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ORIGINAL PAPER

Evidence-Based Assessment in Children and Adolescents with Obsessive–Compulsive Disorder

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Abstract The assessment of varied psychiatric disorders, including obsessive–compulsive disorder (OCD), is shifting towards the use of evidence-based assessments (EBAs). This shift has fostered the development, validation and adaptation of several measures to rate obsessive–compulsive symptoms and other related problematic areas such as functional impairment or family attitudes among others. The aim of this paper is to present a systematic review of psychometric studies on pediatric OCD-specific measures to classify these according to assessment evidence-based criteria. Selection criteria that determined which studies were included in the review were: (1) analyzing an OCD measure and (2) including participants' age being 18 years or younger. The literature search procedure was conducted in *Medline*, *PsycINFO, PsycARTICLES, ERIC, Cochrane Library,* and *Scholar Google* databases and enabled us to locate 42 studies which analyzed psychometric properties of 14 OCD measures studied in children and adolescents. Instruments were grouped into the following assessment areas: symptom presence and severity, functional impairment, family functioning and cognitive dimensions of OCD. Psychometric data regarding internal structure, internal consistency, reliability, validity and diagnostic precision were also reported. Further, measures were classified as *well-established*, *approaching well-established* and *promising assessments* in terms of reliability and validity. We concluded that the assessment of OCD in pediatric populations is a growing field that in a short-medium term could provide a wide variety of EBAs for the evaluation obsessive–compulsive symptoms and other OCD-related dimensions. The paper concludes by highlighting directions for future research.

Keywords Obsessive–compulsive disorder · Evidence-based assessment · Children · Adolescents

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Introduction

Obsessive–compulsive disorder (OCD) is characterized by interfering obsessions and/or compulsions (American Psychiatric Association 2000) that occurs in approximately 1–2 % of children and adolescents (Apter et al. 1996; Rapoport et al. 2000). Additionally OCD caseness confers significant functional impairment (Piacentini et al. 2007) and risk for other psychological disorders that increase the discomfort and complicate OCD's assessment and treatment (Storch et al. 2010).

As in other psychiatric disorders, the assessment of pediatric OCD needs to move towards the use of evidence-based practices. Evidence-Based Assessments (EBAs) are methods and measures that are selected according research and theory to assess a construct in a particular population (Mash and Hunsley 2005). Besides obsessive–compulsive symptom presence and severity, several related areas should also be examined, such as functional impairment, family factors, and comorbidity (Lewin and Piacentini 2010). One of the most important issues in assessment of OCD in childhood and adolescence is the use of measures specifically designed for this particular population according to EBA approach (Abramowitz 2008). In recent

years, a number of psychometric studies on pediatric OCD-specific measures have been conducted. First, studies about commonly used instruments have been conducted providing new knowledge about their psychometric properties (e.g., Flessner et al. 2011; Freeman et al. 2011; Piacentini et al. 2007), testing new application modalities (e.g., Conelea et al. 2012; Storch et al. 2006a), validating their use in different languages (e.g., Martínez-González et al. 2011; Ronceros et al. 2008), and suggesting some weaknesses in some previously established measures (e.g., Storch et al. 2011b). Second, new pediatric OCD measures have been developed to assess obsessive–compulsive symptom presence and severity (e.g., Foa et al. 2010; Storch et al. 2009a, 2011a) and other problematic responses associated with OCD, such as cognitive bias (e.g., Coles et al. 2010; Wolters et al. 2012) or family attitudes (e.g., Peris et al. 2008).

Given the increased information but absence of a recent review that provided updated information about EBAS in pediatric OCD, this paper presents a systematic review of psychometric studies conducted in children and adolescents with OCD. According to the *Standards for Educational and Psychological Testing*, empirical support for assessment tools could be defined in terms of reliability estimations and validity evidences (American Educational Research Association, America Psychological Association, & National Council on Measurement in Education 1999). For internal consistency, Cronbach's alpha values below .70 indicate poor internal consistency, values from .70 to .79 acceptable, and values .80 and above good (Nunnally and Bernstein 1994). Reliability has been tested essentially by two methods. Inter-rater reliability refers the agreement level reached by the experts, being often analyzing using intraclass correlation coefficient (ICC). According to Cicchetti (1994) ICCs below .40 are considered poor, between .40 and .59 are fair, .60–.74 are good, and .75–1.0 are excellent. Test–retest reliability must be interpreted depending on whether the construct assessed would be expected to change through the time (McGuire et al. 2012); in the case of OCD is expected that patients that do not receive an appropriate intervention for the disorder will not improve spontaneously (Watson and Rees 2008). Finally, there are different evidences of validity. First according to convergent validity is expected that a measure correlates with measures of same or similar constructs. On the contrary, according to discriminant validity, it is expected that a measure presents small correlation with other assessing an un-related construct. Pearson product moment correlation is the index generally used to examine the relationship between two assessment measures. According to Cohen's (1988) criteria correlations from .10 to .29 are considered as small, correlations from .30 to .49 are considered as moderate and correlations .50 and above are considered as large.

Pediatric OCD-Specific measures were classified according the three levels of empirical support that define a measure as EBA (Cohen et al. 2008; McGuire et al. 2012): (1) *well-established assessment* (reliability and validity have been demonstrated in at least two published studies by two research teams); (2) *approaching well-established assessment* (reliability and validity have been demonstrated in at least two published studies by one research team; or two research teams published studies offering mixed psychometric results); (3) *promising assessment* (reliability and validity have been demonstrated in at least one published study). Measures that present absence of psychometric data about internal consistency, reliability or validity; or these were not tested in OCD samples were considered as *insufficiently tested*.

Method

Study Selection Criteria

To be included, studies had to fulfill the following criteria: (a) The study had to examine the psychometric properties of an OCD measure; (b) participants had to be younger than 19 years old; (c) due to language limitations the study had to be written in English or Spanish.

Search Strategy

Several literature search procedures were used to locate studies that fulfilled our selection criteria. First, several electronic databases were consulted: *Medline*, *PsycINFO, PsycARTICLES, ERIC, Cochrane Library,* and *Scholar Google*, as well as the Spanish databases *CSIC* and *PSICODOC*. The following keywords were combined, in English and Spanish: *Obsessive–compulsive, OCD, assessment, scale, inventory, pediatric, child** and *adolesc**. Second, the references of published psychometric articles were consulted. Finally, emails were sent to experts in this area to ask for studies about this issue.

