Effectiveness of multimodal psychotherapy based on the treatment program for children and adolescents with anxiety and obsessive-compulsive disorder (THAZ) in patients with obsessive-compulsive disorder – a within-subject design

Inaugural Dissertation

zur

Erlangung des Doktorgrades
philosophiae doctor (PhD) in Health Sciences
der Medizinischen Fakultät
der Universität zu Köln

vorgelegt von

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2024

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Datum der mündlichen Prüfung: 14.10.2024

DANKSAGUNG

Zunächst danke ich Ihnen, lieber Herr Univ.-Prof. a.D. Dr. Manfred Döpfner, für Ihre umfassende und stets sehr wertschätzende Betreuung und Begleitung sowie Ihre Förderung sowohl bei wissenschaftlichen als auch praktischen Tätigkeiten, auch über die Dissertation hinaus. Sie haben mir die Mitarbeit in spannenden Projekten ermöglicht und ich durfte sehr viel von Ihnen lernen. Dafür bin ich sehr dankbar.

Ich danke außerdem Frau Dr. Hildegard Goletz.
Liebe Hildegard, Du hast mir die psychotherapeutische Arbeit mit Kindern und Jugendlichen mit Zwangsstörungen nahegebracht und mich hierfür begeistert. Hierfür bin ich Dir sehr dankbar. Ich danke Dir außerdem für Deine so wertschätzende Art und Deine so große, mehr als kollegiale, Unterstützung in jeglichen Belangen. Die Zusammenarbeit mit Dir bereitet mir immer wieder viel Freude.

Liebe Frau PD Dr. Julia Plück, herzlichen Dank Ihnen für die Einführung in die Welt der Statistik und Syntaxen, für Ihr stetiges Ansprechbarsein und Ihre große Unterstützung.

Lieber Herr Prof. Dr. Martin Hellmich, lieber Herr PD Dr. Christopher Hautmann, auch Ihnen danke ich sehr für Ihre sehr engagierte Unterstützung und Beratung bei methodischen Fragen.

Mein Dank gilt außerdem Herrn Prof. Dr. Christian Albus und Herrn Univ.-Prof. Dr. Frank Jessen für die Betreuung im Rahmen ihrer Tutorenschaft.

Ich danke dem ganzen Forschungsteam und vor allem allen Kindern, Jugendlichen, jungen Erwachsenen und Eltern, die an den Studien teilgenommen haben.

Ein ganz besonderer Dank gilt meinen Freunden und insbesondere meiner Familie und wundervollen Tochter: Mama, Papa, Sebi, Fabi, Mira, Chris und Hanna, vielen Dank für Eure so große Unterstützung auf jegliche Art!

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Summary

Obsessive-compulsive disorder (OCD) leads to severe consequences for affected children and adolescents as well as their families. Therefore, the need for appropriate and early diagnosis and treatment is beyond question. Yet there is a lack of availability of psychometrically strong German-language measures to assess pediatric OCD symptoms in terms of evidence-based and multimodal assessment. The evidence for the efficacy of cognitive behavioral therapy (CBT) as first-line treatment based on randomized control trials is quite clear. But there is a lack of effectiveness studies that examine effects of CBT within routine clinical care, including usual treatment duration of > 12 sessions. Further limitations relate to the lack of differentiation between the effects of individual treatment components and the fact that often only clinician ratings are considered. Moreover, reported remission rates of 50-60% are not satisfactory.

This is where this dissertation comes in, with the aim of contributing to the further improvement of multimodal assessment and treatment of OCD in children and adolescents.

Study 1 (Adam et al., 2019) assessed the psychometric properties of a new German-language inventory recording self- and parent-ratings – the *OCD inventory for children and adolescents* (OCD-CA; Goletz, Adam & Döpfner, 2020) – in a clinical sample (*n* = 342, age range = 6-18 years) including an OCD subsample (*n* = 181) and a non-OCD clinical subsample (*n* = 161), and in a community sample (*n* = 367, age range = 11-18 years). An exploratory factor analysis resulted in a four-factor solution: (1) Contamination & Washing, (2) Catastrophes & Injuries, (3) Checking, and (4) Ordering & Repeating. Internal consistencies of the subscales and total scale were acceptable to excellent across all samples (exception: subscale Ordering & Repeating in the community sample). Subscales were found to be sufficiently independent of each other. Convergent, divergent, and discriminant validity was supported. To conclude, the OCD-CA was found to be a promising, reliable, and valid instrument to assess OCD symptoms in clinical and non-clinical populations.

The aim of study 2 (Adam et al., 2022) was to investigate the effects of multimodal manual-based CBT in children, adolescents, and young adults with OCD (*n* = 38, aged 6-20 years) within routine care based on the *treatment program for children and adolescents with anxiety and obsessive-compulsive disorder: OCD* (Goletz & Döpfner, in prep.). Treatment included a 12-week standard treatment. The treatment duration was extended individually (maximum: 54 weekly sessions) in case of insufficient symptom improvement. The treatment effectiveness was examined in a within-subject control group design using multi-informant measures. For analyses, multilevel modeling and t-tests for pre-post comparisons were used. OCD symptoms, strain, and functional impairment significantly decreased during the standard treatment and the extended treatment. Moreover, overall treatment led to a significant reduction of comorbid symptoms, especially internalizing symptoms. Additional positive effects were achieved when adding exposure with response prevention. An individual tailored treatment

duration significantly improved treatment effects and remission rate. To conclude, these results confirmed CBT effectiveness and suggest that non-responders/non-remitters cannot be predicted based on the improvement after the first 12-weeks of treatment.

Zusammenfassung

Zwangsstörungen haben schwerwiegende Folgen für die betroffenen Kinder und Jugendlichen sowie deren Familien. Deshalb besteht kein Zweifel an der Notwendigkeit einer adäquaten und frühzeitigen Diagnostik und Behandlung. Dennoch mangelt es an psychometrisch evaluierten deutschsprachigen Messinstrumenten zur Erfassung von Zwangssymptomen im Kindes- und Jugendalter im Sinne von evidenzbasierter und multimodaler Diagnostik. Die Evidenz für kognitive Verhaltenstherapie (KVT) als Behandlung der ersten Wahl ist recht eindeutig. Es mangelt jedoch an Wirksamkeitsstudien, die die Effekte von KVT im klinischen Alltag, einschließlich der üblichen Behandlungsdauer von > 12 Sitzungen, untersuchen. Weitere Limitationen beziehen sich auf die fehlende Differenzierung zwischen den Effekten einzelner Behandlungskomponenten und darauf, dass häufig ausschließlich das klinische Urteil berücksichtigt wird. Darüber hinaus sind die ermittelten Remissionsraten von 50-60% nicht zufriedenstellend.

Hier setzt die vorliegende Dissertation an, mit dem Ziel dazu beizutragen, die multimodale Diagnostik und Behandlung von Zwangsstörungen bei Kindern und Jugendlichen weiter zu verbessern.

Studie 1 (Adam et al., 2019) untersuchte die psychometrischen Eigenschaften eines neuen deutschsprachigen Inventars zur Erfassung von Selbst- und Elternurteil – dem *Zwangsinventar für Kinder und Jugendliche* (ZWIK; Goletz, Adam & Döpfner, 2020) – in einer klinischen Stichprobe (*n* = 342, Altersspanne = 6-18 Jahre), bestehend aus einer Teilstichprobe mit Patient*innen mit Zwangsstörungen (*n* = 181) und einer Teilstichprobe mit Patient*innen mit anderen psychischen Störungen (*n* = 161) sowie in einer Feldstichprobe (*n* = 367, Altersspanne = 11-18 Jahre). Eine explorative Faktorenanalyse ergab eine Vier-Faktoren-Lösung: (1) Kontamination & Waschen, (2) Katastrophen & Verletzungen, (3) Kontrollieren und (4) Ordnen & Wiederholen. Die internen Konsistenzen der Subskalen und der Gesamtskala waren in allen Stichproben akzeptabel bis exzellent (Ausnahme: Subskala Ordnen und Wiederholen in der Feldstichprobe). Die Subskalen erwiesen sich als ausreichend unabhängig voneinander. Konvergente, divergente und diskriminante Validität konnte bestätigt werden. Zusammengefasst stellt das ZWIK ein vielversprechendes, valides und zuverlässiges Instrument zur Beurteilung von Zwangssymptomen in klinischen und nichtklinischen Populationen dar.

Studie 2 (Adam et al., 2022) zielte darauf ab, die Effekte multimodaler kognitiver Verhaltenstherapie bei Kindern, Jugendlichen und jungen Erwachsenen (*n* = 38, Alterspanne = 6-20 Jahre) mit Zwangsstörungen im Rahmen der Routineversorgung basierend auf dem *Therapieprogramm für Angst- und Zwangsstörungen: Zwänge* (THAZ, Goletz & Döpfner, in Vorb.) zu untersuchen. Die Behandlung umfasste eine 12-wöchige Standardbehandlung. Bei unzureichender Symptomverbesserung wurde die Behandlungsdauer individuell verlängert (maxi-

mal: 54 wöchentliche Sitzungen). Die Behandlungswirksamkeit wurde in einem Eigenkontrollgruppendesign unter Berücksichtigung verschiedener Beurteilungsperspektiven überprüft. Für die Analysen wurden Mehrebenenanalysen und T-Tests für Prä-Post-Vergleiche verwendet. Zwangssymptome, Belastung und Funktionsbeeinträchtigung verringerten sich während der Standardbehandlung und der erweiterten Behandlungsoption signifikant. Darüber hinaus führte die Gesamtbehandlung zu einer deutlichen Verringerung der komorbiden Symptomatik, insbesondere der internalisierenden Symptome. Zusätzliche positive Effekte wurden durch Expositionen mit Reaktionsmanagement erzielt. Eine individuelle Behandlungsdauer verbesserte deutlich die Behandlungseffekte und Remissionsrate. Insgesamt bestätigten die Ergebnisse die Wirksamkeit von KVT unter Routinebedingungen. Sie lassen außerdem darauf schließen, dass es nicht möglich ist, Non-Responder/Non-Remitter anhand der Verbesserung nach einer 12-wöchigen Behandlung vorherzusagen.

List of Abbreviations

AACAP	American Academy of Child and Adolescent Psychiatry	FABS	Familien-Anpassungs-und-Belastungs-Skala
APA	American Psychiatric Association	FAS-PR	Family Accommodation Scale-Parent-Report
CBCL	Child Behavior Checklist	FKAU-Z	Fragebogen zu Kausalattributionen bei Zwangsstörungen
CBT	cognitive behavioral therapy	FKON-Z	Fragebogen zu Kontrollattributionen bei Zwangsstörungen
CHOCI	Children's Obsessional Compulsive Inventory	HZI	Hamburger Zwangsinventar
CHOCI-R	Children's Obsessional Compulsive Inventory – Revised	HZI-K	Hamburger Zwangsinventar in Kurzform
C-FOCI	Children's Florida Obsessive Compulsive Inventory	ICC	intraclass correlation coefficient
CGI-I	Clinical Global Impression-Improvement	ICD	International Classification of Mental Disorders
CGI-S	Clinical Global Impression-Severity	ILF-ZWANG/TIC	Interviewleitfaden für Zwang- und Ticstörungen
CI	confidence interval	KVT	Kognitive Verhaltenstherapie
CLIN	clinical sample	LOI	Leyton Obsessional Inventory
COIS-C/P	Child Obsessive Compulsive Impact Scale-Child and Parent Version	LOI-CV	Leyton Obsessional Inventory Child-Version
COIS-RC/RP	Child Obsessive Compulsive Impact Scale-Revised Child and Parent Version	MCQ-A	Meta-Cognitions Questionnaire-Adolescent Version
COS	community sample	MD	mean difference
CrI	credible interval	NICE	National Institute for Health and Care Excellence
CY-BOCS	Children's Yale-Brown Obsessive-Compulsive Scale	NIMH Scale	National Institute of Mental Health Global Obsessive-Compulsive Scale
CY-BOCS-II	Children's Yale-Brown Obsessive-Compulsive Scale Second Edition		
CY-BOCS-CR/PR	Children's Yale-Brown Obsessive-Compulsive Scale – Child Report/ Parent Report	OCD	obsessive-compulsive disorder
CY-BOCS-D	Deutsche Fassung der Children's Yale-Brown Obsessive-Compulsive Scale	OCD-CA	OCD Inventory for Children and Adolescents
DCL-ZWA	Diagnose-Checkliste für Zwangs-Spektrum-Störungen	OCDS	OCD sample
DGKJP	Deutsche Gesellschaft für Kinder- und Jugendpsychiatrie, Psychosomatik und Psychotherapie e.V.	OBQ-CV	Obsessive Beliefs Questionnaire-Child Version
DSM	Diagnostic and Statistical Manual of Mental Disorders	OCI-CV	Obsessive Compulsive Inventory Child-Version
EBA	evidence-based assessment	OCI-CV-R	Revision of the Obsessive-Compulsive Inventory - Child Version
ERP	exposure with response prevention	OCI-CV-5	Ultra-brief version of the Obsessive-Compulsive Inventory-Child Version
ES	effect size	OFF	OCD Family Functioning Scale

PI-WSUR	Padua Inventory-Washington State University Revision	TAFQ-A	Thought-Action Fusion Questionnaire for Adolescents
PABS	Parental Attitudes and Behaviors Scale	THAZ	Therapieprogramm für Angst- und Zwangsstörungen: Zwänge
POTS	Pediatric OCD Treatment Study	TOCS	Toronto Obsessive Compulsive Scale
RCT	randomized controlled trial	WMD	weighted mean difference
SBB-/FBB-ZWA	Selbst- und Fremdbeurteilungsbogen für Zwangsspektrum-Störungen	WHO	World Health Organization
SMT	stress-management control therapy	Y-BOCS	Yale-Brown Obsessive-Compulsive Scale
SOCS	Short OCD Screener	YOCSS	Youth Obsessive-Compulsive Symptoms Scale
SRT	sertraline	YSR	Youth Self Report
SSRI	serotonin reuptake inhibitors	ZWIK	Zwangsinventar für Kinder und Jugendliche

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[1] Chapter 1: Introduction

1 Introduction

Obsessive-compulsive disorder (OCD) is a severe psychological disorder. It is characterized by obsessions (e.g., fear of contamination, aggressive obsessions, intrusive thoughts about harm or images about catastrophic events like the death of a loved person), compulsive rituals (e.g., washing, checking, counting) or, most commonly, both (e.g., Geller et al., 2001). OCD has a prevalence rate of 0.1 to 3.6% in childhood and adolescence (Canals et al., 2012; see also Goletz, Döpfner & Roessner, 2018). Previous studies indicate a bimodal incidence (Geller et al., 1998) with one peak in childhood at the mean age of around 10 to 11 years, and one peak in early adulthood at the mean age of around 21 to 23 years (Geller et al., 1996; Nestadt et al., 2000; Delorme et al., 2005; Taylor, 2011). Age of onset is usually in childhood and adolescence; around 80% of the adult patients with the diagnosis OCD report an onset before the age of 18 years (Nestadt et al., 2000; see also Taylor, 2011). Pediatric OCD shows a 3:2 male-to-female ratio with a slight male preponderance, especially at younger ages (Geller et al., 1998). Obsessions and compulsions are time-consuming, lead to a high psychological strain and interfere with quality of life (Lack et al., 2009; Coluccia et al., 2017; Storch et al., 2018). OCD symptoms affect everyday life. The psychosocial functioning level of children and adolescents with OCD is impaired. Affected children and adolescents are often no longer able to cope with everyday tasks, especially at home, school, and within social activities, like having friends or relatives visit, getting to classes on time, doing homework, or going to movies (Piacentini et al., 2003, 2007). OCD commonly occurs with high rates of comorbidity (about 60-70%; e.g., Jans et al., 2007: 69%; Skriner et al., 2016: 58%; Sharma et al., 2021: 64%), with especially high rates for internalizing disorders, co-occuring anxiety, or depression (Peris et al., 2017a; Stewart et al., 2004). OCD symptoms not only have an impact on the child or adolescent themselves, but on the whole family system, the individual members (parents or caregivers, siblings) and their relationships (e.g., Waters & Barrett, 2000; Futh, Simonds & Micali, 2012). Most of the families (studies show around 90%, e.g., Calvocoressi et al., 1995: 88.2%; Wu et al., 2019: 99.3%) become involved directly or indirectly in their child's rituals and accommodate the symptoms at least to some extent, and at least around 50% of the families do so on a daily basis (e.g., Peris et al., 2008a: 46%-56%, Wu et al., 2019: 82.7%). Family accommodation impairs family functioning and leads to family burden and disharmony between family members. Family accommodation can include assistance to support rituals or avoid OCD triggers (e.g., buying soap for washing compulsions, opening doors and touching the "contaminated" doorknob for the affected child), participation in the rituals (e.g., verbal reassurance), the performance of compulsive rituals for the child (e.g., cleaning, checking), decreasing child responsibility (e.g., the child's duties and tasks in the household are taken over) or modification of the family's lifestyle or daily routines (e.g., the child's room is no longer entered, parents do not go out anymore). This behavior of the families is often well-intentioned,

an attempt to facilitate rituals, reduce frequency of obsessions and compulsions, expenditure of time and duration of OCD symptoms, mitigate the child's strain and impairment, and to restore harmony in the family, especially as some affected children and adolescents can otherwise react aggressive verbally or physically if parents, caregivers, or siblings do not accommodate and support the symptoms. But contrary to these intentions, accommodation enables the child to carry out his or her rituals or the avoidance of OCD-provoking stimuli and therefore, among other things, it maintains OCD (Calvocoressi et al., 1995, 1999; Waters & Barrett, 2000; Storch et al., 2007a; Futh, Simonds & Micali, 2012; Lebowitz et al., 2012).

The predominantly early onset of the disorder as well as the characteristics of OCD and its severe consequences for affected children and adolescents and their families highlight the principal relevance and need for appropriate assessment and treatment in childhood and adolescence. What are the evidence-based cognitive behavioral assessment and treatment options so far? An overview of this and the current state of research is given below. But first, OCD and its diagnostic criteria and classification are described.

1.1 OCD symptoms and classification

According to the International Classification of Mental Disorders ICD-10 and ICD-11, respectively, (World Health Organization [WHO], 1993, 2019) and the Diagnostic and Statistical Manual of Mental Disorders DSM-5 (American Psychiatric Association [APA], 2013) the hallmarks of OCD are either obsessions or compulsions or both.

Obsessions are thoughts, images, or urges, that are intrusive and unwanted, recurring stereotypically and generating uncomfortable feelings, most commonly fear, shame, unease, or disgust. The affected person tries to resist, to suppress or to ignore the obsessions or to neutralize them with the help of actions or other thoughts. Obsessions are recognized as the affected person's own thoughts. Compulsions include intentional observable behaviors or mental actions that the affected person needs to carry out again and again repeatedly. Compulsions are often performed in response to obsessions in a stereotyped manner or according to certain rules that must be strictly followed. The compulsions serve to (mentally) neutralize the unpleasant feeling (partly generated by the obsession) or to prevent a dreaded situation or event (e.g., the death of a loved person). Even though carrying out the compulsive acts leads to tension relief or relief of the negative feeling, it is not pleasant in itself. If a compulsive action cannot be carried out adequately, this leads to an increase in tension and unpleasant feelings, the subjective feeling of incompleteness, or not-just-right-experience (Goletz, Döpfner & Roessner, 2018; Goletz, 2019).

The classification systems (ICD-10, ICD-11 and DSM-5) show similarities but also differences with regard to the diagnostic criteria for OCD and its classification (Table 1; see also Simpson & Reddy, 2014; Goletz, Döpfner & Roessner, 2018).

Table 1

Comparison of OCD diagnostic criteria according to ICD-10 (WHO, 1993), ICD-11 (WHO, 2019) and DSM-5 (APA, 2013) (see also Simpson & Reddy, 2014)

	ICD-10	**ICD-11**	**DSM-5**
Disorder class	Neurotic, stress and somatoform disorders	Obsessive-Compulsive or Related Disorders	Obsessive-Compulsive and Related Disorders
Obsessions and compulsions	obsessions and compulsions share features	obsessions and compulsions are defined differently, a functional relationship (compulsions as response to obsessions) is described, compulsions include mental rituals	obsessions and compulsions are defined differently, a functional relationship (compulsions as response to obsessions) is described, compulsions include mental rituals
Presence of symptoms	"most days for a period of at least 2 weeks"	no criteria	no criteria
Duration	no criteria	"more than one hour per day"	"more than one hour per day"
Impairment or distress	"obsessions or compulsions cause distress or interfere with the patient's social or individual functioning"	"obsessions and compulsions must be time consuming […] or result in significant distress or significant impairment"	"obsessions or compulsions are time-consuming […] or cause clinically significant distress or impairment"
Insight	"at least one obsession or compulsion that is acknowledged as excessive or unreasonable must be present"	range of insight from "absent" to "good"	range of insight from "absent" to "good"
Resistance	"at least one obsession or compulsion that is unsuccessfully resisted must be present"	no criteria	no criteria
Specification	**F41.0** Predominantly obsessional thoughts and ruminations **F42.1** Predominantly compulsive acts [obsessional rituals] **F42.2** Mixed obsessional thoughts and acts **F42.8** Other obsessive-compulsive disorders **F42.9** Obsessive-compulsive disorders, unspecified	**6B20.0** Obsessive-compulsive disorder with fair to good insight **6B20.1** Obsessive-compulsive disorder with poor to absent insight **6B20.Z** Obsessive-compulsive disorder, unspecific	"**With good or fair insight**: The individual recognizes that obsessive-compulsive disorder beliefs are definitely or probably not true or that they may or may not be true." "**With poor insight:** The individual thinks obsessive-compulsive disorder beliefs are probably true." "**With absent insight/delusional beliefs**: The individual is completely convinced that obsessive-compulsive disorder beliefs are true." Specify if: "**Tic-related:** The individual has a current or past history of a tic disorder."

