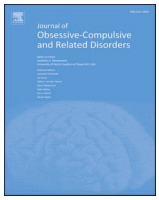
Journal of Obsessive-Compulsive and Related Disorders 42 (2024) 100880

Contents lists available at ScienceDirect

Journal of Obsessive-Compulsive and Related Disorders

journal homepage: www.elsevier.com/locate/jocrd



Incompleteness as a clinical characteristic and predictor of treatment outcome in obsessive-compulsive disorder

Lina Lundström [a], Ekaterina Ivanova [a], David Mataix-Cols [b,c], Oskar Flygare [a], Matti Cervin [c], Christian Rück [a], Erik Andersson [d,*]

[a] Centre for Psychiatry Research, Department of Clinical Neuroscience, Karolinska Institutet, and Stockholm Health Care Services, Region Stockholm, Karolinska University Hospital, SE-141 86 Stockholm, Sweden
[b] Centre for Psychiatry Research, Department of Clinical Neuroscience, Karolinska Institutet, & Stockholm Health Care Services, Region Stockholm, CAP Research Centre, Gävlegatan 22, SE-113 30 Stockholm, Sweden
[c] Department of Clinical Sciences, Lund University, Baravägen 1, Forskningsenheten, 221 85 Lund, Sweden
[d] Department of Clinical Neuroscience, Division of Psychology, Nobels Väg 9, Karolinska Institutet, 171 77 Stockholm, Sweden

ARTICLE INFO

Keywords:
OCD
incompleteness
Internet-delivered CBT
Treatment

ABSTRACT

Incompleteness, that is, a feeling that things are "not just right", is an understudied symptom of obsessive-compulsive disorder (OCD). We used data from 167 adult individuals with OCD who received internet-delivered cognitive behaviour therapy (ICBT) to examine how incompleteness was associated with clinical characteristics and treatment outcomes. Incompleteness was assessed using the Obsessive-Compulsive Trait Core Dimensions Questionnaire (OCTCDQ). Results showed that the proposed two-factor structure of the OCTCDQ had adequate model/data fit in the present sample. Incompleteness was positively associated with baseline symmetry/ordering symptoms ($\beta = 0.52$, [95% CI 0.48 to 0.56], $p < 0.001$), psychiatric comorbidity ($\beta = 0.23$, [95% CI 0.21 to 0.25], $p < 0.05$) and self-reported symptom severity (Y-BOCS-SR $\beta = 0.35$, [95% CI 0.27 to 0.43], $p < 0.001$; OCI-R $\beta = 0.46$, [95% CI 0.34 to 0.59], $p < 0.001$). Results showed that higher degree of incompleteness predicted a worse treatment outcome on clinician-rated, but not self-rated, measures of symptom severity. Participants with a high (vs. low) degree of incompleteness were less likely to be classified as responders (39% vs. 52%) and remitters (10% vs. 34%) at post-treatment. The results suggest that incompleteness is a clinically relevant feature of OCD, which may require treatment adaptations for some patients but more research is needed to confirm that the findings are not entirely due to measurement error.

1. Introduction

Obsessive-Compulsive Disorder (OCD) is a heterogenous disorder consisting of different types of obsessions and compulsions (American Psychiatric Association, 2013). Traditionally, OCD has been categorized according to different symptom dimensions (contamination/cleaning, forbidden thoughts/checking, symmetry/ordering and hoarding) (Bloch, Landeros-Weisenberger, Rosario, Pittenger, & Leckman, 2008; Mataix-Cols, do Rosario-Campos, & Leckman, 2005; Summerfeldt, Kloosterman, Antony, & Swinson, 2014; Summerfeldt, Richter, Antony, & Swinson, 1999; Symptoms of obsessive, 1997; Leckman, Bloch, & King, 2009; Bragdon and Coles, 2017) but a complementary approach to this symptom-based classification could be to study underlying emotional and motivational processes that are hypothesized to drive compulsions (Summerfeldt, 2004; Summerfeldt et al., 2014). Building on the work by Eisen and Rasmussen (1990, 1992), Summerfeldt and colleagues proposed the "Core Dimensions Model of OCD" (Summerfeldt et al., 2014). In this framework, compulsions are hypothesized to be driven by either *harm avoidance* (i.e. explicit intrusive thoughts related to inflated sense of responsibility and fear of causing harm to oneself or others) and/or *incompleteness* (i.e. an inner feeling that something isn't just right/feels wrong) (Summerfeldt et al., 2014). In the literature, the term incompleteness is often used interchangeably with other similar concepts, such as "not-just-right-experiences" (NJRE) or "sensory phenomena" (Ferrão et al., 2012; Sibrava, Boisseau, Eisen, Mancebo, & Rasmussen, 2016; Summerfeldt, 2004).

Factor analytic studies have provided support for the core dimensions model, with harm avoidance and incompleteness appearing to

* Corresponding author. Nobels väg 9, Karolinska Institutet, 171 77, Stockholm, Sweden.
E-mail address: erik.m.andersson@ki.se (E. Andersson).

https://doi.org/10.1016/j.jocrd.2024.100880
Received 18 September 2023; Received in revised form 23 May 2024; Accepted 24 May 2024
Available online 24 May 2024

be distinct constructs, showing divergent validity (Pietrefesa & Coles, 2008), and a high degree of structural validity in both clinical and non-clinical samples (Summerfeldt et al., 2014). Incompleteness has been associated with an earlier age of onset of OCD, higher OCD symptom severity, more comorbidity, perfectionism, and lower functioning (Coles, Frost, Heimberg, & Rhéaume, 2003; Ecker & Gönner, 2008; Ferrão et al., 2012; Ricketts et al., 2021; Sibrava et al., 2016; Summerfeldt, 2004). Incompleteness has further been specifically related to the symmetry/ordering symptom dimension of OCD (Cervin, Perrin, Olsson, Claesdotter-Knutsson, & Lindvall, 2021; Coles et al., 2003; Ecker & Gönner, 2008; Ferrão et al., 2012; Nissen & Parner, 2018; Pietrefesa & Coles, 2008; Sibrava et al., 2016; Summerfeldt, 2004) which in turn has been related to specific cognitive deficits (Bragdon, Gibb, & Coles, 2018; Cameron, Summerfeldt, Rowa, McKinnon, & Rector, 2019; Dominke, Graham-Schmidt, Gentsch, & Schütz-Bosbach, 2021; Vellozo et al., 2021), earlier onset of symptoms (Stein, Andersen, & Overo, 2007; Vellozo et al., 2021), as well as worse treatment response to antidepressant medications (Landeros-Weisenberger et al., 2010; Jenike, Baer, Minichiello, Rauch, & Buttolph, 1997; Stein et al., 2007) and neurosurgery (Denys et al., 2010; Rück, Larsson, & Mataix-Cols, 2012).

There is limited knowledge about the direct impact of incompleteness on treatment outcome with CBT, and previous work primarily emphasizes the role of harm avoidance in treatment outcome studies and long term effects of CBT (Summerfeldt, 2004). Foa et al. reported that adult participants with OCD who could articulate an explicit feared consequence (i.e. thoughts related to harm avoidance) had better treatment outcome from CBT compared to patients who did not articulate such a consequence (Foa, Abramowitz, Franklin, & Kozak, 1999). Similarly, in a study by Eisen et al. (2013), adult patients diagnosed with OCD who rated their main obsession in the category of "over--responsibility for harm" were almost twice as likely to be in remission after receiving CBT compared to patients without "over-responsibility for harm" obsessions. Patients without "over-responsibility for harm" obsessions also had a higher risk of relapse after receiving treatment (Eisen et al., 2013). Studies on pediatric OCD have investigated the direct influence of incompleteness on treatment outcome, where individuals who scored high on incompleteness/not-just-right perceptions achieved less improvements from CBT at post-treatment (Cervin & Perrin, 2021) and also had higher risk of subsequent relapse (Nissen & Parner, 2018). Taken together, these findings suggest that incompleteness may be an important clinical characteristic of OCD which may be important to assess when providing CBT.

