



Reliability and validity of the Child Behavior Checklist Obsessive-Compulsive Scale

Eric A. Storch^{a,b,*}, Tanya K. Murphy^b,
Daniel M. Bagner^c, Natalie B. Johns^b,
Audrey L. Baumeister^b, Wayne K. Goodman^b,
Gary R. Geffken^b

^a *Department of Pediatrics, University of Florida, Gainesville, FL 32610, USA*

^b *Department of Psychiatry, Box 100234, University of Florida, Gainesville, FL 32610, USA*

^c *Department of Clinical and Health Psychology, University of Florida, Gainesville, FL 32610, USA*

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Abstract

This study examined the psychometric properties of the Obsessive-Compulsive Scale (OCS) of the Child Behavior Checklist (CBCL). Participants included 48 youth with obsessive-compulsive disorder (OCD), 41 with a non-OCD internalizing disorder, and 101 with an externalizing disorder. Confirmatory factor analysis of the 8-item OCS did not result in an adequate fit. Exploratory factor analysis identified a 1-factor model consisting of 6 items. Adequate internal consistency for the revised OCS (OCS-R) was obtained, and convergent validity was supported by moderate relationships with other OCD indices. The OCS-R had stronger associations with measures of OCD symptoms than with measures of depression and externalizing behaviors. Youth with OCD had significantly higher OCS-R scores than those with internalizing and externalizing disorders. Suggestions for cutoff scores are provided using results from ROC analyses. Overall, these findings suggest that the OCS-R is a reliable and valid instrument for the assessment of pediatric OCD.

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* Corresponding author. Tel.: +1 352 392 3611; fax: +1 352 846 1455.
E-mail address: estorch@psychiatry.ufl.edu (E.A. Storch).

Previously thought rare, recent research has identified pediatric obsessive-compulsive disorder (OCD) as one of the most common childhood psychiatric illnesses with a point-prevalence rate between 2 and 4% (Douglass, Moffitt, Dar, McGee, & Silva, 1995; Maina, Albert, Bogetto, & Ravizza, 1999; Rapoport & Inoff-Germain, 2000). Symptoms frequently begin in childhood (DeVeauh-Geiss et al., 1992), with insidious onset, and pursue a protracted yet fluctuating course (Murphy et al., 2004). Not surprisingly, pediatric OCD is related to significant functional impairment within academic, family, and social domains largely due to distress and frequency of ritual engagement (Piacentini, Bergman, Keller, & McCracken, 2003).

Advances in psychological and pharmacological interventions strongly suggest that early detection and treatment can improve prognosis (Leonard et al., 1993; Pediatric OCD Treatment Study Team, 2004). Yet, the vast majority of children with OCD do not receive appropriate, complete intervention (Heyman et al., 2001). One likely explanation for this finding is the lack of standardized assessment instruments appropriate for large-scale screenings that sufficiently capture the broad phenomenology of symptoms. Only two self-report instruments appear suitable for such screenings, namely the Leyton Obsessional Inventory-Child Version (LOI-CV; Berg, Whitaker, Davies, Flament, & Rapoport, 1988) and the Children's Florida Obsessive-Compulsive Inventory (C-FOCI; Storch et al., 2004). Although both have acceptable psychometric properties, a major limitation is the inability of each to capture the broad range of symptoms often present. Rather, the instruments focus on presence and severity of specific symptoms with relatively high base rates (e.g., checking rituals, germ obsessions), thereby neglecting less frequently occurring obsessions and/or compulsions (e.g., ritualized eating, sexual obsessions, horrific images).

