

BRIEF COMMUNICATION

Factor structure of the Dimensional Yale-Brown Obsessive-Compulsive Scale in a large sample of adults with obsessive-compulsive disorder

Marcelo C. Batistuzzo,^{1,2}  Leonardo Fontenelle,^{3,4,5} Ygor A. Ferrão,⁶  Maria C. Rosário,⁷ 
Euripedes C. Miguel,¹  Daniel Fatori¹ 

¹Departamento de Psiquiatria, Faculdade de Medicina da Universidade de São Paulo, São Paulo, SP, Brazil. ²Departamento de Métodos e Técnicas, Pontifícia Universidade Católica de São Paulo, São Paulo, SP, Brazil. ³Departamento de Psiquiatria, Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil. ⁴Monash Institute of Cognitive and Clinical Neurosciences, Monash University, Clayton, VIC, Australia. ⁵Instituto D'Or de Pesquisa e Ensino, Rio de Janeiro, RJ, Brazil. ⁶Universidade Federal de Ciências da Saúde de Porto Alegre, Rio Grande do Sul, RS, Brazil. ⁷Unidade de Psiquiatria da Infância e Adolescência, Departamento de Psiquiatria, Universidade Federal de São Paulo, São Paulo, SP, Brazil.

Objectives: Although the Dimensional Yale-Brown Obsessive-Compulsive Scale (DY-BOCS) is a widely used instrument for assessing different obsessive-compulsive symptom dimensions, its factor structure has never been studied in a Brazilian population. Thus, we aimed to assess the goodness-of-fit indexes and factor loadings of two higher-order models of the DY-BOCS using confirmatory factor analysis (CFA) in a large obsessive-compulsive disorder (OCD) sample.

Methods: We tested two CFA models in a sample of 955 adults with OCD who had been assessed with the DY-BOCS in a cross-sectional multi-site study. The first model encompassed the symptom checklist (present or absent), whereas the second focused on items related to severity scores.

Results: Both models presented adequate goodness-of-fit indexes. The comparative fit index, Tucker-Lewis index, and omega were > 0.9 , while the root mean square error of approximation was ≤ 0.06 for both models. Factor loadings for each item of each dimension are presented and discussed.

Conclusion: Higher-order factor models showed adequate goodness-of-fit indexes, indicating that they appropriately measured OCD dimensions in this Brazilian population.

Keywords: Obsessive-compulsive disorder; Dimensional Yale-Brown Obsessive-Compulsive Scale; confirmatory factor analysis; psychometrics; validity

Introduction

Even though obsessive-compulsive disorder (OCD) is a unitary nosological construct, studies show it is a heterogeneous mental disorder whose symptoms follow distinct clustering patterns in populations. These patterns are called OCD dimensions, categories of obsessive/compulsive symptoms organized in themes derived from empirical research. Although the number of dimensions and specific themes varies, dimensions are usually a combination of the following themes: aggression, sexual/religious, symmetry, contamination, hoarding, and miscellaneous.^{1,2} Studies have shown that OCD dimensions are related to patterns of comorbidity, trajectory, genetic profile, neural activity, and treatment response.² Thus, the assessment of OCD dimensions has been incorporated in research and clinical settings due to its importance in characterizing patients and determining treatment strategies and prognosis.

The Dimensional Yale-Brown Obsessive-Compulsive Scale (DY-BOCS)¹ is one of the most widely used instruments for this purpose. The DY-BOCS was developed by an international group of researchers, mainly based on the Yale-Brown Obsessive-Compulsive Scale (Y-BOCS). Although it has been translated and validated in different countries, psychometric studies have focused exclusively on internal consistency, inter-rater agreement, and convergent and divergent validities. These parameters are important, but they are only part of a complete validation process. Assessing a scale's factor structure is fundamental to understanding its ability to measure the construct of interest, as well as to empirically test a given theory, in the case of the DY-BOCS, whether the six predetermined dimensions are actually aspects of a single construct (OCD). Such assessment can also help clarify the item-construct relationship and the quality of the scale's overall structure. In this sense, confirmatory factor analysis

Correspondence: Daniel Fatori, Faculdade de Medicina, Universidade de São Paulo, Departamento de Psiquiatria, Rua Dr. Ovídio Pires Campos, 785, 3º andar, sala 9, CEP 05403-010, São Paulo, SP, Brazil.

E-mail: daniel.fatori@gmail.com

Submitted Jun 22 2021, accepted Aug 30 2021, Epub Dec 06 2021.

