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Development and Psychometric Evaluation of the Children's Yale-Brown Obsessive-Compulsive Scale Second Edition

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Abstract

Objective: To develop and examine the psychometric properties of the Children's Yale-Brown Obsessive-Compulsive Scale Second Edition (CY-BOCS-II) in children and adolescents with obsessive-compulsive disorder (OCD).

Method: Youth with OCD ($N=102$; range 7–17 years), who were seeking treatment from one of two specialty OCD treatment centers, participated in the study. The CY-BOCS-II was administered at an initial assessment, and measures of OCD symptom severity, anxiety and depressive symptoms, behavioral and emotional problems, and global functioning were also administered. Inter-rater and test-retest reliability were assessed on a subsample of participants ($n=50$ and $n=31$, respectively) approximately one week after initial assessment.

Results: The CY-BOCS-II demonstrated moderate-to-strong internal consistency ($\alpha = .75-.88$) and excellent inter-rater ($ICC = .86-.92$) and test-retest reliability ($ICC = .95-.98$) across all scales. Construct validity was supported by strong correlations with clinician-rated measures of OCD symptom severity and moderate correlations with measures of anxiety symptoms. Exploratory factor analysis revealed a two-factor structure, which was generally inconsistent with its adult counterpart, the Yale-Brown Obsessive-Compulsive Scale Second Edition (Y-BOCS-II).

Conclusion: Initial findings support the CY-BOCS-II as a reliable and valid measure of obsessive-compulsive symptoms in youth.

Keywords

Children's Yale-Brown Obsessive-Compulsive Scale; obsessive-compulsive disorder; validity; assessment; treatment

Introduction

The Children's Yale-Brown Obsessive Compulsive Scale (CY-BOCS) ^{1,2} is the most widely used measure of clinician-rated obsessive-compulsive symptom severity. It has been translated into numerous languages and its psychometric properties have been supported across many studies.³ Despite its extensive use and established psychometric properties, there is a need for revision to reflect improved phenomenological understanding of obsessive-compulsive disorder (OCD) since the original development of the CY-BOCS over 25 years ago.

First, avoidance is now recognized as a central feature within OCD,⁴ with the presence of avoidance associated with greater symptom severity in adults.⁵ However, avoidance is not presently integrated into the symptom severity rating on the CY-BOCS and instead is captured by a single ancillary item.

Second, the original CY-BOCS total score ranges from 0 to 40 based on item responses ranging from 0 to 4, with ratings of 4 capturing a wide range of patients in the severe to extremely severe range. As a result, this original rating scheme can have difficulty

differentiating between individuals who present at the upper limits of severity and experience severity that is beyond the CY-BOCS ceiling. For example, an individual who dedicated 8 hours of their day to compulsions would be clinically distinct from someone who spent every waking minute engaging in compulsions, but this would not be detected with the CY-BOCS, suggesting the need for a more sensitive rating scale, particularly in the upper range of severity.

Third, the resistance to obsessions item has demonstrated poor psychometric properties across numerous studies, suggesting limited utility in quantifying overall obsessive-compulsive severity.^{1,6,7} Instead of resistance against obsessions, duration between obsessions is believed to provide a better proxy for illness severity, and is conceptually consistent with the cognitive behavioral principles which underlie the leading psychological treatment for OCD,⁸ in which youth are encouraged to sit with the discomfort rather than attempt to distract themselves and resist the obsessions.

Finally, the symptom checklist, although comprehensive, required updates. The original symptom checklist did not take into account avoidance, grouped symptoms by headings (which led to confusion), and contained awkward or ambiguous wording of some items. Thus, to increase the utility and precision of the measure, it is important to update the symptom checklist and also provide practical examples to minimize rater confusion regarding more complicated symptoms.

