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Metric invariance, reliability, and validity of the Child Version of the Obsessive Compulsive Inventory (OCI-CV) in community and clinical samples

Tíscar Rodríguez-Jiménez [a,*], José A. Piqueras [a], Luisa Lázaro [b], Elena Moreno [b], Ana Griselda Ortiz [b], Antonio Godoy [c]

[a] University Miguel Hernández, Elche, Spain
[b] Department of Child and Adolescent Psychiatry and Psychology, Hospital Clínic i Provincial de Barcelona, Barcelona, Spain
[c] University of Málaga, Málaga, Spain

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ABSTRACT

The Obsessive Compulsive Inventory-Child Version (OCI-CV) is a well-established self-report assessment tool and is particularly recommended for the assessment of dimensions of obsessive compulsive disorder (OCD) symptomatology. Although previous studies have shown that the OCI-CV has good psychometric properties to assess dimensions of OCD in clinical and non-clinical samples, a number of aspects remain unexplored: factor invariance across clinical and non-clinical samples, the discriminative validity of the OCI-CV to differentiate clinical from non-clinical samples, and the need for more data concerning the translation and adaptation of the OCI-CV across cultures and languages. Thus, the aim of our study was to provide new data on the validation of the OCI-CV in two community-based samples ($n=2138$) and clinical samples ($n=94$) of participants between 10 and 18 years old. The results showed that the OCI-CV has a sound 6-factor structure (Doubting/Checking, Obsessing, Hoarding, Washing, Ordering, Neutralizing) with one second-order factor (general OCD symptomatology), metric invariance across clinical and non-clinical samples, good reliability in terms of internal consistency and temporal stability, significant correlations with other specific measures of OCD, and acceptable sensitivity and specificity for the detection of OCD. The OCI-CV is a well-established measure to assess obsessive–compulsive symptom dimensions in children and adolescents.

1. Introduction

Obsessive-compulsive disorder (OCD) is a frequently occurring and very disabling disorder with a prevalence of 0.2% to 3.6% in children and adolescents (Canals, Hernández-Martínez, Cosi, & Voltas, 2012b). OCD is included in a new chapter named Obsessive–Compulsive and Related Disorders in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) of the American Psychiatric Association (American Psychiatric Association, 2013).

Several studies have examined the frequency of subclinical obsessive–compulsive symptomatology in children and adolescents (e.g., Alvarenga et al., 2015; Canals, Hernández-Martínez, Cosi, & Domenech, 2012a; Voltas, Hernández-Martínez, Arija, Aparicio, & Canals, 2014), and have reported that the percentage of subclinical OCD in this population ranges from 2.7% to 19%. They have also shown that OCD symptomatology, even when mild, is associated with an increased risk of psychiatric disorders and higher levels of functional impairment (Canals, Hernández-Martínez, Cosi, 2012a,b; de Bruijn, Beun, de Graaf, ten Have, & Denys, 2010), and an increased risk of developing OCD (Fullana et al., 2009). Longitudinal studies have also shown that obsessive–compulsive symptoms may persist for years (Canals, Hernández-Martínez, Cosi, 2012a,b; de Bruijn et al., 2010; Voltas et al., 2014).

For these reasons, there has been a recent increase in the development of instruments to assess OCD and OCD symptoms in children and adolescents (Overduin & Furnham, 2012). Despite these developments, there are few short-format measures with good psychometric properties that specifically analyze the dimensions of OCD.

According to a review by Iniesta-Sepúlveda, Rosa-Alcázar, Rosa-Alcázar, and Storch (2014), given the time needed to administer specific clinical interviews in research and clinical practice, different measures of self-reporting have been developed, such as the Children's Obsessional Compulsive Inventory (CHOCI; Shafran

* Correspondence to: Universidad Miguel Hernández de Elche, Avda. de la Universidad, s/n 03202 Elche, Alicante, Spain.
E-mail address: tiscar.rj@gmail.com (T. Rodríguez-Jiménez).

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et al., 2003), the Children's Florida Obsessive–Compulsive Inventory (C-FOCI; Storch et al., 2009), the Obsessive–Compulsive Subscale (OCS; Achenbach, 1991), the Child Saving Inventory (CSI; Storch et al., 2011), and the Short Obsessive Compulsive Disorder Screener (SOCS; Uher, Heyman, Mortimore, Frampton, & Goodman, 2007). All these measures are promising tools to assess OCD symptoms and severity, but are unable to provide information on the dimensions of OCD.