While obsessions and compulsions share features per ICD-10 definition, compulsions are described in the ICD-11 and DSM-5 as response (function: neutralization, tension relief) to obsessions, and can also comprise mental acts. Thus (and in contrast to the ICD-10), obsessions are only thoughts, which lead to unpleasant feelings without any neutralization function. Another difference relates to time: According to the ICD-10, obsessive-compulsive symptoms must be present for at least two weeks on most days. The ICD-11 (WHO, 2019) and DSM-5 (APA, 2013) criteria describe obsessions and compulsions as "time-consuming", defined as "more than one hour per day". OCD symptoms must be time-consuming (ICD-11, DSM-5) or cause distress or functional impairment (ICD-10, ICD-11, DSM-5). In the ICD-10, a diagnostic criterion is resistance to at least one obsession or compulsion; according to ICD-11 and DSM-5, resisting is not required for diagnosis. Insight, the ability to acknowledge OCD symptoms ("at least one obsession or compulsion"; WHO, 1993) as unreasonable or excessive, is a necessary diagnostic criterion in the ICD-10, but not a necessary diagnostic criterion in the ICD-11 and DSM-5.

In the ICD-10, OCD is differentiated according to the predominant type. The classification system includes the diagnoses (WHO, 1993): (1) *Predominantly obsessional thoughts and ruminations*, (2) *Predominantly compulsive acts (obsessional rituals)* and (3) *Mixed obsessional thoughts and acts*. In the ICD-11 and DSM-5, no differentiation is made in this regard. Instead, in order to take into account a range of insight, and therefore that especially some children and adolescents are not able to assess their OCD symptoms as excessive and unreasonable, the ICD-11 (WHO, 2019) and DSM-5 (APA, 2013) lists specifications from "good" to "absent" with regard to the level of insight. In addition, the DSM-5 allows specification of the current or previous presence of a tic disorder.

In the ICD-10 (WHO, 1993), obsessive-compulsive disorders belong to the group of *neurotic, stress and somatoform disorders (F4*). In the ICD-11 (WHO, 2019) and DSM-5 (APA, 2013), there is a separate category for *Obsessive-Compulsive and/or Related Disorders*. As phenomenologically they show a certain similarity (e.g., Hartmann & Wilhelm, 2013), the ICD-11 as well as the DSM-5 category comprises related disorders and subcategories in addition to OCD (see Table 2).

Table 2

OCD-related Disorders according to ICD-11 (WHO, 2019) and DSM-5 (APA, 2013)

ICD-11	DSM-5

• 6B21 Body Dysmorphic Disorder*
• 6B22 Olfactory Reference Disorder*
• 6B23 Hypochondrias (Health Anxiety Disorder)*
• 6B24 Hoarding Disorder*
• 6B25 Body-Focused Repetitive Behaviour Disorders
  • 6B25.0 Trichotillomania (Hair Pulling Disorder)
  • 6B25.1 Excoriation (Skin Picking) Disorder
  • 6B25.Y Other specified Body-Focused Repetitive Behaviour Disorders
  • 6B25.Z Body-Focused Repetitive Behaviour Disorders, unspecified
• 6B2Y Other specified Obsessive-Compulsive or Related Disorders
• 6B2Z Obsessive-Compulsive or Related Disorders, unspecified
	• Body Dysmorphic Disorder (BDD)
	• Hoarding Disorder
	• Trichotillomania
	• Excoriation (Skin Picking) Disorder
	• Substance/Medication-Induced Obsessive-Compulsive and Related Disorder
	• Obsessive-Compulsive and Related Disorder due to another medical condition
	• Other specified Obsessive-Compulsive and Related Disorder
	• Unspecified Obsessive-Compulsive and Related Disorder

Note.
*Classified in subcategories “fair to good insight”, “poor to absent insight”, and “unspecified”

1.2 Cognitive behavioral assessment

Overall, assessment has an indispensable role in clinical and research practice following different complementary functions: to identify symptoms and severity, to make diagnoses, to determine eligibility for treatment or research project, to monitor symptom change or treatment progress over time, and to evaluate treatment outcome. Assessment is needed for case conceptualization, to identify appropriate treatment targets and to tailor the treatment individually to the patient, and then again to check whether the treatment is appropriate or should be modified. Assessment can also be therapeutically helpful to maintain treatment motivation and compliance, especially when child and parent see documented improvement (Lewin & Piacentini, 2010; Rapp et al., 2016; Rozenman & Bergman, 2018). Moreover, assessment is important and relevant for differential diagnosis, to rule out possible alternative diagnoses, and for the identification of comorbidity, as comorbidity may have an impact on treatment response and require different or further therapy and/or pharmacological treatment strategies (e.g., Lewin & Piacentini, 2010; Lewin 2019).

As OCD is a complex disorder a systematic comprehensive assessment (e.g., Goletz, Döpfner & Roessner, 2018; Pampaloni et al., 2022), integrating in a multimodal approach is needed (Döpfner, 2000; Döpfner, Görtz-Dorten & Petermann, 2024, see also Goletz, 2019). This approach includes (1) the diagnostic on cognitive, emotional, physiological, and behavioral levels, (2) the use of multimethod, which means the application of different methods (e.g., questionnaires, observation) and the integration of different rater perspectives (e.g., child, parents, teachers, educators or other caregivers), (3) situation-specific assessment in different areas of life (e.g., family system, school, peer group), (4) individualized diagnostics, such as

individual problem lists or goal achievement sheets, which enables clinicians to assess individual disorder characteristics, and (5) treatment-related diagnostics to identify treatment indication and to monitor progress and success (Döpfner, Görtz-Dorten & Petermann, 2024).

Thus, the aim of multimodal assessment is a detailed recording of the individual OCD symptoms, their maintaining conditions, the functional impairments, the comorbid problems, and the competencies and resources. Based on this information, symptoms can be dimensional described or be classified in multiaxial categorical systems according to ICD-10 or ICD-11 and DSM-5 (Döpfner & Görtz-Dorten, 2008; Goletz, 2019).

Besides disorder characteristics, the diagnostic process in children and adolescents with OCD is challenging because of potential informant bias: symptoms are often not spontaneously reported, and younger children are not always able to report their symptoms accurately. In some cases, insight into symptoms is poor or limited, and symptomatology is often strongly associated with shame (especially sexual and violent obsessions). Due to embarrassment, some children and adolescent show dissimulation tendencies, minimize, hide, or deny symptoms. Moreover, symptoms can be associated with only low-subjective distress, especially when children and adolescents are able to avoid OCD-provoking stimuli. And parents can only describe what they see, or what their child reports to them. So, their assessment can give underestimations, as some symptoms, particularly obsessions, are difficult for them to notice (Lewin & Piacentini, 2010; Pampaloni et al., 2022; Goletz & Döpfner, 2007; Rozenman & Bergman, 2018; Westwell-Roper & Stewart, 2019; Lewin, 2019).

For the clinician, this means, besides using a multimodal diagnostic approach (Döpfner, 2000; Döpfner, Görtz-Dorten & Petermann, 2024) within the OCD assessment, it is important to be sensitive to children and adolescents' concerns about embarrassment, and to make them feel comfortable by normalizing OCD symptoms, not reacting with surprise or validating the distress the OCD leads to (Pampaloni et al., 2022).

To sum up, the diagnosis of OCD in children and adolescents is embedded in a comprehensive multimodal behavioral and psychological diagnosis (Döpfner, 2000). Within multimodal assessment, information is gained based on a broad clinical exploration of the child and adolescent and his or her caregivers. This exploration is supported by applying broad-band procedures (e.g., *Child Behavior Checklist/6-18R* [CBCL/6-18R]; Döpfner et al., 2014) as well as disorder-specific procedures. Different measures with different degrees of structuring are combined – clinical interviews, diagnostic checklists, and questionnaires. Behavior observation in clinical and natural settings plays a relevant role within multimodal assessment (Döpfner, Görtz-Dorten & Petermann, 2024). As OCD symptoms predominately show up at home, home visits to observe patient's symptoms and the environment, including the family's behavior, can give relevant additional information. Using video conferencing can be one opportunity to enable or simplify this for clinicians, for example, in case of logistic problems (Pampaloni et al.,

2022). Observation by the child or adolescent and parents can be supported with the use of protocols (e.g., Goletz, Roessner & Döpfner, 2018).

1.2.1 Diagnostic measures

To date, there are several internationally widely-used psychometrically diagnostic measures existing – clinical interviews, diagnostic checklists, questionnaires – assessing OCD symptoms and severity in children and adolescents. There are only some existing in the German-speaking area. Both presented in Table 3 below (for an overview, see also e.g., Merlo et al., 2005; Rapp et al., 2016; McGuire, Brennan & Storch, 2017).

Table 3

OCD specific diagnostic measures for childhood and adolescence (Goletz, Adam & Döpfner 2020; Goletz 2019, translated and modified)

Name	Author	Short Description	Age	Rater	Scales
English-language measures					
CY-BOCS Children's Yale-Brown Obsessive-Compulsive Scale	Scahill et al. (1997)	Semi-structured interview to assess OCD symptoms and severity over the previous week. It includes checklists to identify obsessions (e.g., aggressive or contamination obsessions) and compulsions (e.g., checking or washing compulsions), 10 items to assess OCD severity, and a set of OCD-related items regarding insight, avoidance, indecisiveness, pathological doubting, obsessive slowness, and overvalued ideation. OCD severity is rated on a 5-point-scale from "0 = none" to "4 = extreme". Other item scales vary.	8-17 years	Clinician	• Obsession • Compulsion • Total Score
	Psychometric properties: The CY-BOCS was evaluated in a sample of n = 65 children (25 girls and 40 boys, age range = 8-17 years) with OCD. Internal consistency was high for the total OCD severity score (α = .87). A good to excellent inter-rater agreement (subsample of n = 24; four raters) for subscales and total score was found (.66 ≤ ICC ≤ .91). Divergent validity was confirmed by higher correlations of the CY-BOCS with a self-report of OCD (r = .62) than with self-ratings of depression and anxiety (r = .34, .37) (Scahill et al., 1997). Further studies: e.g., Freeman, Flessner & Garcia, 2011; Storch et al., 2004; Yucelen et al., 2006.				
CY-BOCS-II Children's Yale-Brown Obsessive-Compulsive Scale Second Edition	Storch et al., 2019	Revised version of the CY-BOCS (Scahill et al., 1997) with changes regarding e.g., the items response range.	7-17 years	Clinician	• Obsession severity • Compulsion severity • Total severity
	Psychometric properties: The instrument was tested in an OCD sample of n = 102 youth, aged 7-17 years; inter-rater and test-retest reliabilities were examined in subsamples of n = 50 and n = 31, respectively. The CY-BOCS-II showed moderate to good internal consistency (.75 ≤ α ≤ .88) and excellent inter-rater (.86 ≤ ICC ≤ .92) and test-retest (.95 ≤ ICC ≤ .98) reliabilities across the subscales and total scale. Convergent validity was supported by high correlations with clinician ratings of OCD symptom severity (r = .79, .80) and moderate correlation with self-rated OCD symptoms (r = .35). Divergent validity was supported by, among others, small correlations with parent-reported anxiety (r = .25) and externalizing symptoms (r = .24), and moderate correlations with child-reported anxiety (r = .34) and parent-reported depressive symptoms (r = .36) (Storch et al., 2019).				

Table 3 (continued)

Name	Author	Short Description	Age	Rater	Scales
English-language measures					
CY-BOCS-CR/PR Children's Yale-Brown Obsessive-Compulsive Scale – Child Report/ Parent Report	Storch et al. (2006)	10-item inventory to assess symptom severity. The items have to be rated on a 5-point Likert Scale (e.g., time occupied by obsessions: "0 = none" to "4 = extreme").	8-17 years	Child or adolescent Parents	• Obsession severity • Compulsion severity • Total score
	Psychometric properties: In an OCD sample (n = 53, aged 8-17 years) the instrument demonstrated acceptable to good internal consistency for the subscales Obsession severity and Compulsion severity (CY-BOCS-CR: α = .78 and .81; CY-BOCS-PR: α = .83 and .70) as well as good internal consistency for the Total score (CY-BOCS-CR: α = .87; CY-BOCS-PR: α = .86). Convergent validity (e.g., moderate to large correlations between the CY-BOCS-CR/-PR scales and the clinician-rated CY-BOCS scales: .40 ≤ r ≤ .60 and .44 ≤ r ≤ .77) and divergent validity (e.g., small to moderate correlations between the CY-BOCS-CR/-PR Total score and externalizing problems: r = -.14 and r = .29) were confirmed (Storch et al., 2006). Further studies: e.g., Godoy et al., 2011.				
OCI-CV Obsessive Compulsive Inventory Child-Version	Foa et al. (2010)	21-item self-report instrument that serves to assess the presence of OCD-symptoms across common domains. The frequency of obsessions and compulsions have to be rated on a 3-point scale "0 = never" to "2 = always".	7-17 years	Child or adolescent	• Doubting/Checking • Obsessing • Hoarding • Washing • Ordering • Neutralizing • Total Score
	Psychometric properties: The OCI-CV showed good psychometric properties in an OCD-sample (n = 109, age range = 7-17 years). The Cronbach's alpha values were α = .85 for the Total score and .81 ≤ α ≤ .88 for the subscales and indicated therefore acceptable to good internal consistency. The OCI-CV Total score showed small to moderate and significant correlations with the CY-BOCS Total score (r = .31) and measures of same or similar constructs (.23 ≤ r ≤ .45) and moderate to high correlations with measures of anxiety symptoms (r = .62) and depressive symptoms (r = .47). Thus, convergent validity was supported (Foa et al., 2010). Jones et al. (2013) supported divergent validity in their study (n = 96 patients diagnosed with OCD, age range = 6-18 years) by small (negative) correlation with measures of irritability (r = -.02), functioning (r = -.14), and parent-rated disability (r = .07). Further studies: e.g., Martinez-González et al., 2015; Rosa-Alcázar et al., 2014; Pozza, Barcaccia & Dèttore, 2017; Aspvall et al., 2020.				
OCI-CV-R Revision of the Obsessive-Compulsive Inventory - Child Version	Abramovitch et al. (2022a)	Within this revision all items regarding hoarding were excluded.	7-17 years	Child or adolescent	• Doubting/Checking • Obsessing • Washing • Ordering • Neutralizing • Total Score
	Psychometric properties: The revised OCI-CV was examined in a sample of n = 1047 youth, including n = 489 diagnosed with OCD, n = 298 clinical controls, and n = 260 non-clinical controls. Internal consistency of the OCI-CV-R was good for the total scale across subsamples (.83 ≤ α ≤ .88), and also for the subscales (.84 ≤ α ≤ .89), except for the subscale Neutralizing (α = .68). Divergent (moderate correlations with anxiety and depression measures, .35 ≤ r ≤ .49) and convergent validity (moderate correlation with the CY-BOCS, r = .32) were adequate (Abramovitch et al. 2022a).				
OCI-CV-5 Ultra-brief version of the Obsessive-Compulsive Inventory-Child Version	Abramovitch et al. (2022b)	This screening instrument includes 5 selected items of the OCI-CV regarding checking, obsessing, neutralizing/counting, washing, and ordering and serves as indicator for the presence of OCD and therefore further needed assessment.	7-17 years	Child or adolescent	• Total score
	Psychometric properties: The OCI-CV-5 was evaluated in a total of n = 489 youth diagnosed with OCD, n = 299 with other disorders and n = 259 non-clinical controls showing good internal consistency (ω = .70). Convergent and divergent validity was supported by strong correlation with the OCI-CV total score among all subsamples (.92 ≤ r ≤ .94) and lower correlations with depression and anxiety measures (.36 ≤ r ≤ .54) in the OCD sample. Analyses also supported the sensitivity and specificity of the screening tool (Abramovitch et al. 2022b).				

Table 3 (continued)

Name	Author	Short Description	Age	Rater	Scales
English-language measures					
CHOCI Children's Obsessional Compulsive Inventory	Shafran et al. (2003)	The inventory is a two-part measure. The first part consists of 19 items describing compulsive symptoms and 13 items describing obsessive symptoms. The items are rated on a 3-point-scale ("1 = not at all" to "3 = a lot"). The second part includes an "impairment section" in which the degree of impairment/severity resulting from obsessions and compulsion (5 items) is rated on a 5-point-scale. One item asking for avoidance was added.	7-17 years	Child or adolescent Parents	• Symptoms of compulsions • Impairment associated with compulsions • Obsessional symptoms • Impairment associated with obsessions
	Psychometric properties: The psychometric properties of the CHOCI were examined in a pediatric OCD sample (n = 42, aged 7-17 years), showing good internal consistency (α > .80) for all subscales. The instrument also showed convergent validity for the impairment scales. The impairment subscales scores and the Total impairment score of the self- and parent-report correlated moderately to largely (.38 ≤ r ≤ .65) with the CY-BOCS Total score (Shafran et al., 2003). There have been no studies published yet that investigate the divergent validity of the CHOCI.				
CHOCI-R Children's Obsessional Compulsive Inventory – Revised	Uher et al. (2008)	The CHOCI was revised by eliminating some items describing obsessions (9 of the 19 items of the original version were deleted) and compulsions (3 of the 13 items of the original version were deleted). The impairment/severity items remained identical to the original CHOCI.	7-18 years	Child or adolescent Parents	• Obsessions symptoms • Obsessions impairment • Compulsions symptoms • Compulsions impairment
	Psychometric properties: The internal consistency of the four subscales and the total scales (total symptoms, total impairment) of the CHOCI-R parent-form and child-form (n = 285, aged 7-18 years) were acceptable to good (.72 ≤ α ≤ .87). The convergent validity was confirmed by moderate and large correlations between the impairment subscale and total score and the CY-BOCS Total score (.36 ≤ r ≤ .58). Small to moderate correlations between the CHOICI-R impairment scores and conduct problems (.11 ≤ r ≤ .22) and hyperactivity problems (.26 ≤ r ≤ .32) provide support for divergent validity (Uher et al., 2008).				
SOCS Short OCD Screener	Uher et al. (2007)	This self-report form is a screening tool based on the Leyton Obsessional Inventory – Child Version (Berg, Rapoport & Flament, 1986). It comprises seven items to assess common OCD symptoms (checking, touching, cleanliness/washing, repeating, and exactness). The items have to be rated on a three-point response format ("0 = no", "1 = a bit", "2 = a lot").	11-15 years	Adolescent	• Total scale
	Psychometric properties: The instrument was evaluated in a clinical sample (n = 127 patients aged 11-15 years, n = 114 diagnosed with OCD) and a community sample (n = 203 adolescents aged 11-15 years), showing good internal consistency (α = .85) (Uher et al., 2007). Piqueras et al. (2015) examined the validity of the SOCS in an OCD sample (n = 94 patients, age range = 9-19 years) and a community sample (n = 880 students, age range = 10-18 years). Discriminant validity was supported by higher mean scores of the clinical sample compared to the community sample with a medium effect size (probability of superiority = 0.67). Convergent and divergent validity across samples was supported by a moderate correlation with the CY-BOCS (r = .38) and medium to mostly large associations with self-rated OCD (.43 ≤ r ≤ .80). Associations with self-rated anxiety and depression were mainly in a moderate range (.26 ≤ r ≤ .61).				