The aims of this study were three-fold. First, by using confirmatory factor analysis, we aimed to validate if the incompleteness and harm avoidance dimensions could be reliably assessed with the Obsessive-Compulsive Trait Core Dimensions Questionnaire (OCTCDQ) in a sample of 167 individuals receiving internet-delivered CBT (ICBT) for OCD. Second, we aimed to replicate previous findings and investigate whether incompleteness was positively associated with symmetry/ordering symptoms, baseline OCD symptom severity, psychiatric comorbidity, previous treatment attempts and a younger age of onset of OCD symtoms. Finally, we investigated if higher levels of incompleteness at baseline, measured with the OCTCDQ, predicted worse treatment outcome of ICBT for OCD.

2. Method

2.1. Participants

A subset of individuals enrolled in a Swedish clinical implementation study of ICBT for OCD (OCD-NET) between March and December 2020 (Lundström et al., 2023) provided OCTCDQ data for analysis. Participants were 167 consecutive patients at a publicly funded outpatient psychiatric clinic in Stockholm, Sweden, who were either self-referred or clinically referred from a general practitioner (GP) or a psychiatrist. Each participant had one or two psychiatric assessments, performed by clinicians specialized in OCD and related disorders, before starting ICBT. Assessments either took place at the clinic or by encrypted video call and if deemed eligible for treatment, the participant started ICBT within a week after initial assessment. Detailed information about the clinics guidelines for inclusion- and exclusion from internet treatment can be found in the main outcome paper (Lundström et al., 2023).

All participants were informed about the research and had the opportunity to opt out if they did not agree to participate with their outcome data and individuals who declined participation were not included in the current analysis. The study was approved by the Regional Ethics Board of Stockholm (REPN dnr 2018/2550-32).

2.2. Measures

2.2.1. Obsessive-Compulsive Trait Core Dimensions Questionnaire (OCTCDQ)

Symptoms of incompleteness were assessed using the Obsessive-Compulsive Trait Core Dimensions Questionnaire (OCTCDQ), which was administered before the start of treatment. The scale is a 20-item self-rated questionnaire, which is divided into two subscales with 10 items, assessing incompleteness and harm avoidance, respectively. Items are rated on a 5-point scale (0 = Never applies to me, 5 = Always applies to me). Each subscale has a score ranging from 0 to 40, with higher scores indicating more frequent experiences (Summerfeldt et al., 2014). The OCTCDQ has shown good internal reliability for the two subscales in non-clinical and clinical samples (Summerfeldt et al., 2014). A Swedish version of the OCTCDQ was used in the current study, that has been translated in collaboration with the original scale developer and then back-translated and approved by the original developer (Cervin & Perrin, 2019). The Swedish version of the OCTCDQ has indicated good model/data fit, internal consistency, and convergent validity in Swedish children and adolescents with OCD (Cervin & Perrin, 2019).

2.2.2. The yale Brown obsessive compulsive scale (Y-BOCS) and the yale Brown obsessive compulsive scale - self report (Y-BOCS-SR)

The Yale-Brown Obsessive Compulsive Scale (Y-BOCS) is a clinician-rated scale for measuring severity of OCD symptoms and the Y-BOCS-SR is the self-reported version of the same scale. Both versions of the Y-BOCS consist of 10 items, divided into obsessions and compulsions, each rated on a 5-point Likert scale ranging from 0 (no symptoms) to 4 (severe symptoms). The total score of the scale ranges from 0 to 40 points. The Y-BOCS has high test-retest reliability (intraclass correlation average = 0.85) and good internal consistency (Cronbach's = 0.87) (Goodman et al., 1989; López-Pina et al., 2015). The Swedish version of the Y-BOCS has been widely used in clinical trials and has shown moderate correlations with other OCD-relevant measures (Flygare et al., 2023; Lundström et al., 2022). Both scales were administered before and after treatment completion and the Cronbach's Alpha in the current sample on the YBOCS-SR was 0.87 at baseline. The correlation between the Y-BOCS and Y-BOCS-SR (total score) was 0.68 ($p < 0.001$) before treatment and 0.84 ($p < 0.001$) after treatment in the current sample.

2.2.3. Obsessive compulsive inventory - revised (OCI-R)

The Obsessive Compulsive Inventory - Revised (OCI-R) is an 18-item self-report measure of OCD severity, which was administered before treatment, weekly during treatment and after treatment completion. The scale measures six different symptom dimensions of OCD and each item is scored on a scale from 0 to 4, with a total score of 72, where a higher score indicates more severe OCD. The OCI–R has excellent psychometric properties, and the subscales differentiate well between individuals with and without OCD (Abramowitz & Deacon, 2006; Foa et al., 2002). The Swedish version of the scale was translated in 2009 and has shown adequate psychometric properties in a Swedish sample of 1010 individuals with OCD (Mahjani et al., 2022). The Cronbach's Alpha of the total scale in the current sample at baseline was 0.83.

2.2.4. The Clinical Global Impression (CGI)

The Clinical Global Impression (CGI) is a clinician-rated measure of clinical global severity of illness (CGI-S) and clinical global improvement (CGI-I). CGI-S was administered before and after treatment and CGI-I was administered after treatment completion. The CGI-S is a 1-item measure with a score ranging from 1 (not at all ill) to 7 (extremely ill), and the CGI-I is a 1-item measure with a score randing from 1 (very much improved) to 7 (very much deteriorated)(Guy, 1976). The CGI scales have shown good reliability and validity for a range of psychiatric disorders (Kadouri, Corruble, & Falissard, 2007; Zaider, Heimberg, Fresco, Schneier, & Liebowitz, 2003).

2.2.5. Definition of treatment response and remission

Response was defined as a clinician rated Y-BOCS score reduction of ≥35% and a Clinical Global Impressions Improvement Scale (CGI-I) score of ≤2 at post-treatment. Remission was defined as a clinican-rated Y-BOCS score of ≤12 and a Clinical Global Impressions Severity Scale (CGI-S; see below) score of ≤2 at post-treatment (Mataix-Cols et al., 2016, 2022).

2.2.6. Assessment of other clinical variables at baseline

Other clinical variables assessed at baseline were previous treatments with CBT, comorbidity and age of onset. These variables were collected by the clinicians at the initial psychiatric assessment before treatment inclusion. Comorbidity was assessed using the Mini International Neuropsychiatric Interview (Sheehan et al., 1998) (MINI) in combination with medical records of the participants' previously diagnosed disorders. Comorbidity was defined as the number of additional psychiatric diagnoses other than OCD. Previous treatment with CBT was defined as having at least one previous course of CBT for OCD that included exposure with response prevention (ERP). Age of onset was defined as the participants' current age at the start of treatment, minus the number of years since OCD symptoms started. The age of symptom onset was self-reported by the participant during the screening interview.

2.3. Intervention

Participants received 12 weeks of ICBT for OCD. The treatment consisted of 10 modules that were unlocked consecutively by the therapist after the participant had completed the homework for the previous module. The treatment emphasized ERP and case examples were used to illustrate how OCD can manifest and how specific ERP exercises can be applied. One of the case examples was an individual who experienced incompleteness and not-just-right feelings. The treatment modules are described in more detail in the main outcome paper (Lundström et al., 2023).

2.4. Therapists

All therapists were employed at the psychiatric clinic where the treatment took place. Therapists consisted of clinical psychologists, residents in clinical psychology or psychology students in clinical training. Therapists received external supervision every month and frequently discussed practical and clinical issues related to the treatment. Resident psychologists and psychology students had weekly supervisions with an experienced psychologist.

Therapists responded to messages in the Internet platform during office hours (8am-5pm) on weekdays and normally provided response within 24 h. The main job of the therapist was to encourage the participant to conduct ERP exercises and assist in problem solving during treatment. Therapists also monitored treatment engagement and reminded inactive participants through SMS notifications and phone calls to continue to work with the treatment. If a participant was inactive more than 14 days in a row, despite notifications, treatment was terminated, and the individual was offered a follow-up assessment.