Foa et al. (2010) developed the Obsessive Compulsive Inventory-Child Version (OCI-CV) to evaluate the different dimensions of OCD symptoms in adolescents. Currently, the OCI-CV is considered to be an approaching-well-established assessment instrument (Iniesta-Sepúlveda et al., 2014), because several studies have demonstrated its excellent psychometric properties in community and clinical samples. It has been validated in children and adolescents from English-speaking countries (Foa et al., 2010; Jones et al., 2013) and Spanish-speaking countries (Martínez-González, Rodríguez-Jiménez, Piqueras, Vera-Villarroel, & Godoy, 2015; Rodríguez-Jiménez et al., 2015; Rosa-Alcázar et al., 2014). In the meantime, also other measures have been developed to assess OC symptom dimensions in children and adolescents (e.g., the Youth Obsessive–Compulsive Symptoms Scale; De Caluwé & De Clercq, 2014).

The OCI-CV is a brief self-report scale designed for children and adolescents between 7 and 17 years old and was based on an adult version of the scale. It comprises 21 items scored on a three-point Likert-type scale (0=never, 1=sometimes, 2=always). According to the original study (Foa et al., 2010), its factor structure is composed of six subscales which represent the different dimensions of OCD: doubting/checking (five items), obsessing (four items), and washing, hoarding, ordering, and neutralizing (each with three items).

The study found high internal consistency indices of $\alpha \geq .81$ for the total score and subscales. Test–retest reliability was .77 for the total score and ranged from .68 to .89 for the subscales. Statistically significant and moderate correlations were found between the OCI-CV and other measures that assess pediatric OCD, such as the Children's Yale-Brown Obsessive Compulsive Scale (CY-BOCS; Scahill et al., 1997) and the NIMH Global Obsessive Compulsive Scale. Jones et al. (2013) performed a confirmatory factor analysis in a sample of 96 children and adolescents with OCD, and obtained the same six-factor model. Internal consistency was adequate for the global scale (α=.85) and for five of the subscales (α=.79–.87), but was poor for the neutralization subscale (α=.50). Due to the small number of psychometric studies on the OCI-CV, and the importance of having available its adaptation to other languages (because it is brief and provides information on six OCD dimensions), different authors have studied the psychometric properties of the OCI-CV in different Spanish community samples (Rodríguez-Jiménez et al., 2015; Rosa-Alcázar et al., 2014) and Chilean community samples (Martínez-González, et al., 2015). Both groups of studies have confirmed a structure composed of six related factors.

Rosa-Alcázar et al. (2014) showed that the OCI-CV had high internal consistency for the total score (α=.83) and low or moderate internal consistency for the subscales (α=.43–.74). Test-retest reliability was .82 for the total score and ranged from .70 to .79 for the subscales. Statistically significant and moderate correlations were found between the OCI-CV and other measures assessing pediatric OCD (e.g., the LOI-CV and MOCI). Rodríguez-Jiménez et al. (2015) found high internal consistency for the total score (ω=.93) and moderate to high internal consistency for the subscales (ω=.65–.86). In addition, Rodríguez-Jiménez et al. (2015) reported that the OCI-CV factor structure is invariant between boys and girls, between children and adolescents, and between different geographical locations. In a Chilean sample, Martínez-González et al. (2015) also confirmed a six first-order factor structure plus one second-order factor. They also found high internal consistency for the total score (ω=.91) and for the six subscales (ω=.73–.88). Test-retest reliability was .78 for the total score and ranged from .55 to .70 for the subscales. Moderate correlations (.34–.68) were found between the OCI-CV, the C-FOCI, and the SOCS, which also assess OCD in children and adolescents. Additionally, the OCI-CV subscales and the total score have also showed an association with depression and separation anxiety symptoms (Rosa-Alcázar et al., 2014), and a strong relationship with perfectionism (Rodríguez-Jiménez, Blasco, & Piqueras, 2014).

Given that the OCI-CV was designed to be applied to children and adolescents in clinical and community settings, it is relevant to investigate whether its items evaluate the same constructs (e.g., the same dimensions of obsessive–compulsive symptoms) in both age-ranges. However, although several studies have shown that the OCI-CV has excellent psychometric properties; its psychometric properties in Spanish-speaking clinical samples remain unknown.

Given the importance of having adaptations of the OCI-CV available in different languages and that are applicable to community and clinical samples, the main aim of this study was to extend the validation of the OCI-CV in order to contribute to the dissemination of evidence-based assessment procedures for the assessment of OCD dimensions in children and adolescents. Thus, in order to provide new data on the psychometric properties of this instrument, the present study examined the factorial invariance of the OCI-CV between clinical samples of children and community children, and its reliability and validity in both community-based and clinical samples of children and adolescents.

