Development and Preliminary Psychometric Evaluation of the Children's Saving Inventory

**Eric A. Storch · Jordana Muroff · Adam B. Lewin · Daniel Geller ·
Abigail Ross · Katherine McCarthy · Jessica Morgan ·
Tanya K. Murphy · Randy Frost · Gail Steketee**

Abstract This study reports on the development and initial psychometric properties of the Children's Saving Inventory (CSI), a parent-rated measure designed to assess child hoarding behaviors. Subjects included 123 children and adolescents diagnosed with primary Obsessive–Compulsive Disorder (OCD) and their parents. Trained clinicians administered the Children's Yale-Brown Obsessive–Compulsive Scale (CY-BOCS), items assessing Family Accommodation and the Clinical Global Impressions—Severity index. Parents completed the CSI, Child Obsessive–Compulsive Impact Scale (COIS)—Parent Version and Child Behavior Checklist. Youth completed the COIS—Child Version, Obsessive–Compulsive Inventory Child Version (OCI-CV), Multidimensional Anxiety Scale for Children, and Children's Depression Inventory—Short Form. A four factor solution was identified; factors were named Discarding, Clutter, Acquisition, and Distress/Impairment. Internal consistency for the CSI Total and factor scores were good. One-week test–retest reliability ($n = 31$) from a random subsample was excellent. Known groups validity was supported vis-à-vis higher CSI scores for those endorsing hoarding on the CY-BOCS Symptom Checklist. Convergent and discriminant validity was evidenced by weak relationships with OCI-CV Checking and Contamination factors but strong relationships with the OCI-CV Hoarding factor and with hoarding obsession/compulsions on

E. A. Storch (✉) · A. B. Lewin · J. Morgan · T. K. Murphy
Departments of Pediatrics and Psychiatry, University of South Florida, 800 6th Street South 4th Floor, St, Petersburg, FL 33701, USA
e-mail: estorch@health.usf.edu

J. Muroff · A. Ross · G. Steketee
School of Social Work, Boston University, Boston, MA, USA

D. Geller · K. McCarthy
Clinical and Research Program in Pediatric Psychopharmacology, Department of Psychiatry, Massachusetts General Hospital, Boston, MA, USA

R. Frost
Department of Psychology, Smith College, Northampton, MA, USA

the CY-BOCS. These findings provide initial support for the reliability and validity of the CSI for the assessment of hoarding behaviors among youth with OCD. Future studies are needed to extend these findings to non-OCD samples of youth.

Keywords Hoarding · Children's saving inventory · Assessment · Reliability · Validity

Introduction

Hoarding, among both adults and children, is characterized by the excessive and active acquisition of possessions, failure to discard possessions when appropriate, and associated impairment and distress [1, 2]. Considerable debate exists regarding its diagnostic classification; to date, hoarding is included within obsessive–compulsive disorder (OCD), although it is widely recognized that pathological hoarding can exist separate from the disorder [3, 4]. Although hoarding in adults has received increased scholarly attention in recent years [5, 6], there is very little available data on hoarding behaviors in children and adolescents. Yet, as many as 80% of individuals with hoarding experience symptom onset before the age of 18 years [7]. Additionally, youth and adults with OCD present with hoarding symptoms at similar rates [8, 9] with incidence of problematic hoarding among youth with OCD ranging from 26 to 42% [9–11] and as high as 58% in other non-OCD clinical populations (e.g., Prader-Willi Syndrome; [12, 13]).

One of the primary issues limiting investigation into hoarding among youth is the absence of a psychometrically sound instrument that can measure the multiple domains of hoarding in a developmentally sensitive manner. To date, hoarding has been assessed with two items on the Children's Yale-Brown Obsessive–Compulsive Scale Symptom Checklist that query the presence/absence of hoarding obsessions/compulsions [CY-BOCS; [14] or through several items on child-report and parent-report questionnaires of obsessive–compulsive symptoms that query the degree to which items are acquired and collected in an excessive fashion (e.g., Children's Obsessional Compulsive Inventory [CHOCI; [15]; Children's Florida Obsessive–Compulsive Scale [C-FOCI; [16]; Obsessive Compulsive Inventory—Child Version [OCI-CV; [17]). The CY-BOCS items are limited in scope (i.e., do not assess clutter) and do not provide an index of hoarding severity as the CY-BOCS Severity Scale is rated based on all endorsed obsessive–compulsive symptoms. The child- and parent-report measures do not capture the range of hoarding behaviors (e.g., CHOCI, C-FOCI, OCI-CV) and the CHOCI and C-FOCI do not allow for calculation of a separate hoarding index. With this in mind, we developed a parent-rated index of hoarding behaviors in their child that was based on the Saving Inventory-Revised [SI-R; [18, 19].