Structure of the Current Review

We located 42 articles that fulfilled the selection criteria examining the psychometric properties of 14 measures. All of the articles were written in English or Spanish and published between 1988 and 2012. In order to present the information reviewed assessment tools were classified in the following areas: (1) measures of obsessive–compulsive symptom presence and severity, (2) measures of OCD-related functional impairment, (3) measures of family functioning, and (4) measures of cognitive dimensions of OCD.

Results

Measures of Obsessive–Compulsive Symptom Presence and Severity

Table 1 shows the main characteristics and psychometric data reported by studies examining measures of obsessive–compulsive symptom presence and severity.

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

The CY-BOCS (Scahill et al. 1997) is a clinician-administered, semi-structured interview consisting of two sections. First, the Symptom Checklist contains 62 common obsessions and compulsions grouped in 17 categories (Contamination, Checking, Order and Symmetry, etc.) that are rated according their current or past presence. The second section of the CY-BOCS is the Severity Scale, which includes 10 items to rate the frequency, interference, distress, resistance, and control perceived of obsessions (5 items) and compulsions (5 items). Each item is rated from 0 (*None*) to 4 (*Extremely*). With regard to the factor structure of the CY-BOCS, two factorial solutions have been proposed: a model composed of Obsessions and Compulsions factors (McKay et al. 2003) or the Severity and Disturbance model (McKay et al. 2003; Storch et al. 2005). In clinical populations, internal consistency for the CY-BOCS Severity Scale ranged from acceptable to strong (Freeman et al. 2011; McKay et al. 2003; Ronceros et al. 2008; Scahill et al. 1997; Storch et al. 2004, 2005; Ulloa et al. 2004; Yucelen et al. 2006). Alpha indices of subscales of the first factorial model ranged between were generally good for both Obsession and Compulsion subscales (Freeman et al. 2011; McKay et al. 2003; Storch et al. 2004). In the second model, the internal consistency was also adequate with the exception of Disturbance scale in Storch et al. (2005), where it was poor. Gallant et al. (2008) studied the internal consistency of the Symptom Checklist, obtaining good internal consistency for Contamination/Cleaning and Aggression/Checking; but poor for Hoarding, Symmetry/Ordering, and Sexual/Religious dimensions. These symptom domains were related with the corresponding dimensions in the ADIS-IV-P (Anxiety Disorders Interview Schedule for DSM-IV: Parent Version; Silverman and Albano 1996). Concerning reliability of the CY-BOCS, inter-rater reliability was excellent for the total score (Ronceros et al. 2008; Scahill et al. 1997; Ulloa et al. 2004; Yucelen et al. 2006), similarly to test–retest the reliability that was also good for total score and subscales (Storch et al. 2004). The CY-BOCS also demonstrated convergent validity with strong and significant relations with other OCD measures such as OCD subscales of TODS-PR (Tourette's Disorder Scale–Parent Rated; Shytle et al. 2003) and NIMH-OCS (National Institutes of Mental Health-Global Rating Scales; Insel et al. 1983), and CGI (Clinical Global Impression Scale; National Institute of Mental Health 1985). Discriminant validity was demonstrated by weak, non-significant correlations with measures of anxiety, depression and tics (e.g., Scahill et al. 1997; Storch et al. 2004, 2005; Ulloa et al. 2004).

Storch et al. (2006a) developed the self-report and parent-report formats of the CY-BOCS in clinical populations. Exploratory factor analysis yielded a 2-factor model named Severity and Disturbance. Internal consistency was excellent for total score in both child-and parent-report. Similarly, Cronbach's alphas for Severity and Disturbance subscales were good. In another study on the CY-BOCS Child-Report in a non-clinical sample, a confirmatory factor analysis revealed a different solution consisting of Obsessions, Compulsions and Resistance dimensions, which may reflect the community nature of sample. However, internal consistency was poor for both the total and factor scores. In the same study, test–retest reliability analysis produced significant correlations for total score and subscales (Godoy et al. 2011). With regard to convergence between the self-administered and clinician-administered CY-BOCS, the findings revealed a significant and strong association between both forms of administration (Conelea et al. 2012; Storch et al. 2006a).

Obsessive Compulsive Inventory Child-Version (OCI-CV)

The OCI-CV (Foa et al. 2010) is a self-report to assess symptom presence and dimensionality of OCD in children and adolescents from 7 to 17 years old. The OCI-CV demonstrated generally good psychometric properties in a clinical sample of 109 OCD children and adolescents (Foa et al. 2010). Exploratory factor analysis yielded a 21-item, six factor solution (Doubt/Checking, Obsessions, Hoarding, Washing, Ordering and Neutralizing) that was confirmed by Jones et al. (2012) in a sample of 96 OCD children and adolescents. Internal consistency was generally good for the total score and for the subscales with the exception of Neutralizing subscale, which obtaining poor results in Jones et al. (2012). In the reliability analysis, correlations between test and retest administrations were strong for the complete scale and for the subscales. Correlations between OCI-CV and the standard measures of pediatric OCD, such as CY-BOCS and NIMH-OCS were significant and moderate. Finally OCI-CV also showed sensitivity to changes after treatment (Foa et al. 2010).

Children's Obsessional Compulsive Inventory (CHOCI)

The CHOCI (Shafran et al. 2003) is a self-report measure to assess OCD symptoms and the impairment associated