2. Method

2.1. Participants

The community sample was made up of 2138 student volunteers (50.4% boys and young men) from Spanish schools. The mean age was 13.67 years (SD=1.82; range=10–18 years).

The clinical sample consisted of 94 children and adolescents (50% boys and young men) with a diagnosis of OCD according to the DSM-IV criteria (American Psychiatric Association, 1994). The mean age was 14.40 years (SD=2.66; range=10–18 years). All patients were recruited from the Child and Youth Psychiatry and Psychology Unit of the Hospital Clínic of Barcelona (Spain), and the Clinical Psychology Centre for Young People of the Miguel Hernandez University of Elche (Spain).

2.2. Measures

- **Obsessive Compulsive Inventory-Child Version** (OCI-CV; Foa et al., 2010). The psychometric properties of the OCI-CV have been described above.
- ***Ad hoc* socio-demographic questionnaire**. This questionnaire collects data on age, sex, and the geographic area of residence.
- **Children's Florida Obsessive–Compulsive Inventory** (C-FOCI; Storch et al., 2009). This pediatric OCD screening self-report includes two subscales: the symptoms (17 items) and severity (5 items) of the most common compulsions and obsessions. Both the Spanish and the English-speaking versions have shown excellent psychometric properties (Piqueras et al., 2016; Storch et al., 2009).
- **Short Obsessive–Compulsive Disorder Screener** (SOCS; Uher et al., 2007). This measure uses seven items to evaluate general symptoms of obsessions and compulsions. The SOCS has shown

adequate psychometric properties, including good sensitivity and specificity both in English-speaking samples (Uher et al., 2007) and Spanish-speaking samples (Piqueras et al., 2015). Thus, the SOCS is considered to be a useful screening test.

- **The 30-item version of the Revised Child Anxiety and Depression Scales** (RCADS-30; Sandín, Chorot, Valiente, & Chorpita, 2010). The RCADS-30 is a short version of the original 47-item RCADS (Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000). The scale provides scores on the following: separation anxiety disorder, social phobia, generalized anxiety disorder, panic disorder, obsessive–compulsive disorder, major depressive disorder, and total score. Validation data indicate that the scale has excellent psychometric properties (Sandín et al., 2010).
- **Strengths and Difficulties Questionnaire** (SDQ; Goodman, Meltzer, & Bailey, 2003). The SDQ consists of 25 items providing information on five scales: behavior problems, hyperactivity, emotional symptoms, problems with peers, and prosocial behavior. A total score on difficulties is obtained by adding all the scales, with the exception of the prosocial behavior scale. The present study used the Spanish version, which has appropriate psychometric properties (Ortuño, Fonseca, Paino, Sastre, & Muñiz, 2015).
- **Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version** (K-SADS-PL; Kaufman et al., 1997; Spanish adaptation by Ulloa et al. (2006)). The K-SADS-PL is a semi-structured diagnostic interview used to screen and assess 20 psychiatric disorders. This measure has adequate psychometric properties.

2.3. Procedure

The study was approved by the research and ethics committees of the Miguel Hernández University of Elche, the University of Málaga, and the Hospital Clínic of Barcelona. The students in the community sample voluntarily completed the assessment instruments in their normal classrooms. Informed consent was previously obtained from parents or guardians and the principals of the schools. The community sample completed the assessment instruments according to the following scheme: one group received the OCI-CV and the SDQ, and the other group received the OCI-CV, the SOCS, the C-FOCI, and the RCADS. The clinical sample completed the OCI-CV, the SOCS, the C-FOCI, the RCADS, and the interview K-SADS-s. The assessment instruments were collectively applied to the community sample by experienced psychologists, who gave the instructions, provided help when needed, and informed the students that there were no right or wrong answers. All the instruments were individually applied to the clinical sample by the children's clinicians.

One month after the first application, a random sample of children and adolescents from the community sample as well as the whole clinical sample completed the OCI-CV. The community sample for retest was made up of 468 students (45% boys and young men). The mean age was 12.73 years (SD = 2.12; range = 10–18 years).

2.4. Data analyses

The community sample had missing data (2.1%), which was treated by multiple imputations using the PRELIS program (EM algorithm). The clinical sample was free of missing data.

