Yale-Brown Obsessive Compulsive Scale: Psychometric Properties of the Self-Report Version in a Student Sample

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Abstract The aim of the present study was to investigate the psychometric properties of an Icelandic translation of the self-report version of the Yale-Brown Obsessive Compulsive Scale (Y-BOCS-SR). The Y-BOCS-SR was administered to a sample of 427 Icelandic university students along with another measure of OCD symptoms (OCI-R) and measures of general anxiety and worry (GAD-Q-IV and PSWQ). The internal consistency of the Y-BOCS-SR total severity score and its obsession and compulsion subscales was very good. Confirmatory factor analysis supported the original two- factor structure of the severity dimensions but a three-factor model with obsession, compulsion and resistance/control factors fitted the data equally well. Five factors described best the latent structure of the symptom dimensions. Support was found for the convergent and divergent validity of the Y-BOCS-SR. The results indicate that the Y-BOCS-SR is a reliable and valid instrument for assessing the severity of obsessions and compulsions in a student population.

Keywords Y-BOCS · Confirmatory factor analysis · OCD · Assessment · Validity

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The Yale-Brown Obsessive Compulsive Scale (Y-BOCS; Goodman et al. 1989a, b) is a widely used semi-structured interview designed to assess the severity of symptoms of obsessive-compulsive disorder (OCD). The Y-BOCS consists of two parts. The first part is a symptom checklist where presence of different types of obsessions (aggressive, contamination, sexual, hoarding religious, symmetry and somatic) and compulsions (cleaning, checking, repeating, counting, ordering and hoarding) is registered. The second part is a 10-item severity scale which is divided into obsession and compulsion subscales with five parallel items that assess frequency (items 1 and 6), interference (items 2 and 7), distress (items 3 and 8), resistance (items 4 and 9) and control (items 5 and 10) over the symptoms in the past seven days.

The Y-BOCS severity scale has for the most part demonstrated good psychometric properties (Grabill et al. 2008; Taylor 1995). However, the divergent validity seems to be more limited, since the correlations with measures of anxiety and depression tend to be as high as the correlation with other OCD measures (Goodman et al. 1989b; Woody et al. 1995). A self-report version of the instrument, the Y-BOCS-SR, has been developed (Baer 1991; Steketee et al. 1996). This version is very similar to the interview, utilizing the same symptom checklist and the 10-item severity scale. The Y-BOCS-SR therefore combines a broad coverage of symptoms with a content-free assessment of severity that is an advantage in comparison with other popular self-report inventories (i.e. OCI-R, PI-WSUR) that only assess severity indirectly by focusing on the frequency of specific symptoms. The Y-BOCS-SR severity scale has shown excellent internal consistency and test-retest reliability (Grabill et al. 2008; Rosenfeld et al. 1992; Steketee et al. 1996; Warren et al. 1993) as well as good convergent validity, which was supported via correlations with other

measures of OCD and with the interview version of Y-BOCS (Baer et al. 1993; Rosenfeld et al. 1992; Schaible et al. 2001; Steketee et al. 1996). The self-report version has also been found to discriminate as well as the interview between OCD patients and non-OCD patients (Rosenfeld et al. 1992; Steketee et al. 1996). However, the discriminant validity of the self-report version against measures of related constructs, such as anxiety and worry, has yet to be established.

The Y-BOCS-SR as well as the original Y-BOCS is based on a fundamental distinction between obsessions and compulsions. This distinction has been addressed in factorial studies of the original instrument. There have been numerous exploratory (EFA) and at least seven confirmatory factor analytic studies (CFA) of the Y-BOCS severity scale in adult clinical samples (Amir et al. 1997; Arrindell et al. 2002; Deacon and Abramowitz 2005; McKay et al. 1995; McKay et al. 1998; Moritz et al. 2002; Storch et al. 2005). The results have been inconsistent. Some studies have found support for the original two-factor structure, with separate obsession (items 1 to 5) and compulsion (items 6 to 10) factors mirroring the rationally derived subscales of the instrument (McKay et al. 1995; McKay et al. 1998; Storch et al. 2005). Others have reported different two-factor models with factors representing disturbance (items 2, 3, 7 and 8) and severity (items 1, 4, 5, 6, 9 and 10) of symptoms (Amir et al. 1997; McKay et al. 1998) or severity (items 1, 2, 3, 6, 7 and 8) and resistance/control (items 4, 5, 9 and 10) of symptoms (Deacon and Abramowitz 2005). Support has also been found for a three-factor model with obsession (items 1, 2, 3 and 5) and compulsion (items 6, 7, 8 and 10) factors and a third resistance/control factor (items 4, 5, 9 and 10) (Moritz et al. 2002). The rationale for this three-factor model is that in EFA, items 4 and 9 tend to form a separate third factor with items 5 and 10 also having significant loadings on this factor (Kim et al. 1994; Moritz et al. 2002).