2.5. Statistical analysis

For the first aim, we used confirmatory factor analysis to test two factor structures of the OCTCDQ: (1) the proposed original 2-factor structure with 10 items measuring harm avoidance and 10 items measuring incompleteness and (2) a unidimensional structure with all items being used as indicators of a single latent factor. Because this was the first time the OCTCDQ was evaluated in Swedish adults with OCD, we also explored modification indices. Modification indices indicate which parameters to relax to improve model fit and can be used to help identify sources of misfit and ways to improve overall model/data fit. Because the items were ordinal, the diagonally weighted least squares estimator was used. The following fit indexes were estimated to evaluate model/data fit: Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), Tucker-Lewis Index (TLI), and Standardized Mean Square Residual (SRMR). Scaled fit indexes were estimated because of the ordinal nature of the items. A global evaluation of the four indexes was conducted and CFI/TLI values above 0.90 were interpreted to indicate acceptable fit and values above 0.95 to indicate good fit. For RMSEA and SRMR, values below 0.06 and 0.08 respectively, were interpreted to indicate good model/data fit (Hu & Bentler, 1999). Cronbach's alpha was calculated for each of the two subscales (incompleteness and harm avoidance) of the OCTCDQ.

For the second aim, we tested the hypothesis that incompleteness would be positively correlated with symmetry/ordering symptoms, OCD symptom severity, earlier age of onset, previous treatment of CBT and greater comorbidity at baseline. We used multiple linear and logistic regression analyses, with each clinical characteristic serving as the dependent variable and incompleteness (measured with the OCTCDQ) as the independent variable. To specifically isolate the effects related to incompleteness, we used the harm avoidance subscale of the OCTCDQ as a covariate in all regression models. The results were reported in standardized betacoefficients (β) and odds ratios (OR). As we did not expect the number of psychiatric diagnoses to be normally distributed, we also added Spearman's rank correlation as a sensitivity analysis.

For the third and final aim, we tested the hypothesis that a higher degree of incompleteness at baseline would predict worse treatment outcome with ICBT for OCD. We employed a linear mixed-effects regression model with OCD symptom severity as the dependent variable, including fixed effects of time, incompleteness, and harm avoidance, as well as an interaction term between time and incompleteness. Additionally, a random intercept was specified for individual participants. We also repeated the mixed effects regression model with the self-rated measures Y-BOCS-SR and OCI-R as dependent variables (instead of the clinician rated Y-BOCS) and the OCTCDQ harm avoidance subscale measured at baseline as covariate.

To complement the third aim on the association of incompleteness with treatment outcome, response, and remission, we performed a median split and divided participants into a "low incompleteness group" (score on the OCTCDQ incompleteness subscale <18) and a "high incompleteness group" (score on the OCTCDQ incompleteness subscale ≥18). We calculated Y-BOCS means and SDs at baseline and post treatment for each group and used logistic regression to analyze response and remission rates (this analysis did not include the OCTCDQ harm avoidance subscale as covariate).

To analyze patterns of missing data, we performed a logistic regression analysis with a dummy variable (missing data or no missing data post treatment) as the dependent variable and incompleteness (measured with the OCTCDQ) as the independent variable. We set alpha for all analyses at 0.05 and used R statistical software version 4.0.2 (R Project for Statistical Computing) to conduct all statistical analyses (R Core Team, 2021).

3. Results

3.1. Participant flow and data loss

Demographic and clinical characteristics of the 167 participants are presented in Table 1 below. The mean participant age was 30.9 (9.2) years and 63% of the sample were women. The most reported comorbid diagnosis to OCD was depression (22%).

One hundred and eighteen (71%) of the participants completed the clinician rated Y-BOCS post assessment, and 134 (80%) completed the self-rated Y-BOCS assessment post-treatment. Twenty-eight (17%) of the participants discontinued treatment beforehand. Reasons for discontinuation were inactivity (n = 11) on the internet platform, the internet format was not suitable (n = 7), not enough time to work with the treatment (n = 5), worsening of symptoms and not able to continue with the treatment (n = 3), or so much improvement that the participant did not want to complete the treatment (n = 2). A linear regression analysis indicated that incompleteness scores did not predict data loss (B = −0.006, [95% CI -0.04 to 0.02], $p > 0.05$).

3.2. Confirmatory factor analysis of the OCTCDQ scale

Confirmatory factor analysis of the OCTCDQ scale showed that the original 2-factor structure had better fit than a 1-factor structure, with acceptable fit indices for CFI and TLI but poorer estimates for RMSEA and SRMR (Table 2). Modification indices indicated that item 18 (an original incompleteness item; "It takes a long time for me to feel certain about things") should be allowed to load also onto the harm avoidance factor and that correlated residuals should be added for items 14 and 20 (incompleteness items: "There is nothing like the feeling I have when something is finally satisfactorily completed" and "I know I've done something right when I get a certain feeling inside") and items 3 and 5 (harm avoidance items: "Even if harm is very unlikely, I feel the need to prevent it at any cost" and "There are things that I am afraid might happen if I don't take certain steps to prevent them"). This sligtlhy modified structure had good model/data fit, see Table 2. The original 2-factor structure showed high standardized factor loadings for all items: harm avoidance (0.70–0.87) and incompleteness (0.70–0.94), see Table 3. There was a standardized covariance of 0.54 between the two factors of the OCTCDQ scale. Cronbach's Alpha for the incompleteness subscale of the OCTCDQ was 0.92 and 0.89 for the harm avoidance subscale.

3.3. Associations between incompleteness and baseline clinical characteristics

Baseline incompleteness scores (assessed using the OCTCDQ) were significantly associated with symmetry/ordering symptoms (β = 0.52, [95% CI 0.48 to 0.56], $p < 0.001$) and a higher number of psychiatric comorbidities (β = 0.23, [95% CI 0.21 to 0.25], $p < 0.05$; Spearman's rho = 0.25, $p < 0.05$) at baseline. By contrast, incompleteness was not associated with age of onset (β = −0.08, [95% CI -0.24 to 0.09], $p > 0.05$) or previous courses of CBT (OR = 1.02, [95% CI 0.98 to 1.05], $p > 0.05$). Baseline incompleteness scores were also significantly associated with baseline self-reported, but not clinician-rated, OCD severity scores (self rated Y-BOCS-SR β = 0.35, [95% CI 0.27 to 0.43], $p < 0.001$; self-rated OCI-R β = 0.46, [95% CI 0.34 to 0.59], $p < 0.001$; clinician-rated Y-BOCS β = 0.16, [95% CI 0.08 to 0.24], $p > 0.05$). For the sake of comprehensiveness, we also repeated the analyses using the OCTCDQ harm avoidance covariate estimates which showed the following: symmetry/ordering symptoms β = 0.12 (95% CI 0.07 to 0.17, $p > 0.05$); higher number of psychiatric comorbidities β = 0.12 (95% CI 0.10 to 0.14, $p > 0.05$); age of onset β = −0.18 (95% CI -0.36 to 0.01, $p > 0.05$); previous courses of CBT OR = 0.99 (95% CI 0.95 to 1.03, $p > 0.05$); clinician-rated Y-BOCS β = 0.20 (95% CI 0.10 to 0.30, $p < 0.05$); self rated Y-BOCS-SR β = 0.29 (95% CI 0.20 to 0.38, $p < 0.05$); OCI-R β =

Table 1
Participant characteristics at baseline (n = 167).