With these considerations in mind, and in parallel with its adult counterpart (Y-BOCS-II),^{9,10} we developed the CY-BOCS Second Edition (CY-BOCS-II). Although no data have been reported to date on the CY-BOCS-II, the Y-BOCS-II has been the subject of several investigations. The Y-BOCS-II Severity Scale has established internal consistency ($\alpha = .86-.89$) and test retest reliability ($r = .81$). Convergent validity is strong, as evidenced by large correlations with other measures of OCD symptom severity^{10,11} and related impairment.¹¹ Divergent validity was established vis-à-vis non-significant correlations with symptoms of anxiety and impulsiveness and moderate correlations with symptoms of depression.¹¹ Exploratory factor analysis has supported a two-factor structure consisting of obsessive items and compulsive items.¹⁰

In the present study, we examined the psychometric properties of the CY-BOCS-II. First, we examined the internal consistency, inter-rater reliability, and 1-week test-retest reliability of the CY-BOCS-II scores. Second, we examined the convergent validity of the CY-BOCS-II with clinician-rated and self-reported measures of obsessive-compulsive symptom severity. Third, we examined the divergent validity of the CY-BOCS-II with measures of parent- and child-rated measures of anxiety and depression, and other relevant characteristics. Fourth, we examined the association of the CY-BOCS-II with other relevant clinical characteristics. Finally, we examined the factor structure of the CY-BOCS-II.

Method

Participants

Participants in this study included 102 children (54% male), ages 7 – 17 years old, and their parents, who were seeking evaluation and potential treatment from one of two specialty OCD treatment centers. Some demographic data were missing on 6 youths. Youths were Caucasian ($n = 88$), African American ($n = 1$), Asian ($n = 1$), Middle Eastern ($n = 2$), or Other ($n = 5$) with 5 parents not their child's disclosing race. Seven children were Hispanic. Over half of the families reported a total household income of over \$100,000 ($n = 53$), with the remainder most frequently falling in the \$80,000 - \$99,999 ($n = 13$) and \$40,000 - \$59,999 ($n = 12$) ranges. Individuals had a primary diagnosis of OCD, defined by the criteria set forth in the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-V)¹², given by a licensed psychologist with extensive OCD assessment and diagnosis experience. Following chart review and discussion regarding the clinical presentation of the patient, the OCD diagnosis was corroborated by a second psychologist.¹³ Presence of comorbid disorders did not exclude patients from this study if their primary diagnosis remained OCD; however, patients presenting with schizophrenia, mental retardation, pervasive developmental disorders or neurological disorders were not eligible for participation.

Measures

Children's Yale-Brown Obsessive Compulsive Scale Second Edition (CY-BOCS-II).

The CY-BOCS-II is a revised version of the original CY-BOCS,¹ which is a clinician-rated measure of obsessive-compulsive symptom severity in children. As discussed above, the CY-BOCS-II was developed to address emergent concerns about the original CY-BOCS measure regarding specific items and the sensitivity of the entire scale. In addition to the revision of the CY-BOCS Severity Scale, the symptom checklist was also updated in the CY-BOCS-II. Development of the CY-BOCS-II involved several steps. First, items and formatting from the Y-BOCS-II were adapted by the investigators to be relevant for parents and children in terms of OCD content, as well as language. Thereafter, the preliminary CY-BOCS-II was reviewed by child psychologists and psychiatrists with expertise in OCD for item content, wording, and formatting. Delphi procedures were used such that comments were integrated into a revised version that was rereviewed by these individuals for additional comments, which were integrated. Finally, the measure was pilot-tested in a sample of children with OCD and their parents (not included in the present study), and clinicians who administered the measure. Feedback about content, wording, and practical administration was received and, if appropriate, integrated.

Clinical Global Impression-Severity (CGI-S).¹⁴

The CGI-S is a measure used to rate psychopathology severity on a 7-point scale. This measure is clinician-rated, with a severity rating ranging from 0 (which indicates no illness) to 6 (indicating extremely severe symptoms). The CGI-S has proven to be responsive to treatment and is often used in psychotherapy and psychopharmacology trials.¹⁵

National Institute of Mental Health Global Obsessive Compulsive Scale (NIMHGOCS).¹⁶

The NIMH-GOCS is a clinician-rated single-item measure used to assess OCD symptom severity and global functioning. Ratings are provided via a Likert scale, ranging from 1 (indicating minimal symptoms) to 15 (indicating very severe symptoms). There is high test-retest reliability over a 2-week period with this measure ($r_s = .87-.98$),¹⁷ good interrater reliability ($r_s = .77-.95$) and high correlations with the Y-BOCS ($r = .68$).¹⁸