Based on the results of Foa et al. (2010), we tested the hypothesis that the OCI-CV scores can be structured into six first-order factors grouped into a single second-order factor by performing a confirmatory factor analysis on the clinical and community samples together (total sample). We also tested whether OCI-CV scores showed metric invariance, where metric invariance is understood as the OCI-CV having the same number of factors, the same factor weights, the same error variances, and the same intercepts in the clinical and community samples. Metric invariance was tested once, rather than step by step. Thus, all restrictions were introduced simultaneously in all cases using the diagonally weighted least squares method and polychoric correlation matrices (DWLS procedure LISREL). We used this procedure because our data are ordinal and the number of response categories is small (three), following the recommendations made by Mîndrilã (2010). The following indices (Schermelleh-Engel, Moosbrugger, & Müller, 2003) were used as measures of goodness of fit: Satorra-Bentler chi-square; the Root Mean Square Error of Approximation (RMSEA) equal to or less than .06; and the Comparative Fit Index (CFI), the goodness of fit index (GFI), and the non-normed fit index (NNFI) greater than or equal to .90. According to Cheung and Rensvold (2002), invariance between samples is admissible when the difference between the CFIs (ΔCFI) is less than or equal to $-.01$. Cheung and Rensvold suggested that ΔCFI is a better estimator of the admissibility of invariance than $\Delta\chi^2$, which is the index used by some researchers.

The reliability of the OCI-CV scores was estimated by calculating the standardized Cronbach's alpha for the total score and subscales using FACTOR 9.3 software (Lorenzo-Seva & Ferrando, 2006). Test–retest reliability indices were obtained using the IBM SPSS-22 statistics package.

Convergent-discriminant validity was calculated using Pearson correlation coefficients. Cohen's criteria (Cohen, 1988) were used to assess the effect sizes of the correlation: small $\leq .20$ and large $\geq .50$.

Finally, based on the procedure provided by Foa et al. (2002) for the Obsessive Compulsive Inventory-Revised (OCI-R), we analyzed the sensitivity and specificity of the OCI-CV scores using receiver operating characteristic (ROC) curve analysis (AUC; area under the curve). We followed the traditional academic point system for classifying the accuracy of a diagnostic measure by Metz (1978): .90–1.00 = excellent, .80–.90 = good, .70–.80 = fair, .60–.70 = poor, less than .60 = fail. Although the AUC is the most widely used global index of diagnostic accuracy, the Youden Index (Youden, 1950) is a commonly used measure of overall diagnostic usefulness. The Youden Index corresponds to the cut-off point than optimizes the biomarker's differentiating ability when equal weight is given to sensitive and specificity. As a result, the Youden Index was mainly used here to choose the more appropriate cut-off score.

3. Results

3.1. Confirmatory factor analysis

The fit indices for the total sample (community sample and clinical sample together) showed that the model of six first-order factors grouped into a single second-order factor had a good fit with the data (see Table 1). The table also shows that this model presents metric invariance (i.e., the same number of factors, the same factor weights, the same error variances, and the same intercepts) between the two samples because fit indices for the multigroup confirmatory factor analysis (community and clinical samples, each one taken as a group) were the same than fit indices for the confirmatory factor analysis of the total sample (community + clinical samples joined in a single group), except for the value of GFI in the clinical sample (.91), in the limit of an acceptable fit.

Table 2 presents the degree of relationship (standardized *lambda* weights common to both samples) of each item with its

Table 1
Confirmatory factor analysis (total sample: $n=2232$) and multi-group confirmatory factor analyses (diagonally weighted least squares method estimated on polychoric correlation matrices) for children from a clinical setting ($n=94$) and children from the community ($n=2138$).

Sample/Model	χ^2	d.f.	RMSEA (CI 90%)	CFI	GFI	NNFI
Total sample						
Independent	39,844.51	210				
6+1 factors[a]	840.39	183	.04 (.04–.04)	.98	.98	.98
Metric invariance						
Community–clinical						
Independent	37,391.37	420				
6+1 factors[a]	1347.42	428	.04 (.04–.05)	.98	Community: .98 Clinical: .91	.98

Note: χ^2=Satorra-Bentler's chi squared; d.f.=degree of freedom; RMSEA=root mean square error of approximation; CFI=comparative fix index; GFI=goodness of fit index; NNFI=non-normed fit index.

[a] 6+1 factors=Six first-order factors grouped into one second-order factor.

corresponding first-order factor, and the degree of relationship of every first order-factor with the second-order factor (standardized gamma weights). As shown, all items have lambda values above .50, and all first-order factors have gamma values above .60, with $p<.05$ significance.