The reasons for these inconsistent results are not clear. Possible explanations are the small sample size in most studies (n<150), differences in specifications of some models between studies, and absence of statistical difference tests when comparing the fit of different models in CFA studies. Additionally, some of the items have poor psychometric properties. Items 4 and 9 that measure resistance to obsessions and compulsions have been considered problematic because they tend to have low factor loadings in two-factor solutions (McKay et al. 1995; McKay et al. 1998) or tend to form their own factor (Kim et al. 1994). This indicates that these two items do not fit well with the other items of the scale that might cause instability in factor solutions across studies. In fact, some authors have suggested that these items might be dropped from the scale (Deacon and Abramowitz 2005). To date, there has been no factor analytic study reported on the severity scale of the Y-BOCS interview in a non-clinical sample. Additionally, no such studies at all have been conducted on the severity scale of the self-report version.

The symptom checklist of the Y-BOCS has been used to investigate heterogeneity of the OCD phenotype. This line of research relies on factor analysis of the checklist. Although factor analysis has been conducted on individual items of the checklist in some studies, in most studies analysis has been based on scores of the thirteen a priori symptom categories of the checklist, leaving out the miscellaneous categories. Numerous factor analytic studies have been conducted in clinical populations (for a review see Mataix-Cols et al. 2005) and at least one study on the YBOCS-SR in both a clinical and a student population (Wu et al. 2007). Generally, three to five factors emerge but the exact composition of these factors differs between studies. Bloch et al. (2008) conducted a meta-analysis of factor analytic studies of the Y-BOCS symptom checklist in clinical adult and children samples. Four factors emerged in adult samples labeled symmetry (symmetry obsessions, repeating, ordering and counting compulsions), forbidden thoughts (aggression, sexual, religious and somatic obsession and checking compulsions), cleaning (cleaning compulsions and contamination obsessions) and hoarding (hoarding obsessions and compulsions). This is the same four-factor structure that Leckman et al. (1997) reported but deviates from the results of Baer (1994) that reported three factors labeled symmetry/hoarding, contamination/checking and pure obsessions.

Wu et al. (2007) compared their data in a CFA with the three- and four-factor models from Leckman et al. and Baer in two samples of patients and students using the Y-BOCS-SR. In neither case was an acceptable fit obtained. However, EFA of the data revealed five factors labeled pure obsessions (aggressive, sexual and religious), checking (checking and repeating compulsions and somatic obsessions), arranging (symmetry obsessions and ordering and counting compulsions), contamination/cleaning (contamination obsessions and cleaning compulsions), and hoarding (hoarding obsessions and compulsions).

Some support has been found for the usefulness of the dimensional approach to the heterogeneous nature of OCD. Mataix-Cols et al. (2005) review some of the findings. Results for the hoarding dimension seem to be particularly robust but scores on this dimension tend to be associated with greater symptom severity, disability, comorbidity and worse response to medication and psychological treatments. The results are less clear for other dimensions but further research is needed on this topic.

Although the interview version of the Y-BOCS has become the gold standard for assessing severity of OCD symptoms, studies on the agreement between the self-report

format and the interview show that the self-report version is a time-saving and easy to use alternative to the interview (Frost et al. 1995; Schaible et al. 2001; Steketee et al. 1996). This means that the Y-BOCS-SR might be used when time for assessment is limited or repeated testing is required, for example when measuring changes during treatment. It therefore is unfortunate that studies on the psychometric properties of the Y-BOCS-SR have been lacking. The aim of the present study was to investigate the factor structure of an Icelandic translation of the Y-BOCS-SR and its convergent and divergent validity. To be able to study these properties in a large sample with adequate statistical power, the instrument was administered to an unselected university student sample. Although conclusions from studies on clinical phenomena in non-clinical or student samples should be made with caution, research data generally support a dimensional representation of OCD related symptoms (Haslam et al. 2005; Mataix-Cols et al. 2005) with studies showing that both content and structure of symptoms are similar in non-clinical/student and clinical samples (Burns et al. 1995; Gibbs 1996).

Method

Participants

The participants were 427 students enrolled in the Social Science Department of the University of Iceland. A total of 113 were men (26.5%) and 313 women (73.3%). The mean age of the sample was 28.5 years (SD=7.0). Participants did not receive any compensation for participation in the study.

Measures

Yale-Brown Obsessive Compulsive Scale-Self-Report (Y-BOCS-SR; Baer 1991)

The Y-BOCS-SR consists of three parts. In the first part participants are asked to read definitions and examples of obsessions and compulsions. The second part is a 58-item symptom checklist. Respondents are asked to indicate whether the symptoms are present currently (last 30 days) or were present in the past, or otherwise leave a blank. If a symptom was not present, the answer is coded as 0, symptom present during the last 30 days or in the past is assigned a score of 1, and if a symptom had been present both in the past and in the last 30 days the answer is assigned a score of 2. Participants are asked to circle the most prominent obsessions and compulsions before answering the third part, which is the 10-item severity scale. The severity scale assesses, for obsessions and compulsions

separately: 1) time spent on symptoms, 2) interference with functioning, 3) subjective distress, 4) resistance to the symptoms and 5) control over them. The items on the severity scale are rated in terms of average severity during the previous week. The Y-BOCS-SR was translated from English to Icelandic for this study by the second author (IS). This translation was independently controlled by the other two authors and changes made if necessary. This version was then back-translated. Based on this back-translation a final version was made for this study.