Child Version of the Obsessive Compulsive Inventory (OCI-CV).¹⁹

The OCI-CV is a 21-item assessment used to measure obsessive-compulsive symptoms based on a 3-point rating scale, with ratings ranging from 0 (*never*) to 2 (*always*). This measure has strong retest reliability and internal consistency for both subscale and total scores.^{19,20}

Screen for Child Anxiety Related Disorders (SCARED).²¹

The SCARED is a 41-item measure used to assess anxiety disorders in children across four areas, including panic/somatic, separation anxiety, generalized anxiety, and social phobia. Each question is scored on a 3-point Likert-type scale which comes in two versions, the child self-report version (SCARED-C) and the parent-rated version (SCARED-P). The SCARED is a valid and reliable measurement tool with good internal consistency, as well as moderate parent-child correlations.²²

Short Mood and Feelings Questionnaire – Parent/Child Report (SMFQ-P/C).²³

The SMFQ-P/C is a 13-item measure with high internal consistency used to assess depressive symptoms in children and adolescents. Each question is scored on a 3-point Likert-type scale, with responses ranging from 0 (*not true*) to 2 (*true*). This measure is a quick self-report tool completed by parents on behalf of their children.

Child Behavioral Checklist (CBCL).²⁴

The CBCL is a widely-used parent-report measure used to assess behavioral and emotional problems in children. The assessment collects demographic data as well as scores for positive behaviors, school functioning, and social competence. The internalizing and externalizing subscales were of particular interest for the purposes of this study. Each question is scored on a Likert-type scale, with scores ranging from 0 (*not true*) to 2 (*very true*).

Procedure

Parents in this study provided written informed consent, and children provided assent, as approved by the institutional review board (IRB) at each clinic's institution. An initial assessment was comprised of a semi-structured interview conducted by an experienced psychiatrist or psychologist, as well as the administration of the CY-BOCS-II immediately after this visit by a trained masters- or doctoral level provider who was different than the evaluating clinician. The child and parent were each interviewed alone; final ratings were made by the clinician using their clinical judgment. The clinician rated symptom severity on

the CGI-S and NIMH-GOCS. Clinicians had prior experience in the administration of the CY-BOCS-II and received additional training, including attending an instructional meeting, observing a minimum of five clinical administrations of the CY-BOCS-II, and administering the assessment three times under direct observation. Administration of the measure was audio-recorded and later independently rated by a second observer for 50 participants (49%) to determine inter-rater reliability. Following the collection of these clinician-rated measures, participants completed self-report measures. In order to examine test-retest reliability, the CY-BOCS-II was readministered in-person to 31 participants (30.4%) roughly one week after their initial intake by the same clinician. The child had not participated in any new intervention during this interval. Inter-rater reliability was examined via review of audiotapes. Ongoing supervision by the first author was provided to clinicians. External incentives were not offered to any participants for participation in this study.

Analytic Plan

Descriptive statistics were calculated to examine the mean, standard deviation, and range for all measures used in the present study. Frequency and severity of obsessive-compulsive symptoms were examined based on the CY-BOCS-II. Independent sample *t* tests were conducted to determine potential sex differences on the questionnaires, and Pearson correlations were used to investigate potential associations between age and constructs of interest. Internal consistency was calculated separately for the CY-BOCS-II Obsession Severity Scale, Compulsion Severity Scale, and the Total Severity Scale using Cronbach's alpha. Inter-rater reliability was calculated using the intraclass correlation coefficient (ICC) using a two-way random effects model, set for absolute agreement. Test-retest reliability was assessed using the ICC through a two-way mixed-effects model, measuring for absolute agreement. Construct validity was examined through Pearson correlations. Confirmatory factor analyses (CFA) were conducted to examine the fit of three predetermined two-factor structures; the first proposed model was split between the Obsession Severity Scale items and the Compulsion Severity Scale items, and the second proposed model was based on the Interference/Severity and Resistance/Control Factors.^{7,25,26} A third model was a replication of the first proposed model, but it incorporated correlated residuals among parallel obsession and compulsion items based on recent CY-BOCS findings.²⁷ Fit was determined via multiple methods, including the chi square test, comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). To determine an adequate fit, a χ^2 value closer to 0, CFI value > 0.95 , RMSEA value < 0.08 , and SRMR value < 0.08 were determined to have acceptable fit. SPSS version 24²⁸ was used to conduct all analyses, except for the factor analyses, which were conducted using Mplus Version 7.²⁹