Table 3
Means, standard deviations, and differences between community samples ($n=2138$) and clinical samples ($n=94$) for the total score and subscales of the OCI-CV.

	Community Mean (SD)	Clinical Mean (SD)	Mann–Whitney U (z)
OCI-CV Checking/doubting	3.22(2.07)	5.02(2.51)	6.73**
OCI-CV Obsessing	2.04(1.83)	4.27(2.16)	9.26**
OCI-CV Hoarding	2.43(1.46)	2.60(1.86)	.69
OCI-CV Washing	2.24(1.62)	2.60(2.04)	1.36
OCI-CV Ordering	2.81(1.61)	3.18(2.11)	1.97*
OCI-CV Neutralizing	.80(1.02)	1.68(1.65)	5.38**
OCI-CV Total Score+	13.54(6.52)	19.34(8.26)	6.35**

Note:
* $p<.05$.
** $p<.01$.

3.2. Descriptive statistics

Table 3 shows means and standard deviations of the total score and subscale scores obtained in both samples and the comparison of means. We calculated the z statistic with the Mann–Whitney test because all variances were uneven between groups. The means of the doubting/checking, obsessing, ordering and neutralizing scales and the total score of the clinical sample were statistically higher than those of the community sample. The means of hoarding and washing did not differ between samples.

Table 2
Item content, item factor loading (lambda), and first-order factor loadings (gamma). Total sample ($n=2232$), community sample ($n=2138$), and clinical sample ($n=94$).

Item	**Scale name**/item content	**Gamma**/Lambda
	Doubting/Checking	**.95**
04	I check many things over and over again. [Compruebo muchas cosas una y otra vez]	.65
05	After I have done things, I'm not sure if I really did them. [Después de haber hecho algo, no estoy seguro de haberlo hecho realmente]	.54
13	Even after I'm done I still worry that I didn't finish things. [Incluso después de haber terminado algo, me preocupa no haberlo acabado]	.62
15	I check doors, windows, and drawers over and over again. [Compruebo puertas, ventanas y cajones una y otra vez]	.60
20	Even when I do something very carefully I don't think I did it right. [Incluso cuando hago algo con mucho cuidado, no creo que lo he hecho bien]	.65
	Obsessing	**.67**
01	I think about bad things and can't stop. [Cuando comienzo a pensar algo malo no puedo parar]	.69
11	I'm upset by bad thoughts. [Tengo malos pensamientos que me molestan]	.75
14	I get upset by bad thoughts that pop into my head when I don't want them to. [Me siento mal por pensamientos malos que me vienen a la cabeza sin que yo quiera]	.83
18	If a bad thought comes into my head, I need to say certain things over and over. [Cuando se me viene a la cabeza un pensamiento malo, necesito decir ciertas cosas una y otra vez]	.76
	Hoarding	**.68**
03	I collect so much stuff that it gets in the way. [Acumulo tantas cosas que terminan por estorbarme]	.67
07	I collect things I don't really need. [Acumulo cosas que realmente no necesito]	.62
16	I don't throw things away because I'm afraid I might need them later. [No tiro las cosas por miedo a necesitarlas después]	.56
	Washing	**.70**
02	I feel like I must wash and clean over and over again. [Siento que necesito lavarme y limpiarme una y otra vez]	.80
10	I worry a lot about things being clean. [Me preocupo mucho de que las cosas estén limpias]	.59
21	I wash my hands more than other kids. [Me lavo las manos más que otros niños/as]	.72
	Ordering	**.72**
08	I get upset if my stuff is not in the right order. [Me siento mal si mis cosas no están en el orden correcto]	.66
17	I get upset if people change the way I arrange things. [Me molesta que la gente cambie la forma en que yo arreglo las cosas]	.60
19	I need things to be in a certain way. [Necesito que las cosas estén de una cierta manera]	.76
	Neutralizing	**.77**
06	I need to count while I do things. [Necesito contar mientras hago algo]	.53
09	I get behind in my school-work because I repeat things over and over again. [Me retraso en mis deberes escolares porque repito las cosas una y otra vez]	.64
12	I have to say some numbers over and over. [Tengo que repetir algunos números una y otra vez]	.61

3.3. Reliability

The reliability (standardized Cronbach's alpha) of the OCI-CV scores was moderate to high for the subscales and the total score of both samples.

In the community sample, reliability was high for the total score (α=.89), and for the obsessing subscale (α=.84), but moderate for the remaining subscales (doubting/checking=.75; hoarding=.62; washing=.72; ordering=.69; neutralization=.62).