Obsessive Compulsive Inventory—Revised (OCI-R; Foa et al. 2002)

The OCI-R is an 18-item self-report inventory designed to measure distress associated with obsessive and compulsive symptoms. Participants rate the items on a 5-point scale, from 0 (not at all) to 4 (extremely), with regard to how distressing the symptoms have been during the past month. OCI-R yields a total score for overall distress associated with the symptoms as well as a score for six subscales: 1) Washing, 2) Obsessing, 3) Hoarding, 4) Ordering, 5) Checking and 6) Neutralizing. The Icelandic translation of the OCI-R has demonstrated good psychometric properties in a non-clinical student sample (Smári et al. 2007).

Generalized Anxiety Disorder Questionnaire for DSM-IV (GAD-Q-IV; Newman et al. 2002)

The GAD-Q-IV is a 9-item self-report measure designed to diagnose generalized anxiety disorder based on DSM-IV criteria. The items assess the occurrence of excessive and uncontrollable worry, control over worries, the content of worrisome topics, frequency of worries during previous six months, six different physical symptoms related to worries and the extent to which both worries and physical symptoms interfere with daily life functioning. Good psychometric properties of GAD-Q-IV have been established (Newman et al. 2002). The GAD-Q-IV was translated from English to Icelandic by the first author (RPO). A back-translation was made and a final version created. This Icelandic translation has good psychometric properties (Snorrason et al. 2008).

Penn State Worry Questionnaire (PSWQ; Meyer et al. 1990)

The PSWQ is a 16-item questionnaire developed to assess the tendency to experience worry. Items are rated on a 5-point scale ranging from "not at all typical of me" to "very typical of me". Jónsdóttir and Smári (2000) found that the Icelandic translation of this instrument has good psychometric properties.

Procedure

The participants were approached during class hours and asked to fill out the questionnaires on a voluntary basis. Participants could end their participation at any time and results were not personally identifiable. This procedure is in agreement with recommendations of the Institutional Review Board of the University of Iceland. The questionnaires were administered in the following order: Y-BOCS-SR, OCI-R, GAD-Q-IV and PSWQ.

Data analysis

SPSS 13.0 was used for basic statistical analysis. LISREL 8.80 (Jöreskog and Sörbom 2006) was used for Confirmatory Factor Analysis that was conducted using maximum likelihood (ML) estimation of covariance structure models. As a test of the fit of the models being tested, the chi-square test was used. However, due to non-normality of the data, we used the Satorra-Bentler scaled chi-square statistic (S-B X^2; Satorra and Bentler 1994) that adjusts the chi-square value from a standard ML estimation relative to the non-normality of the data (Kline 2005).

Like all other tests of significance, the chi-square test is sensitive to sample size that can result in good fitting models being rejected on grounds of only a small discrepancy between sample and fitted covariance matrices. Use of other indices of fit has therefore been recommended to obtain additional information on model fit (Hu and Bentler 1999; Kline 2005). In addition to S-B X^2 we used the Root Mean Square Error of Approximation (RMSEA) and its 90% confidence interval (CI_{RMSEA}), the Comparative Fit Index (CFI) and the Standardized Root Mean Residual (SRMR). Following conventional rules, we considered RMSEA <0.05 as indicative of good fit, 0.05≤RMSEA<0.08 as a reasonable fit, 0.08≤RMSEA<0.10 as mediocre and RMSEA≥0.10 as indicative of poor fit (Browne and Cudeck 1993). Values of CFI of 0.95 or higher were considered indicative of a good fitting model (Hu and Bentler 1999). Values of SRMR under 0.10 (Kline 2005) or close to 0.08 (Hu and Bentler 1999) have been considered favorable and we applied these same criteria here. In addition, we also examined the parameters in the models tested in determining the goodness of fit of the models.

Because adjustments were made to the chi-square values in the present analysis with the S-B X^2, the traditional chi-square difference test could not be used to compare the fit of nested models (Kline 2005). Satorra and Bentler (2001) have developed a scaled difference chi-square test statistic (Δ S-B X^2) that can be used in this case. We calculated this statistic with a computer program that has recently been made available on the World Wide Web (see also Crawford and Henry 2003). Because the normal chi-square is also used when calculating this statistic, both the χ^2 and S-B χ^2 are presented in the tables of results.