Table 1 Studies examining measures of symptom and severity

Study	Sample	Internal consistency	Reliability	Validity
Children's Yale-Brown Obsessive–Compulsive Scale (CY-BOCS): *well-established assessment*				
Scahill et al. (1997)	65 OCD participants aged between 8 and 17 years (USA)	Total score $\alpha = .87$	Inter-rater: total score ICC = .84; obsessions ICC = .66; compulsions ICC = .91	Convergent validity: total score correlated with LOI-CV ($r = .62$) Discriminant validity: non-significant correlations with anxiety ($r = .34$) and depression measures ($r = .37$)
McKay et al. (2003)	233 OCD participants aged between 5 and 17 years (USA)	Total score $\alpha = .95$; obsessions $\alpha = .92$; compulsions $\alpha = .94$; severity $\alpha = .88$; disturbance $\alpha = .95$	NR	NR
Storch et al. (2004)	61 OCD participants aged between 4 and 18 years (USA)	Total score $\alpha = .90$; obsessions $\alpha = .80$; compulsions $\alpha = .82$	Test–retest: total score ICC = .79; obsessions ICC = .76; compulsions ICC = .70	Convergent validity: total score correlated with CGI ($r = .75$); TODS-PR OCD ($r = .70$) Discriminant validity: non-significant correlation with anxiety measure ($r = .22$)
Storch et al. (2005)	82 OCD participants aged between 5 and 18 years (USA)	Total score $\alpha = .76$; severity $\alpha = .92$; disturbance $\alpha = .47$	NR	Convergent validity: total score correlated with CGI ($r = .63$); TODS-PR OCD ($r = .66$) Discriminant validity: non-significant correlation with measures of anxiety ($r = -.07$); tic ($r = .18$)
Ronceros et al. (2008)	46 OCD participants aged between 9 and 18 years (Peru)	Total score $\alpha = .87$	Test–retest: total score $r = .90$ Inter-rater: total score $r = .95$–$.97$; obsessions $r = .93$–$.96$; compulsions $r = .97$–$.96$	Convergent validity: total score correlated with CGI ($r = .83$–$.89$) Discriminant validity: NR
Ulloa et al. (2004)	28 OCD participants aged between 8 and 16 years (Mexico)	Total score $\alpha = .87$	NR	Convergent validity: total score correlated with OCD subscale of clinical interview ($r = .60$) Discriminant validity: NR
Storch et al. (2006a) CY-BOCS-PR/SR	53 OCD participants aged between 8 and 17 years (USA)	Parents: total score $\alpha = .86$; obsessions $\alpha = .83$; compulsions .70; severity $\alpha = .88$; disturbance $\alpha = .78$ Children: total score $\alpha = .87$; obsessions $\alpha = .78$; compulsions $\alpha = .81$; severity $\alpha = .86$; disturbance $\alpha = .78$	NR	Convergent validity: total score correlated with CY-BOCS clinician-administered ($r = .58$–$.72$); TODS-PR OCD ($r = .51$–$.67$); CBCL-OCS ($r = .28$–$.46$) Discriminant validity: small correlations with measure of externalizing disorders ($r = .14$–$.29$)
Yucelen et al. (2006)	19 OCD participants aged between 8 and 16 years (Turkey)	Total score $\alpha = .77$	NR	Convergent validity: total score correlated with LOI-CV ($r = .46$); CGI ($r = .61$) Discriminant validity: non-significant correlations with measures of depression and anxiety ($r = -.15$–$.24$) and CBCL ($r = .01$–$.22$)

Table 1 continued

Study	Sample	Internal consistency	Reliability	Validity
Gallant et al. (2008)	86 OCD participants aged between 8 and 20 years (USA)	Hoarding *KR-20* = .50; contamination/cleaning *KR-20* = .81; aggression/checking *KR-20* = .80; symmetry/ordering *KR-20* = .55; sexual/religious *KR-20* = .68	NR	Convergent validity: moderate to high correlations with the corresponding dimensions of ADIS-IV-P (r = .30–.70) Discriminant validity: minimal to small correlations with measures of trichotillomania (r = − .09–.25); anxiety (r = .02–.29); depression (r = − .09–.17)
Freeman et al. (2011)	42 OCD participants aged between 4 and 8 years (USA)	Total score α = .72; obsessions α = .64; compulsions α = .71	NR	Convergent validity: total score correlated with NIMH-OCD (r = .63); CGI (r = .61) Discriminant validity: small correlation with measure of depression (r = .12)
Godoy et al. (2011) CY-BOCS-SR	1,706 Community participants aged between 9 and 17 years (Spain)	Total score α = .58; obsessions α = .32; compulsions α = .37; resistance α = .63	Test–retest: total score ICC = .66; obsessions ICC = .69; compulsions ICC = .61	NR
Conelea et al. (2012) CY-BOCS-SR	35 OCD participants aged between 14 and 17 years (USA)	NR	NR	Convergent validity: total score correlated with CY-BOCS clinician-administered (r = .76) Discriminant validity: NR
Obsessive Compulsive Inventory Child-Version (OCI-CV): *approaching well-established assessment*				
Foa et al. (2010)	109 OCD participants aged between 7 and 17 years (USA)	Total score α = .85; doubting/checking α = .82; obsessing α = .83; hoarding α = .88; washing α = .83; ordering α = .83; neutralizing α = .81	Test–retest: total score r = .77; doubting/checking r = .68; obsessing r = .85; hoarding r = .79; washing r = .89; ordering r = .70; neutralizing r = .83	Convergent validity: total score correlated with CY-BOCS (r = .31); NIMH-OCD (r = .23); COIS-C/P (r = .32–.45); anxiety (r = .62); depression (r = .47) Divergent validity: NR
Jones et al. (2012)	96 OCD participants aged between 6 and 18 years (USA)	Total score α = .85; doubting/checking α = .80; obsessing α = .87; hoarding α = .79; washing α = .87; ordering α = .81; neutralizing α = .50	NR	Convergent validity: significant correlations with CY-BOCS total score (r = .26); corresponding CY-BOCS symptom dimensions (r = .23–.52);CGI (r = .27) Discriminant validity: non-significant correlation with general psychopathology (r = .07)
Children's Obsessional Compulsive Inventory (CHOCI): *promising assessment*				
Shafran et al. (2003)	42 OCD and 46 Community participants aged between 7 and 17 years (UK)	Subscales α > .80	NR	Convergent validity: total score for child- and parent-report correlated with CY-BOCS total score (r = .42–.65) Discriminant validity: NR