Demographics at baseline	
Source of referral, N (%)	**N=167**
Clinical referral	25 (15)
Self-referral	142 (85)
Age, mean (SD)	30.9 (9.2)
Gender, N (%)	**N=167**
Female	105 (63)
Male	62 (37)
Years with OCD diagnosis, mean (SD)	**N=126**
	13.9 (11.4)
Previous CBT treatment for OCD, N (%)	**N=155**
	46 (30)
Previous suicide attempts, N (%)	**N=86**
	17 (20)
Source of income, N (%)	**N=155**
Employed	89 (57)
Student	45 (29)
On sick leave	12 (8)
Unemployed	6 (4)
Retired	2 (1)
OCTCDQ, mean (SD)	35.96 (18.98)
OCTCDQ-INC, mean (SD)	18.40 (11.31)
OCTCDQ-HA, mean (SD)	20.13 (9.69)
OCI-R, mean (SD)	22.40 (11.86)
Y-BOCS, mean (SD)	23.36 (5.48)
Number of comorbid diagnoses (SD)	0.88 (1.10)
Level of education, N (%)	**N=163**
Primary school	14 (9)
High school	73 (45)
Vocational school	8 (5)
College/University	68 (42)
Main obsessions, N (%)[a]	**N=155**
Aggressive	102 (66)
Contamination	73 (47)
Unacceptable thoughts	53 (34)
Symmetry	25 (16)
Main compulsions, N (%)[a]	**N=155**
Checking	113 (73)
Washing	65 (42)
Mental rituals	74 (48)
Ordering	40 (26)
Current medications, N(%) [b]	**N=151**
SSRI	55 (36)
Antihistamine	14 (9)
Sleep medication	12 (8)
Central stimulants	8 (5)
Anti-anxiety medication	7 (5)
Other antidepressant	4 (3)
Antipsychotic	3 (2)
Psychiatric comorbidities, N (%)	**N=155**
Depression	34 (22)
Generalized anxiety disorder	28 (18)
Social anxiety disorder	9 (6)
ADHD	9 (6)
Autism spectrum disorder	5 (3)
Panic disorder	5 (3)
BDD	5 (3)
Excoriation disorder	4 (3)
Post-traumatic stress disorder	3 (2)
Bipolar disorder	2 (1)
Health anxiety disorder	2 (1)
Specific phobia	2 (1)
Eating disorder	1 (1)
Tic disorder	1 (1)

Abbreviations: OCTCDQ, Obsessive-Compulsive Trait Core Dimensions Questionnaire; OCTCDQ, Obsessive-Compulsive Trait Core Dimensions Questionnaire – Incompleteness subscale; OCTCDQ-HA, Obsessive-Compulsive Trait Core Dimensions Questionnaire – Harm Avoidance subscale; ADHD, Attention-deficit hyperactivity disorder; BDD, Body Dysmorphic Disorder; CBT, Cognitive behaviour therapy; OCD, Obsessive-compulsive disorder; SSRI, Selective serotonin reuptake inhibitor.

[a] Participants could report more than one category of obsessions and compulsions.

[b] Participants could report more than one medication. Data loss in some categories were due to assessors not filling out/answering all questions at the psychiatric assessment.

0.37 (95% CI 0.22 to 0.52, $p < 0.01$).

3.4. Incompleteness as a predictor of treatment outcome with ICBT

For the whole sample, there was a significant reduction in OCD symptom severity on the clinician rated Y-BOCS from pre to post treatment (B = − 8.71, [95% CI -9.88 to −7.54], $p < 0.001$). Baseline incompleteness scores were associated with smaller improvements from pre to post treatment on the clinician rated Y-BOCS (B = 0.13, [95% CI 0.03 to 0.23], $p < 0.01$). The main result was not replicated with the self-rated measures of OCD symptom severity, with incompleteness predicting larger improvements in OCD severity from pre to post treatment measured with OCI-R (B = −0.15, [95% CI -0.24 to −0.07], $p < 0.001$), and the effect on Y-BOCS-RS improvement being non-significant (B = −0.04, [95% CI -0.13 to 0.05], $p > 0.05$).

As shown in Fig. 1, participants with high incompleteness scores had higher mean Y-BOCS score at post treatment (mean = 17.1, SD = 7.1), compared to the low incompleteness group (mean = 12.3, SD = 7.4) and this difference was statistically significant ($p < 0.001$). The probability of being in remission after treatment was higher for individuals in the low incompleteness group 34% [95% CI 22%–48%] vs. the high incompleteness group 10% [95% CI 4%–22%], $p < 0.05$ (see Fig. 2). The probability of being a responder was also higher for the low incompleteness group 52% [95% CI 38%–66%] compared to the high incompleteness group 39% [95% CI 26%–53%], but this difference was not statistically significant ($p > 0.05$).

4. Discussion

This study investigated the role of incompleteness as a potentially useful clinical feature in a sample of individuals with OCD who received

Table 2
Fit indices for confirmatory factor analysis of the OCTCDC.

OCTCDQ factor model	χ (Bloch et al., 2008)	df	*p*	CFI	TLI	RMSEA	SRMR
Original 2-factor structure)	508.88	169	<0.001	0.937	0.929	0.110	0.094
Modified 2-factor structure	321.08	166	<0.001	0.971	0.967	0.075	0.071
1-factor structure	1052.68	170	<0.001	0.836	0.816	0.177	0.176

Abbreviations: OCTCDQ, Obsessive-Compulsive Trait Core Dimensions Questionnaire; χ^2, chi-squared; df, degrees of freedom; CFI, Comparative Fit Index; TLI, Tucker−Lewis Index; SRMR, Standardized Mean Square Residual; RMSEA, Root Mean Square Error of Approximation.

Table 3
Unstandardized and standardized item loadings for the 2-factor confirmatory factor analysis of the OCTCDQ scale.

Items HA	Unstandardized (SE)	Standardized	Items INC	Unstandardized (SE)	Standardized
1	1.00 (NA)	0.70	2	1.00 (NA)	0.82
3	1.24 (0.07)	0.86	4	0.91 (0.04)	0.74
5	1.25 (0.07)	0.87	6	1.15 (0.04)	0.94
7	1.16 (0.07)	0.81	8	1.01 (0.04)	0.89
9	1.03 (0.08)	0.72	10	0.92 (0.06)	0.75
11	1.14 (0.08)	0.79	12	1.07 (0.04)	0.87
13	0.99 (0.09)	0.69	14	0.96 (0.05)	0.78
15	1.16 (0.08)	0.81	16	0.89 (0.05)	0.73
17	1.10 (0.07)	0.75	18	0.90 (0.06)	0.74
19	1.03 (0.08)	0.72	20	0.85 (0.05)	0.70

Abbreviations: NA, not applicable; SE, standard error; HA, harm avoidance; INC, incompleteness.

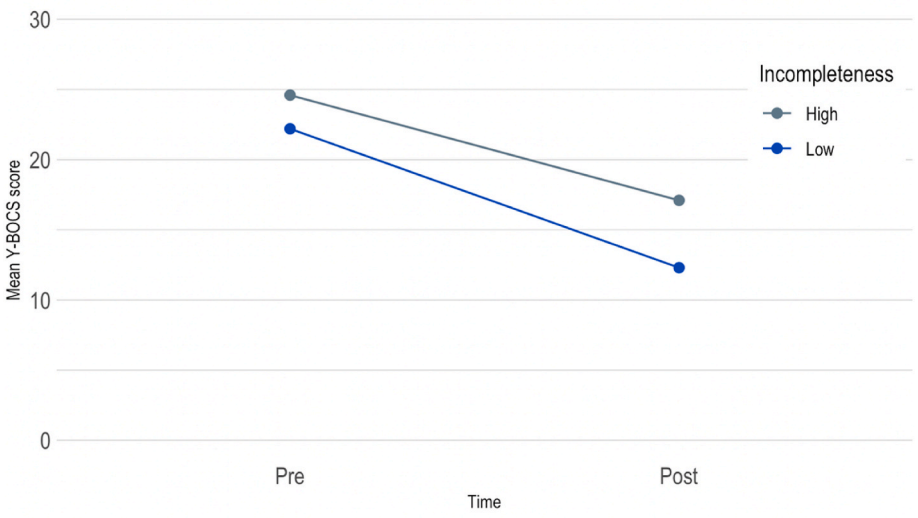


Fig. 1. Mean Y-BOCS score for the high and low incompleteness groups at pre and post treatment.
Figure caption: High incompleteness = OCTCDQ incompleteness subscale point of ≥18; Low incompleteness = OCTCDQ incompleteness subscale point of <18.