How to cite this article: Batistuzzo MC, Fontenelle L, Ferrão YA, Rosário MC, Miguel EC, Fatori D. Factor structure of the Dimensional Yale-Brown Obsessive-Compulsive Scale in a large sample of adults with obsessive-compulsive disorder. Braz J Psychiatry. 2022;44:57-60. <http://dx.doi.org/10.1590/1516-4446-2021-2088>

(CFA) is the preferred method for investigating a scale's factor structure.³

Studies assessing the psychometric properties of the DY-BOCS presented important caveats: small samples of approximately 100 participants,^{4,5} insufficient statistical approaches with no concern for the quality of structural equation models derived from the scale,⁴⁻⁷ no evaluation of the factor structure of the severity scale,⁸ and the use of exploratory factor analysis to determine factor structures beyond the original scope of the scale.⁸ Finally, no study has evaluated the scale's factor structure in an exclusively Brazilian sample or the factor structure of its severity scale. Therefore, our main objective was to verify the psychometric properties of the originally proposed factor structure of the DY-BOCS. More specifically, using CFA we assessed the goodness-of-fit indexes and factor loadings of two higher-order models of the DY-BOCS in a large OCD sample, including symptom checklist items (present or absent) and severity items (frequency, distress, and interference) of each dimension.

Methods

A total of 955 patients with OCD aged 18 to 82 years were enrolled in the Brazilian Research Consortium on Obsessive-Compulsive Spectrum Disorders (Consórcio Brasileiro de Pesquisa em Transtornos do Espectro Obsessivo-Compulsivo),⁹ a cross-sectional multi-site study. The DY-BOCS was administered to all participants by OCD specialists who were trained to apply the scale. This scale consists of 88 items referring to different obsessive-compulsive symptoms; participants must respond with present (in the last week), absent, or past (any time prior to the last week). The items are divided into six dimensions: 15 evaluating aggression, injury, violence, or natural disaster symptoms; 15 on sexual, moral, and religious symptoms; 12 on symmetry, ordering, and arrangement; 12 on contamination and cleaning; seven on hoarding symptoms; and 28 miscellaneous items related to somatic concerns, superstitions, and other symptoms.¹ For the purposes of this study, we recoded past responses as absent to avoid recall bias.

The DY-BOCS also has a severity scale for each dimension that includes three items assessing the amount of time spent with symptoms: distress (symptom impact), and interference items (symptom interference in daily life). Patients report OCD dimension severity using a scale from 0 (no interference or impairment) to 5 (extreme interference or impairment). Therefore, the total score for each dimension ranges from 0 to 15. The scale was originally developed in English, but was translated to Brazilian Portuguese by one of the authors (MCR). The Brazilian Portuguese version was then back-translated to English by a certified translator, the two versions were compared, and the differences were resolved.

Statistical analysis

We used two CFA models to assess the factor structure of the DY-BOCS: 1) DY-BOCS items related

to present or absent symptoms from all dimensions were tested in a higher-order model; and 2) DY-BOCS items from the severity section (frequency, distress, and interference) were tested in a similar high-order model (Figure 1).

CFA analyses were performed with the weighted least square mean and variance estimator. Fit indexes included the χ^2 test p-value, comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), RMSEA p-value, and standardized root mean square residual (SRMR). We considered an χ^2 p-value > 0.05 a good model fit. CFI and TLI values > 0.95 were considered a good model fit.¹⁰ An RMSEA value < 0.06 and a RMSEA p-value > 0.05 were considered acceptable.¹⁰ An SRMR value of < 0.08 was considered a good fit.^{3,10} We also assessed the internal consistency of the scale using McDonald's hierarchical omega (ω_h). ω_h values > 0.90 were considered an excellent fit, > 0.80 a good fit, and > 0.70 an acceptable fit.

All analyses were performed with R and RStudio. All CFA-related procedures were performed in lavaan 0.6.7.

Ethics statement

All centers obtained local ethics committee approval and all participants gave written informed consent after being assured that their decision to participate in the study would not interfere with their access to treatment.