The Child Behavior Checklist (CBCL; Achenbach, 1991) is a widely used parent-report questionnaire designed to assess the behavioral problems and social competencies of children 4–18 years of age. Recently, Nelson et al. (2001) developed a factorally derived 8-item Obsessive-Compulsive Scale (OCS) imbedded within the CBCL. Analyses for this study were conducted in a sample of 73 youth with OCD, 73 with a non-OCD psychiatric disorder, and 73 healthy controls. The OCS had good internal consistency ($\alpha = .84$) and discriminated between youth with OCD and a mixed psychiatric diagnostic group and non-psychiatric controls. Using cutoff scores at the 60th and 70th percentiles, sensitivity was 75–85% and specificity was 82–93%. Other measures of OCD (e.g., Children's Yale-Brown Obsessive-Compulsive Scale [CY-BOCS]) or impairment were not included to examine convergent or divergent validity. A second relevant study was conducted to determine genetic, age, gender, and environmental contributions to OCS scores (Hudziak et al., 2004). Participants were a large twin sample taken from the Netherlands Twin Registry and the Missouri Twin Study. Findings suggested that OCS scores were highly heritable and influenced by genetic and unique environmental factors in younger children. Genetic and environmental influences were

consistent across gender and age within the younger group, but were less for older children.

Overall, a major strength of the OCS over existing OCD measures is that the OCS assesses general constructs of OCD (e.g., “obsessions” and “compulsions”) and characteristics that are not specific to a single symptom (e.g., “strange ideas”). A second strength is that the use of parent-ratings addresses the issue of underreporting that is frequently characteristic in ego-syntonic OCD (Merlo, Storch, Murphy, Goodman, & Geffken, *in press*). Additional advantages of the OCS that are specific to the CBCL include the ease of administration and scoring, translation into 43 languages, existence of parallel teacher and self-report measures, and utility for assessing other psychiatric symptomatology. Despite positive findings of Nelson et al. (2001) and Hudziak et al. (2004), however, there are several compelling reasons to further evaluate the OCS. First, the OCS item content was based on results from a principal factor analysis where factors with eigenvalues greater than one were extracted. Use of this criterion alone to extract factors is susceptible to retaining too many factors (Velicer, Eaton, & Fava, 2000). In contrast, utilizing algorithms (e.g., Glorfeld’s extension [Glorfeld, 1995] and minimum average partials (MAP) method [Velicer, 1976]) has been emphasized as the most accurate method of recovering the true number of factors (O’Connor, 2000). Thus, results must be replicated in an independent sample to ensure factor reliability. Second, estimates of convergent and divergent validity of the OCS were not obtained which limits understanding of the OCS clinical utility. Finally, discriminant validity was examined through comparisons with a mixed diagnostic group and non-psychiatric control group. Examining discriminant validity with such samples limits the ability to determine the extent to which instruments are assessing specific or common features across child psychopathology (Schniering & Rapee, 2002). Few studies have examined the discriminant validity of measures between clinical disorders with similar nosological composition, namely other internalizing disorders.

Given these issues, the specific aims of this study were as follows: (1) to re-examine the factor structure found by Nelson et al. (2001) using a different sample of children and adolescents with OCD; (2) to examine further psychometric properties of the OCS, including internal consistency, convergent and divergent validity, and discriminant validity; and (3) to provide information about the specificity and sensitivity of the OCS.

1. Method

1.1. Participants

Participants were obtained from two sources: (a) consecutive patients with OCD at an outpatient psychiatry clinic diagnosed with OCD by a board certified child psychiatrist with 10 years experience in OCD and related disorders (TKM),

and (b) children and adolescents with a non-OCD psychiatric condition seen for outpatient psychodiagnostic testing by a licensed clinical psychologist with 16 years experience in child psychopathology (GRG). Psychiatry clinic patients were seen between March and November 2004. Psychodiagnostic assessments were conducted between January 1998 and November 2004. In both instances, diagnoses were based on a detailed clinical interview and all available clinical information. In the Psychiatry clinic, diagnoses were confirmed by one of two licensed clinical psychologists with extensive experience in pediatric OCD. Written consent/assent to participate, approved by the University of Florida Institutional Review Board (IRB), were obtained for patients attending the psychiatry clinic. Approval from the University of Florida IRB was obtained to conduct an archival records review of children and adolescents seen for psychodiagnostic testing.