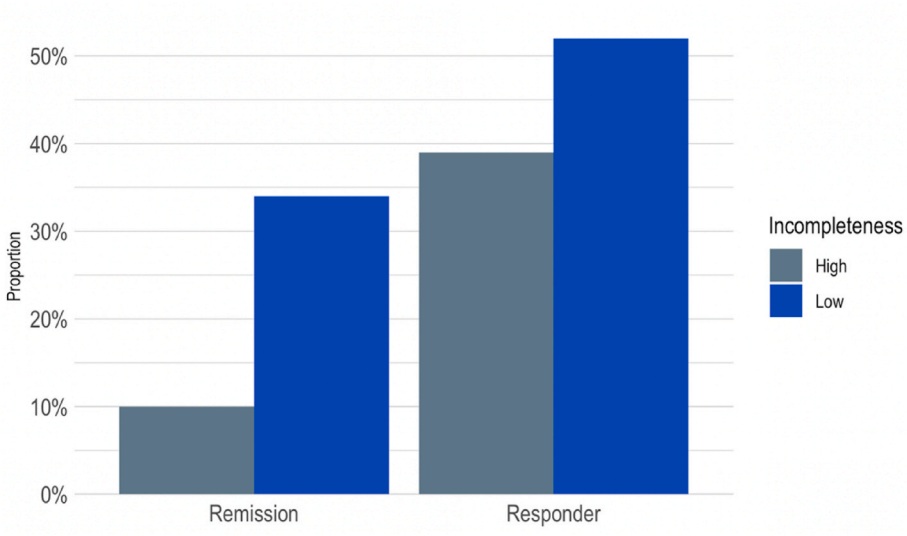


Fig. 2. Proportion of remitters and responders in the high and low incompleteness groups.
Figure caption: High incompleteness = OCTCDQ incompleteness subscale point of ≥18; Low incompleteness = OCTCDQ incompleteness subscale point of <18. Response = Y-BOCS ≥35% and CGI-I ≤ 2 at post-treatment; Remission = Y-BOCS ≤12 and CGI-S ≤ 2 at post-treatment (Mataix et al., 2016).

highly structured internet-delivered CBT. Results from the factor analysis confirmed the original 2-factor structure of the OCTCDQ, although slight modifications were used to achieve good model/data fit. Further, the incompleteness and harm avoidance constructs were distinct, and each factor had excellent internal consistency. The study further found that incompleteness was associated with baseline symmetry/ordering symptoms, global symptom severity (self-reported only), and the number of psychiatric comorbidities. Finally, incompleteness scores at baseline predicted more modest treatment effects with ICBT on the clinician-rated Y-BOCS but the results could not be replicated on the self-report measures. The proportions of treatment responders and remitters were lower for individuals with high incompleteness (response, 39%; remission, 10%) compared to participants who scored low on this subscale (response, 52%; remission, 34%). These outcome results are partly in line with previous research on both adult and pediatric OCD samples (Cervin & Perrin, 2021; Pinciotti et al., 2023).

The results from the factor analysis are consistent with prior research that has found harm avoidance and incompleteness to be separate constructs, in both student and clinical samples of OCD (Pietrefesa & Coles, 2008; Summerfeldt et al., 2014; Taylor et al., 2014). Furthermore, our findings are comparable to the previous study that validated the current version of the OCTCDQ in a Swedish youth OCD sample (Cervin & Perrin, 2019).

As predicted, incompleteness was strongly associated with symmetry/ordering symptoms, which is a highly replicated finding in previous research (Cervin et al., 2021; Coles et al., 2003; Ecker & Gönner, 2008; Ferrão et al., 2012; Nissen & Parner, 2018; Pietrefesa & Coles, 2008; Sibrava et al., 2016; Summerfeldt, 2004). From a neurobiological standpoint, symmetry/ordering/incompleteness symptoms may have partially distinct neural correlates, different from those in other dimensions of OCD (van den Heuvel et al., 2008; Vellozo et al., 2021). Specifically, symmetry/ordering symptoms have been linked to cognitive control areas in the dorsolateral prefrontal cortex and motor areas in the dorsal striatum. In contrast, contamination and washing symptoms have been associated with more "limbic" neural systems, such as the orbitofrontal cortex and ventral striatum (Gilbert et al., 2009). Moreover, there is preliminary evidence to suggest that symmetry/ordering symptoms are related to specific genetic polymorphisms (Kohlrausch et al., 2016; Lochner et al., 2015; Taj. et al., 2013), though these results require more replication studies. Previous research have also indicated impaired levels of cognitive flexibility and set-shifting, logical and verbal memory, attention, and inhibition in individuals with symmetry/ordering symptoms (Bragdon et al., 2018; Hashimoto et al., 2011; Kashyap, Kumar, Kandavel, & Reddy, 2017; Lawrence et al., 2006) as well as worse response to medical- (Landeros-Weisenberger et al., 2010; Jenike, Baer, Minichiello, Rauch, & Buttolph, 1997; Stein et al., 2007) and neurosurgical treatments (Denys et al., 2010; Rück et al., 2012).

The fact that results in this study also showed that higher levels of baseline incompleteness predicted clinician-rated but not patient-rated outcomes is puzzling and it may reflect either measurement error through floor effects on the OCI-R or patient characteristics. For example, it is possible that clinicians underestimate the amount of clinical improvement of patients with prominent incompleteness or that patients overestimate it. It is not possible from our study design to have a definitive answer to this question. More research is therefore needed before we can be sure. Given the previously found link between symmetry/ordering/incompleteness and specific impairments in executive functioning (Bragdon et al., 2018; Cameron, Summerfeldt, Rowa, McKinnon, & Rector, 2019; Dominke et al., 2021), it is possible that these individuals have difficulties in planning and executing ERP exercises or even self-reporting symptoms. Future studies should look more closely into whether incompleteness is associated with executive dysfunctions that in turn has a mediating effect on treatment compliance. It is also possible that individuals with high degree of incompleteness experience difficulties to achieve sufficient extinction during and/or between the ERP exercises. Milgram et al., found that participants who scored high on incompleteness reported less distress and more often exhibited a "flat" trajectory of change in distress during exposure tasks than individuals who experienced problems more closely related to harm avoidance (Milgram et al., 2022). Another study by Houghton et al., provided ERP to patients with chronic tics. Contrary to their hypothesis, they did not find a positive association between habituation of premonitory urges (a construct similar to incompleteness) and improved treatment response (Houghton et al., 2017). Taken together, it is possible that incompleteness follows a different trajectory of change during ERP compared to other forms of OCD, which includes primarily harm avoidance. Consequently, future studies should consider employing larger sample sizes to explore whether incompleteness genuinely exhibits a distinct relationship with treatment response.

Symmetry/ordering/incompleteness symptoms have been associated with deficits in inhibitory control (Dominke et al., 2021; Hashimoto et al., 2011) and with neuropsychiatric and inhibition-related disorders such as ADHD, tics, skin-picking/trichotillomania, substance use

disorders and bulimia nervosa (Ferrão et al., 2012; Ricketts et al., 2021; Summerfeldt, 2004; Vellozo et al., 2021). A potential avenue for future research could therefore be to involve the integration of strategies from habit reversal training and other forms of inhibition-based techniques. One meta-analysis revealed that psychological treatments specifically targeting incompleteness lead to larger improvements than more general OCD treatments (Schwartz, 2018). Future research should aim to develop interventions that specifically target incompleteness and, crucially, investigate whether reductions in incompleteness are causally related to decreased levels of OCD severity. Furthermore, a prospective area of study could be to tailor the ICBT treatment content to better align with incompleteness and to examine how this modification may influence treatment outcomes for this patient population. One suggestion of such modification could be to borrow techniques from ERP-based treatments of tic disorders, where a stopwatch is used to train tic suppression for increasingly long periods of time (Black & Black, 2018; Verdellen, Keijsers, Cath, & Hoogduin, 2004). In the case of incompleteness OCD, this may involve using a timer to, for example, prevent the ordering/arranging compulsion for increasing periods of time. This can potentially be "gamified" (e.g. try to beat your own record) as a way to provide daily positive reinforcement. In subsequent steps, the patient could be encouraged to practice this in a range of provoking situations (e.g. messy environments).