Models

Results from previous studies formed the basis for selection of models to be tested. For the ten items of the Y-BOCS-SR that assess severity of obsessions and compulsions, the fit of a single factor model, the traditional two-factor model (McKay et al. 1995), the two-factor model with disturbance and symptom severity factors (Amir et al. 1997), and the more recent two-factor model of Deacon and Abramowitz (2005) with severity and resistance/control factors were tested. The three-factor model of Moritz et al. (2002) with severity of obsessions (items 1, 2, 3 and 5), severity of compulsions (items 6, 7, 8 and 10) and a resistance/control factor (items 4, 9 but also 5 and 10) was also tested. In this model, items 5 and 10 load both on their corresponding obsessions or compulsions factor and the resistance/control factor. However, the same good reasons apply for allowing items 4 and 9 to load on the same two factors as well. A modified version of this model was therefore tested, model 3b with severity of obsessions (items 1, 2, 3, 4 and 5), severity of compulsions (items 6, 7, 8, 9 and 10) and resistance/control factor (items 4, 5, 9 and 10). Where appropriate, error terms between question pairs (items 1 and 6, items 2 and 7 etc.) were allowed to correlate in the above models.

For the evaluation of the structure of symptom dimensions, the following models were tested using the 13 categories of symptoms: a single factor model, a two-factor model with obsession and compulsion factors where the seven obsessions and six compulsions categories load on separate but correlated factors, and the three–, four– and five-factor models of Baer (1994), Leckman et al. (1997) and Wu et al. (2007).

Results

Table 1 shows the means and standard deviations of all the measures for both men and women separately and the total sample. It was found that women scored significantly higher than men on GAD-Q-IV, $t(424)=-2.49$, $p<0.05$, and PSWQ, $t(424)=-3.68$, $p<0.001$, whereas there were no differences between the sexes on any OCD measure. Cronbach´s alpha of the Y-BOCS-SR total score and its subscales were good.

Convergent and Divergent Validity of the YBOCS-SR Severity Scales

The total severity score of the Y-BOCS-SR had a correlation of 0.60 with the total score of the OCI-R, 0.44 with PSWQ and 0.48 with GAD-Q-IV ($p<0.01$ in all cases).

Table 1 Descriptive statistics for the measures in the study (N=427)

	Men M (SD)	Women M (SD)	Overall M (SD)	Cronbach's alpha
Y-BOCS-SR total	4.4 (4.9)	3.6 (5.0)	3.8 (5.0)	0.87
Y-BOCS-SR obs.	2.6 (3.0)	2.1 (2.3)	2.3 (3.0)	0.85
Y-BOCS-SR com.	1.8 (2.6)	1.5 (2.8)	1.6 (2.7)	0.80
OCI-R total	8.9 (8.0)	8.7 (7.7)	8.7 (7.7)	0.87
OCI-R washing	0.9 (1.6)	0.8 (1.5)	0.9 (1.5)	0.70
OCI-R obsessing	2.0 (2.3)	1.8 (2.1)	1.9 (2.1)	0.83
OCI-R hoarding	1.9 (2.2)	1.8 (2.1)	1.8 (2.1)	0.81
OCI-R ordering	1.7 (2.1)	2.0 (2.3)	1.9 (2.1)	0.85
OCI-R checking	1.7 (2.1)	1.7 (2.4)	1.7 (2.3)	0.83
OCI-R neutral.	0.6 (1.4)	0.5 (1.0)	0.5 (1.1)	0.50
PSWQ	37.7 (11.2)	42.4 (11.9)	41.2 (11.9)	0.91
GAD-Q-IV	3.0 (2.8)	3.8 (3.1)	3.6 (3.0)	0.84

M mean; *SD* standard deviation; *Y-BOCS-SR total* Yale-Brown Obsessive Compulsive Scale-Self Report total score; *Y-BOCS-SR obs.* obsessions subscale; *Y-BOCS-SR com.* compulsions subscale; *OCI-R total* Obsessive-Compulsive Inventory Revised total score; *OCI-R washing* washing subscale; *OCI-R obsessing* obsessing subscale; *OCI-R hoarding* hoarding subscale; *OCI-R ordering* ordering subscale; *OCI-R checking* checking/doubting subscale; *OCI-R neutral.* mental neutralizing subscale; *PSWQ* Penn State Worry Questionnaire; *GAD-Q-IV* Generalized Anxiety Disorder Questionnaire-IV

Steiger's method (see Howell 2002) for testing differences between dependent correlations showed that the correlation of the Y-BOCS-SR severity score with the OCI-R was significantly higher than with the measures of worry and generalized anxiety disorder symptoms ($p<0.01$ in both cases), supporting the divergent validity of the severity measure. Both the obsession subscale and the compulsion subscale of the Y-BOCS-SR correlated significantly higher with the OCI-R (0.53 and 0.52 respectively) than with the GAD-Q-IV and the PSWQ (in both cases 0.40 and 0.37, respectively).

Correlations of the YBOCS-SR subscales with the different subscales of the OCI-R were compared. As shown in Table 2 the obsession subscale of the Y-BOCS-SR correlated strongest with the obsessing subscale of the OCI-R, correlating significantly higher with this subscale compared to other OCI-R subscales, ($p<0.01$ in all cases). The compulsive subscale of the Y-BOCS-SR had a moderately high correlation with the ordering scale and the checking scale and a somewhat lower correlation with the washing and hoarding scales. The compulsion subscale of the Y-BOCS-SR also had a relatively high correlation with the obsessing scale of the OCI-R.