The final sample consisted of 190 children and adolescents (55 female and 135 male). Overall, the mean age of the sample was 10.5 years (S.D. = 3.3, range = 4–18 years). The ethnic composition was: 86% Caucasian, 8% African American, 2% Latin American, and 4% parent-identified as “Other.” No significant differences were found in gender, age, or ethnicity across groups.

The sample was classified into three diagnostic groups: Group I included 48 subjects with a primary diagnosis of OCD (OCD Group); Group II included 41 participants with internalizing disorders other than OCD (e.g., generalized anxiety disorder, major depression; Internalizing Group); and Group III included 101 subjects with externalizing disorders (e.g., conduct disorder, oppositional defiant disorder, attention-deficit hyperactivity disorder; Externalizing Group). The children in Group II had the following primary diagnoses: generalized anxiety disorder ($n = 8$), posttraumatic stress disorder ($n = 4$), anxiety disorder not otherwise specified (NOS) ($n = 3$), social phobia ($n = 1$), specific phobia ($n = 3$), major depression ($n = 10$), depressive disorder NOS ($n = 6$), dysthymic disorder ($n = 6$). The children in Group III had the following primary diagnoses: oppositional defiant disorder ($n = 41$), conduct disorder ($n = 6$), disruptive behavior disorder NOS ($n = 4$), attention deficit hyperactivity disorder, combined type ($n = 35$), attention deficit hyperactivity disorder, inattentive type ($n = 7$), attention deficit hyperactivity disorder, not otherwise specified ($n = 6$), and alcohol abuse ($n = 2$). No Group II or III children had comorbid diagnoses of OCD.

1.2. Measures

1.2.1. Child Behavior Checklist

The Child Behavior Checklist (Achenbach, 1991) is an empirically derived behavior rating scale, appropriate for children and adolescents between the ages of 4 and 18. Parents rate items on a 3-point scale: 0 = not true, 1 = somewhat or sometimes true, and 2 = very true or often true. The CBCL is widely used and has established psychometric properties. Mean test-retest reliabilities have been

reported to range from 0.95 to 1.00, and internal consistency has ranged from 0.78 to 0.97 (Achenbach, 1991).

1.2.2. Children's Yale-Brown Obsessive-Compulsive Scale

The Children's Yale-Brown Obsessive-Compulsive Scale (Scahill et al., 1997) is a clinician rating scale for children and adolescents based upon the adult version (Goodman et al., 1989a,b). The 10-item CY-BOCS rates the severity of obsessions and compulsions over the past week. The CY-BOCS is internally consistent, stable over 6 weeks, and has good convergent and divergent validity (Scahill et al., 1997; Storch et al., 2004a). Cronbach's α for the Total Score was .87.

1.2.3. Children's Depression Inventory – Short-Form

Presence and severity of depressive symptoms were assessed using the Children's Depression Inventory – Short-Form (CDI-S; Kovacs, 1992). The CDI-S is a 10-item self-report measure adapted from the original 27-item version. The child endorses one of three statements that best describe his or her cognitive, affective, or behavioral symptoms of depression during the previous 2 weeks. Psychometric studies of the CDI-S, within clinical and non-clinical populations, suggest that the measure has relatively high levels of internal consistency and convergent and divergent validity (Kovacs, 1992). Cronbach's α in this sample was .76.

1.2.4. Tourette's Disorder Scale – Parent Rated

The Tourette's Disorder Scale – Parent Rated (TODS-PR; Shytle et al., 2003) is a 15-item parent-rated scale designed to measure a broad range of symptoms common to Tourette's disorder, including tics, obsessions, compulsions, inattention, hyperactivity, aggression, and mood disturbances. Factor analysis has identified four factors, namely OCD, Tics, Aggression, and ADHD (Shytle et al., 2003; Storch et al., 2004b). Factor items are summed to derive factor scale scores. A Total Score is computed by summing all items. Support for the convergent and divergent validity of the TODS-PR scores has been reported (Shytle et al., 2003; Storch et al., 2004b). Cronbach's α in this sample for the Total Score, OCD, Tics, Aggression, and ADHD factors were .92, .72, .78, .93, and .90.