The SI-R is a self-report questionnaire designed for adults that assesses three domains of hoarding, namely difficulty discarding (i.e., difficulty parting with unneeded items), compulsive acquisition (i.e., acquiring items that are not needed or have limited value), and clutter (i.e., clutter within the home). The current version, which is based on the Saving Inventory [19], consists of 23-items anchored on 0 to 4 scales. Widely used, the SI-R has excellent psychometric properties including strong internal consistency [$\alpha = .91$–.94; [20]; convergent and divergent validity [20, 21]; known groups validity (i.e., hoarders scored higher than non-hoarders; [22]); and treatment sensitivity [23, 24].

This study reports on the development and preliminary evaluation of psychometric properties of the Children's Saving Inventory (CSI) in a relatively large sample of youth with OCD. We chose to study the initial psychometric properties of the CSI in youth

with OCD given the relatively high rates of hoarding symptoms in pediatric OCD patients [9–11] that would allow for increased variance in subject responses. As well, although hoarding may be removed from within OCD in the forthcoming version of the Diagnostic and Statistical Manual for Mental Disorders—Fifth Edition, this would not impinge on the utility of the CSI as the measure was designed to assess the child's difficulty discarding, compulsive acquisition, and overall clutter independent of diagnostic status. On this note, there exists no measure of hoarding symptoms among youth at this time, which will be critical for assessing this construct should a separate 'hoarding disorder' be instituted in the Diagnostic and Statistical Manual for Mental Disorders—Fifth Edition. The following questions were addressed in this study: (1) What is the factor structure of the CSI? (2) What is the internal consistency of the CSI Total Score and resultant factors? (3) Are CSI scores stable over a one-week period? (4) Does the CSI correlate with other measures of hoarding symptoms, OCD severity, and OCD-related impairment? (5) Is the CSI more strongly associated with child-rated hoarding symptoms than other OCD symptom dimensions? (6) Is the CSI able to provide meaningful differentiation between subjects rated by the clinician as exhibiting hoarding symptoms versus those who are not?

Method

Participants and Procedures

Participants included 123 youth (ages 8–17 years) diagnosed with OCD and their parents who were seen in one of two OCD specialty clinical research centers for treatment planning evaluations between October 2007 and July 2009 (Universities of South Florida/Florida [$n = 87$] and Massachusetts General Hospital [$n = 36$]). All participants had a primary diagnosis of OCD according to the Diagnostic and Statistical Manual Fourth Edition Text Revision [25]. Diagnoses were made based on a semi-structured clinical interview by an experienced clinical psychologist or board certified child psychiatrist. In addition, diagnoses were confirmed in a subset of the sample ($n = 95$) by administration of a widely accepted structured diagnostic interview (i.e., Anxiety Disorders Interview Schedule for Children [26]; Kiddie-Schedule for Affective Disorders and Schizophrenia [27]) by a trained research assistant. The diagnostic measure was administered within ten days following the semi-structured clinical interview as part of the child's involvement in research studies unrelated to the present investigation. Only youth for whom the OCD diagnosis was made with 100% certainty were included in this study. Status as a primary diagnosis was determined by assessing which illness was associated with the greatest level of impairment and distress per clinician judgment (which integrated parent and child-report, responses on clinical measures, and clinician impressions). Youth were excluded from participation if they had a diagnosis of psychosis, substance abuse, or bipolar disorder; a primary diagnosis other than OCD; or their parent/guardian was unable to provide appropriate consent for them due to cognitive functioning. Concurrent medication use was not exclusionary. Sample demographic and clinical characteristics did not differ across collection sites and are shown in Table 1. The majority of families were relatively affluent (46% reported a family income above $100,000; 16% reported an income of $76,000–100,000; 18% reported an income of $51,000–75,000, 20% reported an income of $26,000–50,000, and only 2% reported incomes of less than $25,000). Ten families

Table 1 Sample demographic characteristics (N = 123)

Age	M = 13.0 (SD = 2.9; range 8–17) years
Gender	62% male
Ethnicity	
% Caucasian/White	85.0% (n = 104)
% Hispanic/Latino	3.0% (n = 4)
% African American/Black	1.6% (n = 2)
% Other	10.4% (n = 13)
Mean CY-BOCS total score	23.0 (±5.9)
Mean CGI-severity score	3.6 (±1.1)
Percent of youth on psychiatric medication	70.5%
% With 1 or more Comorbid DSM-IV Axis I disorder	66.3%*
% With 2 or more Comorbid DSM-IV Axis I disorder	41.0%*
Attention deficit hyperactivity disorder	N = 26*
Generalized anxiety disorder	N = 17*
Major depression	N = 15*
Tourette syndrome/Chronic Tic disorder	N = 15*
Disruptive behavior disorder	N = 7*
Social phobia	N = 5*
Asperger's syndrome/PDD not otherwise specified	N = 6*
Trichotillomania	N = 2*
Body dysmorphic disorder	N = 1*
Separation anxiety disorder	N = 1*