Table 3 (continued)

Name	Author	Short Description	Age	Rater	Scales
English-language measures					
C-FOCI Children's Florida Obsessive Compulsive Inventory	Storch et al. (2009)	The C-FOCI is a self-report instrument consisting of a 17-item Symptom Checklist to assess the presence of common obsessions and compulsions (rating scale: "yes" or "no") and a 5-item Severity Scale asking for time occupied by obsessions and compulsions, distress, degree of control, avoidance and interference (5-point-ratingscale, e.g., degree of control: "0 = complete control" to "4 = no control").	7-20 years	Child or adolescent	• Symptom Checklist • Severity Scale
	Psychometric properties: Psychometric properties were evaluated in a clinical (n = 82 OCD participants, age range = 7-20 years) and a community sample (n = 191, age range = 14-18 years). Internal consistencies were acceptable for the Severity Scale (α. = 79 and α. = 73) and the Symptom-Checklist (*KR-20* = .76 and *KR-20* = .74). Convergent Validity was confirmed by moderate to large correlations between the C-FOCI Severity Scale and the CY-BOCS Obsessions, Compulsions and Total Severity scales (.37 ≤ r ≤ .54) and another OCD impairment scale in a self- and parent-format (r = .42 and .49). The C-FOCI Symptom Checklist correlated weakly to largely with the corresponding CY-BOCS symptom domains (.26 ≤ r ≤ .56). Moderate to large correlations between the Severity Scale and Symptom Checklist and measures of anxiety (r = .40 and .61) and depressive symptoms (r = .41 and .35) and the Internalizing score of the CBCL (r = .48 and .36) provided also convergent validity support. Small correlations between the C-FOCI (Severity Scale and Symptom Checklist) and the Externalizing score of the CBCL (r = .11 and .13) confirmed divergent validity (Storch et al., 2009). Further studies: e.g., Zemestani et al., 2021; Sandoval-Lentisco et al., 2023.			
LOI-CV Survey Form Leyton Obsessional Inventory Child-Version, Survey Form	Berg et al. (1988)	The LOI-CV Survey Form includes 20 items assessing the presence and frequency of OCD symptoms (rating scale: "yes" or "no"), followed by interference ratings on a 4-point scale ("0 = this habit does not stop me from doing other things I want to do" to "3 = this stops me from a lot of things and wastes a lot of my time").	7-18 years	Child or adolescent	• General obsessive • Dirt-contamination • Numbers-luck • School
	Psychometric properties: Reliability was examined in a community sample (n = 4551, age range = 14-17 years). Internal consistencies were good for the Total Scale (α = .81) and the subscale General Obsessive (α = .81) and poor for the subscales Dirt-Contamination (α = .65), Numbers-Luck (α = .65) and School (α = .49) (Berg et al., 1988). Storch et al. (2011) examined psychometric properties, including the validity of the LOI-CV in a clinical sample (n = 50 OCD participants, aged 7-18 years). Small and negative correlation between the LOI-CV Total score and the CBCL Externalizing score (r = -.04) supported divergent validity. For convergent validity there was only weak support. Correlations between the LOI-CV Total score and child-rated OCD-related impairment (r = .45) was moderate, but correlations with any other ratings of OCD symptom frequency or severity were small (e.g., correlations with the CY-BOCS Severity subscales and Total score: .18 ≤ r ≤ .23). Further studies: e.g., Stewart, et al., 2005; Sánchez-Meca et al., 2016.			
Short LOI-CV Survey Form Leyton Obsessional Inventory Child-Version Survey Form – Short Version	Bamber et al. (2002)	This short version of the LOI-CV includes 11 items of the original instrument.	7-18 years	Child or adolescent	• Compulsions • Obsessions/incompleteness • Concern with cleanliness
	Psychometric properties: Internal consistency, analyzed in a community sample (n = 253, age range = 12-16 years) were good for the Total scale (α = .86) and the subscales Compulsions (α = .73), Obsessions/Incompleteness (α = .79) and Cleanliness (α = .75) (Bamber et al., 2002). Storch et al. (2011) could not confirm these results in analyses of the LOI-CV short version in an OCD sample. Findings demonstrated poor internal consistency for all scales (.33 ≤ α ≤ .65). Support for convergent validity was weak (e.g., correlations between the LOI-CV short version and the CY-BOCS Severity subscales and Total score: .12 ≤ r ≤ .18). Divergent validity was supported by negative small correlations with the CBCL Externalizing subscale (r = -.01).			

Table 3 (continued)

Name	Author	Short Description	Age	Rater	Scales
English-language measures					
YOCSS Youth Obsessive-Compulsive Symptoms Scale	De Caluwé & De Clercq (2013)	This self-report includes 57 symptom items describing OCD symptoms (e.g., obsessions regarding aggression or somatization, compulsions regarding magic games or cleanliness), and 11 items describing the level of impairment.	12-18 years	Adolescent	• Obsessive factor, including the facets Aggression, Guilt, Sensitivity to physical appearance, and Somatization • Compulsive factor, represented by the facets Repeating, Magic games, and Hoarding • Order/Clean/Perfect construct, structuring the facets of Orderliness, Cleanliness and Perfectionism • Total Symptom Score • Impairment Score
	Psychometric properties: The instrument was evaluated in three community (and referred) samples (n = 336, 289, 209 adolescents, aged 12-18 years). Internal consistency of the Total Symptom Score and the Impairment Score (α = .95 and α = .87) were excellent. Convergent validity was supported by moderate correlation with of the total scale with other self-rated measures (.68 ≤ r ≤ .70). No analyses regarding divergent validity were conducted (De Caluwé & De Clercq, 2013).				
TOCS Toronto Obsessive Compulsive Scale	Park et al. (2016)	This scale is based on the OCI-CV (Foa et al., 2010) and the LOI-CV (Berg et al., 1988; Bamber et al., 2022). It comprises a parent- or self-report questionnaire with 21 items to assess a variation of obsessions and compulsions. Items are rated on a 7-point Likert-type scale: "-3 = far less often than average", "-2 = less often than average", "-1 = slightly less often than average", "0 = average amount of time", "1 = slightly more often than average", "2 = more often than average" and "3 = far more often than average".	6-17 years	Adolescent Parents	• Cleaning/Contamination • Symmetry/Ordering • Counting/Checking • Rumination • Superstition • Hoarding • Total score
	Psychometric evaluation The TOCS was evaluated in a community sample (n = 16 718, aged 6-17 years). High internal consistency was found across subscales (.80 ≤ α ≤ .93) and total scale (α = .94). Convergent validity was supported by a moderate correlation (r = .51) of the TOCS total score with parent-rated OCD symptoms, divergent validity by a very low correlation (r = .01) with parent-rated ADHD symptoms (Park et al., 2016). Lambe et al. (2021) investigated the parent-report form of the TOCS in an OCD sample (n = 350, aged 6-21 years). Findings confirmed the psychometric properties of the TOCS regarding reliability, and convergent and divergent validity.				

Table 3 (continued)

Name	Author	Short Description	Age	Rater	Scales
German-language measures					
[CY-BOCS-D] German version of the Children's Yale-Brown Obsessive-Compulsive Scale [Deutsche Fassung der Children's Yale-Brown Obsessive-Compulsive Scale]	Goletz & Döpfner (2018)	The German version of the CY-BOCS comprises a 58-item symptom checklist to assess the presence or absence of a variety of obsessions and compulsions and a 19-item rating scale to measure OCD symptom severity and OCD-associated (personality) traits and abnormalities. OCD severity is rated on a 5-point Likert scale ranging from 0 to 4, where higher scores indicate greater symptom severity. Other scales vary.	From 4 years based on a parent (or another caregiver) interview From 11 years based on a patient interview	Clinician	• Obsessions regarding loss of control and religion [Impulskontrolle/Kontrollverlust und Religiöse Zwangsgedanken] • Checking, harm avoidance and sexual obsessions [Kontrollieren und Schadensvermeidung, Sexualität] • Contamination and cleaning [Waschen und Reinigen] • repeating, ordering/arranging, hoarding and magical thinking [Zählen, Berührungs-, Wiederholungs-, Ordnungszwänge, Horten und Sammeln und Magische Zwangsgedanken] • Total OCD symptoms [Checkliste - Gesamtskala] • Obsession severity [Zwangsgedanken] • Compulsion severity [Zwangshandlungen] • Total OCD severity [Ratingskala – Gesamtskala]
	Psychometric properties: In an OCD sample (n = 169, age range = 11–18 years) reliability was supported by acceptable to good internal consistencies across all scales (.72 ≤ α ≤ .87). Convergent validity was supported by moderate to high correlations of the total OCD severity scale (r = .50) and the total OCD symptom scale (r = .69), respectively, with self-rated OCD symptoms; divergent validity by low to moderate correlations (.23 ≤ r ≤ .38) with self-rated anxiety, depression, internalizing and externalizing problems (Goletz & Döpfner, 2018).				
[HZI] Hamburger OCD Inventory [Hamburger Zwangsinventar]	Zaworka et al. (1998)	The instrument comprises 188 items that ask for various obsessions and compulsions (scale: "true" or "not true).	From 16 years	Adolescent	• Control [Kontrollieren] • Washing and cleaning [Waschen und Reinigen] • Ordering [Ordnen] • Counting, touching and talking [Zählen, Berühren und Sprechen] • Thinking words and pictures [Denken von Wörtern und Bildern] • Thoughts of causing harm to self or others [Gedanken, sich selbst oder anderen ein Leid zuzufügen]
	Psychometric properties: In an OCD sample (n = 75, age range = 18-50 years) good to very good test-retest reliability was found for the total scale (r = .93) and the subscales (.78 ≤ r ≤ .96). Divergent validity was supported by small to moderate correlations with self-rated depression (.24 ≤ r ≤ .57) (Zaworka et al., 1998).				

Table 3 (continued)

Name	Author	Short Description	Age	Rater	Scales
German-language measures					
[HZI-K] Short form of the Hamburger OCD Inventory [Hamburger Zwangsinventar in Kurzform]	Klepsch et al. (1993)	The instrument comprises 72 items that ask for various obsessions and compulsions (scale: "true" or "not true").	From 16 years	Adolescent	• Control [Kontrollieren] • Washing and cleaning [Waschen und Reinigen] • Ordering [Ordnen] • Counting, touching and talking [Zählen, Berühren und Sprechen] • Thinking words and pictures [Denken von Wörtern und Bildern] • Thoughts of causing harm to self or others [Gedanken, sich selbst oder anderen ein Leid zuzufügen]
	Psychometric properties: Regarding reliability (OCD sample: n = 98, aged 17-57 years) across scales acceptable internal consistency (.71 ≤ α ≤ .79) except for the scale Thinking words and pictures (α = .50) was found. Test-retest reliability was good (.73 ≤ r ≤ .94) across scales (Klepsch et al., 1993). In an OCD sample of n = 41 (age: M = 33.44 years, SD = 9.79) convergent and divergent validity was supported by high correlations (.56 ≤ r ≤ .85) between the HZI-K total scale and self-rated OCD (using another instrument) and low correlations between the HZI-K total scale and self-rated depression (.02 ≤ r ≤ .20, exception subscale Ordering: r = .44) (Backenstrass, Schaller & Jäntsch, 2012). Further study: e.g., Maß et al., 1997.				
[DCL-ZWA] Diagnostic checklist for OCD [Diagnose-Checkliste für Zwangs-Spektrum-Störungen]	Döpfner & Görtz-Dorten (2017)	The checklist includes diagnostic criteria for OCD and related disorders according to ICD-10 and DSM-5. It enables categorical and dimensional classification. For dimensional classification symptoms are rated on a 4-point scale from 0 ("not present or age-appropriate") to 3 ("very much").	From 4 years based on an interview with caregivers (e.g., parent or teachers) From 8 years based also on an interview with the child	Clinician	(Categorial classification of OCD and related disorders according to ICD-10 and DSM-5) Dimensional classification • Obsessions [Zwangsgedanken] • Compulsions [Zwangshandlungen] • Anankastic personality disorder [Zwanghafte Persönlichkeitsstörung] • Psychosocial impairment and strain regarding OCD and related disorders [Funktionsbeeinträchtigung und Leidensdruck Zwangs-Spektrum] • Symptoms regarding OCD and related disorders in the examination situation [Zwangs-Spektrum-Symptome in der Untersuchungssituation]
	The checklist was evaluated in its former version (Döpfner, Görtz-Dorten & Lehmkuhl, 2008) in an OCD sample (n = 209, age range = 4-17 years) regarding reliability of the scales obsessions, compulsions, and total OCD. Internal consistencies were acceptable to good (.68 ≤ α ≤ .83). No analyses regarding divergent and convergent validity have been conducted.				

Table 3 (continued)

Name	Author	Short Description	Age	Rater	Scales
German-language measures					
[ILF-ZWANG/TIC] Interview for Obsessive-Compulsive and Tic Disorders [Interviewleitfaden für Zwang- und Ticstörungen]	Görtz-Dorten, Thöne & Döpfner (2022)	This semistructured diagnostic interview includes the exploration of symptom and diagnostic criteria, psychosocial impairment and strain to assess OCD and related disorders according to ICD-10 and DSM-5. It enables categorical and dimensional classification.	From 3-4 years based on interviews with caregivers (e.g., parent or teachers) From 8 years based also on an interview with the child	Clinician	(Categorial classification of OCD and related disorders according to ICD-10 and DSM-5) Dimensional classification • Body Dysmorphic Disorder [Körperdysmorphe Störung] • Hoarding Disorder [Pathologisches Horten] • Psychosocial impairment and strain [Funktionsbeeinträchtigung und Leidensdruck] • OCD symptoms in the examination situation [Zwangs-Symptome in der Untersuchung]
	Psychometric properties: The instrument has not been evaluated yet.				
[SBB-/FBB-ZWA] Self- and parent report form for OCD and related disorders [Selbst- und Fremdbeurteilungsbogen für Zwangsspektrum-Störungen]	Döpfner & Görtz-Dorten (2017)	The questionnaire includes 31 items, assessing symptoms regarding OCD and related disorders symptoms according to ICD-10 and DSM-5 as well as psychosocial impairment on a 4-point scale from 0 (“not at all”) to 3 (“very much”). Self- and parent report form are constructed analogously to each other.	11-17 years 4-17 years	Child or adolescent Parents	• Obsessions [Zwangsgedanken] • Compulsions [Zwangshandlungen] • Anankastic personality disorder [Zwanghafte Persönlichkeitsstörung] • Body Dysmorphic Disorders & Trichotillomania / Excoriation disorder [Körperdysmorphe Störungen & Tricho-/ Dermatillomanie] • Total OCD symptoms [Gesamtsymptomatik Zwang] • Psychofunctional impairment and strain OCD and related disorders [Funktionsbeeinträchtigung und Leidensdruck Zwangsspektrum]
	Psychometric properties: The questionnaire was examined in a representative sample (n = 802, age range 4-17) regarding reliability. Internal consistency was acceptable to good across total scale and subscales in the self-report (α = .57-.89) and the parent report form (.71 ≤ α ≤ .91). No analyses regarding divergent and convergent validity have been conducted (Döpfner & Görtz-Dorten, 2017).				

Table 3 (continued)

Name	Author	Short Description	Age	Rater	Scales
German-language measures					
OCD-CA [ZWIK] German OCD Inventory for Children and Adolescents [Zwangsinventar für Kinder und Jugendliche]	Goletz, Adam & Döpfner (2020)	This questionnaire includes 36 items for assessing various obsessions and compulsions on a 5-point scale from 0 (not at all) to 4 (very much). Self- and parent report form are constructed analogously to each other.	11-18 years 6-18 years	Child or adolescent Parents	• Contamination & Washing [Kontaminationsgedanken und Waschzwänge] • Catastrophes & Injuries [Zwangsgedanken und Zwangshandlungen zu Katastrophen und Verletzungen] • Checking [Kontrollzwänge] • Ordering & Repeating [Ordnungs- und Wiederholungszwänge] • OCD Total [Zwangssymptomatik-Gesamt]
	Psychometric properties: see Adam et al. (2019), chapter 2				

Notes.
[Original German name], *α* = Cronbach's Alpha, *ω* = McDonald's Omega, *ICC* = intraclass correlation coefficient

Besides the assessment of OCD symptoms and severity, OCD-specific assessment should comprise of the examination of OCD-related beliefs and cognitions, psychosocial functioning and family accommodation (e.g., Lewin & Piacentini, 2010; Rapp et al., 2016). Assessing psychosocial functioning is important as it is OCD diagnostic criterion, relevant treatment target and response component (Rapp et al., 2016). The assessment of family accommodation should be included, as family dysfunction maintains OCD symptoms and is also associated with poorer responsiveness to treatment (Ginsburg et al., 2008; Turner et al., 2018). It should be considered accordingly in treatment planning, as should dysfunctional beliefs and cognitions (e.g., Lewin & Piacentini, 2010; Rapp et al., 2016). Appropriate measures to assess these OCD-related relevant types of information are available, although predominately in English language (Dysfunctional cognitions: *Obsessive Beliefs Questionnaire-Child Version* [OBQ-CV; Coles et al., 2010], *Meta-Cognitions Questionnaire-Adolescent Version* [MCQ-A; Cartwright-Hatton et al., 2004], *Thought-Action Fusion Questionnaire for Adolescents* [TAFQ-A; Muris et al., 2001], *Questionnaire on causal attributions in OCD* [German: *Fragebogen zu Kausalattributionen bei Zwangsstörungen*, FKAU-Z; Goletz, Adam & Döpfner, 2020], *Questionnaire on control attributions in OCD* [German: *Fragebogen zu Kontrollattributionen bei Zwangsstörungen*, FKON-Z; Goletz, Adam & Döpfner, 2020]; psychosocial functioning: *Child Obsessive Compulsive Impact Scale-Child and Parent Versions* [COIS-C/P; Piacentini & Jaffer, 1999], *Child Obsessive Compulsive Impact Scale-Revised* [COIS-RC/RP; Piacentini et al., 2007]; family accommodation (*Family Accommodation Scale-Parent-Report* [FAS-PR; Flessner et al., 2009], *Parental Attitudes and Behaviors Scale* [PABS; Peris et al., 2008b],

OCD Family Functioning Scale [OFF; Stewart et al., 2011], *German Family Accommodation and Impact Scale* [German: *Familien-Anpassungs-und-Belastungs-Skala*, FABS; Goletz, Adam & Döpfner, 2020]).

1.2.2 Evidence based assessment (EBA)

Overall, there is an increasing movement towards and attention to evidence-based assessment (EBAs) in child and adolescent psychiatry and psychotherapy (Lewin & Piacentini, 2010; Mash & Hunsley, 2005; Cohen et al., 2008). In accordance to the measures' empirical support, assessments can be classified to the following three-level hierarchy of EBA (Cohen et al., 2008; see also Iniesta-Sepúlveda et al., 2014): (1) *well-established assessment*: reliability and validity must have been presented in at least two peer-reviewed articles by different investigators, (2) *approaching well-established assessment*: reliability and validity must have been supported in at least two peer-reviewed articles by one research team (3) *promising assessment*: reliability and validity must have been demonstrated in at least one peer-reviewed article.
Essential criteria of EBA are therefore validity (convergent, divergent, and discriminant) and reliability (internal consistency, inter-rater reliability, and test-retest reliability). Issues of EBA are the variety of purposes and the variety of populations, assessment can be used for. Reliability and validity can vary across purposes and populations. So, if for instance, an assessment instrument is designated for use in children and adolescents with OCD, it should be investigated in this population, otherwise it is *insufficiently tested* (La Greca & Lemanek, 1996). Currently there is, according to EBA's criteria, only one OCD-specific diagnostic instrument for childhood and adolescence that can be classified as a *well-established assessment*, the *Children's Yale-Brown Obsessive-Compulsive Scale* (CY-BOCS; Scahill et al., 1997). Because of its excellent psychometric properties, examined across studies, this instrument is the so-called gold standard of pediatric OCD-specific measures (Iniesta-Sepúlveda et al., 2014). Others are approaching well-established, promising, or insufficiently tested assessments.

1.3 Cognitive behavioral therapy (CBT)

According to national and internationally recognized guidelines, cognitive behavioral therapy (CBT) is recognized as first-line treatment in pediatric OCD. In severe cases additional pharmacotherapy should be considered in form of serotonin reuptake inhibitors (SSRIs) or the tricyclic antidepressant clomipramine (Deutsche Gesellschaft für Kinder- und Jugendpsychiatrie, Psychosomatik und Psychotherapie e.V. [DGKJP], 2021; American Academy of Child and Adolescent Psychiatry [AACAP], 2012; National Institute for Health and Care Excellence [NICE], 2005).

These guidelines are based on the current state of research. Before giving an overview of the current state of research, a brief digression on efficacy and effectiveness research is given below.

Digression: Efficacy & effectiveness research

Randomized controlled trials (RCTs) are considered as the gold standard to test the efficacy of treatment interventions (Gartlehner et al., 2006). The so-called efficacy studies/explanatory trials (see also Table 4) include randomization, control/waiting group comparison, and are conducted under clear predefined (ideal) conditions. These include strict inclusion and exclusion criteria, which lead to homogenous groups of patients, e.g., regarding comorbidity. Treatment contents, process, and duration are standardized, and treatment is conducted by highly trained and/or experienced therapists. The possibility of bias is kept to a minimum regarding study design and conduct to achieve the highest possible internal validity. High internal validity means that effects are most likely attributable to the treatment. Thus, data on treatment effects provided by efficacy studies are most reliable. The most frequent criticism of efficacy research is the lack of external validity, the generalizability of the study results to the real-world conditions (Howard et al., 1996; Godwin et al., 2003; Rothwell, 2005, 2006; Döpfner, 2009; Hunsley & Lee, 2007; Lee, Horvath & Hunsley, 2013; Wieland et al., 2017).