1.3. Procedures

Following obtainment of parental consent and child assent for the children and adolescents diagnosed with OCD who were seen in the psychiatry clinic, families were administered the CBCL, CY-BOCS, TODS-PR, and CDI-S. Experienced clinicians (either a postdoctoral clinical psychology fellow or psychiatric nurse) administered the CY-BOCS to both the child and parent jointly. Training consisted of an instructional meeting about the CY-BOCS content and structure with the first or second author, two practice interviews, and two directly observed interviews. Children and parents completed their respective measure(s) in a

private research office following administration of the CY-BOCS. The CY-BOCS, TODS-PR, and CDI-S were not collected for the non-OCD participants. Data on the CY-BOCS, TODS-PR, or CDI-S were not included for six youth with OCD due to various reasons (e.g., incomplete, not collected due to time constraints by family).

1.4. Analytic plan

To examine the factor analytic structure of the OCS in the current sample, we performed a confirmatory factor analyses (CFA) using LISREL 8.53 on the OCD group (Jöreskog & Sörbom, 2002). The measurement and structural models were evaluated with the following fit indices: χ^2 , the Goodness of Fit Index (GFI), the comparative fit index (CFI), the incremental fit index (IFI), Normed Fit Index (NFI), Relative Fit Index (RFI), and the root mean square residual (RMR). GFI, CFI, IFI, NFI, and RFI fit indices range from 0 to 1, with values of .95 or higher indicating an adequate fit between the observed model and the theoretical model (Chou & Bentler, 1993). For the RMR, values below .05 indicate a good fit and values as high as .08 represent an adequate fit, and these values match the numbers recommended for the Root Mean Square Error of Approximation. In the event that the data did not adequately fit the hypothesized model, we planned to conduct an exploratory factor analysis using algorithms such as Glorfeld's extension and minimum average partials method.

The internal consistency of the OCS was evaluated using Cronbach's α coefficient (Cronbach, 1951). Pearson product-moment correlations were conducted to examine the relations between the OCS and clinician-ratings of OCD severity, self-reported depression, and parent-reported OCD symptoms, behavior, and tics. One-way analysis of variance (ANOVA) was calculated to investigate differences in the OCS across diagnostic groups (OCD vs. Internalizing vs. Externalizing). A statistically significant ANOVA was further examined using Tukey honestly significant difference (HSD) follow-up tests for pairwise comparisons. We also computed sensitivity and specificity against the Internalizing and Externalizing Groups to assess the diagnostic accuracy of cut-off scores.

2. Results

2.1. Factor analysis

Based on the previously found 1-factor structure of the OCS (Nelson et al., 2001), all eight items were specified as loading on the single factor. The Goodness of Fit for this model was poor, $\chi^2(21, N = 48) = 97.18, P < .001$, with fit indices corroborating this finding, GFI = .59, RMR = .28, NFI = .26, CFI = .26, IFI = .31, and RFI = .009.