Results

The mean age of the participants was 35.8 years (standard deviation [SD] = 12.5) and the total global DY-BOCS mean score was 21.2 (SD = 6.2). Further details regarding sample characteristics can be found elsewhere.¹¹ Both models presented good psychometric properties and goodness-of-fit indexes: the first model (88-item checklist) presented a model fit (χ^2) of 15,030.5 with a p-value < 0.001, CFI = 0.923, TLI = 0.921, RMSEA = 0.056 (90% confidence interval [90%CI] 0.055-0.057), SRMR = 0.115, and ω_h = 0.93. Factor loadings for each item can be found in Table 1, which ranged from 0.25 (item 26 from miscellaneous) to 0.97 (item 1 from hoarding). The miscellaneous and aggression dimensions presented the highest standardized factor loadings (0.74 and 0.73, respectively), followed by sexual (0.64) and symmetry (0.63). The lowest estimated scores were for hoarding (0.54) and contamination (0.52).

The second model (severity) presented a χ^2 of 569.3 with a p-value < 0.001, CFI = 0.999, TLI = 0.998, RMSEA = 0.060 (90%CI 0.055-0.065), SRMR = 0.058, and ω_h = 0.98. Factor loadings for each severity item can be found in Figure 1. Interestingly, all items were above 0.9. The symmetry dimension had the highest factor loading (0.66), followed by miscellaneous (0.64), aggression (0.61), sexual (0.53), contamination (0.52), and hoarding (0.50).

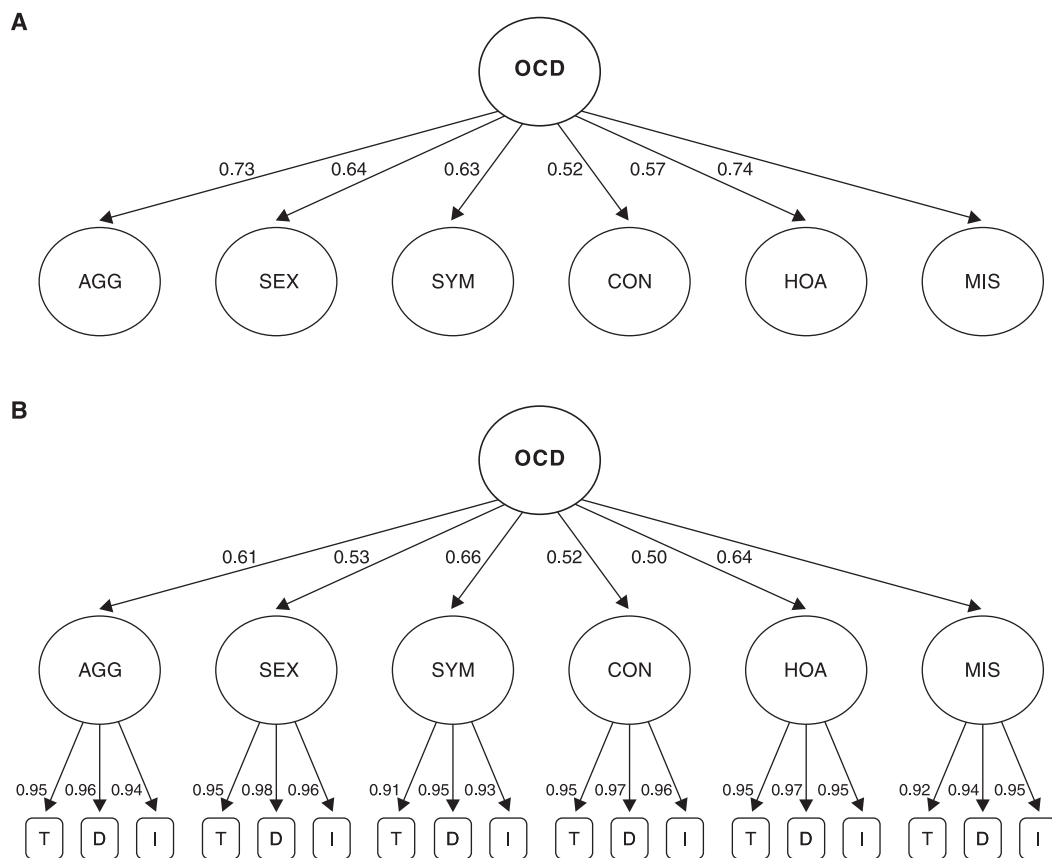


Figure 1 A) Standardized factor loadings that contribute to the total OCD latent variable from the DY-BOCS symptom checklist. Individual items are omitted. B) Standardized factor loadings that contribute to the total OCD latent variable and to each DY-BOCS severity scale dimension. AGG = aggression, injury, violence, or natural disasters symptoms; CON = contamination and cleaning; D = distress; DY-BOCS = Dimensional Yale-Brown Obsessive-Compulsive Scale; HOA = hoarding symptoms; I = interference; MIS = miscellaneous items; OCD = obsessive-compulsive disorder; SEX = sexual, moral and religious symptoms; SYM = symmetry, ordering and arrangement; T = time.