Table 4

Efficacy & effectiveness studies (e.g., Howard et al., 1996; Weisz, 2000; Hunsley & Lee, 2007)

	Efficacy research	**Effectiveness research**
Question	Does the intervention work under ideal research conditions?	Can the intervention work under real-word conditions?
Setting	"Ideal setting", resource-intensive	Routine care
Sample	Homogenous, highly selected	Heterogenous, few to no exclusion criteria
Therapists	Highly trained and/or experienced	Representative
Intervention	Highly standardized, no concurrent intervention	Flexible, individually tailored, concurrent intervention possible

The so-called effectiveness studies/pragmatic trials (see also Table 4) focus on external validity. They are based on everyday, natural clinical conditions. Included participants are spontaneously referred, heterogenous, and usually represent the full spectrum of patients met within routine clinical practice as e.g., patients with (several) comorbid disorders or previous treatment attempts are included. Treatments are generally delivered by routine care working therapists, who are not specifically trained. While efficacy research demonstrates what treatments can work, effectiveness research (usually chosen study designs are e.g., pretest-posttest designs or quasi-experimental designs; Stewart & Chambless, 2009) demonstrates what does work within routine care (Howard et al., 1996; Weisz, 2000; Godwin et al., 2003; Rothwell,

2005, 2006; Döpfner, 2009; Hunsley & Lee, 2007; Lee, Horvath & Hunsley, 2013; Wieland et al., 2017).
Accordingly, both – efficacy and effectiveness research – are very relevant within psychotherapy evaluation (Jacobi, 2011).

1.3.1 Efficacy of CBT – what can work?

The efficacy of CBT (including different treatment modalities) in children and adolescents with OCD is supported by various meta-analyses of RCTs (see Table 5), showing very high effect sizes (*ES*). In contrast, pharmacotherapy showed only medium to high effect sizes (e.g., CBT: *ES* = 1.45, pharmacotherapy: *ES* = 0.48; Watson & Rees, 2008; CBT: *ES* = 1.74, pharmacotherapy: *ES* = 0.75; Sánchez-Meca et al., 2014).
Not all studies found this superiority of CBT compared to pharmacotherapy. Skarphedinsson et al. (2015a) and more recent meta-analyses by Uhre et al. (2020) and Cervin et al (2024) found similar decreases in OCD severity with no significant difference between these two therapy options (CBT or pharmacotherapy) (Skarphedinsson et al. [2015a]: mean difference [*MD*] = -4.4, 95% confidence interval [*CI*] = -9.8 to 1.1, p = .116; Uhre et al. [2020]: *MD* = -0.75, *CI* = -3.79 to 2.29, *p* = .63; Cervin et al. [2024]: *MD* = 3.07, *CI* = 0.07 to 6.20). But studies show strong limitations. The finding of Skarphedinsson et al. (2015a) is only based on two studies. Uhre et al. (2020) themselves point out that their finding includes a high risk of bias and thus a low certainty of evidence. Cervin et al. (2024) describe fundamental difficulties in comparing pharmacotherapy and CBT treatment and that, therefore, more large-high quality trials are needed to reach clarity on their relative efficacy.
In this context (CBT vs. pharmacotherapy) the potential confounding of the type of control group used is also discussed: Most CBT studies used inactive control groups while most pharmacological studies used placebo control groups (e.g., Watson & Reese, 2008; Sánchez-Meca et al., 2014). This may lead to the conclusion, that the type of control group explains the better results in favor of CBT. However, Sánchez-Meca et al. (2014) could show, that CBT still yields a larger effect size than pharmacotherapy when controlling the type of control group.
As well as CBT as stand-alone treatment, the combination of SSRI+CBT outperformed pharmacotherapy as a single treatment (Watson & Rees, 2008; Sánchez-Meca et al., 2014; McGuire et al., 2015; Tao et al., 2022). In a recently published meta-analysis by Mendez et al. (2023) including *n* = 14 RCTs (*n* = 1146 patients), SSRI and SSRI+CBT also was found to be efficacious regarding OCD symptom change over 12 weeks of treatment with significant differences compared with placebo (SSRI: β = −3.59, credible interval [95% *CrI*]: −4.13 to −3.02, $p < 0.001$; SSRI+CBT: β = −4.07, 95% *CrI*: −5.05 to −3.04, $p < 0.001$). But the combination of CBT and SSRI did, in contrast to previous results, show (although numerically) not statistically significantly greater improvement than SSRI as monotherapy. The authors themselves note

that one potential explanation for this result could be that the additive benefit of CBT may require more time than the examined 12 treatment weeks.

Table 5

Meta-analyses of RCT studies of the effects on pediatric OCD symptoms (Goletz, Döpfner & Roessner, 2018; Goletz 2019, translated and modified)

Authors	**Therapy**	**Mean duration**	**Number of included RCTS**	**Effect sizes[2] (*d* [b oder c] [Cohen, 1988], Hedges *g* or weighted mean difference [*WMD*]) (95 %-Confidence Interval; CI)**			
				total	Inactive control group	Active control group	Mixed control group (active/ inactive)
Watson & Rees (2008)			15				
	CBT[d]	11.74 weeks	5				*d* = 1.45 0.68–2.22
	Pharmacotherapy	11.91 weeks	10				*d* = 0.48 0.36–0.61
Sánchez-Meca et al. (2014)			18				
	CBT[d]	11.79 weeks	11				*d* = 1.74 1.34–2.15
	Pharmacotherapy	10.33 weeks	10				*d* = 0.75 0.36–1.13
	Combined treatment	12.00 weeks	3				*d* = 1.71 1.00–2.42
McGuire et al. (2015)			20 (one included combined treatment)				
	CBT[d]	12.10 sessions of 1 hr	10				*g* = 1.21 0.83–1.59
	Pharmacotherapy	Not reported	11				*g* = 0.50 [f] 0.37–0.63
Skarphedinsson et al. (2015a)	CBT[d]	13.00 weeks	13		*WMD* = -11.8 (-15.9– -7.7)	n.s.[e,g] *WMD* = -0.2 (-2.9–1.9)	
Uhre et al. (2020)							
	CBT[d]	13 weeks	12		*SMD*[c] = -10.64 (-15.18- -6.11)	*SMD*[c] = -6.86 (-8.39- -5.32)	*SMD*[c] = -8.51 (-10.84- -6.18)
Reid et al. (2021)	CBT	946.7 minutes	11				*g* = 1.09 (0.60-1.58)
Cervin et al. (2024)			30				
	CBT	12.37 weeks	22				*SMD*[c] *range* = -3.95-11.10
	Pharmacotherapy	10.83 weeks	13		*SMD*[c] = 8.03 (4.24-11.82)	*SMD*[c] = -4.59 (2.70-6.48)	
	Notes. Non-active control group: control condition in which participants do not interact with the examiner (e.g., waiting list group, non-treatment control group). Active treatment control group (no CBT): active control condition in which participants interact with the examiner (e.g., attention placebo control group, pharmacological placebo, treatment as usual) but no CBT. Mixed control group (active/non-active): includes the non-active control group and the active treatment control group. Effect sizes: [a]: standardized mean difference between pre-post measurements [b]: standardized mean difference between the change values of the treatment and control groups [c]: standardized mean difference between intervention and control group at post [d]: CBT: cognitive behavioral therapy [e]: not significant [f]: in this study, the active treatment control group also includes pharmacotherapy (e.g., waiting list, placebo, desipramine) [g]: in this study, the active treatment control group also includes CBT and pharmacotherapy (e.g., attention placebo control group, treatment as usual, CBT [e.g., short-term, intensive], pharmacotherapy)						

[2] Regarding the effect size measure d, according to Cohen (1988; see Döring & Bortz, 2016), an effect size of *d* = 0.20 is considered a small effect, an effect size of *d* = 0.50 is considered a medium effect and an effect size of *d* = 0.80 is considered a large effect.
Hedges' effect size measure (*g* measure) (derivation of Cohen's *d*) takes the different sample sizes into account (Durlak, 2009).

The efficacy of CBT is usually determined by effect sizes. The clinical relevance of post-treatment OCD symptoms, such as extent of recovery and end-state functioning, is often not considered, although this is of particular interest for patients, parents, and clinicians (Abramowitz, Whiteside & Deacon, 2005). McGuire et al. (2015) considered recovery rates in their meta-analysis, showing a mean recovery rate of 57%.

Rosa-Alcázar et al. (2014) also examined in their meta-analysis effects on co-existing symptoms. Both CBT and pharmacological interventions improved anxiety, depression symptoms, and functional impairment. Mean effect sizes were lower than for OCD. Overall, mean effects for CBT ranged from moderate to large and were statistically significant (anxiety: *n* = 6 studies, *ES* = 0.59; depression: *n* = 6 studies, *ES* = 0.40; functional impairment: *n* = 4 studies, *ES* = 0.84). Whereas for pharmacotherapy, poor to moderate effects were found, that did not reach statistical significance (anxiety: *n* = 3 studies, *ES* = 0.23; depression: *n* = 5 studies, *ES* = 0.23; functional impairment: *n* = 2 studies, *ES* = 0.37). Thus, mean effects for CBT were higher across all secondary outcomes compared to pharmacological interventions.

1.3.2 Effectiveness of CBT – What does work?

There are at least some (mostly small) studies evaluating the effectiveness of CBT within clinical routine care, demonstrating treatment effects (within-group effect sizes) on pediatric OCD comparable to those from efficacy research (e.g., Valderhaug et al., 2007: *n* = 28, treatment duration: 12 sessions, *d* = 3.5; Nakatani et al., 2009: *n* = 75, treatment duration: *M* = 11 sessions [*SD* = 5, range = 5-28], *d* = 2.3; Farrell, Schlup & Boschen, 2010: *n* = 35, treatment duration: *M* = 11.5 sessions [*SD* = 1.3, range = 8-14 sessions], *d* = 2.1; Torp et al., 2015: *n* = 269, treatment duration: 14 sessions, *d* = 1.6; Beig et al., 2017: *n* = 53 parents / *n* = 53 patients, treatment duration: *M* = 49.66 / 53.62 sessions [*SD* = 23.52 / 26.67, range = 8-119 / 8-132], *d* = 0.91 / 0.88; see also Adam et al. 2022).

Wergeland, Riise & Öst (2021) reported a very large effect (*ES* = 2.5) on OCD (*n* = 10 studies, *n* = 560 patients) within their *review and meta-analysis of CBT for internalizing disorders in children and adolescents in routine clinical care*. The average remission rate (*n* = 7 studies provided data) was 56.7% (95% *CI* 41.7-70.6). The remission criteria used varied. For example, CY-BOCS (Scahill et al., 1997) cut-off score (9 or 10 points) was used.

Across internalizing disorders (including besides OCD, posttraumatic stress disorder, mixed anxiety, and depression) efficacy and effectiveness studies did not differ significantly on remission rates or effect size at post-treatment.

Some of the effectiveness studies also investigated the effects on comorbid symptoms (Farrell, Schlup & Boschen, 2010: 45% reduction in clinician-rated secondary diagnoses, child-rated anxiety/depression: *ES* = 0.2, 0.4 / *ES* = 0.3; Torp et al., 2015: child-/parent-rated overall comorbid symptoms: *ES* = 0.4, 0.6, child-/parent-rated anxiety: *ES* = 0.6, 0.6, clinician-/child-

/parent-rated depression: *ES* = 0.5, 0.4, 0.6; Beig et al., 2017: child-/parent-rated anxiety: *ES* = 0.87, 0.74, child-/parent-rated depression: *ES* = 0.55, 0.46; child-/parent-rated internalizing problems: *ES* = 0.79, 0.60, child-/parent-rated externalizing problems: *ES* = 0.28, 0.26; see also Adam et al., 2022) and psychosocial impairment (Valderhaug et al., 2007: child-/parent-rated: mean reduction = 49.6%, 60.8%, Farrell, Schlup & Boschen, 2010: child-/parent-rated: *ES* = 0.5, 0.5; Torp et al., 2015: child-/parent-rated: *ES* = 0.3, 0.6; see also Adam et al. 2022). Overall, results show low to moderate effects on these outcomes.

Most studies investigated CBT packages, which included several treatment components. What are these components?

1.3.3 CBT components

CBT in children and adolescents with OCD includes the combination or partial combination of the following treatment components (Goletz 2019; for a detailed description see Goletz et al., 2018; Storch et al., 2007b):

- *Psychoeducation*
  Information about OCD is provided, and together with the patient, a disorder model is developed, considering triggering and maintaining factors.
- *Exposure with response prevention*
  Gradual confrontation with the OCD-triggering stimuli including the possible compulsive thoughts and unpleasant emotions without simultaneously doing a mental ritual or compulsive action.
- *Cognitive interventions*
  Methods for identifying and restructuring dysfunctional cognitions and beliefs (e.g., perfectionism).
- *Family-centered interventions*
  Methods to modify the conditions in the family system that support and maintain OCD symptoms, e.g., guiding parents to positively reinforce the child's coping efforts or guiding the family to gradually reduce their involvement in the child’s performance and avoidance of OCD symptoms.
- *Other environment-centered interventions*
  Change of conditions in the non-family environment (e.g., kindergarten or school), that maintain OCD symptoms, for instance, in the form of temporary school relief or measures to reduce conflicts with other children in school.

- *Relapse prevention*
  Repetition of learned strategies, discussion of possible stressful situations in the future that may lead to OCD symptoms, and development of appropriate coping strategies to be used in these cases.

Overall, there is only limited knowledge about the "active ingredients" of CBT, so what treatment components actually work (e.g., Freeman et al., 2014). Only very few studies with (very) small sample sizes focused on individual CBT components, demonstrating that cognitive therapy (Simons, Schneider & Herpertz-Dahlmann, 2005: n = 5, ES = 2.92) and ERP (Bolton & Perrin, 2008: n = 20, ES = 1.23; De Haan et al., 1998: n = 12, ES = 1.58) lead to significant reductions in OCD severity. Himle et al. (2024) compared in their RCT with larger sample size (n = 126) ERP to a stress-management control therapy (SMT) in adolescent and adults, showing significant difference in favor of ERP (ES = -0.72, CI = -0.52 to -0.91, p<.001; remission rate: ERP: 39%, SMT: 7%; χ^2 = 16.14, p < .001). Adolescents and adults benefitted equally. It should be mentioned that ERP was the main treatment component, but ERP sessions were also supplemented with other topics (e.g., cognitive methods).
Results of the meta-analyses by Sánchez-Meca et al. (2014) and Rosa-Alcázar et al. (2015) indicate that CBT programs including multi-components, especially cognitive strategies, ERP and relapse prevention are the most promising.

1.3.5 CBT manuals

In the English-speaking area, there are some published and evaluated CBT programs (see Table 6). Those combine several treatment components. The focus varies. For example, there are CBT manuals that included some cognitive strategies, but modules generally and mostly focus on ERP activities (e.g., McKenney, Simpson & Stewart, 2020). The manual by Freeman & Garcia (2009 a,b), addressing (as the only manual) only children (age: 5-8 years), does not comprise any cognitive interventions. Psychoeducation, family-centered interventions, and relapse prevention are included in all treatment manuals. The contents are developed for 12 (or 12 to 20; March & Mulle, 1998) sessions, or number of sessions is tailored individually and not predefined (McKenney, Simpson & Stewart, 2020).
In the German-speaking area, there has been only one CBT manual (Wewetzer & Wewetzer, 2012) published, and it has not been evaluated yet. There is another one by Goletz & Döpfner (in prep.), that has not been published yet. Both CBT manuals contain all relevant CBT components described above (see chapter 1.3.4), age range addressed is similar, but the minimum age is defined differently (Wewetzer & Wewetzer, 2012: 8 years; Goletz & Döpfner, in prep.: 4 years). Both manuals do not specify the total duration of treatment.

Table 6

CBT manuals

Author	Age	Contents	Number of sessions
English-speaking manuals			
March & Mulle (1998)	from 4 years	• Session 1: Establishing a Neurobehavioral Framework • Session 2: Introducing the "Tool Kit" • Session 3: Mapping OCD • Session 4: Completing the Tool Kit • Session 5: Putting E/RP into Action • Session 6: E/RP Continues • Session 7: Family Session • Sessions 8-11: Moving Up the Stimulus Hierarchy • Session 12: Family Session II • Sessions 13-18: Completing E/RP • Session 19: Relapse Prevention • Session 20: Graduation • Session 21: Booster Session	12-20 + 1 booster session
	Treatment evaluation • March, Mulle & Herbel (1994): o Study design: open trial o Sample: *n* = 15, age: 8-18 years o Effects on OCD (clinician-rated) ▪ Significant pre-post change on Yale-Brown Obsessive-Compulsive Scale (Y-BOCS; Goodman et al., 1989) Score ▪ Remission rate = 60% (criteria: 50% Y-BOCS reduction); 40% asymptomatic on the National Institute of Mental Health Global Obsessive-Compulsive Scale (NIMH Scale; Leonard et al., 1989) • Pediatric OCD Treatment Study (POTS) Team (2004): o Study design: RCT o Control group: placebo o Sample: *n* = 112, age: 7-17 years o Effects on OCD (clinician-rated): ▪ Between-group *ES* = 0.97 ▪ Remission rate = 39.2% (criteria: CY-BOCS total score ≤10)		
Piacentini, Langley & Roblek (2007a,b)	8-17 years	• Session 1: Psychoeducation and Rationale • Session 2: Creating a Symptom Hierarchy/Psychoeducation • Session 3: Beginning ERP/Challenging Negative Assumptions • Session 4: Cognitive Restructuring/Blame Reduction • Session 5: Dealing with Obsessions/Family Responses to OCD • Session 6: Reviewing Progress/Child's Responsibility for Treatment • Session 7: Troubleshooting Obstacles to ERP/Secondary Gain • Session 8: Continuing ERP/Differentiating OCD vs. Non-OCD Behaviors • Session 9: Addressing More Difficult Symptoms/Family Self-Care • Session 10: Addressing More Difficult Symptoms/Family Problem Solving • Session 11: Planning for Termination/Relapse Prevention • Session 12: Graduation	12
	Treatment evaluation • Piacentini et al. (2011): o Study design: RCT o Control group: Psychoeducation/Relaxation Training o Sample: *n* = 71, age: 8-17 years o Effects on OCD (clinician-rated): ▪ CY-BOCS total score reduction = 46.2% ▪ Between-group *ES* = 0.40 ▪ Within-group *ES* = 2.37 ▪ Remission rate = 42.5% (criteria: CY-BOCS total score <11) o Effects on psychosocial functioning (child- and parent-rated): ▪ Child-rated within-group *ES* = 0.81 ▪ Parent-rated within-group *ES* = 1.01 • Peris & Piacentini (2013): o Study design: RCT o Control group: Positive Familiy Interaction Therapy o *n* = 20, age: 8-17 years o Effects on OCD (clinician-rated): ▪ Remission rate = 20% (criteria: CY-BOCS total score ≤10)		

Table 6 (continued)

Author	Age	Contents	Number of sessions
English-speaking manuals			
Freeman & Garcia (2009a,b)	5-8 years	• Session 1: Introduction to the Treatment Program (Parents only) • Session 2: Laying the Groundwork (Parents Only) • Session 3: Child Introduction to the Treatment Program • Session 4: Family-Based Treatment • Session 5: E/RP/Modeling • Session 6: E/RP/Introduction to Scaffolding • Session 7: E/RP Using Parental Scaffolding • Session 8: E/RP: Mid Hierarchy/Portability of Tools • Session 9: E/RP: Mid Hierarchy/Extending Strategies • Session 10: E/RP: Top of the Hierarchy/Preparation for Termination • Session 11: E/RP: Top of the Hierarchy/Relapse Prevention • Session 12: Review/Graduation Party	12
	Treatment evaluation • Freeman et al. (2008): o Study design: RCT o Control group: family-based relaxation treatment o Sample: *n* = 42, age: 5-8 years o Effects on OCD (clinician-rated): ▪ CY-BOCS total score reduction = 37.03% ▪ Between-group *ES* = 0.53 ▪ Remission rate = 50% (criteria: CY-BOCS total score ≤12)		
McKenney, Simpson & Stewart (2020)	6-18 years	• Module 1: Treatment Preparation with the Child or Youth and Their Parents • Module 2: Explaining ERPs, Building an OCD Ladder, and Implementing Reward • Module 3: Foundational Treatment Tools: Breaking Free of OCD's Traps, Bossing Back OCD, and Identifying Family Accommodation • Module 4: Breaking OCD's Rules: The Four S's, Exposure Games, and Limiting Family Accommodation and Reassurance Seeking • Module 5: Tools to Help with OCD "Bad Thoughts": Imaginal Exposures and Dealing with OCD-Related Rage • Module 6: Tools to Help with ERPs: Coping Cards, Floating on By, Coping with Doubt Scripts, and Reducing Stigma • Module 7: Troubleshooting ERPs: Suboptimal Response, Therapist Pitfalls, and Barriers to Treatment Success • Module 8: Self- and Family Care: Boosting Self-Esteem, Attending to Personal Needs, and Managing OCD in Schools • Module 9: Preparing for the Future: Relapse Prevention and Consolidating Gains • Module 10: Graduation: Celebration and Maintenance of Gains	Individually tailored
	Treatment evaluation • Selles et al. (2018): o Study design: open, uncontrolled study o Sample: *n* = 85, age: 8-18 years o Effects on OCD (clinician- and parent-rated): ▪ Clinician-rated within-group *ES* = 1.47 ▪ Parent-rated within-group *ES* = 1.32 ▪ Remission rate = 37.8% (criteria: CY-BOCS total score < 11 or > 55% symptom reduction) o Effects on psychosocial functioning (child- and parent-rated): ▪ Child-rated within-group *ES* = 0.87 ▪ Parent-rated within-group *ES* = 0.67		

Table 6 (continued)

Author	Age	Contents	Number of sessions
German-speaking manuals			
Wewetzer & Wewetzer (2012)	8-18 years	• Module 1: Diagnostics • Module 2: Psychoeducation • Module 3: Initial measures to limit compulsions (e.g., reducing parental involvement in compulsive behaviors) • Module 4: Cognitive therapy • Module 5: Exposure therapy • Module 6: Psychopharmacotherapy • Module 7: Aftercare and relapse prevention	15 + x
	Treatment evaluation has not been evaluated to date		
Goletz & Döpfner (in prep.)	4-18 years	• Module 1: Relationship building & resource activation • Module 2: Psychoeducation & motivation for therapy • Module 3: Treatment of problem (co-)causing and maintaining family conditions • Module 4: Treatment of problem (co-)causing and maintaining school and other conditions • Module 5: Cognitive interventions regarding dysfunctional cognitions • Module 6: Exposures with response prevention • Module 7: Emotion-focusing methods, interventions to increase social skills, and interventions to stabilize treatment success and prevent relapse	Individually tailored
	Treatment evaluation see Adam et al. (2022), chapter 3		

1.4 Aim of the thesis

Considering the prevalence rate (Canals et al. 2012), the often early onset in childhood and adolescence (Geller et al., 1996; Nestadt et al., 2000; Delorme et al., 2005, Taylor, 2011), and the serious consequences of OCD for the affected child or adolescent (Piacentini et al., 2003, 2007; Storch et al., 2018) and their family (e.g. Waters & Barrett, 2000; Futh, Simonds & Micali, 2012), the need for appropriate assessment and treatment for pediatric OCD is quite clear. Furthermore, better prognosis for treatment outcome and long-term course appears to be related with shorter OCD duration. This association between duration of OCD and treatment outcome also highlights the need for early detection and intervention (Stewart et al., 2004; Perris et al., 2021; Liu et al., 2021).