In the clinical sample, the reliability indices (standardized Cronbach's alpha) were high in all cases (total score=.88; doubting/checking=.85; obsessing=.87; hoarding=.85; washing=.84; ordering=.91; neutralizing=.78).

3.4. Test–retest reliability

The test and the retest total scores of the OCI-CV were moderate (intra-class correlation, *ICC*=.85) in the community sample (n=468). However, the correlations coefficients were lower for the subscale scores (doubting/checking: *ICC*=.76) obsessing: *ICC*=.78; hoarding: *ICC*=.71; washing: *ICC*=.82; ordering: *ICC*=.72; neutralizing: *ICC*=.76). In all cases the p values were less than .01.

Higher intra-class correlation indices were obtained in the clinical sample (n=94). Test–retest reliability was high for the total score (*ICC*=.92) and moderate to high for the subscales (doubting/checking: *ICC*=.85; obsessing: *ICC*=.87; hoarding: *ICC*=.88; washing: *ICC*=.93; ordering: *ICC*=.87; neutralizing: *ICC*=.86). In all cases the p values were less than.01.

3.5. Convergent and discriminant validity

A significant correlation was found between the OCI-CV total score and well-established measures of pediatric OCD (C-FOCI, SOCS, and the OCD subscale of the RCADS; see Tables 4 and 5). In general, the effect sizes ranged from medium to large in the community students (r=.53–.72) and in the clinical sample (r=.41–.76). Moderate correlations were found between the OCI-CV subscales and the scores of other measures of obsessive–compulsive symptoms. These correlations were relatively similar to correlations between OCI-CV subscales and RCADS subscales that measure other types of anxiety symptoms.

Regarding the related construct of anxiety symptoms, a moderate association was found between the subscales of both samples and the RCADS anxiety subscales (community sample: r=.18–.55; clinical sample: r=.13–.58)

Correlations between the subscales and RCADS major depression subscale were low or moderate (r=.12–.46) in the community sample, and slightly higher in the clinical sample (r=.23–.52).

On the other hand, correlations were low or close to zero (r=–.01–.21) between the subscales and the SDQ subscales that evaluate non-OCD-related constructs except between Obsessing (.32) and Hoarding (.22) with Behavior Problems of SDQ. As expected, the correlations were higher for the emotional symptoms subscale (r=.17–.47).

3.6. Sensitivity and specificity

The AUC was.78 (p < .01; 95% confidence interval=.73–.83), which suggests that there is a 78% probability that a child or adolescent with OCD will have a higher score on the obsessing subscale than a child or adolescent without OCD. Table 6 shows the obsessing subscale; at an optimal cut-off point of 3, sensitivity was 79%, specificity was 61%, Youden Index was.40, and accuracy or informativeness (percentage of participants correctly classified) was 62%. The remaining subscales and the total score are of little use in differentiating between children and adolescents with and without obsessive–compulsive symptoms.

4. Discussion

The main aim of this study was to investigate whether the OCI-CV assesses the same constructs (e.g., dimensions of obsessive–compulsive symptoms) in clinical and non-clinical samples. This objective was addressed using multi-group confirmatory factor analyses. This study also provides new data on the validation of the OCI-CV in Spanish-speaking community and clinical samples of children and adolescents (10–18 years old). The results showed that the OCI-CV assesses similar constructs in clinical and community populations, and that it can be considered a valid measure in both types of samples.

As shown in Table 1, this study replicates the six-factor structure reported in the original study by Foa et al. (2010). However, in

Table 4
Convergent/divergent validity of the community sample.

	OCI-CV Total	Doubting/Checking	Obsessing	Hoarding	Washing	Ordering	Neutralizing
N=880							
C-FOCI-Symptom	.72**	.63**	.52**	.40**	.50**	.46**	.45**
C-FOCI-Severity	.53**	.42**	.58**	.27**	.25**	.34**	.31**
SOCS	.71**	.60**	.44**	.43**	.52**	.48**	.44**
RCADS Obsessive–Compulsive Disorder	.64**	.56**	.56**	.32**	.40**	.35**	.40**
RCADS Separation Anxiety	.44**	.38**	.37**	.23**	.31**	.22**	.30**
RCADS Social Phobia	.47**	.46**	.40**	.32**	.18**	.28**	.28**
RCADS Generalized Anxiety	.55**	.49**	.40**	.33**	.35**	.39**	.28**
RCADS Panic Disorder	.50**	.41**	.48**	.27**	.26**	.26**	.42**
RCADS Major Depression	.46**	.41**	.46**	.33**	.12**	.21**	.36**
RCADS total score	.69**	.61**	.60**	.41	.36**	.39**	.44**
N=1258							
SDQ Emotional Symptoms	.44**	.36**	.47**	.30**	.17**	.19**	.18**
SDQ Behavior Problems	.29**	.20**	.32**	.22**	.10**	.15**	.11**
SDQ Hyperactivity	.27**	.21**	.18**	.19**	.18**	.16**	.13**
SDQ Problems with peers	.19**	.17**	.20**	.09**	.05	.13**	.08**
SDQ Prosocial Behaviors	.09**	.04	.03	.06*	.11**	.11**	−.01
SDQ total score	.47**	.36**	.46**	.32**	.20**	.24**	.20**