Confirmatory Factor Analysis of the YBOCS-SR Severity Scale

The results are presented in Table 3. A one-factor model results in a poor fit according to all fit indices. Of the two-factor models, the model of McKay et al. (1995) with its correlated obsessions and compulsions factors clearly

exhibited a superior fit with a non-significant chi-square ($S\text{-}B\ \chi^2 =37.51$, $df=29$, $p>0.05$) and other fit indices meeting criteria for a good fitting model ($RMSEA<0.05$; $SRMR<0.10$ and $CFI>0.95$). This model is shown in Fig. 1. The correlation between the latent factors in this model is 0.67. This model was also fitted without correlated error terms for all of the five question pairs to see if adjusting the model for effects of wording of the questions resulted in a significant improvement in model fit, as has often been hypothesized in previous studies (Deacon and Abramowitz 2005; McKay et al. 1995; Moritz et al. 2002) but never directly tested. Fitting model 2a without correlated error terms resulted in an inferior fit, indicated by a significant chi-square ($S\text{-}B\ \chi^2 =83.41$, $df=34$, $p<0.05$), although other fit indices indicated a reasonable ($RMSEA=0.058$; $CI_{RMSEA}=0.043\text{-}0.074$) or good fit ($SRMR=0.051$; $CFI=0.99$).

These two versions of model 2a are nested models and a chi-square difference test indicated a significant difference between the models ($\Delta\ S\text{-}B\ \chi^2=-182.09$, $\Delta df=5$, $p<0.01$). According to this, a significant improvement was obtained in model fit by incorporating correlated errors for the question pairs, although according to the present results, this might not be needed for all of the five pairs (items 3 and 8, 5 and 10).

Finally, the three-factor models were tested. However, the model first put forward by Kim et al. (1994) and tested by Moritz et al. (2002) could not be identified in the data. Adjusting this model (adjusted model I) by dropping the correlated error terms between items 4 and 9, and items 5 and 10 that loaded on the resistance/control factor, resulted in a significant chi-square ($S\text{-}B\ \chi^2 =85.42$, $df=29$, $p<$

Table 2 Correlations between the subscales of the Y-BOCS-SR severity scale and the OCI-R (N=427)

	Y-BOCS-SR obsession	Y-BOCS-SR compulsion
OCI-R washing	0.26**	0.24**
OCI-R obsessing	0.52**	0.36**
OCI-R hoarding	0.26**	0.27**
OCI-R ordering	0.39**	0.41**
OCI-R checking	0.36**	0.45**
OCI-R neutralizing	0.29**	0.29**

Y-BOCS-SR obsession obsessions subscale of the Yale-Brown Obsessive-Compulsive Scale-Self Report; *Y-BOCS-SR compulsion* compulsions subscale; *OCI-R washing* washing subscale of the Obsessive-Compulsive Inventory Revised; *OCI-R obsessing* obsessing subscale; *OCI-R hoarding* hoarding subscale; *OCI-R ordering* ordering subscale; *OCI-R checking* checking/doubting subscale; *OCI-R neutralizing* mental neutralizing subscale

**p<0.01

0.001) but other fit indices indicated reasonable (*RMSEA*= 0.068; CI_{RMSEA}=0.051–0.084) or good fit (*CFI*=0.99), except the *SRMR* (0.32). The error terms for items 1 and 3 were non-significant and also the path between the error terms of items 3 and 8. Adjusting this model further (adjusted model II) by allowing items 4 and 9 to also load on the obsessions or compulsions factor resulted in a model with superior fit with a non-significant chi-square (*S-B* χ^2 =

32.64, *df*=27, *p*>0.05) and all other fit indices indicating a good fit (*RMSEA*=0.022; CI_{RMSEA}=0.000–0.046; *SRMR*= 0.039; *CFI*=1.0). This model is shown in Fig. 1. In this model, item 10 did not have a significant loading on the resistance/control factor. Further, the error terms of items 1, 3, 6 and 9 were non-significant and the correlation between the errors of items 3 and 8 was also not significant. This last model and model 2a are nested models, but a chi-square difference test between them only resulted in a marginally significant difference (Δ *S-B* χ^2 =5.1, Δdf=2, *p*<0.08).

Convergent and Divergent Validity of Scores of YBOCS-SR Symptom Categories

Correlations were calculated between scores on each of the thirteen symptom categories of the YBOCS-SR and the different subscales of the OCI-R (see Table 4).

The correlations were low to moderate, but in most cases the subscales of the YBOCS-SR correlated highest with the corresponding scale of the OCI-R. The only exception was religious obsessions, which might have been expected to correlate highest with the OCI-R obsessions.