Results

Table 1 displays the descriptive statistics for all clinician-, parent-, and child-rated measures for the study. Table 2 displays CY-BOCS-II item frequencies and descriptive statistics. When considering potential sex differences on the various study measures, only the child-reported SCARED, $t(84) = 1.28$, $p < .01$, and OCI-CV, $t(84) = 0.000021$, $p < .05$, demonstrated statistically significantly higher scores for females versus males; all other measures had *p*'s

> .05. Regarding correlations between age and the study measures, the CY-BOCS-II Total ($r = .20, p = .049$), parent-reported SMFQ ($r = .25, p < .05$), and CBCL internalizing ($r = .22, p = .046$) scores exhibited small, positive, and statistically significant correlations; all other measures had p 's > .05.

Reliability

Internal Consistency.—The internal consistencies of the Obsession Severity Scale and Total Severity Scale were good, Cronbach's $\alpha = .86$ and $.88$, respectively. The internal consistency of the Compulsion Severity Scale was acceptable, Cronbach's $\alpha = .75$.

Inter-rater Reliability.—Inter-rater reliability ($n = 50$) was good to excellent across all scales. The inter-rater reliability for the Obsession Severity Scale was good ($ICC = .86$, 95% CI [.77, .92]). The inter-rater reliability for the Compulsion Severity Scale was excellent ($ICC = .92$, 95% CI [.86, .95]), as was the inter-rater reliability for the Total Severity Scale ($ICC = .91$, 95% CI [.84, .95]).

Test-retest Reliability.—The test-retest reliability ($n = 31$) of the Obsession Severity Scale ($ICC = .95$ [.90, .98]), Compulsion Severity Scale ($ICC = .98$ [.96, .99]), and Total Severity Scale ($ICC = .96$ [.92, .98]) were all excellent.

Construct Validity

When examining the correlations between the CY-BOCS-II Total Severity score and various OCD measures (Table 3), the CY-BOCS-II demonstrated large, positive correlations with both of the clinician-rated measures (CGI-S and NIMH GOCS). A medium, positive correlation was found between the CY-BOCS-II and the OCI-CV total scores.

When examining the correlation between the CY-BOCS-II Total Severity scale and divergent constructs (Table 3), the CY-BOCS-II exhibited small, positive correlations with parent-reported child anxiety and child externalizing symptoms. However, a small, negative correlation was observed for child-reported depressive symptoms. Medium correlations were found between the CY-BOCS-II and child-reported anxiety, parent-reported child depressive symptoms, and child internalizing symptoms.

Factor Structure

Table 4 displays the goodness-of-fit indices for the three CFAs that were conducted. All three models displayed poor fit, as determined by all goodness-of-fit indicators, though the SRMR values were barely above the proposed cutoff of < .08 (.08 - .09). Additional CFAs using categorical estimators were conducted to determine whether the model fit was affected by item response characteristics, but they failed to improve the overall fit.

Given the poor fit from the two proposed CFAs, an exploratory factor analysis (EFA) was subsequently conducted, using the default settings in Mplus Version 7 (e.g., geomin rotation, maximum likelihood method for extracting factors). Ultimately, a two-factor solution was determined based on retaining factors that had eigenvalues > 1 and parallel analysis. Table 5 displays the geomin-rotated factor loadings for the final two-factor model. In the end, one

factor contained the items measuring resistance and control over compulsions (2-items), with the remaining items loading onto another factor (8-items).

Discussion

We report on the development and psychometric properties of the CY-BOCS-II. Overall, findings supported its use as a reliable and valid measure of obsessive-compulsive symptoms in youth. Reliability was measured by internal consistency, 1-week test-retest, and inter-rater reliability, ranging from good to excellent. Mean scores on measures were slightly higher than in previous studies using the CY-BOCS, which may be attributable to the expanded scoring range. Indeed, 9 children (9%) had scores above 40, which was the ceiling of the original CY-BOCS.