Note:

* p < .05.
** p < .01.

Table 5
Convergent/divergent validity of the clinical sample ($n=94$).

	OCI-CV Total	Doubting/Checking	Obsessing	Hoarding	Washing	Ordering	Neutralizing
C-FOCI-Symptoms	.76**	.54**	.57**	.41**	.56**	.47**	.47**
C-FOCI-Severity	.41**	.32**	.49**	.17	.36**	.09	.18
SOCS	.71**	.56**	.45**	.35**	.52**	.43**	.51**
RCADS Obsessive–Compulsive Disorder	.67**	.52**	.68**	.27**	.39**	.34**	.40**
RCADS Separation Anxiety	.44**	.26*	.36**	.31**	.34**	.35***	.13
RCADS Social Phobia	.54**	.46**	.31**	.26*	.33**	.42**	.35**
RCADS Generalized Anxiety	.57**	.40**	.58**	.31**	.32**	.29**	.32**
RCADS Panic Disorder	.56**	.54**	.44**	.26*	.39**	.28**	.25*
RCADS Major Depression	.49**	.29**	.52**	.26*	.38**	.23*	.25*
RCADS total score	.74**	.57**	.67**	.39**	.46**	.43**	.40**

Note:
* $p < .05$.
** $p < .01$.

Table 6
Sensitivity, specificity, Youden Index, and accuracy of the OCI-CV Obsessing Subscale. Total sample ($n=2232$), community sample ($n=2138$), and clinical sample ($n=94$).

Cut-off	Sensitivity	Specificity	Youden Index	Accuracy
1	.93	.28	.21	.31
2	.90	.45	.36	.47
3	.79	.61	.40	.62
4	.61	.78	.39	.78
5	.49	.89	.38	.88
6	.34	.96	.30	.93
7	.17	.99	.16	.95
8	.04	1	.04	.96

Accuracy (informativeness), percentage of children correctly classified.

addition to their results, our data also indicate that the six factors can be grouped into a second-order factor, which adds support to the common procedure of adding across the six subscale scores to obtain an OCI-CV total score.

The OCI-CV demonstrated metric invariance between the samples of community students and clinical children and adolescents, which indicates that the OCI-CV assesses the same constructs, in the same way, with the same degree of error, and on the same metric scale. Table 1 shows that the RMSEA index is lower than.06, and that the CFI, GFI and NNFI are higher than or equal to.90. According to Schermelleh-Engel et al. (2003), these values can be considered to be indicators of acceptable adjustment. To our knowledge, the present study is the first to provide evidence of measurement invariance of OCI-CV scores in clinical and community samples. This new finding suggests that the same dimensions of obsessive–compulsive symptoms are present in children and adolescents with and without OCD.

As expected, the means of the doubting/checking, obsessing, ordering, and neutralizing subscales and the total score were higher in the clinical sample than in community sample (see Table 3). However, contrary to expectations, the hoarding and washing subscales did not differ between the samples. Given that the means of the clinical sample were quite similar to those reported by Jones et al. (2013) in clinical samples, this similarity between samples can be attributed to the high scores of the community sample, rather than to the low scores of the clinical sample. This interpretation is supported by the means observed in our study and those observed in the study by Rosa-Alcázar et al. (2014), which was also conducted in Spain with students from the community. The latter study reported means that were quite similar to those observed in clinical samples from other countries (e.g., Jones et al., 2013).