Some strengths of the current study were the relatively large sample size of clinical OCD cases, a highly structured ICBT protocol which minimised therapist drift, clinician administered outcome measures both pre- and post-treatment and the use of a validated measure of incompleteness. The study also had several limitations. First, the non-experimental design and single measurement point on the OCTCDQ means that the associations found in this study could potentially be attributable to other, unmeasured, latent variables (e.g. general functioning, other comorbidities etc.) than have not been measured in the current study. As such, future research should employ study designs that allow for the direct manipulation of incompleteness and to investigate its effects on OCD symptoms. Another limitation is the relatively large data loss, which could affect the reliability of the findings. However, a regression analysis revealed that incompleteness scores were not associated with data loss, thereby diminishing the likelihood of missing data impacting the predictive outcomes. Our use of a highly structured treatment format may pose a challenge to generalization of results to other forms of CBT. It is possible that CBT provided in a traditional in-person format can provide more flexible opportunities to adjust the treatment content, particularly ERP, and that incompleteness therefore could have a potentially lower predictive impact of treatment outcome than in ICBT.

5. Conclusion

This study confirms previous research and indicates that incompleteness can be reliably measured using the OCTCDQ. Incompleteness was strongly associated with symmetry/ordering symptoms, global symptom severity (self-reported only), and moderately associated with psychiatric comorbidity. Additionally, incompleteness may be associated with worse treatment outcome with ICBT, but more research is needed before definite conclusions can be reached.

6. Funding and role of funder

This study was supported by the Swedish Research Council [2021-00898], the Swedish Research Council for Health, Working Life and Welfare [2021-00132], Center for Innovative Medicine – CIMED, and the regional agreement on medical training and clinical research between Stockholm County Council and Karolinska Institutet. The funders had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

CRediT authorship contribution statement

Lina Lundström: Writing – review & editing, Writing – original draft, Visualization, Project administration, Formal analysis, Conceptualization. **Ekaterina Ivanova:** Writing – review & editing, Writing – original draft, Supervision, Formal analysis, Conceptualization. **David Mataix-Cols:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Funding acquisition, Conceptualization. **Oskar Flygare:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Investigation, Formal analysis. **Matti Cervin:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis. **Christian Rück:** Writing – review & editing, Writing – original draft, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Erik Andersson:** Writing – review & editing, Writing – original draft, Supervision, Formal analysis, Conceptualization.

Declaration of competing interest

Prof. Mataix-Cols receives royalties for contributing articles to UpToDate, Wolters Kluwer Health, outside of the submitted work.

Prof. Rück has received book royalties from Natur & Kultur, Studentlitteratur and Albert Bonniers Förlag and various speakers fees all unrelated to the submitted work.

Dr Andersson receives royalties from Natur & Kultur for a self-help book on health anxiety.

Dr Flygare has received speaking fees from the Swedish OCD Association, Insight Events AB, and Kry International AB, as well as reimbursement for writing articles for Inside Practice Psychiatry, all outside the submitted work.

Dr Lundström and Dr Andersson had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Dr Ivanova has no competing interests to declare.

Dr Lundström has no competing interests to declare.

Data availability

Data will be made available on request.

Acknowledgements

Dr Lundström and Dr Andersson had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

References

Abramowitz, J. S., & Deacon, B. J. (2006). Psychometric properties and construct validity of the Obsessive–Compulsive Inventory—Revised: Replication and extension with a clinical sample. *Journal of Anxiety Disorders, 20*(8), 1016–1035. https://doi.org/10.1016/j.janxdis.2006.03.001

American Psychiatric Association. (2013). *Diagnostic and statistical manual of Mental disorders (DSM-5®)*. American Psychiatric Pub.

Black, J. K., & Black, K. J. (2018). Software for web-based tic suppression training. *F1000Research, 6*, 2150. https://doi.org/10.12688/f1000research.13460.2

Bloch, M. H., Landeros-Weisenberger, A., Rosario, M. C., Pittenger, C., & Leckman, J. F. (2008). Meta-analysis of the symptom structure of obsessive-compulsive disorder. *Am J Psychiatry, 165*(12), 1532–1542. https://doi.org/10.1176/appi.ajp.2008.08020320

Bragdon, L. B., & Coles, M. E. (2017). Examining heterogeneity of obsessive-compulsive disorder: Evidence for subgroups based on motivations. *Journal of Anxiety Disorders, 45*, 64–71. https://doi.org/10.1016/j.janxdis.2016.12.002

Bragdon, L. B., Gibb, B. E., & Coles, M. E. (2018). Does neuropsychological performance in OCD relate to different symptoms? A meta-analysis comparing the symmetry and obsessing dimensions. *Depression and Anxiety, 35*(8), 761–774. https://doi.org/10.1002/da.22785

Cervin, M., & Perrin, S. (2019). Measuring harm avoidance, incompleteness, and disgust in youth with obsessive-compulsive disorder and anxiety disorders. *J Obsessive-*

Compuls Relat Disord., 22, Article 100442. https://doi.org/10.1016/j.jocrd.2019.100442

Cervin, M., & Perrin, S. (2021). Incompleteness and disgust predict treatment outcome in pediatric obsessive-compulsive disorder. *Behav Ther, 52*(1), 53–63. https://doi.org/10.1016/j.beth.2020.01.007

Cervin, M., Perrin, S., Olsson, E., Claesdotter-Knutsson, E., & Lindvall, M. (2021). Involvement of fear, incompleteness, and disgust during symptoms of pediatric obsessive–compulsive disorder. *Eur Child Adolesc Psychiatry, 30*(2), 271–281. https://doi.org/10.1007/s00787-020-01514-7

Coles, M. E., Frost, R. O., Heimberg, R. G., & Rhéaume, J. (2003). "Not just right experiences": Perfectionism, obsessive–compulsive features and general psychopathology. *Behaviour Research and Therapy, 41*(6), 681–700. https://doi.org/10.1016/S0005-7967(02)00044-X

Denys, D., Mantione, M., Figee, M., van den Munckhof, P., Koerselman, F., Westenberg, H., et al. (2010). Deep Brain stimulation of the nucleus accumbens for treatment-refractory obsessive-compulsive disorder. *Arch Gen Psychiatry, 67*(10), 1061. https://doi.org/10.1001/archgenpsychiatry.2010.122

Dominke, C., Graham-Schmidt, K., Gentsch, A., & Schütz-Bosbach, S. (2021). Action inhibition in individuals with high obsessive-compulsive trait of incompleteness: An ERP study. *Biological Psychology, 159*, Article 108019. https://doi.org/10.1016/j.biopsycho.2021.108019

Ecker, W., & Gönner, S. (2008). Incompleteness and harm avoidance in OCD symptom dimensions. *Behaviour Research and Therapy, 46*(8), 895–904. https://doi.org/10.1016/j.brat.2008.04.002

Eisen, J. L., Sibrava, N. J., Boisseau, C. L., Mancebo, M. C., Stout, R. L., Pinto, A., et al. (2013). Five-year course of obsessive-compulsive disorder: Predictors of remission and relapse [CME]. *The Journal of Clinical Psychiatry, 74*(3), 233–239. https://doi.org/10.4088/JCP.12m07657