Table 1 continued

Study	Sample	Internal consistency	Reliability	Validity
Uher et al. (2008)	285 OCD participants aged between 7 and 18 years (UK)	Children: symptoms $\alpha = .84$; impairment $\alpha = .86$ Parents: symptoms $\alpha = .87$; impairment $\alpha = .85$	NR	Convergent validity: total score for child- and parent-report correlated with CY-BOCS ($r = .38$–$.48$) Discriminant validity: small correlations with measures of behavioral problems ($r = .11$–$.22$); ADHD ($r = .26$–$.32$)
Children's Florida Obsessive Compulsive Inventory (C-FOCI): *promising assessment*				
Storch et al. (2009a)	82 OCD participants aged between 7 and 20 years (USA)	Severity $\alpha = .76$; symptoms *KR-20* = .79	NR	Convergent validity: Severity scale total score correlated with CY-BOCS ($r = .49$); COIS-C/P ($r = .41$–$.48$) Symptom domains correlated with corresponding domains of CY-BOCS ($r = .26$–$.56$)
Storch et al. (2009a)	191 community participants aged between 14 and 18 years (USA)	Severity $\alpha = .73$; symptoms *KR-20* = .74	NR	NR
Leyton Obsessional Inventory Child-Version Survey-Form (LOI-CV): *insufficiently tested*				
Berg et al. (1988)	4,551 community participants aged between 14 and 17 years (USA)	Total score $\alpha = .81$; general obsessive $\alpha = .81$; dirt/ contamination $\alpha = .65$; numbers/luck $\alpha = .65$; school $\alpha = .49$	NR	NR
King et al. (1995a)	106 community participants aged between 8 and 16 years (Australia)	NR	Test–retest: total sample $r = .72$; 8–10 years $r = .51$; 11–13 years $r = .75$; 14–16 years $r = .83$;	NR
King et al. (1995b)	106 community participants aged between 8 and 16 years (Australia)	8–10 years $\alpha = .75$; 11–13 years $\alpha = .74$; 14–16 years $\alpha = .77$;	NR	NR
Bamber et al. (2002)	253 community participants aged between 12 and 16 years (UK)	Long version total score $\alpha = .90$; brief version total score $\alpha = .86$	NR	NR
Stewart et al. (2005)	81 OCD participants with 11.5 years of mean age (USA)	NR	NR	Convergent validity: non-significant correlations with CY-BOCS ($r = .20$) Discriminant validity: total score correlated with general psychopathology measure ($r = .37$)
Rueda-Jaimes et al. (2007)	501 community participants with 14.5 years of mean age (Colombia)	Total score $\alpha = .75$	Test–retest: Total score $r = .75$	NR

Table 1 continued

Study	Sample	Internal consistency	Reliability	Validity
Storch et al. (2011b)	50 OCD participants aged between 7 and 18 years (USA)	Long version: total score $\alpha = .79$; general obsessive $\alpha = .53$; dirt/contamination $\alpha = .49$; numbers/luck $\alpha = .66$; school $\alpha = .56$ Brief version: total score $\alpha = .65$; compulsions $\alpha = .57$; obsessions/incomp. $\alpha = .64$; cleanliness $\alpha = .33$	NR	Convergent validity: non-significant correlations with CY-BOCS ($r = .22$), CGI ($r = .16$), CBCL-OCS ($r = .13$) and COIS-P ($r = .07$). Only moderate correlation with COIS-C ($r = .44$) Discriminant validity: non-significant correlations with anxiety and depression measures ($r = .11$–$.22$); CBCL subscales ($r = -.03$ to $.03$)
Canals et al. (2011)	1,514 community participants aged between 8 and 12 years (Spain)	Total score $\alpha = .90$; order/checking/pollution $\alpha = .82$; obsessive concern $\alpha = .81$; superstition/compulsion $\alpha = .77$	NR	NR
Maudsley Obsessional-Compulsive Inventory (MOCI): *insufficiently tested*				
Fonseca-Pedrero et al. (2007)	508 community participants aged between 12 and 19 years (Spain)	Checking $\alpha = .87$; washing $\alpha = .84$; slowness $\alpha = .81$	NR	NR
Obsessive Compulsive Inventory-Revised (OCI-R): *insufficiently tested*				
Piqueras et al. (2009)	269 community participants aged between 16 and 18 years (Spain)	Total score $\alpha = .77$; checking $\alpha = .64$; obsessing $\alpha = .66$; hoarding $\alpha = .50$; washing $\alpha = .53$; ordering $\alpha = .43$; neutralizing $\alpha = .46$	NR	NR
Martínez-González et al. (2011)	525 community participants aged between 12 and 18 years (Spain)	Total score $\alpha = .82$; checking $\alpha = .62$; obsessing $\alpha = .67$; hoarding $\alpha = .49$; washing $\alpha = .59$; ordering $\alpha = .47$; neutralizing $\alpha = .55$	Test–retest: total score $r = .56$; checking $r = .46$; obsessing $r = .55$; hoarding $r = .51$; washing $r = .44$; ordering $r = .40$; neutralizing $r = .39$	Convergent validity: total score correlated with measures of disgust ($r = .31$–$.53$) Discriminant validity: non-significant correlation with positive affect measure ($r = .08$)
CBCL Obsessive–Compulsive Subscale (OCS): *promising assessment*				
Nelson et al. (2001)	73 OCD, 73 psychiatric, and 73 community participants aged between 8 and 18 years (USA)	Total score $\alpha = .84$	NR	NR
Geller et al. (2006)	64 OCD, 64 psychiatric, and 65 Community participants with 11 years of mean age (USA)	Total score $\alpha = .87$	NR	NR
Storch et al. (2006b)	48 OCD and 149 participants with other disorders, aged between 4 and 18 years (USA)	Total score $\alpha = .75$	NR	Convergent validity: total score correlated with CY-BOCS ($r = .54$); TODS-PR OCD ($r = .60$) Discriminant validity: total score correlated with measures of depression ($r = .38$); Tourette's disorder ($r = .49$)

Table 1 continued

Study	Sample	Internal consistency	Reliability	Validity
Hudziak et al. (2006)	61 OCD, 64 psychiatric, and 73 community participants aged between 8 and 18 years (USA)	NR	NR	NR
Ivarsson and Larsson (2008)	185 OCD, 177 psychiatric, and 317 community participants, aged between 6 and 18 years (Norway)	NR	NR	NR
Child Saving Inventory (CSI): *promising assessment*				
Storch et al. (2010)	123 OCD participants aged between 8 and 17 years (USA)	Total score $\alpha = .96$; discarding $\alpha = .95$; clutter $\alpha = .90$; acquisition $\alpha = .94$; distress/impairment $\alpha = .84$	Test–retest: total score $r = .92$; discarding $r = .85$; clutter $r = .89$; acquisition $r = .86$; distress/impairment $r = .90$	Convergent validity: total score correlated with Hoarding dimension of OCI-CV ($r = .69$); CY-BOCS ($r = .53$) Divergent validity: small correlations with no-hoarding dimensions of the OCI-CV ($r = .02$–$.23$); measures of anxiety ($r = .23$) and depression ($r = .19$)