Dealing with treatment effects always also means to deal with diagnosis. Valid and reliable diagnostic instruments are needed to assess treatment effects. “Evidence-based assessment is the cornerstone of evidence-based treatment” (Rapp et al., 2016, p. 25).

The overview of existing diagnostic instruments (see chapter 1.2.1, Table 3) showed the general lack of OCD specific measures for childhood and adolescence in German-speaking areas. To date, there are hardly any newly developed instruments or German translations of the internationally widespread and evaluated measures specific to pediatric OCD. To record the clinician-rating, there is the *CY-BOCS-D* (Goletz & Döpfner, 2018), the German translation of the CY-BOCS (Scahill et al., 1997), which has been psychometrically evaluated many times

(e.g., Freeman et al., 2011; Storch et al., 2004) and is considered the gold standard internationally (Iniesta-Sepúlveda et al., 2014). Regarding self- and parent-report forms, there is the *Hamburger Zwangsinventar* (HZI; Zaworka et al., 1998) and its short version (HZI-K; Klepsch et al., 1993), self-report forms constructed for assessment for adults and adolescents 16 years or older. From the HZI and HZI-K, scores for common OCD symptom domains (e.g., washing & cleaning, ordering) are derived based on a “true” or “not true” scale. There is only one instrument to assess pediatric OCD, that exists in a self- and parent-rated version, the *Selbstbeurteilungsbogen für Zwangsspektrum-Störungen* (SBB-ZWA; Döpfner & Görtz-Dorten, 2017) and the *Fremdbeurteilungsbogen für Zwangsspektrum*-Störungen (FBB-ZWA; Döpfner & Görtz-Dorten, 2017). This measure provides global scores for e.g., obsessions and compulsions based on frequency ratings. But the SBB-/FBB-ZWA is not sufficiently psychometrically examined. The instrument showed mainly satisfying internal consistency, while divergent and convergent validity have not been investigated yet.

To conclude, there was no German-language diagnostic instrument available that records both self- and parent- rating, that was sufficiently psychometrically examined and/or provided scales assessing different OCD symptom domains, for gaining a comprehensive clinical picture of OCD symptoms. And therefore, there was no evidence-based instrument available for assessing treatment effects in terms of multimodal (multi-informant) assessment.

Accordingly, the first publication and study of this doctoral thesis (Adam et al., 2019, chapter 2) focused on assessment. **Study 1** aimed to examine an inventory to measure OCD symptoms in children and adolescents across common OCD domains, the *German OCD Inventory for Children and Adolescents* (OCD-CA; German: Zwangsinventar für Kinder und Jugendliche; ZWIK, Goletz, Adam & Döpfner, 2020). This multidimensional instrument includes a self- and parent-report form (see also Table 3). The OCD-CA is based on the Padua Inventory-Washington State University Revision (PI-WSUR; Burns et al., 1996), which, as well as its original version, the Padua Inventory (Sanavio, 1988), was found to be a reliable and valid questionnaire for the diagnosis of OCD symptoms in adulthood (e.g., Sternberger & Burns, 1990; Van Oppen, Hiekstra & Emmelkamp, 1995; Kyrios, Bhar & Wade, 1996). The parent-report and self-report form of the OCD-CA was investigated in a clinical sample (CLIN: n = 342, aged 6-18 years) including an OCD subsample (OCDS: n = 181) and a non-OCD clinical subsample (non-OCD: n = 161), and in a community sample (COS: n = 367, aged 11-18 years). The main analyses were conducted in the CLIN, its OCD subsample, and the COS separately. For group comparison the non-OCD clinical subsample was used.

Study 1 was fundamental for the second publication dealing with treatment effects.

Considering the treatment of pediatric OCD, the current state of research is relatively clear. CBT as single treatment as well as in combination with pharmacotherapy has shown better results than pharmacotherapy as single treatment (e.g., POTS, 2004; Franklin et al., 2011;

Sánchez-Meca et al., 2014). Consequently, internationally recognized guidelines (DGKJP, 2021; AACAP, 2012; NICE, 2005) consider CBT (in severe cases augmented with pharmacotherapy) to be the first-line treatment. Although the state of research is so clear, there is room for improvement regarding treatment effects and there are limitations regarding treatment evaluation (see also Adam et al., 2022). Overall, CBT in children and adolescents with OCD reaches large effect sizes (e.g., Sánchez-Meca et al., 2014), but the recovery rates lay at just 50% to 60% at post-treatment (e.g., Öst et al., 2016: 52.7%; McGuire et al., 2015: 57%). And recovery or remission does not necessarily mean symptom- or OCD-diagnosis-free (e.g., Farhat et al., 2022). So, improvement regarding treatment effects is required to increase remission rates. Limitations regarding treatment evaluations refer especially to study design and investigated outcomes and treatment duration. The research is mostly based on RCT (efficacy research) (e.g., Watson & Rees, 2008; McGuire et al., 2015). There is evidence that CBT does also work under routine care conditions (effectiveness research) (e.g., Valderhaugh et al., 2007; Farrell, Schlup & Boschen, 2010), but so far it is better examined under rather ideal conditions. This means that in many studies, among other things, patients' characteristics as study participants do not necessarily correspond to patients' characteristics in routine care (Weisz, 2000; Barrett et al., 2008). Moreover, the treatment duration usually examined in Anglo-American treatment outcome studies has been limited regarding the period of time (Skarphedinsson et al., 2015b). Duration or number of sessions (12 weeks and 15.5h; Rosa-Alcázar et al., 2015), respectively, are lower than within psychotherapy treatment as usual on average (Kazdin et al., 1990: 27 to 55). Beig et al. (2017) showed that on average about 50 sessions (range of 8-132) are conducted within treatment as usual in children and adolescents diagnosed with OCD. So, we do not know whether the usual treatment duration > 12 sessions in routine care is helpful and necessary, although this is a relevant information, among others, for our health care system. There is only one RCT by Skarphedinsson et al. (2015b) finding that continued CBT (10 session in 16 weeks) for non-responders after initial CBT of 14 weekly sessions increased remission rate.

Efficacy and effectiveness are often determined exclusively by effect sizes. End-state functioning and extent of recovery (remission rates) are often not investigated, although these are of particular interest for clinicians, patients and parents (Abramowitz, Whiteside & Deacon, 2005). Another shortcoming is (see also Adam et al., 2022), that the effects of individual CBT components are few analyzed (e.g., Freeman et al., 2014). Furthermore, previous research hardly considered secondary outcomes, like comorbid symptoms or psychosocial impairment. Yet these outcomes are of particular interest because of the high comorbidity rates of OCD, especially with depression and anxiety (Peris et al., 2017a; Stewart et al., 2004) as well as the serious consequences of OCD symptoms on psychosocial functioning (Piacentini et al., 2003,

2007; Storch et al., 2018). Most outcomes comprise clinician-rated OCD symptoms only. Different rater perspectives have been often neglected (Abramowitz, Whiteside & Deacon, 2005). And this despite the fact that the need for multimodal assessment is stressed due to low correlations between rater (especially child or adolescent and parents) perspectives (e.g., De Los Reyes et al., 2015; Canavera et al., 2009). The overview of available CBT treatment manuals (chapter 1.3.5, Table 6) showed the lack of German-speaking programs. Only one CBT manual (Wewetzer & Wewetzer, 2012) has been published for the use in clinical psychotherapy practice, and none evaluated.

Accordingly, the second publication and study (Adam et al., 2022; see chapter 3) focused on manual-based CBT treatment outcome within routine care and addressed the described limitations. **Study 2** aimed to systematically investigate the effectiveness of multimodal CBT based on the *treatment program for children and adolescents with anxiety and obsessive-compulsive disorder: OCD* (German: Therapieprogramm für Angst- und Zwangsstörungen: Zwänge; THAZ, Goletz & Döpfner, in prep.) in children, adolescents, and young adults (n = 38, aged 6-20 years) with OCD. Patients were referred to a university-based outpatient clinic within routine care. Treatment comprised a 12-week standard treatment of initially six weeks of CBT without ERP, followed by six weeks of CBT including ERP. In case of insufficient symptom improvement, the treatment duration was extended on an individually tailored basis to an overall maximum of 54 weekly sessions. Effects of the treatment phases on OCD and also co-existing symptoms and psychosocial functioning were examined in a within-subject control group design using multiple-informant outcome measures (including the evaluated OCD-CA; Adam et al., 2019). Particularly, the effects of differential CBT strategies (non-exposure CBT vs. exposure CBT) and individually tailored treatment duration (standard treatment vs. extended treatment) were investigated. Effectiveness was assessed based on effect sizes but also clinical significance, including remission rates and reliable changes.

Overall, this doctoral thesis aims to contribute to further improving the multimodal assessment and treatment of OCD in children and adolescents.

2 Psychometric evaluation of an inventory for pediatric OCD

Adam, J., Goletz, H., Mattausch, S.K., Plück, J. & Döpfner, M. (2019). Psychometric evaluation of a parent-rating and self-rating inventory for pediatric obsessive-compulsive disorder: German OCD Inventory for Children and Adolescents (OCD-CA). *Child Adolesc Psychiatry Ment Health, 13*:25. https://doi.org/10.1186/s13034-019-0286-z

Adam *et al.*
Child Adolesc Psychiatry Ment Health (2019) 13:25
https://doi.org/10.1186/s13034-019-0286-z

Child and Adolescent Psychiatry and Mental Health

RESEARCH ARTICLE Open Access

Psychometric evaluation of a parent-rating and self-rating inventory for pediatric obsessive-compulsive disorder: German OCD Inventory for Children and Adolescents (OCD-CA)

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Abstract

Background: This study assesses the psychometric properties of the German version of the Padua Inventory-Washington State University Revision for measuring pediatric OCD.

Methods: The parent-rating and self-rating inventory is assessed in a clinical sample (CLIN: n = 342, age range = 6–18 years) comprising an OCD subsample (OCDS: n = 181) and a non-OCD clinical subsample (non-OCD: n = 161), and in a community sample (COS: n = 367, age range = 11–18 years).

Results: An exploratory factor analysis yielded a four-factor solution: (1) Contamination & Washing, (2) Catastrophes & Injuries, (3) Checking, and (4) Ordering & Repeating. Internal consistencies of the respective scales were acceptable to excellent across all samples, with the exception of the self-report subscale Ordering and Repeating in the community sample. The subscales correlated highly with the total score. Intercorrelations between the subscales were mainly $r \leq .70$, indicating that the subscales were sufficiently independent of each other. Convergent and divergent validity was supported. Participants in the OCD subsample scored significantly higher than those in the non-OCD clinical subsample and the COS on all scales. In the COS, self-rating scores were significantly higher than parent-rating scores on all scales, while significant mean differences between informants were only found on two subscales in the OCD subsample.

Conclusion: The German version of the Padua Inventory-Washington State University Revision for measuring pediatric OCD is a promising, valid and reliable instrument to assess self-rated and parent-rated pediatric OCD symptoms in clinical and non-clinical (community) populations.

Keywords: Obsessive-compulsive disorder, Children, Adolescents, Assessment, Reliability, Validity

Background

Obsessive-compulsive disorder (OCD) is a severe mental disorder, characterized by obsessions, compulsive rituals, or both. Its prevalence rate in childhood and adolescence lies at approximately 1 to 4% [1, 2], and up to half of adult patients diagnosed with OCD report an onset of the disorder during childhood or adolescence [3]. To identify symptoms and treat the disorder as early as possible, appropriate assessment instruments for pediatric OCD are needed. OCD symptoms lead to a high psychological strain, distress and psychosocial impairment in children and adolescents [4], and considerably interfere with quality of life [5]. These serious consequences of the disorder have encouraged clinicians and researchers to develop new assessment instruments [6].

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Several pediatric OCD-specific measures have been developed, which assess the self-report of children and adolescents only [7–10]. Most of these measures showed satisfactory internal consistencies and there is at least some support for their convergent and/or divergent validity. However, there is a need to assess OCD symptoms as rated by parents and children separately, because younger children may be unable to report their OCD symptoms accurately. Moreover, some children and adolescents may not report their symptoms accurately due to shame and embarrassment about their OCD [11]. On the other hand, parent reports may give underestimations because some symptoms (e.g. recurrent thoughts) are more difficult for parents to notice [12].

Overall, correlations between parent ratings and self-ratings have usually been found to be low, both in the assessment of mental health problems in children and adolescents generally (e.g. [13]) and in the assessment of OCD symptoms in particular [11]. Thus, to achieve a comprehensive clinical picture of the disorder, a multiple-informant assessment is required.

Therefore, researchers have recently developed questionnaires which encompass both self- and parent reports (*child-report version and parent-report version of the CY-BOCS,* CY-BOCS-CR, CY-BOCS-PR [14]; *Children's Obsessional Compulsive Inventory,* CHOCI/CHOCI-R [15, 16]. Satisfactory internal consistencies have predominantly been reported for these questionnaires. However, analyses in a community sample revealed poor internal consistency for the Obsession and the Compulsion subscales and the Total scale of the CY-BOCS-CR [17]. Support for convergent and/or divergent validity was found for both instruments. However, only global scores for OCD symptoms or obsessive symptoms and compulsive symptoms were derived from these rating scales, while scales assessing different domains (e.g. controlling, washing) are not provided. This is also true for the only self- and parent-rated instrument developed for the German-speaking countries—the SBB-ZWA (Selbstbeurteilungsbogen für Zwangsspektrum-Störungen and the FBB-ZWA (Fremdbeurteilungsbogen für Zwangsspektrum-Störungen) [18].

Overall, none of these self-rated or parent-rated scales fulfill the criteria for a well-established assessment tool according to the criteria for evidence-based assessment (EBA; i.e.: reliability and validity must have been presented in at least two peer-reviewed articles by different investigators [19, 20]. Currently, the clinician-rated Children's Yale-Brown Obsessive-Compulsive Scale (CY-BOCS [21]) is the only pediatric OCD-specific measure that can be classified as a well-established assessment according to these criteria [22].

In sum, despite the variety of self-report and parent-report forms for the assessment of pediatric OCD symptoms and severity/impairment, there is, to the best of our knowledge, only one measure, the Obsessive Compulsive Inventory-Child Version (OCI-CV) [7], that focuses on symptom frequency across symptom domains. However, The OCI-CV only exists in a self-report form. Clearly, there is a lack of instruments assessing symptoms across common OCD domains, and there are no measures that record both self- and parent report regarding OCD symptom domains. To gain a comprehensive clinical picture of the child or adolescent, however, the assessment should encompass multiple informants and perspectives.

Therefore, the current study examined an inventory to assess OCD symptoms in children and adolescents across common OCD domains, the OCD-CA (OCD Inventory for Children and Adolescents) [23], which is rated by children and parents separately and is based on the Padua Inventory-Washington State University Revision [24].

The main goals of the study are to: (1) identify the factor structure of the self-report and the parent-report form of the OCD-CA, (2) assess internal consistency of the subscales and the Total scale derived from factor analyses, (3) assess the correlations between the subscales for each informant, (4) assess the correlations between parent ratings and self-ratings, and (5) evaluate convergent and divergent and discriminant validity of the scales.

Methods

Instruments

The *German OCD Inventory for Children and Adolescents* (OCD-CA; German: Zwangsinventar für Kinder und Jugendliche; ZWIK [23]) is a modified version of the Padua Inventory-Washington State University Revision (PI-WSUR [24] /PI-WSUR (German translation) [25]). The OCD-CA enables the assessment of pediatric OCD symptoms on different symptom scales. The inventory comprises two multidimensional questionnaires: a parent form (target group: parents/caregivers of children and adolescents aged 6;0–18;11 years) and a self-report form (target group: children and adolescents aged 11;0–18;11 years), which are constructed analogously to one another. Accordingly, both rating forms include the same 36 items assessing various obsessions and compulsions. Parents or children/adolescents are asked to rate each item on a 5-point scale from 0 (not at all) to 4 (very much).

The development of the inventory is described below (see Fig. 1).

The starting point for the development was the revised version of the Padua Inventory [26–31], the *Padua Inventory-Washington State University Revision* (*PI-WSUR;*

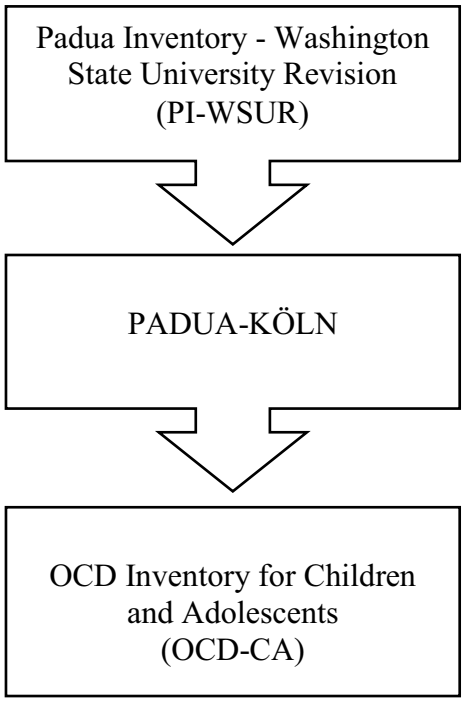

Fig. 1 Development of the OCD-Inventory for Children and Adolescents

[24]). The PI-WSUR is a self-report measure assessing obsessions and compulsions in adulthood (applicable from the age of 16 years onwards). The instrument includes 39 items, rated on a 5-point scale from 0 (not at all) to 4 (very much) and measuring five OCD-relevant content dimensions: obsessional thoughts about harm to oneself or others, obsessional impulses to harm oneself or others, contamination obsessions and washing compulsions, checking compulsions, and dressing/grooming compulsions. As the PI-WSUR was found to be a valid and reliable questionnaire for the assessment of OCD symptoms in adulthood [24], the German translation of this instrument [25] was used as the basis for the development of the OCD-CA.