Ferrão, Y. A., Shavitt, R. G., Prado, H., Fontenelle, L. F., Malavazzi, D. M., de Mathis, M. A., et al. (2012). Sensory phenomena associated with repetitive behaviors in obsessive-compulsive disorder: An exploratory study of 1001 patients. *Psychiatry Res, 197*(3), 253–258. https://doi.org/10.1016/j.psychres.2011.09.017

Flygare, O., Wallert, J., Chen, L. L., Fernández de la Cruz, L., Lundström, L., Mataix-Cols, D., et al. (2023). Empirically defining treatment response and remission in obsessive-compulsive disorder using the obsessive-compulsive inventory–revised. *Behav Ther, 54*(1), 43–50. https://doi.org/10.1016/j.beth.2022.06.009

Foa, E. B., Abramowitz, J. S., Franklin, M. E., & Kozak, M. J. (1999). Feared consequences, fixity of belief, and treatment outcome in patients with obsessive-compulsive disorder. *Behav Ther, 30*(4), 717–724. https://doi.org/10.1016/S0005-7894(99)80035-5

Foa, E. B., Huppert, J. D., Leiberg, S., Langner, R., Kichic, R., Hajcak, G., et al. (2002). The Obsessive-Compulsive Inventory: Development and validation of a short version. *Psychological Assessment, 14*(4), 485–496. https://doi.org/10.1037/1040-3590.14.4.485

Gilbert, A. R., Akkal, D., Almeida, J. R. C., Mataix-Cols, D., Kalas, C., Devlin, B., et al. (2009). Neural correlates of symptom dimensions in pediatric obsessive-compulsive disorder: A functional magnetic resonance imaging study. *Journal of the American Academy of Child & Adolescent Psychiatry, 48*(9), 936–944. https://doi.org/10.1097/CHI.0b013e3181b2163c

Goodman, W. K., Price, L. H., Rasmussen, S. A., Mazure, C., Fleischmann, R. L., Hill, C. L., et al. (1989). The Yale-Brown obsessive compulsive scale. I. Development, use, and reliability. *Arch Gen Psychiatry, 46*(11), 1006–1011. https://doi.org/10.1001/archpsyc.1989.01810110048007

Guy, W. (1976). *Clinical global impression scale. ECDEU assessment manual for psychopharmacology*. US Department of Health, Education, and Welfare, Public Health Service, Alcohol, Drug Abuse, and Mental Health Administration.

Hashimoto, N., Nakaaki, S., Omori, I. M., Fujioi, J., Noguchi, Y., Murata, Y., et al. (2011). Distinct neuropsychological profiles of three major symptom dimensions in obsessive–compulsive disorder. *Psychiatry Res, 187*(1–2), 166–173. https://doi.org/10.1016/j.psychres.2010.08.001

Houghton, D. C., Capriotti, M. R., Scahill, L. D., Wilhelm, S., Peterson, A. L., Walkup, J. T., et al. (2017). Investigating habituation to premonitory urges in behavior therapy for tic disorders. *Behav Ther, 48*(6), 834–846. https://doi.org/10.1016/j.beth.2017.08.004

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct Equ Model Multidiscip J, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Jenike, M. A., Baer, L., Minichiello, W. E., Rauch, S. L., & Buttolph, M. L. (1997). Placebo-controlled trial of fluoxetine and phenelzine for obsessive- compulsive disorder. *Am J Psychiatry, 154*(9), 1261–1264. https://doi.org/10.1176/ajp.154.9.1261

Kadouri, A., Corruble, E., & Falissard, B. (2007). The improved clinical global impression scale (iCGI): Development and validation in depression. *BMC Psychiatry, 7*(1), 7. https://doi.org/10.1186/1471-244X-7-7

Kashyap, H., Kumar, J. K., Kandavel, T., & Reddy, Y. C. J. (2017). Relationships between neuropsychological variables and factor-analysed symptom dimensions in obsessive compulsive disorder. *Psychiatry Res, 249*, 58–64. https://doi.org/10.1016/j.psychres.2016.12.044

Kohlrausch, F. B., Giori, I. G., Melo-Felippe, F. B., Vieira-Fonseca, T., Velarde, L. G., de Salles Andrade, J. B., et al. (2016). Association of GRIN2B gene polymorphism and obsessive compulsive disorder and symptom dimensions: A pilot study. *Psychiatry Res, 243*, 152–155. https://doi.org/10.1016/j.psychres.2016.06.027

Landeros-Weisenberger, A., Bloch, M. H., Kelmendi, B., Wegner, R., Nudel, J., Dombrowski, P., et al. (2010). Dimensional predictors of response to SRI pharmacotherapy in obsessive–compulsive disorder. *Journal of Affective Disorders, 121*(1–2), 175–179. https://doi.org/10.1016/j.jad.2009.06.010

Lawrence, N. S., Wooderson, S., Mataix-Cols, D., David, R., Speckens, A., & Phillips, M. L. (2006). Decision making and set shifting impairments are associated with distinct symptom dimensions in obsessive-compulsive disorder. *Neuropsychology, 20*(4), 409–419. https://doi.org/10.1037/0894-4105.20.4.409

Leckman, J. F., Grice, D. E., Boardman, J., Zhang, H., Vitale, A., Bondi, C., et al. (1997 Jul). Symptoms of obsessive-compulsive disorder. *Am J Psychiatry., 154*(7), 911–917. https://doi.org/10.1176/ajp.154.7.911. PMID: 9210740.

Leckman, J. F., Bloch, M. H., & King, R. A. (2009). Symptom dimensions and subtypes of obsessive-compulsive disorder: A developmental perspective. *Dialogues in Clinical Neuroscience, 11*(1), 21–33. https://doi.org/10.31887/DCNS.2009.11.1/jfleckman

Lochner, C., McGregor, N., Hemmings, S., Harvey, B. H., Breet, E., Swanevelder, S., et al. (2015). Symmetry symptoms in obsessive-compulsive disorder: Clinical and genetic correlates. *Revista Brasileira de Psiquiatria, 38*(1), 17–23. https://doi.org/10.1590/1516-4446-2014-1619

López-Pina, J. A., Sánchez-Meca, J., López-López, J. A., Marín-Martínez, F., Núñez-Núñez, R. M., Rosa-Alcázar, A. I., et al. (2015). The Yale–Brown obsessive compulsive scale: A reliability generalization meta-analysis. *Assessment, 22*(5), 619–628. https://doi.org/10.1177/1073191114551954

Lundström, L., Flygare, O., Andersson, E., Enander, J., Bottai, M., Ivanov, V. Z., et al. (2022). Effect of internet-based vs face-to-face cognitive behavioral therapy for adults with obsessive-compulsive disorder: A randomized clinical trial. *JAMA Network Open, 5*(3), Article e221967. https://doi.org/10.1001/jamanetworkopen.2022.1967

Lundström, L., Flygare, O., Ivanova, E., Mataix-Cols, D., Enander, J., Pascal, D., et al. (2023). Effectiveness of Internet-based cognitive-behavioural therapy for obsessive-compulsive disorder (OCD-NET) and body dysmorphic disorder (BDD-NET) in the Swedish public health system using the RE-AIM implementation framework. *Internet Interv, 31*, 100608. https://doi.org/10.1016/j.invent.2023.100608

Mahjani, B., Gustavsson Mahjani, C., Reichenberg, A., Sandin, S., Hultman, C. M., Buxbaum, J. D., et al. (2022). Psychometric properties of the Swedish translation of the Obsessive–Compulsive Inventory-Revised and the population characteristics of the symptom dimensions of OCD. *Soc Psychiatry Psychiatr Epidemiol, 57*(10), 2147–2155. https://doi.org/10.1007/s00127-022-02231-z

Mataix-Cols, D., Andersson, E., Aspvall, K., Boberg, J., Crowley, J. J., de Schipper, E., et al. (2022). Operational definitions of treatment response and remission in obsessive-compulsive disorder capture meaningful improvements in everyday Life. *Psychotherapy and Psychosomatics, 91*(6), 424–430. https://doi.org/10.1159/000527115