NR not reported

with them. The symptom presence section includes 19 symptom items which are classified as obsessions or compulsions, rating with a 3-point scale, from *Not at all* to *A lot*. The impairment section is based on the CY-BOCS severity section, including five items for impairment related to obsessions and five related to compulsions. The scale was developed in two forms, parent- and child-report. Internal consistency was good in a pediatric OCD samples for both the total score and subscales (Shafran et al. 2003; Uher et al. 2008). The CHOCI also showed convergent validity with moderate to strong correlations with the CY-BOCS total score. Uher et al. (2008) revised the CHOCI, deleting 9 of the 19 symptom items and using a five point scale to rate them. Analysis of internal structure of interference section conducted by CFA showed a single common factor model, where the two interference items were deleted. They also carried on a further EFA, finding a 12-item, 3-factor solution (compulsion, obsession and resistance factors). The CHOCI-Revised demonstrated concurrent validity, since moderate and significant correlations with the CY-BOCS were found. With regard to discriminant validity, correlations were moderate with emotional and hyperactivity problems and weak with conduct problems measures. Finally, the measure was useful to discriminate between normal controls and OCD participants, with sensitivity and specificity 88 and 95 %, respectively, for a cutoff point >17.

Children's Florida Obsessive Compulsive Inventory (C-FOCI)

The C-FOCI was developed from the adult version by Storch et al. (2007b) and assesses the presence and the severity of obsessive compulsive symptoms in children and adolescents. The first section in the scale is the Symptom Checklist. It contains 17 items about frequent obsessions and compulsions experienced in the last month. Second, the Severity Scale contains 5 items for a unitary assessment of obsessions and compulsions severity. The psychometric properties of the C-FOCI have been validated in one study (Storch et al. 2009a). Internal consistency was adequate for the Severity Scale and Symptom Checklist. This measure showed convergent validity, being significantly related with the CY-BOCS and COIS-C/P. In addition, symptom dimensions of the C-FOCI were significant related to the corresponding symptom domains in the CY-BOCS. Correlations with depression and anxiety measures (MASC, CDI and CBCL Internalizing/Externalizing) were significant and moderate as well. Finally, the C-FOCI showed sensitivity to changes after a CBT treatment and the possibility of being administered via internet.

Leyton Obsessional Inventory Child-Version Survey-Form (LOI-CV)

The LOI-CV Survey-Form (Berg et al. 1988), based on the LOI-CV Card Sorting Task (Berg et al. 1986), is a self-report measure with 20-items about the presence and frequency of obsessive–compulsive symptoms. Factor analysis showed a 4-factor model, including General Obsessive, Dirt/Contamination, Numbers/Look and School factors. Few studies have been conducted examining the LOI-CV with clinical populations, thus, most of the data about its psychometric properties has been obtained in community samples. Although internal consistency have been acceptable for the whole scale (Berg et al. 1988; Bamber et al. 2002; Canals et al. 2011; King et al. 1995b; Rueda-Jaimes et al. 2007; Storch et al. 2011b) for subscales was poor in general (Berg et al. 1988; Storch et al. 2011b). Similarly, the LOI-CV showed adequate test–retest reliability overall, (King et al. 1995a; Rueda-Jaimes et al. 2007) but poor in children between 8 and 10 years (King et al. 1995a). The sensitivity and specificity of the LOI-CV are mixed. These were adequate in some studies, with values of 75 and 84 %, respectively for a cut-off point ≥25 (Flament et al. 1988), and 82.4 and 84.1 % for a 20 cut-off point (Canals et al. 2011). However, other studies found poor sensitivity and specificity. This is the case of sensitivity data reported by Stewart et al. (2005) for cut-off points 20 and 25 where they obtained 36 and 27 %, respectively. Storch et al. (2011b) also found poor sensitivity (14 %) for LOI-CV. The results about convergent validity are also weak, as the LOI-CV did not significantly correlate with the CY-BOCS (Stewart et al. 2005; Storch et al. 2011b). Only one study assessed the discriminant validity of LOI-CV, finding no significant correlations with depression measure and CBCL-Internalizing and Externalizing subscales (Storch et al. 2011b). Finally, the LOI-CV showed a significant lower ability to detect an intervention's effects than the CY-BOCS in several treatment trials (Geller et al. 2003).

On the other hand, Bamber et al. (2002) revised the internal structure of LOI-CV, finding a different 3-factor model consisting of 11 items, in a community sample. This new version was named LOI-CV Short-Version and subscales were Compulsions, Obsessions/Incompleteness, and Cleanliness. The results about the psychometric properties of the reduced scale are as contradictory as the original version. Internal consistency was initially good for the total score and adequate for subscales. However, Storch et al. (2011b) tested some of the psychometric properties of the LOI-CV Short-Version, finding poor internal consistency for the total score and subscales. With regard to the validity, the measure demonstrated weak and non-significant correlations with the CY-BOCS, CDI, CBCL-Internalizing, and CBCL-Externalizing (Storch et al. 2011b). The sensitivity and specificity of the measure were 78 and 70 %, respectively for a 5 cutoff point (Bamber et al. 2002). Finally, the LOI-CV Short-Version did not reflect significant change after a CBT treatment (Storch et al. 2011b).

Other measures for symptoms and severity

There are other measures for OCD that have been tested in samples of children and adolescents, although these are not pediatric OCD-specific instruments. First, in some studies, adult scales have been used with youth populations. One of them is the Maudsley Obsessional-Compulsive Inventory (MOCI, Hodgson and Rachman 1977). The psychometric performance of the MOCI was studied by Fonseca-Pedrero et al. (2007) in a Spanish community sample of adolescents. Internal structure observed was composed by 3 factors; Checking, Washing, and Slowness. Internal consistency was good for all subscales. Another adult measure studied in pediatric population is the Obsessive Compulsive Inventory-Revised (OCI-R) by Foa et al. (2002). The studies conducted in the community population showed an internal structure composed by the same six factors as in adult samples: Checking, Obsessions, Hoarding, Washing, Ordering, and Neutralizing. Internal consistency was adequate for the complete scale but poor for the subscales, ranging from (Martínez-González et al. 2011; Piqueras et al. 2009). Martínez-González et al. (2011) also reported adequate test–retest reliability for the total score and subscales. In the same study OCI-R exhibited moderate association with measures of digusts and non-significant correlation with positive affect measure.