CY-BOCS Children's Yale-Brown Obsessive Compulsive Scale, *CGI* Clinical Global Impression—Severity Scale, *DSM* Diagnostic and Statistical Manual

* Based on N = 95 (75%) of youth assessed with the Anxiety Disorders Interview Schedule for Children or Kiddie-Schedule for Affective Disorders and Schizophrenia

declined reporting income. Forty-one percent of participants endorsed hoarding symptoms on the Children's Yale-Brown Obsessive Compulsive Scale (CY-BOCS).

Institutional ethics boards at the respective sites approved all data collection procedures. Approximately 90% of families who were approached about study involvement provided informed consent and assent for their participation (there were no site differences in participation rates). Participants completed an assessment that lasted approximately one hour in duration involving the CY-BOCS, CSI, items assessing family accommodation, and parent- and child-rated measures. Following the clinical interview, the CY-BOCS was completed; thereafter, the parent and child independently completed questionnaires. Training of study raters at both sites included didactics on the measure and common symptom presentations; observation of experienced clinicians administering the CY-BOCS; and administering the CY-BOCS under direct supervision. Inter-rater reliability calculated on a random subsample of youth at the Universities of South Florida/Florida was high ($n = 31$; $r = .99$; $p < .001$). Approximately one week later, a subsample of parents completed the CSI a second time. The one week interval was chosen as families were seeking treatment, which may have confounded later stability estimates.

Measures

Child Saving Inventory (CSI)[1]

The CSI is the experimental measure under development in this study. At the time of administration, the CSI was a 23-item parent-rated scale with five ordinal response choices (None, A little/Minimal, Some/Moderate, Most/Much, Almost all/Completely). The CSI is based on the SI-R [19], a widely used adult self-report measure with well-established psychometric properties that are detailed above [20, 21]. Items from the SI-R were revised by several of the authors so that content would be applicable and appropriately worded for completion by parents of a child sample. Subsequently, an expert panel of clinical psychologists and psychiatrists with expertise in hoarding reviewed the items for initial content validity as well as for clarity. Revisions were made accordingly and items were re-screened by the panel for final review. Scale format and response choices were kept consistent with the SI-R. Higher scores suggest more hoarding behaviors.

Children's Yale-Brown Obsessive Compulsive Scale (CY-BOCS)

The CY-BOCS [14] is a clinician administered semi-structured interview and consists of a Symptom Checklist and Severity Scale. The parent and child were interviewed together. The Symptom Checklist measures the presence or absence of 54 OCD symptoms. Several studies have used the Symptom Checklist to derive measurements of symptom dimensions. Generally, the symptom dimensions of contamination/washing, symmetry/ordering, and hoarding were consistently found across studies. However, some studies found that the aggressive/checking and sexual/religious dimensions form a single factor [28, 29] whereas others found support for separate factors [30–32]. Given that the evidence reviewed in Mataix-Cols et al. [32] supports the validity of a five-factor model of symmetry/ordering, contamination/cleaning, sexual/religious obsessions, aggressive/checking, and hoarding, we chose to use the five-factor dimensional model of OCD for later analyses. Consistent with Storch et al. [33], the current presence of a primary symptom on the CY-BOCS Symptom Checklist was coded as 1; its absence was coded as 0. Scores on the five-factor analytically derived symptom dimensions (symmetry/ordering, contamination/cleaning, sexual/religious obsessions, aggressive/checking, and hoarding) were derived by summing the scores of the symptom categories for each dimension. The Severity Scale consists of 10-items that measure obsession and compulsion severity over the previous week on a five-point scale. Obsession and Compulsion Severity Scores are derived by summing the applicable five-items; a Total Score is derived by summing all ten items (higher scores suggest greater OCD severity). Ratings were made based on parent and child responses to items, together with clinical judgment and behavioral observations of any overt symptoms. Excellent psychometric properties and treatment sensitivity of the CY-BOCS have been shown [14, 34, 35]. Internal consistency for the Severity Scale in the present sample was $\alpha = .88$.

Clinical Global Impression: Severity Scale (CGI)

The CGI [36, 37] is a clinician-rated, single-item global scale with scores ranging from 0 ("no illness") to 6 ("serious illness").