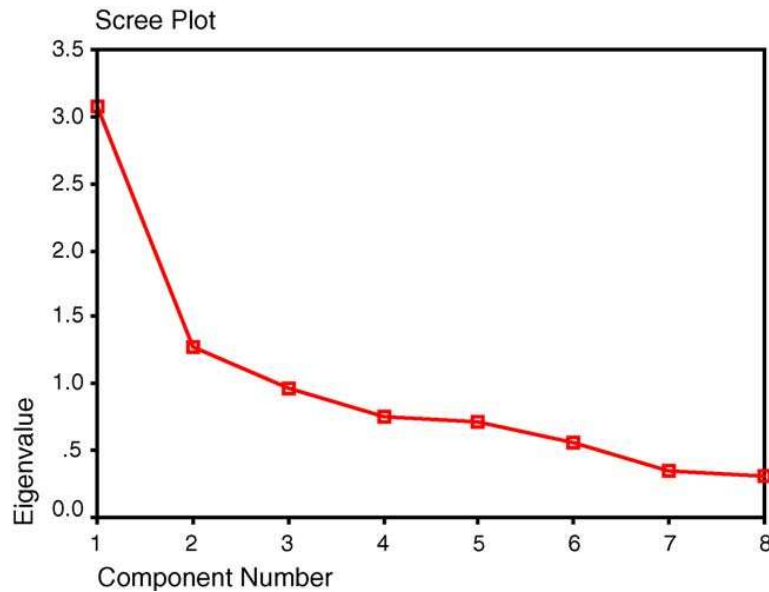


Fig. 1. Scree plot for the OCS-R exploratory factor analysis.

Given this, a principal axis exploratory factor analysis (EFA) was performed to identify a model that fits the current sample data. Criteria for identifying the factors were based on: (1) Glorfeld's version of parallel analysis with a sample size of $N = 48$ and $k = 8$ variables (the eigenvalue must be greater than 1.663 eigenvalues for the first component, 1.388 for the second component, and 1.20 for the third component, using the 95th percentile and 1000 replications); (2) the minimum average partials method (Velicer, 1976); and (3) the scree plot (see Fig. 1). A 1-factor solution meeting these criteria and accounting for 38% of the variance was identified (eigenvalue = 3.066 for the factor). With the use of available syntax (O'Connor, 2000), Velicer's MAP test was conducted and indicated one component as well. Items 32 (feels he/she has to be perfect) and 84 (strange behaviors), however, loaded on a second factor and were subsequently dropped from the scale because the second factor was not sufficiently strong to be retained. The eigenvalue was only 1.273, which was less than the required value (1.388) from Glorfeld's version of parallel analysis. In addition, the MAP method and scree plot are evidence for retaining only the first factor. Thus, our revised version of the OCS (OCS-R) contains six items. See Table 1 for factor loadings.

Table 1
Exploratory factor analysis of the OCS-R

Item no.	Item	Factor loading
112	Worries	.79
31	Feels he/she might think or do something bad	.78
52	Feels too guilty	.70
85	Strange ideas	.64
9	Can't get his/her mind off certain thoughts; obsessions	.62
66	Repeats certain acts over and over; compulsions	.42

2.2. Reliability and convergent validity

Cronbach's α for the OCS-R was .75. The OCS-R correlated strongly with the OCS ($r = .96, P < .001$). Table 2 presents correlations among the OCS-R, original OCS, and measures of OCD, depression, tics, and behavior. Overall, correlations between the OCS-R and measures of OCD (CY-BOCS and TODS-PR OCD factor) were highest. The OCS-R was also correlated with the CDI Total Score, TODS-PR Aggression factor, TODS-PR ADHD factor, and TODS-PR Total Score with correlations of a moderate effect size. The OCS-R was not significantly related to the TODS-PR Tic factor. The relations between the original OCS and CY-BOCS and TODS-PR OCD factor were slightly lower as compared to the OCS-R. Additionally, associations between the original OCS and the CDI Total Score, TODS-PR Aggression factor, TODS-PR ADHD factor, and TODS-PR Total Score were slightly higher than those with the OCS-R.

2.3. Criterion validity

The overall model examining differences on the OCS-R among the three diagnostic groups was significant, $F(2, 187) = 11.87, P < .001$. Tukey's post hoc analyses suggest that youth diagnosed with OCD ($M = 6.48, S.D. = 3.52$) had significantly higher scores on the OCS-R than youngsters with internalizing ($M = 4.75, S.D. = 3.17$) and externalizing behavior disorders ($M = 3.69, S.D. = 3.46$).