To compile a child-appropriate version, items of the PI-WSUR were transformed and extended concerning the most frequently occurring OCD symptoms in childhood. The item pool was developed through intensive discussion within a group of experienced clinical psychologists. Finally, thirty-two items of the German translation of the PI-WSUR were adopted and, in part, slightly changed to make items more suitable for children. For example, the PI-WSUR Item 1 "I feel my hands are dirty when I touch money" was changed to "I feel my hands are dirty when I touch money, books or toys", and the PI-WSUR Item 18 "I keep on checking forms, documents, checks, etc., in detail to make sure I have filled them in correctly" was changed to "I keep on checking homework and other documents in detail to make sure I have completed them in correctly". Seven items of the PI-WSUR were not adopted because they were assessed as not up-to-date or as not child-appropriate (e.g. Item 6 "I avoid using public telephones because I am afraid of contagion and disease" or Item 34 "While driving, I sometimes feel an impulse to drive the car into someone or something"). Furthermore, ten items were newly developed, which refer to repeating compulsions, counting, reassurance-seeking, (un)lucky number, hoarding/saving and not getting ready.

Accordingly, the first draft of a child-appropriate self-rating measure included 42 items assessed on a 5-point Likert scale, equivalent to the adult version. Analogously to the self-report form, a parent-report form was developed, including the same items. The self- and parent-report form were named *PADUA-KÖLN*. The PADUA-Köln was evaluated within a pilot study in a clinical sample (n = 55, age range 10–17 years). The adopted initial scale of the PI-WSUR *Obsessional Impulses to harm oneself or others* could not be confirmed through reliability analyses and comparison of means. Besides unsatisfactory internal consistency, comparisons of means showed that patients without OCD, especially those diagnosed with hyperkinetic disorders, had significantly higher means (self-reported and parent-reported) than patients affected by OCD. As a consequence, the PADUA-Köln was revised by eliminating the corresponding six items of the mentioned scale. The new scale was finally named *OCD Inventory for Children and Adolescents* (*OCD-CA*) (German*: Zwangsinventar für Kinder und Jugendliche; ZWIK*).

First analyses with the OCD-CA were conducted within a community sample (Waclawiak 2006, unpublished) comprising 367 self-reports and 434 parent reports (271 mothers and 163 fathers). Exploratory principal component analyses with varimax rotation (40 patients with OCD were included in the dataset to increase the variance in the sample) yielded a four-factor solution (Additional file 1). Internal consistencies for the self-report form and parent-report form (rated by mothers or fathers), respectively, were satisfactory to excellent for all subscales: Contamination Obsessions and Washing Compulsions ($.86 \leq \alpha \leq .93$), Checking and Repeating Compulsions ($.82 \leq \alpha \leq .85$), Obsessions concerning harm and injuries of others or oneself ($.75 \leq \alpha \leq .78$), Counting Compulsions and Reassurance-Seeking Compulsions and (un)lucky numbers ($.77 \leq \alpha \leq .85$).

The German version of the *Children's Yale-Brown Obsessive-Compulsive Scale* (*CY-BOCS-D* [32]) is based on the English original version of the CY-BOCS, developed by Goodman and colleagues (1986, unpublished scale). The clinician-rated CY-BOCS-D (based on

parent/patient interview) comprises a symptom checklist and a semi-structured rating scale. The 58-item symptom checklist serves to assess the presence or absence of a variety of obsessions and compulsions. Symptoms can be summarized into four symptom scales [(1) obsessions regarding loss of control and religion; (2) checking, harm avoidance and sexual obsessions; (3) contamination and cleaning; (4) repeating, ordering/arranging, hoarding and magical thinking] and a total score. The 19-item rating scale serves especially to measure obsession severity, compulsion severity and the total OCD severity as well as to assess OCD-associated (personality) traits and abnormalities.

The OCD severity scale is derived by summing up the responses to the items 1–10, including items 1b and 6b. Items are rated on a 5-point Likert scale ranging from 0 to 4, with higher scores indicating greater symptom severity.

Psychometric evaluations of the CY-BOCS revealed positive results (see "Background"). The CY-BOCS-D symptom checklist and the rating scale displayed acceptable and good internal consistency, respectively. There was also evidence for the validity of the CY-BOCS-D [32]. In the present analyses, the symptom checklist scales and the total OCD severity score of the rating scale were used. Data were collected based on an interview with children and adolescents ≥ 11 years old with an OCD diagnosis (OCD subsample, see below).

The German version of the *Child Behavior Checklist—CBCL/6-18R* [33, 34], originally developed by Achenbach [35], is a parent-report instrument including 113 items which assess a range of behavioral and emotional problems in children and adolescents rated on a 3-point scale ("0 = not true", "1 = somewhat or sometimes true", "2 = very true or often true"). Items are assigned to two broad-band syndrome scales (Externalizing and Internalizing Problems) and eight syndrome scales. The German version shows good reliability and factorial validity [33, 34]. In the present study, the raw scale scores of the Internalizing and Externalizing scales were used.

The German version of the *Youth Self Report—YSR/11-18R* [34, 36], originally developed by Achenbach [37], is the equivalent self-report form of the CBCL (described above). The 112-item measure is child/adolescent-based and includes widely identical items to the CBCL. The structure and scales are the same. Research has also demonstrated good reliability (internal consistency) and factorial validity for the German version of the YSR [34, 36]. In the present study, the raw scale scores of the Internalizing and Externalizing scales were used.

The German *Symptom Checklists for Anxiety Disorders and Obsessive-Compulsive Disorders* are rated by parents (FBB-ANZ) of patients aged 6 to 18 years and by patients aged 11 to 18 years (SBB-ANZ). These scales are part of the Diagnostic System for the Assessment of Mental Disorders in Children and Adolescents based on the ICD-10 and DSM-IV (DISYPS-II) [38]. All items are rated on a 4-point Likert scale ranging from 0 ("not at all") to 3 ("very much"). The questionnaires comprise 31 items describing anxiety symptoms and two items describing obsession and compulsion (scales: Separation Anxiety, Generalized Anxiety, Social Phobias, Specific Phobias and Total Scale). Psychometric evaluations of the SBB-/FBB-ANZ have yielded good results regarding reliability and validity [38]. The present analyses included the total score of the parent- and self-rated questionnaire.

The German *Symptom Checklists for Depressive Disorders* are likewise rated by parents (FBB-DES) of patients aged 6 to 18 years and by patients aged 11 to 18 years (SBB-DES). The rating scales are also part of the Diagnostic System for the Assessment of Mental Disorders in Children and Adolescents based on the ICD-10 and DSM-IV [38]. The structure, implementation and assessment are the same as described for the SBB-/FBB-ANZ. The total score includes 29 items. Psychometric evaluations of the SBB-/FBB-DES have also shown good results regarding reliability and validity [38]. Parent-rated and child/adolescent-rated questionnaires (Total Score) were used for the present analyses.

Participants and samples

Table 1 summarizes the demographic characteristics of the OCD subsample, the non-OCD clinical subsample, and the community sample separately for different age groups.

OCD subsample (OCDS)

Participants comprised 181 children and adolescents referred to the outpatient unit of the Department for Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy at the Medical Faculty of the University of Cologne and the School for Child and Adolescent Cognitive Behavior Therapy at the University Hospital Cologne (n = 91, 50.30% males) and their parents. The patients' mean age was 13.15 years (SD = 2.92; range = 6–18 years; 46 patients aged 6–10 years, 135 patients aged 11–18 years). All participants met criteria for a diagnosis of OCD (ICD diagnoses: predominantly obsessional thoughts or ruminations (F42.0): n = 15; predominantly compulsive acts, obsessional rituals (F42.1): n = 62; mixed obsessional thoughts and acts (F42.2): n = 104). The OCD diagnosis was based on a semi-structured clinical interview with the patient and the parents using the Diagnostic Checklist for OCD, which is part of the Diagnostic System for Mental Disorders in Childhood and Adolescence (DISYPS-II)

Table 1 Description of the samples

	Clinical sample (CLIN)				Community sample (COS)
	OCDS		Non-OCD		
	6–10 years old	11–18 years old	6–10 years old	11–18 years old	11–18 years old
Sample size: *N*	46	135	64	97	367
Age: Mean (SD)	9.42 (1.16)	14.42 (2.15)	9.05 (1.26)	13.80 (2.21)	14.29 (2.21)
Gender, male: *N* (%)	25 (54.3)	66 (48.9)	47 (73.4)	68 (70.1)	146 (39.8)

[38]. Overall, 70 (38.9%) patients also had a comorbid diagnosis, consisting of tic disorders (F95, n = 19), hyperkinetic disorders (F90, n = 14), major depressive disorders (F32, n = 13), pervasive developmental disorders (F84, n = 9), emotional disorders (F93, n = 8) or phobic anxiety disorders (F40, n = 7). In total, the OCD subsample comprised 181 OCD-CA parent reports (for 46 6–10-year olds and 135 11–18-year-olds) and 134 OCD-CA self-reports.

Non-OCD clinical subsample (non-OCD)

This subsample comprised 161 children and adolescents referred to the same institutions described above (n = 115, 71.4% boys), with ages ranging from 6 to 18 years (M = 11.91, SD = 3.00). The most common diagnoses, primary or comorbid, were tic disorders (F95, n = 118), hyperkinetic disorders (F90, n = 30), emotional disorders (F93, n = 28), phobic anxiety disorders (F40, n = 11), reaction to severe stress and adjustment disorders (F43, n = 9), other behavioral and emotional disorders with onset usually occurring in childhood and adolescence (F98, n = 9), pervasive developmental disorders (F84, n = 7), habit and impulse disorders (F63, n = 4) and mixed disorders of conduct and emotions (F92, n = 4). In total, the non-OCD subsample comprised 161 OCD-CA parent reports (for 64 6–10-year-olds and 97 11–18-year-olds) and 84 OCD-CA self-reports.

Community sample (COS)

The community sample (Waclawiak 2006, unpublished) included 367 school pupils aged 11–18 years ($M = 14.29$, $SD = 2.21$; n = 146, 39.8% boys) and their caregivers (either mother or father). The participants were recruited in 11 schools in four different Federal states in Germany (North Rhine-Westphalia, Hesse, Rhineland-Palatinate, Schleswig–Holstein). 1310 OCD-CA self-report and parent-report forms were sent to the 11 schools. Questionnaires that did not meet the criteria regarding missing values < 10% were excluded. In total, 367 OCD-CA self-report forms were included in the dataset (response rate = 28%). Parent forms were only considered if they met the criteria regarding missing values and if the corresponding self-report form was present. Finally, 367 OCD-CA parent forms were selected for subsequent analysis. The CBCL and YSR were also rated by parents and pupils in the COS.

Data analyses

To examine the factor structure of the OCD-CA in the combined OCD and non-OCD clinical sample (CLIN sample) and the OCD clinical subsample (OCDS), confirmatory factor analyses for the self-report form and the parent form were conducted separately in both samples in a first step, based on the factor structure previously found in analyses in a community sample (Waclawiak 2006, unpublished) (Additional file 1). Correlation paths between the factors were allowed because Waclawiak (2006, unpublished) found intercorrelations ≤ .65 between subscales. The tested model was assessed using x^2 test and further fit indices. The x^2 test examines the difference between observed and predicted data by the model, with a non-significant result indicating a good model fit. Moreover, as the x^2 test is very sensitive to sample size, it was likely to reveal significant results considering the sizes of the assessed samples. Thus, further goodness-of-fit indices employed in comparable studies were computed to assess the model fit: the root mean square error of approximation (RMSEA), standardized root mean square (SRMR), comparative fit index (CFI) and the Tucker-Lewis index (TLI). To judge the goodness of model fit, we used the cut-off criteria proposed by Hu and Bentler [39]: RMSEA ≤ .08, better ≤ .05, SRMR ≤ .11, and CFI/TLI ≥ .80, better ≥ .95. Due to non-normally distributed data, the method of maximum-likelihood estimation was applied, using the Bollen-Stine bootstrapping (1000 samples) procedure [40].

The confirmatory factor analyses showed no satisfactory model fit (see results). Therefore, exploratory principal component analyses with varimax rotation, comprising the items of the OCD-CA, were applied in the CLIN, separately for the self-report form and the parent form. Beforehand, the data were checked with regard to their suitability for conducting exploratory principal component analyses: The Kaiser–Meyer–Olkin (KMO) and the measure of sampling adequacy (MSA) coefficient

were computed, and Bartlett's test of sphericity was carried out [40]. Additionally, as a criterion for extraction, Velicer's (1976) minimum average partial (MAP) test and parallel analyses according to Horn were conducted to determine the number of components [40, 41].

To make the different samples comparable for further data analyses, age was divided into two groups consisting of children aged 6–10 years and adolescents aged 11–18 years (see Table 1). For analyses regarding the OCD-CA scales, raw scale scores were used. The analyses were conducted separately for the CLIN, its OCD subsample, and the COS. The non-OCD clinical subsample was only used for group comparison.

Based on the samples, descriptive analyses (means and standard deviations) for the OCD-CA subscales and the OCD Total scale were conducted. Additionally, internal consistency (Cronbach's alphas) for the subscales developed on the basis of the principal component analyses as well as item-total correlations were calculated. For each informant (parent, child), Pearson product-moment correlations were applied for the corresponding subscales of the OCD-CA in the self-report form and the parent form. Moreover, Pearson product-moment correlations were computed to examine the relationships among the scores on the OCD-CA scales and the clinician-rated measure of OCD severity (CY-BOCS-D), the scores on parent- and self-rated measures of depressive symptoms (FBB-/SBB-DES), anxiety symptoms (FBB-/SBB-ANZ) and internalizing and externalizing problems (CBCL/YSR). ANOVAS and independent and dependent t-tests were used for group comparisons between the different samples, informants and age and gender groups regarding the OCD-CA scores (subscales and Total scale).

Results

Confirmatory factor analyses in the CLIN (patients with OCD and patients with other psychological disorders) and the OCDS based on the factor structure found in the analyses of Waclawiak (2006, unpublished) did not reveal any satisfactory model fit. In none of the samples were all cut-off criteria for an acceptable model fit achieved (see Additional file 1).

Thus, *exploratory principal component analyses* with varimax rotation were conducted on the OCD-CA in the CLIN, separately for the parent form and the self-report form (Additional file 2). Data of the OCD-CA parent form consistently met criteria for conducting a factor analysis (Kaiser–Meyer–Olkin (KMO) = .90, measure of sampling adequacy coefficient: .76 ≤ MSA ≤ .96, Bartlett's test of sphericity: $x^2 = 7077.69$, df = 630, $p < .001$). The MAP test and parallel analysis determined four factors to be extracted. Therefore, an exploratory principal component analysis extracting four factors was applied. The four extracted factors (Additional file 2) had eigenvalues greater than 1.95 and explained 54.04% of the variance. The first factor explained 17.40% of the variance (.57 ≤ factor loadings ≤ .88) and included nine items, which describe contamination obsessions and washing compulsions (*Contamination & Washing*). The second factor explained 14.30% of the variance (.43 ≤ factor loadings ≤ .75) and consisted of 11 items describing obsessions and compulsions concerning catastrophes and injuries *(Catastrophes & Injuries)*. The third factor explained 11.39% of the variance (.36 ≤ factor loadings ≤ .73) and contained seven items describing checking compulsions *(Checking)*; item 22, describing hoarding and saving, also loads highly on this factor. The fourth factor explained 10.96% of the variance (.43 ≤ factor loadings ≤ .69) and contained five items describing ordering/arranging and repeating compulsions (*Ordering & Repeating*). Three further items regarding counting (items 20–21) and not getting ready (item 23) also load highly on the fourth factor. An additional exploratory principal component analysis with four extracted factors excluding items 20–23, which did not fit to any of the described factors in terms of content, showed the same results.

Data of the OCD-CA self-report form also met criteria for conducting a factor analysis (Kaiser–Meyer–Olkin (KMO) = .88, measure of sampling adequacy: .76 ≤ MSA ≤ .93, Bartlett's test of sphericity: $x^2 = 3956.82$, df = 630, $p < .001$). The MAP test suggested that five factors should be extracted. The five-factor solution did not show any meaningfully interpretable result. Parallel analysis determined four factors to be extracted. Thus, in line with the parent form, an exploratory principal component analysis extracting four factors was applied. The four-factor solution of the OCD-CA self-report form (Additional file 2) showed the following results: The four extracted factors had eigenvalues greater than 1.83 and explained 50.05% of the variance. The first factor explained 14.80% of the variance (.26 ≤ factor loadings ≤ .75) and contained six items regarding checking compulsions. A further eight items also had substantial loadings on the first factor. The second factor explained 13.67% of the variance (.54 ≤ factor loadings ≤ .78) and included nine items which describe contamination obsessions and washing compulsions. The third factor explained 10.91% of the variance (.40 ≤ factor loadings ≤ .72) and included five items describing ordering/arranging and repeating compulsions. Items 18, 20, 21, and 25, which describe compulsions regarding checking, counting and compulsions concerning catastrophes and injuries, also load (highly) on this factor. The fourth factor explained 10.67% of the variance (.45 ≤ factor loadings ≤ .74) and

contained four items which describe obsessions and compulsions regarding catastrophes and injuries. Item 17 ("count and recount money") and item 22 ("hoarding and saving") also load highly on this factor. Although six further items describing obsessions and compulsions concerning catastrophes and injuries load on the fourth factor, all six actually load higher on other factors.

To sum up, the self-report form showed a less clear factor structure than the parent form. The factor structure of the parent form was broadly found in the self-report (see Additional file 2). For this reason, the factor structure of the parent form was used for scale formation. As items 20–23 (regarding "counting"/"certain number", "hoarding and saving" and "not getting ready") did not match to any of the described factors in terms of content, they were not included in any of the subscales but were included in the *Total scale*.

Exploratory principal component analyses with varimax rotation were also conducted in the OCDS, showing the same factorial solution as described for the CLIN above. Furthermore, exploratory principal axis factoring with varimax rotation also revealed no differences in the results.

To confirm the four-factor solution found in exploratory factor analyses, confirmatory factor analyses were conducted once again. Correlation paths between the factors were allowed. The x^2 test was significant for the parent form in the CLIN ($x^2_{(df=458)}=1503.170$, $p=.001$) and OCDS ($x^2_{(df=458)}=1024.023$, $p=.001$). Further fit-indices (except for the TLI in the OCDS) indicated an acceptable factorial validity of the model (CLIN: RMSEA = .08, SRMR = .08, CFI = .83, TLI = .82; OCDS: RMSEA = .08, SRMR = .09, CFI = .80, TLI = .78).

Except for the SRMR (CLIN: .08, OCDS: .09), no fit indices met cut-off criteria for the self-report (CLIN: $x^2_{(df=458)}=1285.319$, $p=.001$, RMSEA = .09, CFI = .74, TLI = .72; OCDS: $x^2_{(df=458)}=1013.752$, $p=.008$, RMSEA = .09, CFI = .71, TLI = .69).

Table 2 shows the *internal consistency* (Cronbach's alphas) and the ranges of the item-total correlations for the OCD-CA subscales and the Total scale (parent form and self-report form) across the CLIN, OCDS and COS. The Cronbach's alpha values of the subscales and the Total scale (regarding both age groups) in the parent form were acceptable to excellent across the samples (CLIN: $.78 \leq \alpha \leq .94$; OCDS: $.74 \leq \alpha \leq .93$; COS: $.77 \leq \alpha \leq .93$). The self-report form also had acceptable to excellent internal consistency, with the exception of the subscale *Ordering & Repeating* in the COS (CLIN: $.74 \leq \alpha \leq .93$; OCDS: $.70 \leq \alpha \leq .92$; COS: $.55 \leq \alpha \leq .91$). Item-total correlations were generally satisfactory. Although several items had low item-total correlations (rit < .30), excluding any of these items did not noticeably change the Cronbach's alpha.