Table 1 Standardized factor loadings of the six dimensions of DY-BOCS symptoms checklist

Aggression	FL	Sexual/ religious	FL	Symmetry	FL	Cleaning	FL	Hoarding	FL	Miscellaneous	FL	Miscellaneous	FL
AGG1	0.81	SEX1	0.83	SYM1	0.86	CLE1	0.85	HOA1	0.97	MIS1	0.79	MIS16	0.74
AGG2	0.75	SEX2	0.70	SYM2	0.81	CLE2	0.81	HOA2	0.94	MIS2	0.76	MIS17	0.72
AGG3	0.81	SEX3	0.58	SYM3	0.82	CLE3	0.71	HOA3	0.90	MIS3	0.72	MIS18	0.71
AGG4	0.80	SEX4	0.79	SYM4	0.80	CLE4	0.79	HOA4	0.91	MIS4	0.56	MIS19	0.55
AGG5	0.80	SEX5	0.63	SYM5	0.58	CLE5	0.75	HOA5	0.87	MIS5	0.61	MIS20	0.54
AGG6	0.68	SEX6	0.74	SYM6	0.61	CLE6	0.78	HOA6	0.88	MIS6	0.73	MIS21	0.73
AGG7	0.67	SEX7	0.75	SYM7	0.76	CLE7	0.80	HOA7	0.81	MIS7	0.66	MIS22	0.78
AGG8	0.71	SEX8	0.88	SYM8	0.61	CLE8	0.73			MIS8	0.65	MIS23	0.38
AGG9	0.78	SEX9	0.87	SYM9	0.59	CLE9	0.86			MIS9	0.60	MIS24	0.37
AGG10	0.77	SEX10	0.78	SYM10	0.72	CLE10	0.68			MIS10	0.66	MIS25	0.58
AGG11	0.79	SEX11	0.67	SYM11	0.64	CLE11	0.77			MIS11	0.62	MIS26	0.25
AGG12	0.59	SEX12	0.72	SYM12	0.60	CLE12	0.82			MIS12	0.60	MIS27	0.40
AGG13	0.66	SEX13	0.84							MIS13	0.63		
AGG14	0.74	SEX14	0.76							MIS14	0.46		
AGG15	0.77	SEX15	0.84							MIS15	0.79		

AGG = aggression items; CLE = cleaning items; DY-BOCS = Dimensional Yale-Brown Obsessive-Compulsive Scale; FL = factor loading; HOA = hoarding items; MIS = miscellaneous items; SEX = sexual/religious items; SYM = symmetry items. More information regarding fit indexes and factor loadings for unidimensional models (each with a specific dimension) can be found in the supplementary materials.

Discussion

The DY-BOCS severity assessment showed very good goodness-of-fit indexes, even better than the symptom checklist. More importantly, it was superior to the Y-BOCS in terms of goodness-of-fit.¹² This could be explained by the fact that the DY-BOCS does not have items that investigate resistance to OCD symptoms, since a previous study on the Y-BOCS found that these items presented the lowest factor loading and that removing them led to better goodness-of-fit indexes.¹² This interesting finding indicates that the DY-BOCS could be a useful alternative for adequate OCD severity measurement in research and clinical settings.

Even though both higher-order models were adequate in terms of goodness-of-fit indexes, the factor loadings for 19 items from the symptom checklist were below 0.63. The majority of factor loadings for items in the miscellaneous dimension were below 0.63 (13 items), although this dimension had the largest factor loading (0.74), i.e., it contributed the most to the latent construct. This could be explained by the fact that the miscellaneous dimension includes more items than the other dimensions (27 items). To further explore this issue, we also ran CFA analyses without this dimension, which improved the fit indexes for the checklist and severity scales (supplementary material). Future studies could test whether removing items with low factor loadings improves the overall fit of the model. Alternatively, the miscellaneous dimension could be divided into additional dimensions. A recent study involving part of our sample used exploratory factor analysis, finding eight broad OCD dimensions with adequate model fit.⁸ However, most studies suggest that OCD is clustered in four to six dimensions,^{1,2,13} and adding further dimensions could complicate clinical interpretation.