Table 2

Pearson product moment correlations for various measures of psychological functioning

	(1) N = 42	(2) N = 42	(3) N = 42	(4) N = 42	(5) N = 42	(6) N = 42	(7) N = 42	(8) N = 42
(1) OCS-R	1.00							
(2) CY-BOCS Total	.54** (.48**)	1.00						
(3) CDI Total	.38* (.38*)	.32*	1.00					
(4) TODS-PR Aggression	.45** (.50**)	.44**	.36*	1.00				
(5) TODS-PR ADHD	.44** (.46**)	.55**	.30	.81**	1.00			
(6) TODS-PR OCD	.60** (.56**)	.71**	.41**	.54**	.55**	1.00		
(7) TODS-PR Tic	.05 (.03)	.48**	.11	.52**	.67**	.42**	1.00	
(8) TODS-PR Total	.49** (.50**)	.63**	.37*	.90**	.93**	.72**	.74**	1.00

Note: Correlations between the original OCS and respective indices are presented in parentheses in column 1. OCS-R = Obsessive-Compulsive Scale – Revised; CY-BOCS Total = Children's Yale-Brown Obsessive-Compulsive Scale Total Score; CDI Total = Children's Depression Inventory Total Score; TODS-PR Aggression = Tourette's Disorder Scale – Parent Rated Aggression factor; TODS-PR ADHD = Tourette's Disorder Scale – Parent Rated ADHD factor; TODS-PR OCD = Tourette's Disorder Scale – Parent Rated OCD factor; TODS-PR Tic = Tourette's Disorder Scale – Parent Rated Tic factor; TODS-PR Total = Tourette's Disorder Scale – Parent Rated Total Score.

* $P < .05$.

** $P < .01$.

Table 3
OCS-R cutoff scores and their sensitivity and specificity values

OCS-R	Sensitivity	Specificity
OCD vs. internalizing disorders		
2.5	.896	.244
3.5	.771	.415
4.5	.688	.561
5.5	.583	.683
OCD vs. externalizing disorders		
2.5	.896	.485
3.5	.771	.594
4.5	.688	.673
5.5	.583	.723

Using ROC analysis, we examined cutoff values that distinguished individuals with OCD from those with other internalizing disorders and those with externalizing disorders. First, an ROC analysis was performed on the OCD group ($n = 48$) and the internalizing disorders group ($n = 41$). The area under the curve (AUC) was .656 and was significant versus the chance or random ROC line ($P < .01$). As shown in Table 3, an OCS-R score of 4.5 provided the optimum balance between sensitivity and specificity. That is, 69% of individuals with OCD were correctly classified and 56% of the individuals with other internalizing disorders were correctly classified. A second ROC analysis was conducted on the OCD group ($n = 48$) and the externalizing disorders group ($n = 101$). The AUC was .732 and was significantly different from the random ROC line ($P < .0001$). As shown in Table 3, sensitivity and specificity were maximized at a cutoff value of 3.5. The majority of the OCD participants (77%) were correctly classified, and 59% of the externalizing group was correctly classified.

3. Discussion

The importance of detecting and monitoring obsessive-compulsive symptoms in pediatric populations highlights the need for a valid, reliable, and sensitive instrument that can be used in routine clinical practice or as a screening tool. Two measures have been developed in an attempt to achieve this goal, yet the utility of both are limited by the heterogeneous nature of pediatric OCD symptoms. Recently, Nelson et al. (2001) developed the OCS, a subset of questions contained within the CBCL that are hypothesized to assess shared phenomenological elements across diverse pediatric OCD clinical presentations. Although initial psychometric properties of the OCS were promising, a number of psychometric results needed replication or initial examination, including the factor structure, convergent and divergent validity, and criterion validity. Accordingly, each of these was addressed within this study.

The OCS factor structure was examined using confirmatory and exploratory factor analytic techniques. A CFA of the model found by Nelson et al. (2001) resulted in a relatively poor fit in the present sample. A subsequent EFA revealed a similar 1-factor model that retained six of the eight original items (items 32 (feels he/she has to be perfect) and 84 (strange behavior) were deleted). Several reasons may account for differences between these results and those of Nelson et al. (2001). First, we used stringent criteria for factor extraction which may be most appropriate for the research questions addressed in this study (O'Connor, 2000). Second, our sample may have differed from Nelson et al. (2001) in terms of demographics and illness presentation (e.g., comorbidity). The questions deleted may be more applicable for adolescents than child; thus, the relatively younger age of this sample may have influenced our findings. Although our sample was somewhat smaller than that of Nelson et al. (2001), our sample size conforms to accepted guidelines for factor analysis (Hair, Anderson, Tatham, & Black, 1998).