The *intercorrelations* of the subscales in the parent form (Additional file 3) yielded different results across the samples. In the CLIN, the subscales showed low to high intercorrelations ($.23 \leq r \leq .61$). All intercorrelations were significant at a level of .01 (except for the intercorrelation between the subscale *Contamination & Washing* and the subscale *Checking*, $p < .05$). In the OCDS, low and

Table 2 OCD-CA parent form and self-report form: Cronbach's alphas (α) and item-total correlations, CLIN, {OCDS}, (COS)

Scale	Parent form				Self-report form	
	6–10 years old		11–18 years old		11–18 years old	
	α	Item-total r	α	Item-total r	α	Item-total r
Contamination & Washing (9 items)	.91 {.91} 	.55–.83 {.49-.83} 	.94 {.93} (.85)	.62–.89 {.54–.87} (.47–.69)	.89 {.88} (.78)	.55–.71 {.54–.72} (.31–.60)
Catastrophes & Injuries (11 items)	.88 {.88} 	.42–.76 {.35-.76} 	.87 {.85} (.84)	.25–.74 {.16–.73} (.28–.73)	.87 {.87} (.82)	.43–.71 {.41–73} (.36–.64)
Checking (7 items)	.80 {.83} 	.33–.67 {40-.69} 	.82 {.81} (.80)	.43-.68 {.37–.68} (.31–.64)	.78 {.79} (.74)	.41–.62 {.40–.64} (.34–.55)
Ordering & Repeating (5 items)	.78 {.74} 	.49–.67 {.33-.63} 	.84 {.80} (.77)	.60–.75 {.53–.69} (.48–.63)	.74 {.70} (.55)	.49–.54 {.43–.53} (.11–.49)
OCD Total (36 items)	.92 {.90} 	.18–.69 {.18-.71} 	.93 {.88} (.93)	.18-.67 {.08-.54} (.23–.66)	.93 {.92} (.91)	.35–.68 {.29–.66} (.14–.61)

Parent-report form: 6–10 years old: n = 110, {n = 46}; 11–18 years old: n = 232, {n = 134}, (n = 367)

Self-report form: n = 218, {n = 134}, (n = 367)

moderate intercorrelations emerged ($.05 \leq r \leq .51$, partially significant at a level of $p < .01$ or $p < .05$). High intercorrelations were found in the COS ($.55 \leq r \leq .71$, $p < .01$). The intercorrelations of the subscales in the self-report form (Additional file 4) yielded similar, comparable results across the samples. Subscales showed moderate to high significant intercorrelations ($.32 <= r <= .71$, $p < .01$), with the exception of the subscales *Contamination & Washing* and *Ordering & Repeating* in the OCDS ($r = .28$, $p < .01$, low and significant correlation).

The correlations between the corresponding OCD-CA subscales and Total scores of the parent form and self-report form (Table 3) were generally moderate to high and significant ($.32 \leq r \leq .68$, $p < .01$), with the exception of the correlations of the corresponding subscales *Contamination & Washing* ($r = .27$, $p < .01$) and *Catastrophes & Injuries* ($r = .29$, $p < .01$) in the COS, which were significant but low.

Table 3 Correlation between corresponding scales in the parent and self-report form, CLIN, {OCDS}, (COS)

Scale	r parent-/self-report
Contamination & Compulsions	.68 {.65} (.27)
Catastrophes & Injuries	.47 {.44} (.29)
Checking	.55 {.54} (.32)
Ordering & Repeating	.53 {.43} (.46)
OCD Total	.54 {.44} (.32)

All correlations significant at $p < .01$; $n = 218$, {$n = 134$}, ($n = 367$)

Convergent and divergent validity

Correlations between the OCD-CA scales of the parent form and self-report form, respectively, and other scales assessing anxiety, depression, and internalizing and externalizing problems in the CLIN (divided into two age groups) are reported in Table 4. Predominantly moderate correlations were found between the parent-rated/self-rated *OCD-CA Total* scores on the one hand and parent-rated/self-rated *Internalizing Problems, Anxiety Symptoms* and *Depression Symptoms* on the other, while correlations with *Externalizing Problems* were lower. The correlations of the OCD-CA subscales with other ratings were predominantly close to those of the OCD-CA Total scores, with the exception of the subscale *Checking*, which had mainly lower correlations. Correlations in the other samples (OCDS, COS) were similar (Additional file 5, 6).

Correlations between the *self-rated OCD-CA Total score* and the clinician-rated *CY-BOCS-D Total score* were in the moderate range ($r = .53$) and higher than the correlations between *parent-rated OCD-CA scale scores* and the *CY-BOCS-D Total score*, which were not statistically significant (Additional file 7). The parent-rated OCD-CA scales correlated with the content-corresponding subscales of the CY-BOCS-D Checklist. These correlations were statistically significant ($p < .05$) in the small to moderate range ($.23 \leq r \leq .69$), with the exception of the correlation between the OCD-CA subscale *Catastrophes & Injuries* and the CY-BOCS-D Checklist subscale Repeating, ordering/arranging, hoarding and magical

Table 4 CLIN: Correlations between the OCD-CA scales and internalizing and externalizing problems and symptoms

OCD-CA scales	CBCL/YSR		FBB-/SBB-DES Total score	FBB-/SBB-ANZ Total score
	Internalizing problems	Externalizing problems		
Contamination & Washing	.54** [.32**] (.30**)	.02 [.17**] (.22**)	.49** [.22**] (.25**)	.54** [.39**] (.29**)
Catastrophes & Injuries	.64** [.46**] (.54**)	.02 [.24**] (.33**)	.56** [.30**] (.48**)	.63** [.67**] (.66**)
Checking	.19 [.30**] (.45**)	.04 [.16*] (.28**)	.18 [.21**] (.38**)	.24* [.50**] (.50**)
Ordering & Repeating	.33** [.34**] (.34**)	− .01 [.26**] (.19**)	.39** [.31**] (.32**)	.39** [.37**] (.35**)
OCD Total	.59** [.49**] (.52**)	.03 [.29**] (.34**)	.58** [.38**] (.46**)	.62** [.67**] (.57**)

Parent form/(self-report form); CLIN: 6–10 years old and [11–18 years old]

* $p < .05$, ** $p < .01$; CBCL: $n = 105$, FBB-DES: $n = 92$, FBB-ANZ: $n = 69$, [CBCL: $n = 224$, FBB-DES: $n = 203$, FBB-ANZ: $n = 164$]; (YSR: $n = 210$, SBB-DES: $n = 199$, SBB-ANZ: $n = 162$)

thinking (r = .12). No significant correlations were found on the non-corresponding subscales. The self-rated OCD-CA scale scores also correlated statistically significantly ($p < .01$) in the low to high range ($.30 \leq r \leq .75$) with the content-corresponding subscales of the CY-BOCS-D Checklist. Only two significant correlations were found for the non-corresponding subscales (Additional file 7).

Comparisons of means between samples and informants, age and gender effects

Table 5 presents the mean scores and standard deviations of the OCD-CA subscales and Total scale for the OCDS, non-OCD and COS for the age group 11–18 years. ANOVAs (one-way) revealed significant ($p < .001$) group differences on the OCD-CA Total and subscale scores between these groups. Post hoc comparisons showed that the OCDS scored significantly higher than the non-OCD and the COS on all scales in the parent form and the self-report form. Additionally, in the self-report form, the COS scored significantly higher ($p < .05$) than the non-OCD on the scale *Contamination & Washing* and the OCD *Total Score*.

Within the clinical sample of 6–10-year-old children, parent-rated OCD-CA scores were higher in the OCD subsample than in the non-OCD subsample (Additional file 8).

In the OCD subsample, no significant differences were found between the self-rated and the parent-rated OCD-CA total scores, while in the COS, self-reported OCD-CA total scores and subscale scores were higher than parent-reported scores. Within the OCD sample, higher parent ratings were found for *Contamination & Washing* and lower parent ratings emerged for *Checking* (Additional file 9).

Significant age effects were found within the CLIN (parent form) across all scales except for the scale *Ordering and Repeating*. Parents of 11–18-year-olds gave higher ratings than parents of 6–10-year-olds. Gender effects only emerged on the scale *Checking*. Parents of girls provided significantly higher ratings than parents of boys on this scale (Additional file 10). Within the OCD subsample, no age or gender effects were found on the OCD-CA subscales and the Total score, with the exception of the subscale *Contamination & Washing* (Additional file 11).

Within the CLIN (self-report form), significantly higher ratings for girls than for boys were found on the scales *Catastrophes & Injuries*, *Ordering & Repeating* and the *OCD Total scale*. No significant mean gender differences were found in the COS, with the exception of the subscale *Ordering & Repeating* in the parent form (Additional file 12).

Discussion

The aim of this study was to examine the psychometric properties of a new parent-rated and self-rated inventory for pediatric obsessive-compulsive disorder, the OCD-CA, across a clinical sample comprising an OCD subsample and a non-OCD clinical subsample, as well as a community sample. For the total clinical sample and

Table 5 Comparison of means between clinical OCDS and Non-OCD and COS (11–18-year-olds) (ANOVA)

Scale	Sample	Parent form			Self-report form		
		N	M (SD)	F	N	M (SD)	F
Contamination & Washing	OCDS	135	13.06 (10.91)[a]	128.32**	134	9.96 (8.39)[a]	36.23**
	Non-OCD	97	3.02 (5.59)[b]		84	3.81 (5.61)[bc]	
	COS	367	2.89 (4.05)[b]		367	5.54 (4.77)[bd]	
Catastrophes & Injuries	OCDS	135	9.28 (8.53)[a]	95.07**	134	9.72 (9.19)[a]	25.99**
	Non-OCD	97	2.80 (5.36)[b]		84	4.07 (4.87)[b]	
	COS	367	1.94 (3.50)[b]		367	5.49 (5.65)[b]	
Checking	OCDS	135	4.36 (5.08)[a]	44.60**	134	5.54 (5.43)[a]	12.88**
	Non-OCD	97	1.09 (2.31)[b]		84	2.55 (3.02)[b]	
	COS	367	1.43 (2.54)[b]		367	4.59 (4.03)[b]	
Ordering & Repeating	OCDS	135	6.10 (5.32)[a]	172.65**	134	5.56 (4.50)[a]	102.99**
	Non-OCD	97	0.95 (2.12)[b]		84	1.46 (2.54)[b]	
	COS	367	0.65 (1.67)[b]		367	1.51 (2.08)[b]	
OCD Total	OCDS	135	36.30 (20.70)[a]	198.11**	134	34.31 (23.26)[a]	49.38**
	Non-OCD	97	9.38 (14.69)[b]		84	13.51 (14.53)[bc]	
	COS	367	8.16 (11.01)[b]		367	19.39 (14.83)[bd]	

** $p < .001$

[a,b] Samples differ significantly at a level of < .001; [c,d] samples differ significantly at a level of < .05

the OCD subsample, confirmatory factor analyses were unable to replicate the factor structure found in a community sample in a previous study (Waclawiak 2006, unpublished). Thus, exploratory principal component analysis with varimax rotation was conducted, resulting in a four factor-solution: (1) *Contamination & Washing*, *(2) Catastrophes & Injuries*, *(3) Checking*, and *(4) Ordering & Repeating*. Internal consistency was acceptable to excellent for all subscales (except for the self-report subscale *Ordering & Repeating* in the COS) and for the *Total scale* across the samples (CLIN, OCDS, COS). Therefore, internal consistency is comparable to that of other OCD-specific assessment instruments examined in OCD patients (e.g. Scahill et al. [21]; Storch et al. [14]). In contrast to the CY-BOCS-CR [17], but in line with the OCI-CV [7, 42–44], good internal consistency was also confirmed in a community sample.

Intercorrelations between the subscales mainly lay at $r \leq .70$, with the exception of those between the subscales *Catastrophes & Injuries* and *Checking* ($r = .71$) and *Checking* and *Ordering and Repeating* ($r = .71$) in the COS (parent form: 11–18 years old), and between *Catastrophes & Injuries* and *Checking* ($r = .71$) in the CLIN (self-report). The intercorrelations of the self-report subscales in the OCD subsample were similar to or higher than those found in analyses of the OCI-CV [42].

Thus, subscales of the OCD-CA are generally sufficiently independent of each other [45].

The correlations between the corresponding OCD-CA subscales and Total scale of the parent form and self-report form were generally moderate to high and statistically significant, which is in line with results reported by Shafran et al. [15], Uher et al. [16], and Storch et al. [8].

In the OCD subsample, self-rated and parent-rated corresponding scales only demonstrated significant mean differences on two scales with opposite tendencies, while Storch et al. [8] demonstrated significantly lower self-rated scores than parent-rated scores in an OCD sample. However, significant mean differences between informants were found across all scales in the COS, with children/adolescents providing higher scores than their parents. It might be assumed that children/adolescents from a mainly healthy population have not discussed the assessed OCD symptoms with their parents, while those affected by OCD (and who have already visited outpatient departments) are likely to have communicated with their parents about their obsessions and compulsions. This finding might also indicate that some of the symptoms of OCD (e.g. obsessions) might be more difficult for other people to detect [12].

With regard to convergent validity, the self-reported OCD-CA Total score correlated moderately with the clinician-rated CY-BOCS-D Total Score in the OCD sample. In other studies, moderate to large correlations between pediatric OCD assessments and the CY-BOCS were only found when the assessed instruments also focused on more global severity assessment, unrelated to the number and type of symptoms (e.g. CHOCI Impairment Scale [15]). Instruments assessing OCD symptoms in different domains usually found lower correlations with the CY-BOCS Rating Scale Total Score [7, 42, 46]. In contrast, parent ratings on the OCD-CA did not correlate with the CY-BOCS-D Total Score. This difference between parent ratings and self-reports on the OCD-CA may be due to the fact that the clinicians rated the CY-BOCS-D primarily based on an interview with the child or adolescent.

The correlations between the OCD-CA scales and the corresponding CY-BOCS-D Checklist scales (also focusing on OCD symptom dimensions) were higher than correlations with the Total scale of the CY-BOCS-D Rating Scale.

Correlations between the OCD-CA Total scores (parent- and self-reported) and measures of internalizing problems, depressive symptoms and anxiety symptoms were predominantly moderate to high across samples, which is in line with other studies [7, 8, 46].

To sum up, correlations between the OCD-CA and the CY-BOCS-D as well as measures of internalizing problems, depressive symptoms and anxiety symptoms provided support for convergent validity.

Discriminant validity of the OCD-CA was confirmed by (negative) low to moderate correlations between the self-report/parent form and the subscale Externalizing Problems of the CBCL and YSR. Other studies found exclusively low correlations between pediatric OCD measures and the subscale Externalizing Problems of the CBCL (e.g. Storch et al. [8]).

Regarding discriminant validity, in line with expectation, the OCD-CA scores in the OCD subsample were significantly higher than those in the non-OCD subsample and the COS sample.

The strengths of the current study include the evaluation of a new pediatric OCD-specific assessment, including a self-report and a parent-report form, across three samples (CLIN, OCDS, COS) with large sample sizes. However, some limitations should also be mentioned: First, with regard to the samples, the COS was not a representative sample, and the CLIN consisted mainly of patients with tic disorders and OCD as the data were collected at the corresponding outpatient departments of the described institutions. Second, the exploratory factor analysis did not show an adequate fit for any clearly interpretable model for the self-rated OCD-CA. Furthermore, except for the SRMR, the values resulting from the confirmatory factor analysis did not indicate goodness

of fit of the model. Accordingly, the factorial validity of the self-report form could not be confirmed. Nevertheless, based on the parent report model, reliability and validity of the self-report form were confirmed. Overall, internal consistency, factorial validity (for the parent version only), and convergent und divergent validity of the new rating scale were confirmed. However, the OCD-CA should be examined further by other research teams based on the EBA criteria.

Conclusion

Due to the lack of instruments assessing self-rated and parent-rated symptoms across common OCD domains, this study aimed to evaluate a German version of the Padua Inventory-Washington State University Revision which enables to measure pediatric OCD and records both self- and parent report regarding OCD symptom domains. Accordingly, the OCD-CA supports multiple-informant assessment to achieve a comprehensive clinical picture of the disorder. Overall, the results of the present study show that the OCD-CA is a promising, valid and reliable instrument to assess self-rated and parent-rated pediatric OCD symptoms in clinical and non-clinical (community) populations.

Additional files

Additional file 1. Results from confirmatory factor analyses based on the four-factor solution by Waclawiak (2006; unpublished). The four-factor solution found by Waclawiak (2006; unpublished) is illustrated, and results from confirmatory factor analyses based on this four-factor solution and conducted in the CLIN and OCDS are summarized.

Additional file 2. Exploratory principal component analysis with varimax rotation, four-factor solution. Results of the four-factor solution of the OCD-CA parent- and self-report form are shown.

Additional file 3. Parent form: Intercorrelations between the subscales. Intercorrelations between the OCD-CA subscales in the parent form across the OCD subsample (OCDS), the combined clinical sample (CLIN) and the community sample (COS) are shown.

Additional file 4. Self-report form: Intercorrelations between the subscales. Intercorrelations between the OCD-CA subscales in the self-report form across the OCD subsample (OCDS), the combined clinical sample (CLIN) and the community sample (COS) are shown.

Additional file 5. OCDS: Correlations between the OCD-CA scales and internalizing and externalizing problems and symptoms. Correlations between the OCD-CA scales of the parent form and self-report form, respectively, and other scales assessing anxiety, depression, and internalizing and externalizing problems in the OCD subsample (divided into two age groups) are reported.

Additional file 6. COS: Correlations between the OCD-CA scales and internalizing and externalizing problems. Correlations between the OCD-CA scales of the parent form and self-report form, respectively, and other scales assessing internalizing and externalizing problems in the community subsample are reported.

Additional file 7. OCDS: Correlations between the OCD-CA scales of the parent form/(self-report form) and the CY-BOCS-D. Correlations between the self-rated OCD-CA/parent-rated OCD-CA and the clinician-rated CY-BOCS-D in the OCD subsample of the 11 to 18 years old are reported.

Additional file 8. Comparison of OCD-CA parent ratings in the OCDS and non-OCD in children aged 6 to 10 years old. OCD-CA parent ratings of the 6 to 10 years old children in the OCD subsample and the non-OCD clinical subsample (patients with other psychological disorders) are compared.

Additional file 9. Comparison of means between self- and parent-report form. In the OCD subsample and the community sample self-rated and parent-rated OCD-CA mean scale scores are compared.

Additional file 10. CLIN: Comparison of means between age groups and gender in the parent form (ANOVA). Results of ANOVA in the combined clinical sample regarding comparison of means between age groups (6–10 years old and 11–18 years old) and gender in the parent form are presented.

Additional file 11. OCDS: Comparison of means between age groups and gender in the parent form (ANOVA). Results of ANOVA in the OCD subsample regarding comparison of means between age groups (6–10 years old and 11–18 years old) and gender in the parent form are presented.

Additional file 12. Comparison of means between boys and girls. Results of ANOVA in the combined clinical sample, OCD subsample and community sample regarding comparison of means between gender in the parent and self-report form are reported.

Abbreviations

OCD-CA: OCD Inventory for Children and Adolescents; OCD: obsessive-compulsive disorder; CY-BOCS: Children's Yale-Brown Obsessive-Compulsive Scale; CY-BOCS-CR: Child-report version of the Children's Yale-Brown Obsessive-Compulsive Scale; CY-BOCS-PR: Parent-report version of the Children's Yale-Brown Obsessive-Compulsive Scale; CHOCI: Children's Obsessional Compulsive Inventory; CHOCI-R: Children's Obsessional Compulsive Inventory-Revised; SBB-ZWA: Self-rated German Symptom Checklist for Obsessive-Compulsive and Related Disorders; FBB-ZWA: Parent-rated German Symptom Checklist for Obsessive-Compulsive and Related Disorders; EBA: evidence-based assessment; OCI-CV: Obsessive Compulsive Inventory-Child Version; ZWIK: Zwangsinventar für Kinder und Jugendliche; PI-WSUR: Padua Inventory-Washington State University Revision; PI: Padua Inventory; CY-BOCS-D: German version of the Children's Yale-Brown Obsessive-Compulsive Scale; CBCL/6-18R: German version of the Child Behavior Checklist; YSR/11-18R: German version of the Youth Self Report; FBB-ANZ: Parent-rated German Symptom Checklist for Anxiety and Obsessive-Compulsive Disorders; SBB-ANZ: Self-rated German Symptom Checklist for Anxiety and Obsessive-Compulsive Disorders; ICD-10: tenth edition of the International Statistical Classification of Diseases and Related Health Problems; DSM-IV: fourth edition of the Diagnostic and Statistical Manual of Mental Disorders; DISYPS-II: Diagnostic System for the Assessment of Mental Disorders in Children and Adolescents based on the ICD-10 and DSM-IV; FBB-DES: Parent-rated German Symptom Checklist for Depressive Disorders; SBB-DES: Self-rated German Symptom Checklist for Depressive Disorders; OCDS: clinical subsample including patients diagnosed with obsessive-compulsive disorders; Non-OCD: clinical subsample including patients diagnosed with other psychological disorders than obsessive-compulsive disorders; COS: community sample; CLIN: combined sample including patients with obsessive-compulsive disorders and other psychological disorders; RMSEA: root mean square error of approximation; SRMR: standardized root mean square; CFI: comparative fit index; TLI: Tucker-Lewis index; KMO: Kaiser-Meyer-Olkin; MSA: measure of sampling adequacy; MAP: Velicer's minimum average partial.

Acknowledgements

Not applicable.

Authors' contributions

MD, HG and JA conceptualized the study. SKM collected and managed the data regarding the Community Sample. MD and JP supervised data management and analysis. JA and MD analyzed and JA, MD and HG interpreted the data. JA was the major contributor in writing the manuscript. HG and MD revised the manuscript critically. All authors read and approved the final manuscript.

Funding
This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Availability of data and materials
The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate
All procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.The present study was approved by the ethics committee of the University of Cologne. Informed consent was obtained from all individual participants included in the study.This article does not contain any studies with animals performed by any of the authors.