In the present study, the coefficients of the internal consistency of the OCI-CV in the clinical sample were high and similar to those found in previous studies (Foa et al., 2010; Jones et al., 2013; Storch et al., 2010, 2011). In the clinical sample, all the values of Cronbach's alpha were higher than the recommended value of .70 proposed by Nunnally and Bernstein (1994). However, in the community sample, the coefficients were higher for the total score and obsessions subscale than for the remaining subscales, a finding which is similar to the findings of other studies conducted with community samples (e.g., Rosa-Alcázar et al., 2014; Martínez-González et al., 2015; Rodríguez-Jiménez et al., 2015). In the present study, the hoarding and neutralizing subscales had the lowest value of internal consistency (.62), which is very similar to the value found when the OCI-R was applied to teenagers (Martínez-González, Piqueras, & Marzo, 2011; Piqueras et al., 2009).

In the clinical sample, the test–retest reliability coefficients were high and similar to the values reported by Foa et al. (2010). In the community sample, the test–retest reliability coefficients were slightly lower, but very similar to those reported in previous studies with Chilean and Spanish samples (Martínez-González et al., 2015; Rosa-Alcázar et al., 2014).

In the community sample, significant correlations were found between the OCI-CV scores and the C-FOCI and SOCS scores. The latter three measures have been validated to assess obsessive–compulsive symptoms in children and adolescents (see Iniesta-Sepúlveda et al. (2014)). In the clinical sample, correlations between the OCI-CV subscales and the other scales were similar. In general, as expected, the highest correlations were found between the OCI-CV total score and the scores of the remaining obsessive–compulsive symptoms scales. Similarly, high correlations were also found between the OCI-CV subscales and obsessive–compulsive symptoms, although the values were slightly lower than those found with the total score. Correlations were similar between the OCI-CV subscales and RCADS depression and the types of anxiety symptoms assessed using the RCADS.

On the other hand, evidence of discriminant validity was provided by the low to moderate correlations between the OCI-CV subscales and the SDQ subscales that assess psychopathological constructs unrelated to obsessive–compulsive symptoms (e.g., behavior problems, hyperactivity, problems with peers, and prosocial behavior). In general, the results regarding the convergent/discriminant validity of the OCI-CV scores were similar to those found in previous studies with clinical samples (Foa et al., 2010; Jones et al., 2013) and community samples (Martínez-González et al., 2015; Rosa-Alcázar et al., 2014).

Finally, ROC curve analysis was used to study the sensitivity and specificity of the OCI-CV scores. These psychometric properties have been previously studied in the OCI-R (Foa et al., 2002),

but not in the OCI-CV. The results for the obsessing subscale scores indicated an AUC of .78. In general, values of around .70 can be considered representative of acceptable discriminant power. According to our data, the optimal cut-off point for the obsessing scale was 3, with a sensitivity of .79 and a specificity of .61. This cut-off point for the obsessing subscale could be used to screen and identify OCD in children and adolescents. However, the cut-off point may vary according to the objective. For example, if we want to screen for OCD in a school community, it will be a priority to include everyone with obsessive–compulsive symptoms, even if this increases the rate of false positives. In this case a cut-off score of 2 is more sensitive than the more balanced 3 cut-off point. On the other hand, if we wish to minimize the number of false positives, and therefore increase specificity, then a cut-off score of 4 or even 5 would be preferable. Although the checking-doubting subscale and the total score of the OCI-CV had a statistically significant AUC. For the checking-doubting subscale is .69 (95% confidence interval=.63–.75; $p=<.01$) and for the total score is .70 (95% confidence interval=.65–.76; $p=<.01$), their degrees of discriminant power are of lesser clinical use than the obsessing scale. The discriminant power of the remaining OCI-CV subscales did not reach statistical significance.

Further research should take into account the following limitations: (a) This study did not examine the psychometric properties of the OCI-CV in a large clinical sample; (b) the community sample was not interviewed to investigate whether some of the students warranted a diagnosis of OCD; and (c) the relationship between the OCI-CV scores and non-self-report procedures (e.g., information gathered from parents and teachers) should be studied.

In summary, the results of the study show that the OCI-CV assesses the same constructs in children and adolescents diagnosed with OCD and those in the general population. The OCI-CV also has acceptable psychometric properties in both types of samples. The OCI-CV should be considered a first-choice test, given that it is a valid and reliable instrument, and that great empirical support has been provided regarding its power to assess different dimensions of obsessive–compulsive symptoms in children and adolescents. The OCI-CV meets the criteria required of an evidence-based assessment instrument (Cohen et al., 2008), given that several studies by different research teams have shown that it has good psychometric properties of reliability and validity (Foa et al., 2010; Jones et al., 2013; Martínez-González et al., 2015; Rodríguez-Jiménez et al., 2015; Rosa-Alcázar et al., 2014). The OCI-CV can be used as a well-established measure in research for the development and assessment of the effectiveness of empirically validated therapies.

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