Mataix-Cols, D., Fernandez de la Cruz, L., Nordsletten, A. E., Lenhard, F., Isomura, K., & Simpson, H. B. (2016). Towards an international expert consensus for defining treatment response, remission, recovery and relapse in obsessive-compulsive disorder. *World Psychiatry, 15*(1), 80–81. https://doi.org/10.1002/wps.20299

Mataix-Cols, D., do Rosario-Campos, M. C., & Leckman, J. F. (2005). A multidimensional model of obsessive-compulsive disorder. *Am J Psychiatry, 162*(2), 228–238. https://doi.org/10.1176/appi.ajp.162.2.228

Milgram, L., Sheehan, K., Cain, G., Carper, M. M., O'Connor, E. E., Freeman, J. B., et al. (2022). Comparison of patient-reported distress during harm avoidance and incompleteness exposure tasks for youth with OCD. *J Obsessive-Compuls Relat Disord, 35*, 100760. https://doi.org/10.1016/j.jocrd.2022.100760

Nissen, J. B., & Parner, E. (2018). The importance of insight, avoidance behavior, not-just-right perception and personality traits in pediatric obsessive-compulsive disorder (OCD): A naturalistic clinical study. *Nord J Psychiatry, 72*(7), 489–496. https://doi.org/10.1080/08039488.2018.1486454

Pietrefesa, A. S., & Coles, M. E. (2008). Moving beyond an exclusive focus on harm avoidance in obsessive compulsive disorder: Considering the role of incompleteness. *Behav Ther, 39*(3), 224–231. https://doi.org/10.1016/j.beth.2007.08.004

Pinciotti, C. M., Bulkes, N. Z., Bailey, B. E., Storch, E. A., Abramowitz, J. S., Fontenelle, L. F., et al. (2023). Common rituals in obsessive–compulsive disorder and implications for treatment: A mixed-methods study. *Psychological Assessment, 35*(9), 763–777. https://doi.org/10.1037/pas0001254

R Core Team. (2021). R: A language and environment for statistical computing. Published online March 31 https://www.R-project.org/.

Rasmussen, S. A., & Eisen, J. L. (1990). Epidemiology of obsessive compulsive disorder. *The Journal of Clinical Psychiatry, 51*(Suppl), 10–13. ; discussion 14.

Rasmussen, S. A., & Eisen, J. L. (1992). The epidemiology and clinical features of obsessive compulsive disorder. *Psychiatr Clin North Am, 15*(4), 743–758.

Ricketts, E. J., Snorrason, Í., Mathew, A. S., Sigurvinsdottir, E., Ólafsson, R. P., Woods, D. W., et al. (2021). Heightened sense of incompleteness in excoriation (Skin-Picking) disorder. *Cogn Ther Res, 45*(4), 759–766. https://doi.org/10.1007/s10608-020-10201-5

Rück, C., Larsson, K. J., & Mataix-Cols, D. (2012). Predictors of medium and long-term outcome following capsulotomy for obsessive–compulsive disorder: One site may not fit all. *European Neuropsychopharmacology, 22*(6), 406–414. https://doi.org/10.1016/j.euroneuro.2011.11.003

Schwartz, R. A. (2018). Treating incompleteness in obsessive-compulsive disorder: A meta-analytic review. *J Obsessive-Compuls Relat Disord., 19*, 50–60. https://doi.org/10.1016/j.jocrd.2018.08.001

Cameron, D.H., Summerfeldt, L.J., Rowa, K., McKinnon, M.C., Rector, N.A., Richter, M. A.,et al. (2019). Differences in neuropsychological performance between incompleteness- and harm avoidance-related core dimensions in obsessive-compulsive disorder. J Obsessive-Compuls Relat Disord, 22, 100448. doi:10.1016/j.jocrd.2019.100448.

Sheehan, D.V., Lecrubier, Y., Sheehan, K.H., Amorim, P., Janavs, J., Weiller, E., et al. (1998). The mini-international neuropsychiatric interview (M.I.N.I.): The development and validation of a structured diagnostic psychiatric interview for

DSM-IV and ICD-10. The Journal of Clinical Psychiatry, 59(Suppl 20:22–33). quiz 34-57.

Sibrava, N. J., Boisseau, C. L., Eisen, J. L., Mancebo, M. C., & Rasmussen, S. A. (2016). An empirical investigation of incompleteness in a large clinical sample of obsessive compulsive disorder. *Journal of Anxiety Disorders, 42*, 45–51. https://doi.org/10.1016/j.janxdis.2016.05.005

Stein, D. J., Andersen, E. W., & Overo, K. F. (2007). Response of symptom dimensions in obsessive-compulsive disorder to treatment with citalopram or placebo. *Revista Brasileira de Psiquiatria, 29*(4), 303–307. https://doi.org/10.1590/S1516-44462007000400003

Summerfeldt, L. J. (2004). Understanding and treating incompleteness in obsessive-compulsive disorder. *Journal of Clinical Psychology, 60*(11), 1155–1168. https://doi.org/10.1002/jclp.20080

Summerfeldt, L. J., Kloosterman, P. H., Antony, M. M., & Swinson, R. P. (2014). Examining an obsessive-compulsive core dimensions model: Structural validity of harm avoidance and incompleteness. *J Obsessive-Compuls Relat Disord., 3*(2), 83–94. https://doi.org/10.1016/j.jocrd.2014.01.003

Summerfeldt, L. J., Richter, M. A., Antony, M. M., & Swinson, R. P. (1999). Symptom structure in obsessive-compulsive disorder: A confirmatory factor-analytic study. *Behaviour Research and Therapy, 37*(4), 297–311. https://doi.org/10.1016/S0005-7967(98)00134-X

Taj, M. J. R. J., Viswanath, B., Purushottam, M., Kandavel, T., Janardhan Reddy, Y. C., & Jain, S. (2013). DRD4 gene and obsessive compulsive disorder: Do symptom dimensions have specific genetic correlates? *Progress In Neuro-Psychopharmacology & Biological Psychiatry, 41*, 18–23. https://doi.org/10.1016/j.pnpbp.2012.10.023

Taylor, S., McKay, D., Crowe, K. B., Abramowitz, J. S., Conelea, C. A., Calamari, J. E., et al. (2014). The sense of incompleteness as a motivator of obsessive-compulsive symptoms: An empirical analysis of concepts and correlates. *Behav Ther, 45*(2), 254–262. https://doi.org/10.1016/j.beth.2013.11.004

van den Heuvel, O. A., Remijnse, P. L., Mataix-Cols, D., Vrenken, H., Groenewegen, H. J., Uylings, H. B., et al. (2008). The major symptom dimensions of obsessive-compulsive disorder are mediated by partially distinct neural systems. *Brain, 132*(4), 853–868. https://doi.org/10.1093/brain/awn267

Vellozo, A. P., Fontenelle, L. F., Torresan, R. C., Shavitt, R. G., Ferrão, Y. A., Rosário, M. C., et al. (2021). Symmetry dimension in obsessive–compulsive disorder: Prevalence, severity and clinical correlates. *Journal of Clinical Medicine, 10*(2), 274. https://doi.org/10.3390/jcm10020274

Verdellen, C. W. J., Keijsers, G. P. J., Cath, D. C., & Hoogduin, C. A. L. (2004). Exposure with response prevention versus habit reversal in tourettes's syndrome: A controlled study. *Behaviour Research and Therapy, 42*(5), 501–511. https://doi.org/10.1016/S0005-7967(03)00154-2

Zaider, T. I., Heimberg, R. G., Fresco, D. M., Schneier, F. R., & Liebowitz, M. R. (2003). Evaluation of the Clinical Global Impression Scale among individuals with social anxiety disorder. *Psychol Med, 33*(4), 611–622. https://doi.org/10.1017/S0033291703007414