Confirmatory Factor Analysis of the YBOCS-SR Symptom Dimensions

The results are presented in Table 3. The chi-square test was significant for all of the models. Inspection of other fit

Table 3 Results from CFA of the severity and symptom dimensional models of the Y-BOCS-SR

Models[a]	S-B χ^2	χ^2	df	RMSEA	CI_{RMSEA}	SRMR	CFI
Severity dimension (N=427)							
1) One factor	309.01***	1757.18***	30	0.148	0.130–0.160	0.110	0.97
2) Two correlated factors							
a) McKay et al. (1995)	37.51	323.96***	29	0.026	0.000–0.048	0.043	1.00
b) Amir et al. (1997)	296.04***	1707.43***	29	0.147	0.130–0.160	0.120	0.97
c) Deacon and Abramowitz (2005)	298.53***	1715.53***	29	0.148	0.130–0.160	0.110	0.97
3) Three factors							
a) Moritz et al. (2002), adjusted model I	85.42***	622.35***	29	0.068	0.051–0.084	0.320	0.99
b) Moritz et al. (2002), adjusted model II	32.64	283.71***	27	0.022	0.000–0.046	0.039	1.00
Symptom dimensions (N=415)							
1) One factor	146.34***	651.16***	65	0.055	0.043–0.067	0.094	0.97
2) Two correlated factors (obs. and comp.)	145.91***	650.23***	64	0.056	0.044–0.068	0.094	0.97
3) Baer (1994)	134.98***	626.80***	62	0.053	0.041–0.066	0.090	0.98
4) Leckman et al. (1997)	103.88***	522.70***	59	0.043	0.029–0.056	0.091	0.99
5) Wu et al. (2007)	80.33*	425.03***	55	0.033	0.015–0.048	0.068	0.99

N Number of subjects; *S-B* χ^2 Satorra-Bentler scaled chi-square; χ^2 Chi-square; *df* Degrees of freedom; *RMSEA* Root Mean Square Error of Approximation; CI_{RMSEA} 90% confidence interval of RMSEA; *SRMR* Standardized Root Mean Residual; *CFI* Comparative Fit Index

[a] For more information on model specification see the method section
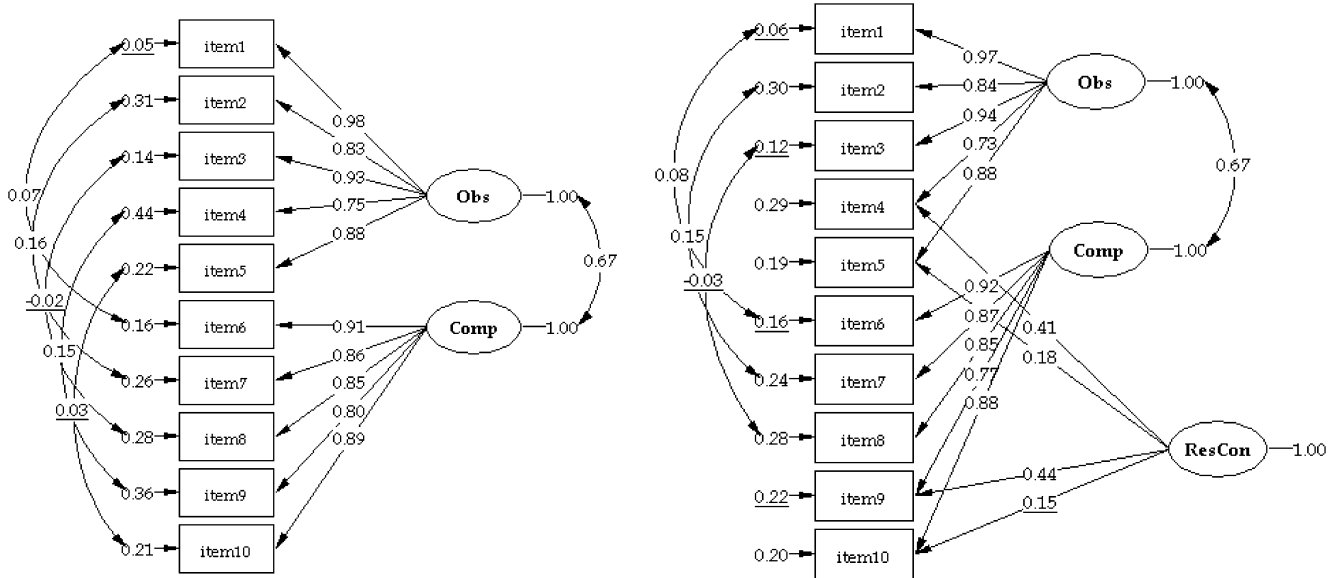
*p<0.05; **p<0.01; ***p<0.00

Fig. 1 Two best fitting models in a CFA of the ten severity items of the Y-BOCS-SR. Left: two-factor model of McKay et al. (1995) with correlated obsession (*Obs*) and compulsion (*Comp*) factors. Right: adjusted three-factor model of Moritz et al. (2002) with correlated obsession (*Obs*) and compulsion (*Comp*) factors and orthogonal resistance/control (*ResCon*) factor. Standardized solution is shown. All parameters significant except those underlined. For model fit see Table 3

indices reveals good fit for both the four-factor model of Leckman et al. (1997) and the five-factor model of Wu et al. (2007). Of these two models, the fit of the five-factor model was superior ($\Delta S\text{-}B\ \chi^2$ =66.59, Δdf=4, p<0.01). In this model, all parameters were significant except for the error variance of hoarding obsessions. Correlations between the five factors varied from 0.37 between hoarding and arranging to 0.82 between pure obsessions and contamination/cleaning.