Reliability and validation analyses were generally supportive for the utility of the OCS-R. The internal consistency was adequate, although slightly lower than Nelson et al. (2001). However, the OCS-R correlated strongly with the OCS, suggesting that the original version may not provide additional information beyond the OCS-R. Convergent validity was supported vis-à-vis moderate relationships with parent-rated and clinician-rated OCD symptoms. The OCS-R was also positively and moderately associated with depression, aggressive behavior, and ADHD symptoms. Intuitively, this may reflect the comorbidity inherent in pediatric OCD. For example, studies have documented high comorbidity with depression (26%; Swedo, Rapoport, Leonard, Lenane, & Cheslow, 1989), disruptive behavior (53%; Geller, Biederman, Griffin, Jones, & Lefkowitz, 1996), and ADHD (48%; Storch et al., 2005). Of note, our reduction of two items may provide a more efficient symptom measurement as the OCS-R showed relatively higher relationships with measures of OCD and slightly lower associations with measures of behavior than the original OCS.

The OCS-R successfully discriminated between youth with OCD and those with an internalizing or externalizing disorder. ROC analyses demonstrated that the OCS-R had acceptable sensitivity and specificity in classifying youth with OCD from those with an internalizing or externalizing disorder. Use of cutoff scores should be based on the goals of the measurement. For example, if one wishes to capture all youth with OCD and has little concern for false positives, a cutoff score of 2.5 would correctly classify 90% of cases with OCD, but only exclude 24% of youth with a different internalizing disorder and 49% of those with an externalizing diagnosis. These modest figures may be reflective, in part, of the use of a sample with high external validity (e.g., multiple comorbid disorders, attending a outpatient university psychology clinic) and the shared symptom presentation between OCD and other internalizing disorders. On balance, however, sensitivity and specificity figures were lower than Nelson et al. (2001) and not uniformly high for any particular cutoff value suggesting the limits of relying on the OCS-R alone as a screening instrument. Administering adjunctive

measures concurrently, such as the LOI-CV and C-FOCI, is recommended and may improve the accuracy of detection rates.

These findings should be interpreted in the context of several limitations. First, as this is only the second psychometric examination of the OCS and our analysis favored a slightly revised scale, numerous empirical questions remain. For example, is the OCS-R factor structure stable, reliable between raters and over time, sensitive to treatment effects, and uniform across age and gender? Although Hudziak et al. (2004) provides convincing evidence for the stability of the OCS across gender and age, this should be examined in the revised measure. Second, we did not examine specificity and sensitivity in a sample of children without a psychiatric diagnosis. Specificity and sensitivity estimates may be greater in such a sample. Third, given that many children disguise or hide their symptoms, parents may under-report symptoms on the OCS-R. Despite this limitation, the OCS-R is currently the only known parent-report instrument for the assessment of pediatric OCD a fact that takes on increased salience given that many youth will misrepresent symptom severity. On balance, the OCS should not be used in isolation as parents may not be aware of certain symptoms, particularly those which are embarrassing to the youth. Finally, although both attending providers have considerable clinical experience and are board certified or licensed (and OCD diagnoses were confirmed by an independent clinician), diagnoses were made on the basis of an unstructured clinical interview and thus, may reflect some subjectivity.

In sum, the content of the OCS-R is similar to the OCS, yet results in a briefer, psychometrically sound measure. Given the wide use, strong psychometric properties, and ease of administration and scoring of the CBCL, the OCS-R provides a method of screening for obsessive-compulsive symptoms in a manner that is less influenced by symptom heterogeneity than symptom specific measures. Although these data support the reliability and validity of the OCS-R, we highlight the need for future studies to examine additional psychometric questions (e.g., factor structure, inter-parent reliability, and temporal stability).

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