Construct validity was also supported. The measure was strongly associated with other clinician ratings of obsessive-compulsive symptom severity, as well as with child self-reports of obsessive-compulsive symptom, frequency, and distress. Only modest relationships were found with anxiety symptoms in general, which supports the ability of the CY-BOCS-II to measure OCD specifically, without being significantly influenced by co-occurring anxiety or depression. CY-BOCS-II scores were negatively correlated with child-reported depression severity, although modestly positively related to parent-rated reports of child depressive symptoms. The inverse correlation with child-rated depression symptoms was somewhat surprising, given the long-established history supporting the linkage between OCD and depression in youth and adults.^{30–32} However, this may reflect the independence of the measure from depression and/or be attributable to the method of assessing depression through self-report.

The CY-BOCS-II factor structure was not consistent with its adult counterpart. Rather, a two-factor structure was found, in which 8 items assessing interference and distress related to obsessions and compulsions, as well as control against obsessions, loaded on one factor. The second factor included two items assessing resistance and control against compulsions. The resistance and control items have historically loaded on different factors; this may reflect difficulty by the affected individual and/or rater in assessing/conceptualizing these questions resulting in divergent factor structures. Indeed, the EFA results may not fit into current theoretical models, likely due to the poor fit of items 7 and 8 (resistance and control), so these item properties should be examined in future research. Additionally, it may be that removing resistance against obsessions item altered the scale composition in such a manner that the factor structure now reflects obsessive-compulsive severity and compulsion resistance/control. On balance, it is worth noting that the CY-BOCS (and Y-BOCS) factor structure has varied across studies,³³ which may reflect differing sample characteristics.

The present study had several limitations. First, a structured diagnostic interview was not performed. However, clinical diagnostic interviews followed by consensus diagnostic procedures conducted by several experienced psychiatrists and psychologists in OCD were used to verify primary and co-occurring diagnoses. Second, our sample was fairly homogeneous in terms of ethnicity/racial variables. Further investigations are warranted in diverse samples, as well as translations into languages other than English. Finally, not all

youths had retest or inter-rater administrations. Within these limitations, this is the first report on the development and psychometric properties of the CY-BOCS-II, with initial findings demonstrating promising results.

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Table 1

Descriptive Statistics for Study Measures

Measure	<i>M</i>	<i>SD</i>	Range
CY-BOCS-II Obsession Severity Scale	15.01	4.41	3 – 24
CY-BOCS-II Compulsion Severity Scale ^a	14.98	4.33	2 – 23
CY-BOCS-II Total Severity Scale ^a	29.99	8.03	5 – 46
CGI-S	3.58	0.96	1 – 6
NIMH GOCS ^b	8.49	2.12	2 – 13
OCI-CV ^c	15.92	9.22	0 – 42
SCARED-C ^c	30.95	18.81	0 – 82
SCARED-P ^e	29.26	17.77	0 – 75
SMFQ-C ^d	9.88	6.54	0 – 26
SMFQ-P ^f	17.58	6.25	0 – 26
CBCL Internalizing ^h	19.25	10.33	1 – 50
CBCL Externalizing ^e	10.70	8.33	0 – 37

Note: N = 101 unless otherwise specified. CBCL = Child Behavior Checklist. CGI-S = Clinical Global Impression-Severity. CYBOCS-II = Children's Yale-Brown Obsessive Compulsive Scale – II. NIMH GOCS = National Institutes of Mental Health Global Obsessive Compulsive Scale (NIMH-GOCS). OCI-CV = Obsessive-Compulsive Inventory – Child Version. SCARED-P/C = Screen for Child Anxiety Related Emotional Disorders – Parent/Child Report. SMFQ-P/C = Short Mood and Feelings Questionnaire – Parent/Child Report.