Second, OCD subscales from screening tools have been analyzed separately. The Obsessive–Compulsive Subscale (OCS) of the CBCL (Child Behavior Checklist; Achenbach 1991) has been widely studied. It is composed of eight items from the CBCL, which reflect a single factor model. Internal consistency for this model was strong in two studies (Geller et al. 2006; Nelson et al. 2001). Its sensitivity (91.8 %) and specificity (67.2 %) were also reliable, for a 5 cutoff point (Hudziak et al. 2006). However, factor analysis conducted in other studies have shown that the OCS should include 6 items (Storch et al. 2006b) or even two items of the CBCL (item 9 and 66) could be enough to discriminate between OCD children and normal controls with a sensitivity and specificity range of 75–85 % and 82–93 %, respectively (Ivarsson and Larsson 2008).

Third, symptom-specific measures are being developed for children and adolescents. Storch et al. (2011a) developed a scale designed specifically to assess the hoarding symptoms in children and adolescents, the Child Saving Inventory (CSI). This is a parent-report questionnaire consisting of 5 items that are rated using a 5-point Likert scale. The factor analysis yielded a solution with four factors: Discarding,

Clutter, Acquisition, and Distress/Impairment, with 75.8 % of variance accounted. Internal consistency was strong for both total score) and subscales. The CSI also showed excellent test–retest reliability and convergent validity since it correlated strong and significant with the hoarding subscales in the CY-BOCS and the OCI-CV.

Measures of OCD-Related Functional Impairment

There is only one measure used to assess functional impairment in children's lives related to obsessive–compulsive symptoms (Table 2).

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

The COIS-C/P (Piacentini and Jaffer 1999) consists of parallel child- or parent-report versions that assess functional impairment related to OCD in children and adolescents. The COIS included 56 items to assess OCD impact in three logically created domains: School, Family, and Social (Piacentini et al. 2003). These areas were not established by factor analysis until a further study (Piacentini et al. 2007), where an exploratory factor analysis revealed a new four-factor structure for parent version conformed by School Activities, Social Activities, Daily Living Skills, and Family Activities. The percentage of variance explained was 38 % and internal consistency values were good. The factor model for child-report was composed by three domains: School, Social, and Activities, whose internal consistency was good to. Test–retest reliability also was satisfactory for both parent- and child-report. Finally, the COIS-C/P showed convergent validity with other impairment measures, such as the C-GAS (Children's Global Assessment Scale; Shaffer et al. 1983) (Piacentini et al. 2003, 2007).

Table 2 Studies examining measures of related-OCD functional impairment and measures of family functioning

Study	Sample	Internal consistency	Reliability	Validity
Child Obsessive Compulsive Impact Scale-Child and Parent Versions (COIS-C/P): *approaching well-established assessment*				
Piacentini et al. (2003)	151 OCD participants aged between 5 and 17 years (USA)	Total score $\alpha = .94$; school $\alpha = .91$; social $\alpha = .92$; home/family $\alpha = .88$	Test–retest: total score ICC = .94; school ICC = .91; social ICC = .92; home/family ICC = .88	Convergent validity: total score correlated with CY-BOCS and C-GAS
Piacentini et al. (2007)	250 OCD participants aged between 5 and 17 years (USA)	Parents: daily living skills $\alpha = .87$; school $\alpha = .91$; family/activities $\alpha = .83$; social $\alpha = .87$	Test–retest: parents: total score ICC = .81; daily living skills ICC = .82; school ICC = .88; family/activities ICC = .80; Social ICC = .80	Convergent validity: total scores for parents ($r = .25$) and children ($r = .27$) correlated with ADIS-IV OCD and CGAS ($r = -.31$; $r = -.43$).
		Children: school $\alpha = .88$; social $\alpha = .78$; activities $\alpha = .92$	Children: total score ICC = .89; school ICC = .86; social ICC = .79; activities ICC = .83	Discriminant validity: small correlations with CBCL externalizing disorders ($r = .10$–$.27$)
Family Accommodation Scale for Obsessive–Compulsive Disorder (FAS): *approaching well-established assessment*				
Otero and Rivas (2006)	20 OCD participants (Spain)	Total $\alpha = .87$	Split-half method: $\rho = .84$	Convergent validity: total score correlates with CY-BOCS ($\rho = .77$); CGI ($\rho = .70$); FES family relationship subscale ($\rho = .40$)
				Discriminant validity: NR
Flessner et al. (2011) FAS-PR	96 OCD participants aged between 7 and 17 years (USA)	Total score $\alpha = .90$; avoidance of triggers $\alpha = .80$; involvement in compulsions $\alpha = .80$	NR	Convergent validity: total score correlated; with CY-BOCS ($r = .32$); COIS-C ($r = .32$)
				Discriminant validity: small non-significant correlations with measures of post-traumatic stress ($r = .17$); self-concept ($r = -.11$)
Parental Attitudes and Beliefs Scale (PABS): *promising assessment*				
Peris et al. (2008)	123 OCD participants aged between 5 and 17 years (USA)	Accommodation $\alpha = .85$; empowerment $\alpha = .71$; hostility/blame $\alpha = .82$	NR	Convergent validity: accommodation subscale correlated with FAS ($r = .64$); hostility/blame subscale correlated with CY-BOCS ($r = .32$)
				Discriminant validity: NR

NR not reported

Measures of Family Functioning

These measures evaluate beliefs, behaviors, and attitudes of relatives of the OCD patient, related to the disorder (see Table 2).