Some limitations must be acknowledged. In terms of validation procedures, we addressed only specific cross-sectional psychometric properties of the scale. Other important aspects of the scale should be further investigated in the future, such as measuring invariance in subgroups (e.g., demographic and clinical characteristics) and over time, etc., as well as investigating the scale's test-retest reliability and sensitivity to change. Our sample consisted of participants from different regions of the country who were assessed by multiple interviewers. Even though the interviewers underwent extensive training and received frequent supervision, heterogeneity may have influenced the model fit findings.

In conclusion, in this study we used CFA to analyze the DY-BOCS symptoms checklist and dimension severity scales. Both high-order factor structures showed adequate goodness-of-fit indexes, which indicates that the scale appropriately measured OCD dimensions in this Brazilian population.

Acknowledgements

The authors would like to thank the researchers and leaders of the Brazilian Research Consortium on Obsessive-Compulsive Spectrum Disorders (Consórcio Brasileiro de Pesquisa em Transtornos do Espectro Obsessivo-Compulsivo, C-TOC), as well as the participants of the C-TOC study, who contributed their time and data.

Disclosure

The authors report no conflicts of interest.

References

- Rosario-Campos MC, Miguel EC, Quatrano S, Chacon P, Ferrao Y, Findley D, et al. The Dimensional Yale-Brown Obsessive-Compulsive Scale (DY-BOCS): an instrument for assessing obsessive-compulsive symptom dimensions. *Mol Psychiatry*. 2006;11:495-504.
- Bloch MH, Landeros-Weisenberger A, Rosario MC, Pittenger C, Leckman JF. Meta-analysis of the symptom structure of obsessive-compulsive disorder. *Am J Psychiatry*. 2009;165:1532-42.
- Brown TA. *Confirmatory factor analysis for applied research*. 2nd ed. New York: Guilford Press; 2015.
- Pertusa A, Jaurrieta N, Real E, Alonso P, Bueno B, Segalàs C, et al. Spanish adaptation of the Dimensional Yale-Brown Obsessive-Compulsive Scale. *Compr Psychiatry*. 2010;51:641-8.
- García-Delgar B, Ortiz AE, Morer A, Alonso P, do Rosário MC, Lázaro L. Validation of the Spanish version of the Dimensional Yale-Brown Obsessive-Compulsive Scale (DYBOCS) in children and adolescents. *Compr Psychiatry*. 2016;68:156-64.
- Güler AS, do Rosário MC, Ayaz AB, Gökçe S, Yulaf Y, Başgöl S, et al. Psychometric properties of the DY-BOCS in a Turkish sample of children and adolescents. *Compr Psychiatry*. 2016;65:15-23.
- Pertusa A, Fernández de la Cruz L, Alonso P, Menchón JM, Mataix-Cols D. Independent validation of the dimensional Yale-Brown obsessive-compulsive scale (DY-BOCS). *Eur Psychiatry*. 2012;27:598-604.
- Cervin M, Miguel EC, Güler AS, Ferrão YA, Erdoğdu AB, Lazaro L, et al. Towards a definitive symptom structure of obsessive-compulsive disorder: a factor and network analysis of 87 distinct symptoms in 1366 individuals. *Psychol Med*. 2021 Feb 9;1-13. doi: 10.1017/S0033291720005437. Online ahead of print.
- Miguel EC, Ferrão YA, do Rosário MC, de Mathis MA, Torres AR, Fontenelle LF, et al. The Brazilian Research Consortium on Obsessive-Compulsive Spectrum Disorders: recruitment, assessment instruments, methods for the development of multicenter collaborative studies and preliminary results. *Braz J Psychiatry*. 2008;30:185-96.
- Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct Equ Modeling*. 1999;6:1-55.
- Shavitt RG, de Mathis MA, Oki F, Ferrao YA, Fontenelle LF, Torres AR, et al. Phenomenology of OCD: lessons from a large multicenter study and implications for ICD-11. *J Psychiatr Res*. 2014;57:141-8.
- Fatori D, Costa DL, Asbahr FR, Ferrão YA, Rosário MC, Miguel EC, et al. Is it time to change the gold standard of obsessive-compulsive disorder severity assessment? Factor structure of the Yale-Brown Obsessive-Compulsive Scale. *Aust N Z J Psychiatry*. 2020;54:732-42.
- Schulze D, Kathmann N, Reuter B. Getting it just right: a reevaluation of OCD symptom dimensions integrating traditional and Bayesian approaches. *J Anxiety Disord*. 2018;56:63-73.