Convergent and Divergent Validity of Scores of the Five Symptom Dimensions

Correlations between scores on the five Y-BOCS-SR dimensions and the subscales of the OCI-R are reported in Table 4. In all cases, the symptom dimensions correlated highest with the corresponding subscale of the OCI-R. These correlations were moderate (between 0.33 and 0.52).

Discussion

There have been only a small number of studies that have focused on the Y-BOCS-SR in contrast to the numerous studies of the original Y-BOCS. This is unfortunate as the YBOCS-SR features a broad assessment of obsessions and compulsions that distinguish it from most self-report measures. In the present study of the Icelandic translation of the instrument, the psychometric properties of the severity scale of the Y-BOCS-SR were overall very good and comparable to those reported for the English version in

non-clinical samples (Warren et al. 1993). The pattern of correlations with other measures in the study (OCI-R, PSWQ, GAD-Q-IV) supports the convergent and divergent validity of the severity scale. The divergent validity was tested against self-report measures of generalized anxiety disorder symptoms and worry. Because of restrictions due to assessment load, the divergent validity of the Y-BOCS-SR against symptoms of depression was not tested.

To our knowledge, this is the first report on the factor structure of the severity scale of the Y-BOCS-SR. In the CFA, two models met criteria for a good fit, the traditional two-factor model with correlated obsession and compulsion factors and a three-factor model with an additional resistance/control factor. Both models are based on the fundamental distinction between obsessions and compulsions that has received support in previous studies of the severity scale of the Y-BOCS (McKay et al. 1995; McKay et al. 1998; Storch et al. 2005). According to the three-factor model, however, the resistance and control items measure something in addition that is not adequately represented within the traditional two-factor structure. To investigate this, we computed the correlations between the latent factors of the OCI-R and the resistance/control factor of the Y-BOCS severity scale. The only significant correlation that emerged was with the latent factor representing obsessions of the OCI-R. The correlation was weak and negative, or -0.17 (p<0.05), and means that a reduced tendency to resist and control symptoms (high scores on the resistance/control factor) are associated with a decrease in obsessions (low scores on the obsession factor).

Table 4 Correlations between scores on the thirteen categories and the five symptom factors of the YBOCS-SR symptom checklist and the subscales of the OCI-R (N=415)

	OCI-R					
	Hoard.	Order.	Obs.	Check.	Wash.	Neutral.
Symptom categories of the Y-BOCS-SR						
Aggressive Obs.	0.22**	0.17*	**0.28****	0.22**	0.17*	0.17**
Contamination Obs.	0.27**	0.17**	0.14*	0.22**	**0.35****	0.16*
Sexual Obs.	0.07	0.07	**0.30***	0.03	0.03	0.09
Hoarding Obs.	**0.43****	0.21**	0.09	0.28**	0.11*	0.09
Religious Obs.	0.21**	0.13*	**0.13***	0.14*	0.16*	0.04
Symmetry Obs.	0.27**	**0.40****	0.09	0.14*	0.14*	0.17**
Somatic Obs.	0.25**	0.19**	**0.23****	0.17**	0.17*	0.03
Cleaning Comp.	0.32**	0.28**	0.15*	0.35**	**0.49****	0.15*
Checking Comp.	0.26**	0.16**	0.19**	**0.43****	0.16*	0.08
Repeating Comp.	0.12*	0.20**	0.15*	**0.32****	0.15*	0.16*
Counting Comp.	0.04	0.03	0.07	0.05	0.02	0.33**
Ordering Comp.	0.15*	**0.42****	0.14*	0.18**	0.13*	0.15*
Hoarding Comp.	**0.44****	0.15*	0.07	0.16*	0.14*	0.20**
Five factors of Wu et al. (2007)						
Pure Obs.	0.22**	0.18**	**0.33****	0.21**	0.17**	0.17**
Checking	0.29**	0.24**	0.26**	**0.43****	0.22**	0.11
Arranging	0.24**	**0.44****	0.15**	0.18**	0.15**	0.30**
Contam./Clean.	0.33**	0.24**	0.16**	0.31**	**0.46****	0.19**
Hoarding	**0.52****	0.22**	0.10	0.28**	0.15**	0.16**

OCI-R Obsessive-Compulsive Inventory Revised; *Hoard* hoarding subscale; *Order* ordering subscale; *Obs* obsessing subscale; *Check* checking/doubting subscale; *Wash* washing subscale; *Neutral* mental neutralizing subscale; *Y-BOCS-SR* Yale-Brown Obsessive Compulsive Scale-Self Report; *Obs* obsessions; *Comp* compulsions; *Contam/Clean* contamination/cleaning

*p<0.05; **p<0.001; Correlations in bold are horizontal values expected to be highest

Because higher scores on the resistance and control items should indicate greater symptom severity, the negative relationship between the resistance/control factor and obsessions goes against the rationale behind these items in the instrument. Although the correlation is weak, it points to the need to explore the Y-BOCS resistance and control items in more detail. This finding has to be replicated and elaborated on in future studies, specially using clinical samples with greater severity of symptoms before any definite conclusions can de drawn. These items may reduce the homogeneity of the obsession and compulsion factors in their current form. It is important to note that difference in fit between the two– and three-factor models was only marginally significant so, at present, it should be concluded that the models fit equally well. The two-factor model is also a more parsimonious account of the latent structure of the severity of OCD symptoms. It should also be pointed out that the value of the three-factor model is reduced by a non-significant loading of item 10 (control over compulsions) on the resistance/control factor and the fact that it emerged in a post hoc evaluation of other three-factor models that were tested in this study and have been tested in previous studies (Kim et al. 1994; Moritz et al. 2002).