Family Accommodation Scale for Obsessive–Compulsive Disorder (FAS)

The FAS (Calvocoressi et al. 1995, 1999) is an assessment tool designed to rate the symptom accommodation level of the relatives of OCD patients. The first section is an OCD symptom checklist adapted from the CY-BOCS to explore patient symptoms of which the family member is aware. The second section consists in a semi-structured interview with 12 items. Nine of the items include different accommodation behaviors (providing objects for rituals, changing routines, helping avoiding stimuli, etc.). The other four items rate the level of distress related to accommodation or resistance against the symptoms of the OCD family member. All items are rated according to 5-point Likert scale from 0 (*Never*) to 4 (*Extreme*). This scale was developed preliminarily as the Family Accommodation Questionnaire (FAQ) in a study conducted by Calvocoressi et al. (1995). The FAQ showed adequate internal consistency and strong interrater reliability. Further, Calvocoressi et al. (1999) revised psychometric properties of the FAQ, changing the name of the scale to Family Accommodation Scale for Obsessive–Compulsive Disorder (FAS). Internal consistency and interrater reliability were strong for this new version. However, most studies examining family accommodation in pediatric samples (e.g., Caporino et al. 2012; Storch et al. 2007a) have employed an abbreviated self-report version of the FAQ. These studies reported good internal consistency ($\alpha = .80$–$.90$) and evidence about convergent and discriminant validity of this brief version, but some features of the interview format such as the Symptom Checklist and three accommodation behaviors included in the FAS by Calvocoressi et al. (1999) were missed.

Although the samples used in the mentioned psychometric studies included relatives of adults OCD patients, the FAS is also widely used to assess the relatives of OCD children and adolescents. There are two studies about the psychometric analysis of the FAS in the relatives of children and adolescents. The first is the conducted by Otero and Rivas (2006) who analyzed the reliability and convergent validity of de interviewer-rated version, obtaining good results for internal consistency and split-half reliability. The FAS also showed convergent validity with measures of OCD severity, such as CY-BOCS and CGI and with Relationship subscale of the FES (Family Environmental Scale; Moos and Moos 1986). The second study is by Flessner et al. (2011) who analyzed the internal structure of the Parent-Report version, obtaining a two-factor model, which explained 53 % of variance. The first domain was named Avoidance of Triggers and the second, Involvement in Compulsions. The internal consistency was strong for the complete scale and for both subscales. Finally, The FAS-PR also showed convergent and discriminant validity since it was significant related with COIS and CY-BOCS and it did not significantly correlate with self-concept and post-traumatic stress scales.

Parental Attitudes and Beliefs Scale (PABS)

The PABS (Peris et al. 2008) is a parent-report questionnaire to rate behaviors and beliefs related to the obsessive–compulsive symptoms of their children. The 42 items of the scale contain statements regarding accommodation, anger or frustration due to symptoms, and other attitudes or emotional reactions to one's child's OCD symptoms. These are rated according to a 5-point Likert scale from *not at all* to *very often*. Peris et al. (2008) developed and analyzed the psychometric properties of the PABS with the parents of 123 OCD children and adolescents. The analysis of internal structure yielded a 3-factor model (Accommodation, Empowerment, and Hostility/Blame) with a 34 % of accounted variance. Internal consistency of the different subscales was strong for accommodation and Hostility/Blame subscales and adequate for the empowerment subscale. Convergent validity was demonstrated by moderate to strong correlations with the FAS and the CY-BOCS.

Measures of Cognitive Dimensions of OCD

Table 3 shows the studies conducted in children and adolescents with these measures.

Obsessive Beliefs Questionnaire-Child Version (OBQ-CV)

The OBQ-CV (Coles et al. 2010) contains 44 items to assess OCD-Related beliefs grouped into three subscales: Responsibility/Threat Estimation, Perfectionism/Certainty, and Importance/Control of Thoughts. Items are rated with a 5-point scale from *Disagree very much* to *Agree very much*. The internal consistency found in OCD samples was strong for both, the complete scale and subscales. In addition, the OBQ-CV and subscales also showed strong test–retest reliability. In a community sample study conducted by Walters et al. (2011), values of internal consistency and test–retest reliability were also strong. However, convergent validity support remains mixed given weak correlations with the CY-BOCS in both the above mentioned studies. Nevertheless the OBQ-CV was related with other OCD measures such as LOI-CV and OCD subscales in anxiety measures.

Table 3 Studies examining measures of cognitive dimensions of OCD

Study	Sample	Internal consistency	Reliability	Validity
Obsessive Beliefs Questionnaire-Child Version (OBQ-CV): *approaching well-established assessment*				
Coles et al. (2010)	29 OCD participants aged between 9 and 17 years (USA)	Total score $\alpha = .96$; responsibility/threat $\alpha = .91$; perfectionism/certainty $\alpha = .94$; importance/control $\alpha = .91$	Test–retest: total score $r = .88$; responsibility/threat $r = .84$; perfectionism/certainty $r = .81$; importance/control $r = .85$	Convergent validity: total score correlates with OCD subscale of anxiety measure ($r = .56$), LOI-CV ($r = .43$–$.48$) Discriminant validity: small non-significant correlation with social phobia ($r = .22$)
Coles et al. (2010)	48 OCD participants aged between 8 and 18 years (The Netherlands)	Total score $\alpha = .95$; responsibility/threat $\alpha = .90$; perfectionism/certainty $\alpha = .93$; importance/control $\alpha = .81$	Test–retest: total score $r = .77$; responsibility/threat $r = .69$; perfectionism/certainty $r = .73$; importance/control $r = .90$	Convergent validity: total score correlates with OCD subscale of anxiety measure ($r = .56$); slightly with CY-BOCS ($r = .28$) Discriminant validity: NR
Wolters et al. (2011)	67 OCD and 547 Community participants aged between 8 and 18 years (The Netherlands)	Community sample: total score $\alpha = .95$; responsibility/threat $\alpha = .89$; perfectionism/certainty $\alpha = .88$; importance/control $\alpha = .84$ OCD sample: total score $\alpha = .95$; Responsibility/threat $\alpha = .90$; Perfectionism/certainty $\alpha = .92$; Importance/control $\alpha = .82$	Test–retest: community sample: total score $r = .72$; responsibility/threat $r = .66$; perfectionism/certainty $r = .66$; importance/control $r = .69$ OCD sample: total score $r = .84$; Responsibility/threat $r = .78$; Perfectionism/certainty $r = .80$; Importance/control $r = .91$	Convergent validity total score correlates with LOI-CV ($r = .49$); OCD subscale of anxiety measure ($r = .59$); slightly CY-BOCS ($r = .22$) Discriminant validity: total score correlated with anxiety and depression measures ($r = .40$–$.76$)
Meta-Cognitions Questionnaire-Adolescent Version (MCQ-A): *promising assessment*				
Wolters et al. (2012)	40 OCD 317 Community participants aged between 12 and 18 years (The Netherlands)	Community sample: total score $\alpha = .88$; positive beliefs $\alpha = .87$; uncontrollability $\alpha = .75$; cognitive confidence $\alpha = .75$; superstition $\alpha = .65$; cognitive self-consciousness $\alpha = .77$ OCD sample: total score $\alpha = .92$; positive beliefs $\alpha = .85$; uncontrollability $\alpha = .84$; cognitive confidence $\alpha = .81$; superstition $\alpha = .70$; cognitive self-consciousness $\alpha = .83$	Test–retest: community sample: total score $r = .75$; positive beliefs $r = .76$; uncontrollability $r = .84$; cognitive confidence $r = .85$; superstition $r = .35$; Cognitive self-consciousness $r = .72$ OCD sample: total score $r = .93$; positive beliefs $r = .81$; uncontrollability $r = .91$; cognitive confidence $\alpha = .91$; superstition $r = .95$; cognitive self-consciousness $r = .79$	Convergent validity: total score correlated with LOI-CV ($r = .21$ OCD subscale of anxiety measure ($r = .18$–$.47$) Discriminant validity: total score correlated with measures of anxiety and depression ($r = .37$–$.53$)