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[1] A copy of the CSI can be obtained by contacting the corresponding author at the address provided.

Child Obsessive Compulsive Impact Scale-Child and Parent Versions (COIS-C and COIS-P)

The COIS-C/P [38–40] are parallel child- or parent-rated questionnaires that assess OCD related impairment across four primary domains: school activities, social activities, daily living, and family activities over the previous month. Four questions assess global impairment related to school, social activities, going places, and home/family activities. The COIS-C/P has demonstrated adequate psychometric properties, such as high internal consistency, convergence with OCD symptom severity [38, 41]; test–retest stability [40]; and treatment sensitivity [42]. Internal consistency was strong for the present sample ($\alpha = .96$ for both parent and child forms). Higher scores suggest elevated impairment.

Obsessive–Compulsive Inventory: Child Version (OCI-CV)

The OCI-CV [17] is a 21-item child self-report measure of obsessive–compulsive symptomology. Each item is rated on a 3-point scale that yields symptom severity scores across six factorially derived domains (e.g., Washing, Checking, Ordering, Obsessing, Hoarding, and Neutralizing). The OCI-CV is internally consistent ($\alpha > .81$; $\alpha = .88$ in the present sample) and shows strong test–retest reliability [17]. Higher scores suggest greater symptomology.

Family Accommodation (FA)

Family accommodation was assessed using the 13-items used by Calvocoressi et al. [43] to measure the degree to which family members have accommodated the child's OCD symptoms during the previous month (9 items) and the level of distress/impairment that the respondent and child experience due to accommodating behaviors (4 items). The parent/primary caregiver was administered these items in this study. The FA items have demonstrated good psychometric properties, including adequate internal consistency, and positive correlations with symptom severity, family relationships, and caregiver distress [44]. Strong internal consistency ($\alpha = .92$) was obtained in this study sample. Higher scores suggest increased family accommodation.

Children's Depression Inventory: Short Form (CDI-S)

The CDI-S [45] is a 10-item child-report questionnaire that is derived from the full 27-item measure that assesses the presence and severity of cognitive, affective, or behavioral symptoms of depression (e.g., negative mood, anhedonia, poor self-esteem) experienced by the child over the previous two weeks. In addition to a large normative database [45], studies have supported the psychometric properties of the CDI/CDI-S documenting adequate internal consistency, test–retest reliability, construct validity [45, 46] and treatment sensitivity [47]. Our sample yielded good internal consistency ($\alpha = .83$). Higher scores suggest more depressive symptomology.

Multidimensional Anxiety Scale for Children (MASC)

The MASC [48] is a 39-item youth-completed questionnaire that assesses a range of anxiety symptoms (e.g., Physical Symptoms, Social Anxiety Scale, Harm Avoidance, Separation/Panic Scale). Each item is answered on a 4-point scale (0 = never true about

me, 1 = rarely true about me, 2 = sometimes true about me, 3 = often true about me), with a total score comprising the sum of all items. Excellent psychometric properties have been reported including high internal consistency [α = .90; 48]; high test–retest reliability at intervals of three-weeks and three-months [r = .88 and .87; [48, 49]; and convergence with measures of anxiety and divergence with measures of depressive symptoms [48]. Internal consistency for the present sample was strong (α = .90). Higher scores suggest a greater endorsement of anxiety symptoms.

Child Behavior Checklist (CBCL)

The CBCL [50] is a 113-item questionnaire completed by parents that assesses behavior problems and social competencies of youth ages 4 to 18 years. Questions are answered on a 3-point scale (0 = never true, 1 = sometimes true, 2 = always true). The CBCL provides Internalizing and Externalizing Problem Scales, as well as eight subscales: Aggressive, Delinquent, Attention Problems, Thought Problems, Social Problems, Anxiety/Depression, Somatic Symptoms, and Withdrawn Behavior (higher scores suggest more problematic symptoms). Excellent psychometric properties have been reported, including good test–retest reliability, inter-parent agreement, internal consistency, and construct validity [50].

Data Analysis

Although the CSI is similar in content and scope to the SI-R, there are several key differences between the two measures, such as item content, wording, and the parent-report nature. Additionally, two previous psychometric studies of the SI-R yielded inconsistent factor solutions [19]. Specifically—in one analysis, distress/interference items loaded separately whereas in the other study they did not. Given this, we chose to use exploratory factor analysis (EFA) for scale identification rather than confirmatory factor analysis. Exploratory factor analysis with promax rotation was performed to determine the optimal factor structure. The oblique (promax) rotation was implemented to allow potential factors to correlate given the authors' *a priori* expectation that various aspects of hoarding behaviors would be interrelated. Criteria for identifying the factors were based on: (1) Glorfeld's [51] version of parallel analysis [52]; (2) the minimum average partials (MAP) method [51–54]; (3) examination of the scree plot. Parallel analysis and MAP are considered among the most accurate procedures for determining factor retention [55]. A minimum loading of greater than 0.32 was required for each item as it equates to approximately 10% overlapping variance with other items on the factor [55] although higher loading was required in cross-loading cases. Specifically, items cross- loading ≥0.5 on multiple factors would be permitted if the items correspond to each factor conceptually [55, 56].