^a *n* = 100

^b *n* = 98

^c *n* = 86

^d *n* = 88

^e *n* = 95

^f *n* = 96

^g *n* = 88

^h *n* = 87

Individual Children's Yale-Brown Obsessive Compulsive Scale – II (CY-BOCS-II) Item Frequencies and Descriptive Statistics

Table 2

CY-BOCS-II Item	M	SD	Range	Frequency of Endorsement					
				0	1	2	3	4	5
1. Time on obsessions	2.70	1.14	1 – 5	0	14	33	32	13	9
2. Obsession-free interval	3.19	0.97	1 – 5	0	4	17	46	24	10
3. Control over obsessions	3.55	1.09	0 – 5	1	6	6	28	43	17
4. Distress associated with obsessions	2.97	1.19	0 – 5	1	10	23	37	17	13
5. Interference from obsessions	2.59	1.12	0 – 5	1	19	25	34	19	3
6. Time on compulsions	2.52	1.15	1 – 5	0	22	28	34	10	7
7. Resistance against compulsions	3.00	1.56	0 – 5	9	14	5	32	20	20
8. Control over compulsions	3.50	1.10	0 – 5	1	7	4	34	38	17
9. Distress if compulsions prevented	3.27	1.10	1 – 5	0	7	13	44	20	17
10. Interference from compulsions	2.66	1.16	0 – 5	3	15	24	33	23	3

Correlation Matrix Between Children's Yale-Brown Obsessive Compulsive Scale – II (CY-BOCS-II) and Measures of Obsessive-Compulsive Disorder (OCD) and Child Psychopathology

	1	2	3	4	5	6	7	8	9	10
1. CY-BOCS-II										
2. CGI-S	.80***									
3. NIMH-GOCS	.79***	.90***								
4. OCI-CV	.35**	.27*	.24*							
5. SCARED-C	.34**	.27*	.19	.69***						
6. SCARED-P	.25*	.29**	.21	.34**	.68***					
7. SMFQ-C	.24*	.14	.15	.35**	.49***	.35**				
8. SMFQ-P	.36***	.41***	.37***	.40***	.49***	.60***	.45***			
9. CBCL-I	.31**	.28**	.21	.39***	.61***	.78***	.46***	.79***		
10. CBCL-E	.24*	.27**	.21*	.14	.08	.27**	.06	.39***	.44***	

Note: CBCL-I/E = Child Behavior Checklist – Internalizing/Externalizing. CGI-S = Clinical Global Impression-Severity; CY-BOCS-II = Children's Yale-Brown Obsessive Compulsive Scale – II; NIMH GOCS = National Institutes of Mental Health Global

Obsessive Compulsive Scale (NIMH-GOCS); OCI-CV = Obsessive-Compulsive Inventory – Child Version; SCARED-P/C = Screen for Child Anxiety Related Emotional Disorders – Parent/Child Report; SMFQ-P/C = Short Mood and Feelings Questionnaire – Parent/Child Report.

* $p < .05$

** $p < .01$

*** $p < .001$

Goodness-of-Fit Indicators for Children's Yale-Brown Obsessive Compulsive Scale – II (CY-BOCS-II) Confirmatory Factor Analysis (N = 100)

Table 4

Model	χ^2	df	CFI	RMSEA	SRMR
Model 1	123.13 ***	34	.83	.16	.08
Model 2	138.20 ***	34	.80	.18	.09
Model 3	77.68 ***	27	.90	.14	.08

Note: CFI = Comparative Fit Index. CY-BOCS-II = Children's Yale-Brown Obsessive Compulsive Scale – II. RMSEA = Root Mean

Square Error of Approximation. SRMR = Standardized Root Mean Residual. Model 1 = Obsessions Factor (Items 1–5) and Compulsions Factor (Items 6–10), Model 2 = Interference/Severity Factor (Items 1–3, 6–8) and Resistance/Control Factor (Items 4, 5, 9, 10).

$p < .001$

Table 5

Geomin Rotated Factor Loadings and Eigenvalues for the Children's Yale-Brown Obsessive Compulsive Scale – II (CY-BOCS-II) Based on a 2-Factor Solution through Exploratory Factor Analysis

CY-BOCS-II Item	Factor 1	Factor 2
1. Time on obsessions	.78	–.01
2. Obsession-free interval	.65	–.01
3. Control over obsessions	.61	.25
4. Distress associated with obsessions	.74	.11
5. Interference from obsessions	.76	–.02
6. Time on compulsions	.72	–.10
7. Resistance against compulsions	–.01	.81
8. Control over compulsions	.32	.70
9. Distress if compulsions prevented	.78	.13
10. Interference from compulsions	.74	.001
<i>Eigenvalues</i>	5.10	1.42

Note. The highest loadings for each item have been bolded.