In the two-factor model, the obsession and compulsion factors correlated strongly (0.67), a finding that might indicate the presence of a higher order factor. However, a second order factor model can not be evaluated in CFA with only two first order factors (Kline 2005), leaving this possibility untested. This means that combining the two scale scores to form a global assessment of OCD symptoms cannot be rejected on the grounds of the results from the present study. Storch et al. (2005) have suggested basing assessment of severity with the Y-BOCS on both the obsession and compulsion scores and the total score. Based on the present results, this might be warranted. Separate scores for each symptom type should be clinically informative, given that not all patients have both types of symptoms. The total score should also be useful given the great amount of research supporting its validity as a global indicator of OCD severity.

The CFA of the thirteen categories of the symptom checklist showed a good fit for both the four-factor model of Leckman et al. (1997) and the five-factor model of Wu et al. (2007) but the five-factor model fitted significantly better. This is important as the five-factor structure that emerged in an exploratory factor analysis in the study of Wu et al. is replicated for the first time in this study using confirmatory factor analysis. This indicates that five dimensions form the latent structure of the symptom checklist of the self-report format representing pure obsessions, checking, arranging, contamination/cleaning and hoarding symptoms. It is worth noting that although both studies rely on a non-clinical sample, Wu et al. used an adapted response format of the checklist (the items were rated on a 5 point scale ranging from strongly agree to

strongly disagree) that is different from the original format used in this study. Thus, the five-factor structure is supported in the current study even though the checklist items are scaled in a different way. The chi-square test of this model was however significant that indicates that the fit of the model was not optimal, although it does fit better than the other models that were tested.

Regarding correlations between scores on dimensions of the checklist and the subscales of the OCI-R, the pattern was in all cases as expected and the dimensions showed moderate correlations with their corresponding subscales, thus adding to the validity of this five-factor structure of the symptom dimensions. However, Wu et al. (2007) raise a number of critical points regarding the adequacy of the symptom checklist of the self-report version in the present form. These points concern validity of the rationally based assignment of symptoms to categories, over– and under-representation of some types of symptoms, the (in)adequacy of the self-report format to distinguish OCD from non-OCD samples, and issues around wording of the items.

In general, we agree with Wu et al. that the checklist of the Y-BOCS-SR needs to be improved for further study of the OCD phenotype. Wu et al. point out that other self-report instruments (i.e. OCI-R, PI-WSUR) are available that have stronger psychometric properties. However, many of these instruments have some of the same shortcomings as the Y-BOCS checklist (for example over– or under- representation of some types of symptoms, lack of breadth in the assessment of content of symptoms because of the number of items). These instruments also fuse assessment of symptom type with severity of symptoms. Regarding moderate discriminant validity of the Y-BOCS checklist, greater differences can probably be expected in severity of symptoms provided with the severity scale as compared to types or number of symptoms provided with the checklist. A broad coverage of symptoms with a content-free assessment of severity provided with the Y-BOCS-SR is an advantage above most other self-report inventories for OCD, although revisions of the instrument are in order.

The results of the present study indicate that the Icelandic translation of the Y-BOCS-SR is a reliable and valid instrument for the assessment of symptom severity of obsessions and compulsions in a student population. The results also add to the existing literature on the factor structure of the severity scale and the symptom checklist. The generalizability of these findings needs to be explored in future studies using different language versions of the instrument and samples from both the general and clinical populations. More studies comparing the Y-BOCS and the Y-BOCS-SR are also needed. Making certain changes to the Y-BOCS and the Y-BOCS-SR should further be considered. There are many reasons for doing so. The

problem with the resistance and control items has already been discussed. A more reliable assessment of severity of obsessions and compulsions might also be achieved by using more than the five current items belonging to each scale. The instrument contains a number of additional items (for example regarding level of insight and avoidance behavior) that are not always administered but were initially included for further investigation and might perhaps be used for these purposes.

Regarding the symptom checklist, more consideration should be given to individual items of the categories as discussed above. The quality of the assessment of severity and content of OCD symptoms that is obtained with the Y-BOCS instrument could be improved by remedying these short-comings. In doing this, the self-report version might be made more useful as its use is less time-consuming than the interview version. New or changed items could be tested and a final version of an improved instrument could be obtained using the self-report format that could form the basis for an adapted version of a clinician administered interview.

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