Validity and reliability were assessed for the CSI Total score via correlations and *t*-tests. Given the ordinal nature of the CSI, Spearman's correlations were used in analyses; *p*-values ≤ .05 were interpreted as significant. Fisher's *r* to *z* transformations were used to contrast correlations to demonstrate convergent and discriminant validity. The internal consistency of the CSI scores was evaluated using Cronbach's α coefficient [57]. For identifying differences in sample characteristics between the test–retest group and the overall sample, multivariate analysis of variance (MANOVA) was utilized.

Results

Scale Development and Factor Analysis

Two items from the 23-item CSI were deleted prior to EFA due to low item-to-total correlations (below $r = .20$; see Table 2 footnote; [58–61]). Subsequently, EFA with promax rotation was performed to determine the optimal factor structure for this sample.

Factor Retention

Parallel analysis identified that real-data eigenvalues must exceed random data eigenvalues 0.89, 0.71, 0.61, and 0.51 for factors 1 through 4, respectively. Similarly, MAP indicated four factors for our sample size of $N = 123$ and $k = 21$ variables (eigenvalues must be at least 11.2 for the first component, 1.6 for the second component, 1.0 for the third component and 1.1 for the fourth component using the 95th percentile and 1000 replications. Consequently, the authors accepted the four-component solution, produced by EFA, accounting for 75.8% of the variance (eigenvalues were 11.2, 1.6, 1.3, and 1.1) and was consistent with the scree plot. Data are presented in Table 2.

Table 2 Rotated factor loadings and communality coefficients for CSI

Content of CSI items	Discarding	Clutter	Acquisition	DI	Communalities
Difficulty throwing away unneeded items	**.92**	.09	−.06	.01	.89
Distress throwing items away	**.92**	.08	−.15	.05	.82
Strength of urge to save unneeded items	**.74**	−.18	.24	.14	.82
Avoid discarding items due to distress/time	**.68**	.32	−.15	.07	.73
Keep something despite lack of storage space	**.79**	−.05	.20	.01	.85
Unable to discard item when parent requests	**.80**	−.04	.19	.00	.84
Room clutter	.00	**.76**	.00	.08	.64
Parent spends substantial time dealing with possessions	.00	**.59**	.22	.00	.53
Difficulty walking in home due to child's clutter	−.15	**.93**	−.14	.11	.72
Playroom clutter	.31	**.64**	.15	−.09	.82
Clutter prevents home use	.27	**.73**	.05	−.13	.78
Clutter stops parents from inviting guests	.02	**.65**	.13	.01	.57
Strength of urge to buy or acquire	.05	.01	**.77**	.13	.78
Compelled to acquire something seen	.38	−.13	**.74**	−.08	.83
Frequency of buying unneeded items	.11	−.02	**.82**	−.01	.79
Parents avoid taking child shopping due to hoarding behavior	−.08	.16	**.84**	−.16	.65
Distressed when new items cannot be acquired	−.34	.17	**.54**	.50	.65
Interference with interpersonal relations	.10	.04	.21	**.55**	.62
Upset by others touching belongings	.05	.10	−.19	**.94**	.87
Upset when others discard items	.31	−.11	−.04	**.80**	.85

Numbers in **bold** represent items with highest loadings on each factor; *DI* Distress and Impairment; Items rating child's control over urges to acquire and urge to save were omitted due to low item-to-total correlations

The first factor (6 items), identified as Discarding, produced uniformly strong factor loadings that ranged from .68 to .92. The 2nd factor also contained 6 items and was labeled Clutter. High factor loadings were obtained, ranging from .59 to .93. The 3rd factor contained 5 items that can be described as Acquisition; factor loading were high, ranging from .54 to .84. The final factor, labeled Distress/Impairment, contained 4 items. Loadings were also high for this factor, ranging from .50 to .94 [62]. Overall, no loading or crossloadings in this model were below .506 (loadings of at least .50 are considered strong loadings [55]). Communalities are markedly strong for this model (.2–.4 are adequate; .6 or higher are excellent [63]). In fact, approximately half of the communalities can be considered high [64]. One item ('Attachment to items interfering with functioning') was deleted given two loadings of inadequate strengths based on our proposed analytical strategies. Accordingly, all subsequent analyses will present data based on a 20-item measure with one item loading on two factors (Acquisition and Distress/Impairment). This item was counted in both factor scores, but only once in the CSI Total Score.

