of OCD in our sample (51.9%). A different cutoff score may prove optimal in settings where OCD is less frequent, such as in primary care clinics.

In summary, the present study suggests that the OCI-R is a psychometrically sound and valid measure of OCD and its various symptom presentations. Consistent with previous research, we found that the OCI-R (a) consists of six distinct factors, (b) demonstrates good convergent validity, and (c) performs well in discriminating OCD from other anxiety disorders (Foa et al., 2002; Hajcak et al., 2004). We extended existing research by reporting a theoretically consistent pattern of associations between OCI-R subscales and OCD-related cognitive variables, and by demonstrating that five of the six OCI-R subscales correspond closely to identified OCD symptom dimensions or subtypes. Based on these findings, we recommend the OCI-R as an empirically validated assessment instrument that can be used in a wide range of settings for research on OCD and its various symptom presentations.

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