Meta-Cognitions Questionnaire-Adolescent Version (MCQ-A)

Meta-cognitive theory, developed by Wells (2000), is an explicative theory about the origin and maintenance of OCD, in which ability to control and regulate thoughts has salience in the pathogenesis of the disorder. The MCQ-A is a self-report measure designed to assess this kind of beliefs. Psychometrics properties of MCQ-A in OCD participants and normal controls were studied with the Deutsch version of the scale by Wolters et al. (2012). Confirmatory factor analysis yielded an internal structure with five factors named Positive Beliefs, Uncontrollability, Cognitive Confidence, Superstition, and Cognitive self-consciousness. Internal consistency was adequate for the complete scale in both OCD and community samples. Convergent and discriminant validity also were demonstrated. Finally, the OCD participants obtained significantly higher means than normal controls in all subscales with the exception of Cognitive Confidence subscale.

Conclusions

This paper has presented a systematic review of the characteristics and psychometric properties of the OCD assessment measures used with pediatric and adolescent populations. Nowadays, there is a wide variety of tools to assess different dimensions of OCD, including symptoms/severity, functional impairment, family attitudes, and cognitive aspects of the disorder. Despite the increased number of studies, there is only one measure that could be

classified as *well-established assessment*, the CY-BOCS, in the symptoms/severity area. To assess the rest of the related-OCD dimensions are available *approaching well-established* or *promising assessments*.

To assess symptom presence and severity the most studied and used measure is the CY-BOCS. This is the gold standard in this field due to its excellent psychometric properties observed across studies. In addition, this is the only one clinician-administered instrument with an interview format. On the contrary, there are many self-reports developed to assess this area. An *approaching well-established assessment* is the OCI-CV; its psychometric properties tested by two research teams were good for internal consistency and validity, although more research for reliability is needed. *Promising assessments* to assess symptoms and severity are the self-reports CHOCI, C-FOCI, OCS, and CSI. These measures have obtained generally good results but have to be studied more thoroughly. One of the most widely used self-report measures is the LOI-CV; however, the performance of this tool has not always been adequate in psychometric studies, primarily due to its lack of sensitivity to change after treatment, weak convergent validity, and poor internal consistency. In addition most of the studies on LOI-CV were conducted in community samples. Thus, this measure has not been sufficiently tested in pediatric OCD samples. Other measures that have not been sufficiently tested in OCD youth are the MOCI and the OCI-R, both developed for their use in adults.

With respect to OCD-related functional impairment, the COIS-C/P is the only measure available to evaluate this area in youth. The COIS-C/P has been classified as *approaching well-established assessment*, since it showed good psychometric properties (reliability, internal consistency and validity) in two studies by the same research team. In addition cut-off points, treatment sensitivity among other aspects, should be further addressed.

There are two scales designed to assess attitudes of the family members of OCD children and adolescents. One of them, the FAS, is an *approaching well-established assessment*, in youth, since the reliability of the measure have not been studied yet in this population. The PABS is the other scale used to analyze the attitudes and behaviors of the relatives. Although it is supported by only one psychometric trial the results obtained were good, thus this was considered a *promising assessment*. Given the importance of family in curse and prognosis of pediatric OCD (Storch et al. 2009b; Valleni-Basile et al. 1995) developments in this area are not still enough.

Recent studies have developed measures in order to explore beliefs or cognitive biases that could have a role in the maintenance of OCD. These are the OBQ-CV to explore OCD related cognitions and the MCQ-A for the assessment of meta-cognitive believes in children with OCD. Several studies have examined the psychometric properties of these measures yielding consistent results suggesting that the OBQ-CV could be considered as *approaching well-established assessment* and the MCQ-A as a *promising assessment*.

Although the use of EBAs is mandatory for the assessment of psychiatric disorders, in the case of pediatric OCD there are some aspects of the measures that have not been sufficiently tested. This fact is still hampering the use of EBAs in research and clinical practice. Within the issues that present limited psychometric evidence are test–retest reliability, sensitivity and specificity for cut-off points and specially the capability of measures to reflect the change after treatment. This last is a considerable problem since for clinicians and researchers could be difficult distinguish between where the deficit is, whether in the intervention or in the assessment tool; this could result in incorrect treatment decisions (McGuire et al. 2012). Furthermore, future research in this field must be encouraged to test the remaining issues for the current measures and to developed new measures to evaluate all OCD-related areas. For example, given that OCD is a heterogeneous condition, development of scales to rate specific symptoms domains, such as the CSI for hoarding disorders, would be very useful. Finally, is important to adapt the EBAs to different languages and cultures in order to avoid generalizations among cultures. These contributions make possible to select the most adequate instruments for a comprehensive assessment of pediatric OCD. Although more research is needed, it is possible to conclude that the OCD assessment of pediatric populations is a growing field that in a short-medium term could provide a wide variety of EBAs for the evaluation obsessive–compulsive symptoms and other OCD-related dimensions.

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