Face-Validity

Examination of respective item loadings appear logical and related to the factor content. Further, inter-correlations between CSI factor scores (see Table 3) suggest separate yet related constructs. Further, the factors are consistent with prior research using the SI-R in adult samples [18, 19].

Reliability

Internal Consistency

Strong internal consistency was found for each CSI scale: CSI Total Score ($\alpha = .96$), Discarding ($\alpha = .95$), Clutter ($\alpha = .90$), Acquisition ($\alpha = .94$) and Distress/Impairment ($\alpha = .84$). Within scale inter-item correlations range as follows: Total Score (.22–.84), Discarding (.60–.89), Clutter (.41–.75), Acquisition (.69–.84) and Distress/Impairment (.46–.79), $p < .001$ for all values.

Table 3 Interrelations between CSI Scores

	(1)	(2)	(3)	(4)	(5)
(1) CSI discarding	1				
(2) CSI clutter	.70***	1			
(3) CSI acquisition	.76***	.66***	1		
(4) CSI distress/impairment	.69***	.62***	.68***	1	
(5) CSI total	.93***	.86***	.87***	.82***	1
Mean (SD)	7.9 (7.2)	7.1 (5.6)	5.8 (4.9)	5.2 (4.1)	24.7 (18.5)
Skew	.38	1.1	.63	.37	.72
Kurtosis	−.77	.79	−.42	−.75	−.41

CSI Child Saving Inventory, *SD* Standard Deviation

*** $p < .001$

Test–Retest Reliability

One-week test–retest data were collected for a random sample representing 25% ($n = 31$) of subjects participating in this research. MANOVA, used to analyze differences between subjects completing test–retest data and youth in the overall sample who did not complete the test–retest, was non-significant for group differences suggesting that these groups did not differ on symptom measures and demographic variables (including the CSI). Strong, positive correlations between the original administration and the retest administration were observed for the CSI Total Score ($r = .92$), Discarding ($r = .85$), Clutter ($r = .89$), Acquisition ($r = .86$) and Distress/Impairment ($r = .90$) (all $p < .001$).

Criterion-Related Validity

Convergent Validity

Correlations between CSI scores and extant measures of hoarding suggest convergent validity. For example, the CSI Total Score related strongly with the OCI-CV Hoarding factor (Child Rated), $r = .69$, $p < .001$ and with hoarding obsession/compulsions on the CY-BOCS ($r = .53$, $p < .001$).

Discriminant Validity

Lower correlations were found between the CSI Total Score and other OCI-CV factors (e.g., OCI-CV Checking factor $r = .12$, $p = .23$ and OCI-CV Washing factor $r = .23$ $p = .02$). Using Fisher's r to z transformation, both relationships were significantly lower than the relation between the OCI-CV Hoarding factor and the CSI Total Score ($z = 5.04$ and 4.13, both $p < .001$ for OCI-CV Checking and Washing factors respectively).

Construct Validity

Means and standard deviations for the CSI Total and factor scores are in Table 3. The CSI differed based on the subject's present endorsement of both hoarding obsessions [$t(71) = -4.2$, $p < .001$] and hoarding compulsions [$t(71) = -7.2$, $p < .001$] on the CY-BOCS. The mean CSI Total Score for those endorsing hoarding compulsions (26% of participants) was 44.7 (SD = 17.7) versus 17.9 (SD = 12.1) for those not endorsing hoarding compulsions on the CY-BOCS. Similarly, the mean CSI Total Score for those endorsing hoarding obsessions (30% of participants) was 37.1 (SD = 19.5) versus 19.4 (SD = 14.5) for those not endorsing hoarding obsessions on the CY-BOCS.

Clinical Correlates

Demographics

No gender differences were identified on the CSI Total Score [$t(103) = 1.5$, $p = .12$], Acquisition factor [$t(103) = -.59$, $p = .55$] or the Distress/Impairment factor [$t(103) = .42, p = .68$]. Girls had more problems with Discarding [$t(103) = -2.1, p = .04$] and Clutter [$t(103) = 2.1, p = .04$] than did boys. Scores on the CSI Total Score ($r = -.21$, $p = .03$), Discarding factor ($r = -.28$, $p = .004$), and Acquisition factor ($r = -.28$, $p = .003$) were inversely correlated with age.

Table 4 Relationship of hoarding to parent and child rated interference

		CSI Total Score
COIS-parent	Total interference	.22*
	Social interference	.11
	School interference	.24**
	Family interference	.21*
	Daily living interference	.22*
COIS-child	Total interference	.34***
	Social interference	.17
	School interference	.30**
	Family interference	.35***
	Daily living interference	.31**

CSI Child Saving Inventory, COIS Child Obsessive Compulsive Impact Scale

*** $p < .001$; ** $p < .01$; * $p = .05$

Relations with OCD and Other Clinical Symptoms

No significant associations between the CSI Total Score and CY-BOCS Obsession ($r = .04$, $p = .73$) and Compulsion ($r = .15$, $p = .16$) scales were identified. Similarly, the CSI did not relate to CGI-Severity ratings ($r = .07$, $p = .50$). The CSI Total Score was modestly associated with child-reported anxiety on the MASC ($r = .23$, $p = .02$) but not with child-rated depressive symptoms on the CDI-S ($r = .19$, $p = .06$). Notably, hoarding rated on the CSI was directly correlated with OCD-specific impairment (child and parent rated) on the COIS-C/P (see Table 4), a number of behavioral and emotional domains on the CBCL (see Table 5), and with family accommodation ($r = .27$, $p = .01$).[2]

Discussion

In the absence of a sound measure of hoarding symptoms in youth, we developed the CSI, a parent-rated inventory of child hoarding behaviors. The development and evaluation of the CSI followed an empirical/statistically-based approach for measure development, including optimizing scale length (rejecting items with poor item-to-total correlations) and evaluation of validity/reliability [61]. Overall, initial results were promising and suggest that the CSI is a psychometrically sound and valid measure for use with pediatric OCD patients. Factor analysis produced a four-factor solution representing four distinct but related areas: Discarding, Clutter, Acquisition, and Distress/Impairment. These factors were consistent with previous findings in adults using the SI-R. In a non-clinical population, Coles et al. [18] found a similar four-factor solution: Difficulty Discarding, Clutter, Interference/Distress and Acquisition Problems. Frost and colleagues [19] obtained similar results in a more clinical population except for the lack of the Interference/Distress Factor. Good to strong internal consistency was found for each of the CSI factors suggesting that items within each scale contribute to the overall scale's score. Similarly, one-week test–retest reliability was also excellent for the CSI Total and factor scores with correlations ranging from .85 to .92.

In addition to its factorial validity, analysis of the CSI's construct validity was also favorable. First, concurrent validity was assessed via comparisons with other measures of

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[2] As the nature of the paper is measure development, only correlations with the CSI Total Score are provided to avoid spurious findings due to multiple comparisons.

Table 5 Relationship of hoarding to parent-reported clinical symptoms

CBCL scale	CSI total score
Internalizing scale	.29**
Externalizing scale	.35***
Aggressive	.38***
Deliquent	−.06
Attention problems	.33***
Thought problems	.06
Social problems	.28**
Anxiety/depression	.28**
Somatic symptoms	.27**
Withdrawn	.15

CSI Child Saving Inventory, *CBCL* Child Behavior Checklist

*** p < .001; ** p < .01

hoarding, yielding strong, significant relations in the expected direction. Second, discriminant validity was also demonstrated in that the CSI correlated with extant measures covering similar content (e.g., hoarding) but not with dissimilar content (e.g., checking, contamination). Finally, construct validity was supported vis-à-vis robust group differences on the CSI Total Score on the basis of endorsing hoarding items on the CY-BOCS Symptom Checklist.

In addition to the psychometric results, data on the phenomenology and prevalence of various hoarding behaviors in a clinical sample was gathered. Younger children exhibited greater problems with acquisition and discarding. This may be explained by increased acquisition of items and difficulty discarding them in younger children and/or increased recognition of developmentally abnormal hoarding-related behavior by parents as their child ages, which may result in limit setting or seeking treatment. Gender differences were noted in that girls exhibited more problems with discarding possessions and overall clutter; this is roughly consistent with some adult findings of gender differences [65] but not others [66]. The reasons for the gender differences are unclear. It may be that girls exhibit stronger emotional attachment to possessions than boys, resulting in difficulty parting with such possessions and associated clutter [67].

Hoarding was not related with OCD symptom severity. This was expected given that the CY-BOCS and CGI-S provide an aggregate assessment of overall symptom severity versus solely hoarding. However, these findings also suggest that hoarding among children occurs independent of other OCD symptoms, consistent with findings in the adult literature [68]. Overall, hoarding related to increased heightened parent ratings of externalizing and internalizing behavior problems. A weak but significant correlation between hoarding and anxiety symptoms was noted. This may reflect pathological attachments experienced by hoarders with hoarded possessions [69, 70]. Clinically, we have seen a number of youth who hoard display strong attachments to their possessions and experience anxiety or disruptive behavior when confronted with the risk of removal.

Not surprisingly, hoarding symptoms related to both youth and parent reports of impairment. Hoarding symptoms were associated with all impairment domains except social impairment. Such significant relations likely reflect the impact of hoarding on academic and family functioning. In academic realms, hoarding may exert a direct impact on school functioning (e.g., impacting organization) or indirectly through executive functioning deficits [71]. Within the home, hoarding is likely associated with clutter and family discord when parents discard or refuse to accommodate hoarded possessions. That

hoarding was not related to social impairment may reflect efforts by the child to minimize the effects of hoarding on peer relationships, perhaps related to anxiety about others' perceptions. If true, this holds similarity to adults who hoard who tend to exhibit high rates of social anxiety [72]. Given that children's environment are often controlled by parents, the hoarding behavior may not be evident to or interfere with a friend coming over. Interestingly, one item—Difficulty walking in home due to child's clutter—exhibited a very strong factor loading relative to other items (e.g., 'Playroom clutter') raising the question of how many parents had serious hoarding problems themselves versus the extent to which parents did not exercise control over the child's hoarding. Unfortunately, our data do not directly address the extent to which parents control their child's clutter and its impact on the home and thus, future research on this question is needed.

Although this study had notable strengths (e.g., a relatively large sample of youth with OCD, two study sites, multiple reporters), certain methodological shortcomings should be considered when interpreting the results. First, the generalizability of our findings may be limited as the sample consisted of youth with OCD who were primarily Caucasian, treatment-seeking, and of middle or upper-middle class. Recruitment of more diverse samples is a critical issue in psychiatric/psychological research to foster enhanced generality of study results [73]. Second, we only sampled parents of youth who exhibited considerable heterogeneity in their obsessive–compulsive symptoms. Other physical and psychiatric conditions have elevated rates of hoarding (e.g., Prader-Willi Syndrome; [12]) and thus, the CSI may not be appropriate for use in other populations. It would have been ideal to examine the CSI in a non-OCD psychiatric sample, which we highlight as a direction for future study. On balance, the CSI was assigned to assess hoarding behaviors independent of diagnosis and thus, would be expected to operate similarly across clinical presentations. Third, a youth report version would allow for parent–child comparisons and could provide additional perspectives on childhood hoarding (e.g., insight). Child-reports, combined with independent observer ratings, would provide information about the child's awareness of hoarding behaviors. Fourth, although our sample may be appropriate for validation, a larger, representative sample is needed for normative purposes and replication of the factor structure using confirmatory techniques. Fifth, inter-rater reliability for the CY-BOCS was not collected at the Massachusetts General Hospital site; on balance, ratings were confirmed by an experienced board certified child psychiatrist. Finally, the retest interval was relatively short (one-week) and the longer-term reliability of the CSI remains unclear.

Implications for Research and Practice

Overall, the CSI is a new parent-report measure with promising reliability and validity that is designed to assess both the presence and severity of hoarding symptoms in youth. Although the present results were supportive of the initial psychometric properties of the CSI, there are a number of areas in need of further empirical attention. First, the measure's treatment sensitivity has not been documented. It is unclear if the CSI will appropriately reflect response to evidence-based therapies targeting hoarding behaviors. Second, the CSI has not been tested in non-OCD samples. As noted, hoarding may be present in other clinical disorders as a central or ancillary feature and the psychometric properties of the CSI may operate differently as a function of population. Related to this, the validity of the CSI as a screener has yet to be determined and normative data in clinical and non-clinical samples is not yet available. This avenue of research is of great clinical import, as the availability of a quick and convenient measure for clinical and community screenings

could improve the identification of youth in need of intervention, as well as assist in monitoring treatment progress and outcome.

Summary

This study examined the development and psychometric properties of a parent-rated measure of child hoarding behaviors in 123 children and adolescents with OCD. The CSI demonstrated good internal consistency for both the Total Score and factor scores, excellent one-week test–retest reliability, and convergent and divergent validity with subscales of the OCI-CV and CY-BOCS. Known groups validity was supported vis-à-vis higher CSI scores for those endorsing hoarding on the CY-BOCS Symptom Checklist. Although this study is limited by demographic homogeneity and the use of a sample of children with OCD, these findings provide initial support for the reliability and validity of the CSI for the assessment of hoarding behaviors. Future studies are needed to extend these findings to non-OCD samples of youth.

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