Consent for publication
Not applicable.

Competing interests
JA, MD and HG are authors of the evaluated questionnaire for which they receive royalties from Hogrefe. SKM and JP have no potential competing interests.

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Received: 2 January 2019 Accepted: 12 June 2019
Published online: 18 June 2019

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Publisher's Note

3 Evaluation of manual-based CBT within routine care

Adam, J., Goletz, H., Dengs, S., Klingenberger, N., Könnecke, S., Vonderbank, C., Hautmann, C., Hellmich, M., Plück, J. & Döpfner, M. (2022). Extended treatment of multimodal cognitive behavioral therapy in children and adolescents with obsessive-compulsive disorder improves symptom reduction: a within-subject design. *Child Adolesc Psychiatry Ment Health, 16(1):*99. https://doi.org/10.1186/s13034-022-00537-z

Adam *et al.*
Child and Adolescent Psychiatry and Mental Health (2022) 16:99
https://doi.org/10.1186/s13034-022-00537-z

Child and Adolescent Psychiatry and Mental Health

RESEARCH

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Extended treatment of multimodal cognitive behavioral therapy in children and adolescents with obsessive–compulsive disorder improves symptom reduction: a within-subject design

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Abstract

Background: Based on the current state of research regarding the treatment in pediatric obsessive–compulsive disorder (OCD), cognitive behavioral therapy (CBT) (in severe cases with additional pharmacotherapy) is considered as the first-line treatment according to internationally recognized guidelines. Research is mostly based on randomized controlled trials (RCTs; efficacy research). Thus, examined treatment conditions, especially the treatment duration, and patients' characteristics do not necessarily correspond to those found within routine care. Studies showed CBT packages as a whole to be efficacious, but less is known about the effects of individual CBT components. Furthermore, effects on comorbid symptoms or psychosocial impairment have been often neglected and different rater perspectives have been hardly considered in previous research.

Methods: This effectiveness study aimed to examine the effects of multimodal CBT in children, adolescents, and young adults (age 6–20 years) with OCD ($n = 38$) within routine care. Effects on obsessive–compulsive and co-existing symptoms were evaluated in a within-subject design by comparing changes during the assessment phase with 12-week standard treatment and with individually tailored extended treatment. Additionally, within the standard treatment, non-exposure treatment was compared to exposure treatment. Multi-informant assessment was applied, and the analyses included multilevel modeling and t-tests for pre-post comparisons.

Results: During the standard treatment and extended treatment, obsessive–compulsive symptoms, strain, and functional impairment significantly decreased. Moreover, a significant reduction of overall comorbid symptoms emerged, particularly regarding internalizing symptoms, including anxiety and depression. Comparisons of treatment components indicated that adding exposure with response prevention (ERP) has an additional positive effect. Clinical improvement and remission rates increased considerably when more treatment sessions were provided.

Conclusions: These results suggest that improvement after an initial 12-week course of treatment may not allow for the prediction of non-responders/non-remitters and for the termination of treatment. Overall, the findings show that results from randomized controlled trials are transferrable to routine care.

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Trial registration number This study was registered retrospectively at the German Clinical Trials Register (https://drks.de/search/de/trial/DRKS00030050).

Keywords: Obsessive–compulsive disorder, Cognitive behavioral therapy, Exposure with response prevention, Children, Adolescents, Treatment evaluation

Background

The number of treatment outcome studies for pediatric obsessive–compulsive disorder (OCD) has increased in recent years. On the whole, the study findings demonstrate the efficacy of cognitive behavioral therapy (CBT) and pharmacotherapy in reducing OCD symptoms as well as the superiority of CBT compared to medication alone [1–4]. A combination of pharmacotherapy and CBT has also shown better results than pharmacotherapy as an individual treatment [2, 5, 6]. Based on these studies, CBT (in severe cases with additional pharmacotherapy) is considered as the first-line treatment according to internationally recognized guidelines [7, 8].

Nevertheless, there are still some issues regarding treatment research in pediatric OCD that need to be further investigated:

Most of the reported CBT effects are based on change scores and effect sizes. These do not necessarily describe the clinical relevance of post-treatment OCD symptoms, such as end-state functioning and extent of recovery, which are of particular interest for patients, parents, and clinicians [9]. Some studies investigated remission, reporting rates of 50 to 60% (e.g. [3, 4]). Thus, despite large pre-post effect sizes, almost half of patients still suffer from OCD symptoms in a clinical range at post-treatment. Moreover, barely any studies have examined rates of reliable change as defined by Jacobson & Truax [10].

Furthermore, the majority of studies analyzed CBT packages as a whole, which include several treatment components like psychoeducation, exposure with response prevention (ERP), and parent management training. As such, there is only limited evidence regarding the "active ingredients" of the treatment (e.g. [11]). A small number of studies focusing on individual CBT components showed that both CBT variants (cognitive therapy and ERP) result in significant reductions in OCD severity [12–14]. In contrast to previous meta-analyses, Rosa-Alcázar et al. [15] demonstrated that the most promising treatment packages are those which include ERP, cognitive strategies and relapse prevention.

Meta-analyses by Abramowitz et al. [9]), Sánchez-Meca et al. [2] and Rosa-Alcázar et al. [15] found that CBT also has effects on co-existing symptoms such as anxiety and depression as well as functional impairment. However, most research projects only evaluated the treatment effects on OCD symptoms, while the effects on comorbid symptoms or psychosocial impairment have been neglected. It is especially important to investigate the effects of CBT on psychosocial functioning and other OCD-related problems given that patients with OCD suffer severe functional impairment [16] and show high comorbidity rates, especially with anxiety and depressive symptoms (e.g. [17, 18]).

Moreover, Abramowitz et al. [9] pointed out that most of the OCD-related outcome measures in studies published in recent years were interviewer-based. However, the need for multimodal assessment integrating parents' and patients' perspectives is stressed due to low correlations between these raters (e.g. [19, 20]).

The current state of research is mostly based on randomized controlled trials (RCTs; efficacy research), but efficacy research usually includes highly selective study samples. It is therefore questionable whether the samples examined are representative of "real patient populations", because among other things, patients are usually recruited through advertisements and not spontaneously referred for treatment [21]. Moreover, such trials exclude patients with comorbidities commonly associated with OCD like depressive disorders, or patients with previous treatment attempts [22]. Therefore, the following question arises: To what extent can results from efficacy studies be generalized to routine clinical practice? (e.g. [21, 23, 24]). There are at least some studies examining the effectiveness of manual-based CBT in clinical routine care, which demonstrated treatment effects on pediatric OCD comparable to those from RCTs [25–29].

As a further shortcoming, the treatments evaluated to date have a median duration of approximately 12 weeks and a total duration of around 15.5 h [15], which does not correspond to the average number of intervention hours (27 to 55) implemented in psychotherapy treatment as usual [30]. Therefore, effects of extended treatments are largely unknown, although some studies have reported evidence in this regard. For instance, Sánchez-Meca et al. [2] showed that the magnitude of interventions (total number of treatment hours) was associated with larger effect sizes. Several recent studies demonstrated the effect of extended treatments beyond a treatment length of 7 weeks [31] and 14 weeks [32] and on long-term stability [33]. The present study aimed to systematically examine the effects of (a) a standard 12-week treatment period with the two treatment phases non-exposure and

exposure CBT, and (b) an extended treatment option for children, adolescents, and young adults with insufficient symptom improvement. Thus, the CBT treatment was examined in a broad sample including the range of ages (6–20 years) encountered within routine care in children and adolescents. The standardized treatment was tailored individually regarding treatment duration and depending on age and problem constellation, the involvement of the parents and the chosen therapeutic materials could vary. The effects were assessed with (c) multiple-informant outcome measures regarding (d) OCD, comorbid symptoms and functional impairment in (e) patients referred to a university-based outpatient clinic (routine care). Additionally, clinical significance, including remission rates and reliable changes, were investigated.

Methods

Inclusion criteria

The study included children, adolescents and young adults (possible age: 4–21 years) with an ICD-10 diagnosis of OCD (F42.x), assessed in a semi-structured clinical interview with the patient and the parents using the *Diagnostic Checklist for OCD* (DCL-ZWA; [34]). Moreover, OCD severity had to be constantly high during the six-week assessment phase (t0-t1; see "Study design and treatment" section), as measured by the *German version of the Children's Yale-Brown Obsessive–Compulsive Scale* (*CY-BOCS-D*; [35]) and at least in a moderate range (CY-BOCS-D total score ≥ 16; [36]). OCD had to be the primary diagnosis according to clinical judgement, and other symptoms were not allowed to be more prominent, but cases with comorbid disorders were not excluded. Comorbid symptoms were assessed based on standardized questionnaires (see Table 1). OCD-specific medication was allowed if no change in dosage or medication was planned throughout the study period. Further inclusion criteria were IQ ≥ 80 assessed with a standardized intelligence test, outpatient CBT had, according to clinical judgement, to be feasible and indicated, no other psychotherapy was permitted throughout study participation, and patients and parents had to provide written informed consent for study participation.

Participant recruitment

Patients were recruited during their initial consultation at the School for Child and Adolescent Cognitive Behavior Therapy at the University Hospital Cologne. All patients had been referred to the outpatient clinic within routine care. If OCD symptoms were prominent, patients and parents were informed about the study and asked to participate. Patients were included between August 2010 and January 2016.

Study design and treatment

The effectiveness of the treatment (Additional file 1) was tested in a within-subject control group design (Additional file 2) comprising three phases, each with a duration of six weeks (phase 1: assessment; phase 2: standard

Table 1 Outcomes & multi-informant assessment

Assessment area and assessment points	Patient-rating	Parent-rating	Therapist-rating (administered by the treating therapist)
OCD symptoms & severity			
• Pre-treatment (t0 and t1) and after every sixth weekly treatment session (t2-tx)	OCD-CA	OCD-CA	CY-BOCS-D
• Pre- and post-treatment (t0 and tx)			DCL-ZWA
OCD-related individual problems			
• Pre-treatment (t0 and t1) and every treatment week from t1 onwards	OCD-PL Daily Observation	OCD-PL Daily Observation	
Functional impairment			
• Pre-treatment (t0 and t1) and every treatment week from t1 onwards	OCD-FL	OCD-FL	
Overall comorbid symptoms			
• Pre- and post-treatment (t1 and tx)	YSR	CBCL	
Anxiety			
• Pre- and post-treatment (t1 and tx)	SBB-ANZ	FBB-ANZ	
Depression			
• Pre- and post-treatment (t1 and tx)	SBB-DES	FBB-DES	

OCD-CA German OCD Inventory for Children and Adolescents, *CY-BOCS-D* German version of the Children's Yale-Brown Obsessive–Compulsive Scale, *DCL-ZWA* Diagnostic Checklist for OCD, *OCD-PL* OCD-related problem list, *OCD-FL* OCD-functional impairment list, *YSR* Youth Self Report/ 11-18R, *CBCL* Child Behavior Checklist/ 6-18R, *SBB-ANZ & FBB-ANZ* German Symptom Checklists for Anxiety Disorders and Obsessive–Compulsive Disorders, *SBB-DES & FBB-DES* German Symptom Checklists for Depressive Disorders

treatment consisting of phase 2a including non-exposure CBT and phase 2b including exposure CBT) and an extension phase based on the individual needs (phase 3) lasting for 6 to 42 weeks. Thus, the overall treatment period (phase 2 to phase 3) encompassed between 18 and 54 weekly sessions, lasting for 50 min each and up to about 100 min for ERP. Additionally, during the treatment, parent sessions were offered according to the individual problem constellation (every four weeks on average). As soon as the OCD symptoms were in a subclinical range (assessed with the CY-BOCS-D rating scale; [35]; cut-off score ≤ 7; [36, 37]), the treatment was completed with a further six weekly sessions, including multimodal relapse prevention (tx = individual treatment end). Accordingly, treatment end depended on the individual improvement; if OCD symptoms did not sufficiently decrease during CBT, treatment was terminated after 54 weeks (t10 = last possible assessment point).

The manual-based CBT was carried out by educationalists or psychologists who were undergoing three-or-five-year training in child and adolescent psychotherapy. All therapists received two-hour weekly group supervision by the manual's first author (HG).

Outcome measures

Table 1 presents an overview of the multi-informant assessment instruments used within the present study. A detailed description is provided in Additional file 3. The primary outcome was OCD severity, derived from the clinician-rated German version of the *Children's Yale-Brown Obsessive–Compulsive Scale* (*CY-BOCS-D*; [35]). OCD was diagnosed based on the clinician-rated *Diagnostic Checklist for OCD* (*DCL-ZWA*), which is part of the Diagnostic System for the Assessment of Mental Disorders in Children and Adolescents based on the ICD-10 and DSM-IV (DISYPS-II; [34]). Further secondary outcomes were parent- and patient-rated OCD symptoms (*German OCD Inventory for Children and Adolescents* [*OCD-CA*]; [38]), OCD-related individual problems (*OCD-related problem list* [*OCD-PL*]; [38] and *Daily Observation*; [39]), functional impairment (*OCD-functional impairment list,* [*OCD-FL*]; developed for the purpose of this study), overall comorbid symptoms (*Child Behavior Checklist/6-18R* [*CBCL/6-18R*] and *Youth Self Report/11-18R* [*YSR/11-18R*]; [40]), anxiety symptoms (*German Symptom Checklists for Anxiety Disorders and Obsessive–Compulsive Disorders* [*FBB-/SBB-ANZ*]; [34]), and depressive symptoms (*German Symptom Checklists for Depressive Disorders* [*FBB-/SBB-DES*]; [34]).

Statistical analyses

For the analyses, if less than 10% of the items were missing, only scale values were computed. Intention-to-treat analyses were conducted. First, the within-subject control group [41] design was analyzed using multilevel analysis [42, 43]. Two different analysis models were computed. Time was coded such that the growth rate reflected the estimated weekly change. Model 1 included six time periods, for which growth rates β (mean change per week) were calculated: (1) assessment (t0-t1), (2) standard treatment (t1-t3) and (3) extended treatment (t3-t10) divided into phase 3a (t3-t5), phase 3b (t5-t7), phase 3c (t7-t9), and phase 3d (t9-t10, last assessment point). Model 2 comprised seven time periods, as in contrast to model 1, standard treatment (t1-t3) was subdivided into non-exposure CBT (t1-t2) and exposure CBT (t2-t3).

To consider the variability of the individual OCD symptoms and related problems at pre-treatment, the models' intercept was assumed to be random and slopes were fixed. All cases, including incomplete cases, remained in the analyses [44]. This strategy has been shown to be appropriate if missing data are at random [45]. Data were collected until the individual end of treatment (tx, max. t10); observation was not carried forward until t10 (last possible assessment point) for every case. The criterion for missing data at random is fulfilled because the propensity for data to be missing is related to observed data, the CY-BOCS-D rating scale value [46]. Missing values were not imputed.

The objectives of the analyses (model 1) were to check whether changes during standard treatment ($\beta_{\text{standard treatment}}$) and optional extended treatment ($\beta_{\text{extended treatment}}$) were significant and whether changes during standard treatment ($\beta_{\text{standard treatment}}$) were significantly larger than changes during the assessment phase ($\beta_{\text{assessment}}$). Furthermore, growth rates $\beta_{\text{standard treatment}}$ and growth rates $\beta_{\text{extended treatment}}$ were compared for those patients who received extended treatment.

Moreover, the objective of the analyses with model 2 was to compare differential effects of CBT packages, hypothesizing that changes during exposure CBT in the standard treatment ($\beta_{\text{exposure CBT}}$) would be significantly larger than changes during the preceding non-exposure CBT ($\beta_{\text{non-exposure CBT}}$). T-tests were used for comparisons of assessment phase and standard treatment ($\beta_{\text{assessment}}$ vs. $\beta_{\text{standard treatment}}$) as well as for comparisons of CBT duration and contents ($\beta_{\text{standard treatment}}$ vs. $\beta_{\text{extended treatment}}$; $\beta_{\text{non-exposure CBT}}$ vs. $\beta_{\text{exposure CBT}}$).

Effect sizes (ES) were calculated using the growth rate multiplied by the length of respective time periods (the number of time periods / intervals) and divided by the initial standard deviations (t0).

Second, dependent t-tests for pre-post comparison were calculated if instruments were only used at pre-treatment (t0 or t1) and individual post-treatment (tx, see "Study design and treatment" section). In such cases,

ES were computed by calculating the difference between pre- and post-treatment divided by the initial standard deviation (t0 or t1).

Clinical significance was computed according to Jacobson and Truax [10] and Jacobson et al. [47]: (1) To evaluate whether OCD symptoms were in a clinical or subclinical range after 12 standard treatment weeks (t3) and at individual post-treatment (tx), OCD symptoms were classified as clinical or subclinical at these assessment points on the basis of available cut-off values (CY-BOCS-D: total score ≥ 8; [36, 37]). (2) To evaluate whether the extent of change between t0 and t3 as well as between t0 and tx was statistically reliable, the reliable change index (RCI; Jacobson & Truax [10]) was calculated. Subsequently, patients were classified into six groups regarding their change during treatment and status at post-treatment: (1) worsened & clinical range, (2) unchanged & clinical range, (3) worsened & subclinical range, (4) unchanged & subclinical range, (4) improved & clinical range, and (6) improved & subclinical range.

Results

Participants

The participant flow of the study is shown in Fig. 1. A total of 38 patients were eligible to participate, 33 of whom finished treatment per protocol.

Table 2 summarizes the demographic and clinical characteristics of the sample. Patients were aged 6 to 20 years ($M = 13.28$, $SD = 3.56$) and 42.1% were boys. On average, OCD symptoms were in a severe range ($M = 25.05$, $SD = 4.26$ [36];). Four patients were receiving OCD-specific medication and 23.7% had comorbid disorders.

Treatment effects

The overall treatment duration (phase 2 to phase 3, see "Study design and treatment" section) of patients who finished treatment per protocol ranged from 18 to 54 weekly sessions ($M = 41.09$, $SD = 14.24$). Thus, all patients needed extended treatment (see Additional file 4). Table 3 shows results for the slopes (growth rates) and effect sizes of the assessment, standard treatment, and extended treatment phases as well as results of the comparisons of these phases with one another regarding OCD symptoms, strain, and impairment.

On the primary outcome (CY-BOCS-D rating scale), the clinician-rated total OCD severity (see also Fig. 2) did not significantly decrease during the assessment (*A*) phase ($\beta = -0.34$, $p = 0.056$, $ES = -0.48$). During standard treatment (*ST*), there was a significant mean decrease per week ($\beta = -0.54$, $p \leq 0.001$) and the effect ($ES = -1.53$, $\Delta\ ES_{A\text{-}ST} = 1.05$) was considerably larger compared to the assessment phase. Considering the entire extended treatment (*ET*; t3-t10), the effect was also large (ES = − 1.65, $\Delta\ ES_{ST\text{-}ET} = 0.12$) between treatment weeks 12 and 54 (phase 3a—phase 3d). A more detailed analysis, however, revealed that only during treatment weeks 12 to 24 (phase 3a) did clinician-rated OCD severity significantly decrease ($\beta = -0.42$, $p \leq 0.001$), with a large effect size (ES = − 1.19). Growth rates (mean changes per week) and effects during further extended treatment (phase 3b – phase 3d) were only (very) small. Comparable results emerged for the CY-BOCS-D subscales assessing clinician-rated obsession and compulsion severity.

Complementary analyses on secondary outcomes revealed the following findings (Table 3, Additional file 5):

During the assessment phase, growth rates ($\beta_{assessment}$) of patient- and parent-rated OCD-specific outcomes mainly did not differ significantly from zero, indicating that patient- and parent-rated OCD symptoms (OCD-CA), OCD frequency (OCD-PL), extent of negative emotions, and OCD duration (Daily Observation) were relatively stable during the assessment phase without any treatment. However, psychosocial impairment resulting from OCD symptoms (OCD-PL, OCD-FL, Daily Observation) decreased significantly during the assessment phase (with the exception of parent-rated psychosocial impairment assessed with the OCD-PL). With regard to strain resulting from OCD symptoms, a significant decrease during the assessment phase was found in parent-ratings, while the results of patient-ratings were inconsistent (no significant change, significant decrease) across measures (OCD-PL, Daily Observation).

During standard treatment, patient- and parent-rated total OCD symptoms (OCD-CA) showed a significant reduction. Regarding extended treatment, a significant reduction of patient- and parent-rated OCD symptoms was only found during treatment weeks 12 to 24 (phase 3a), comparable to clinical ratings. Effects during standard treatment and extended treatment were smaller than clinician-rated effects on OCD symptoms and mainly in the small to moderate range. On all other secondary outcomes, significant decreases during standard treatment were found. Moreover, for almost all secondary outcomes, significant decreases were also apparent during the first 12 extended treatment weeks (phase 3a). However, OCD-related problems only partially significantly decreased during further extended treatment phases, and no further significant decrease was found during treatment weeks 48 to 54 (phase 3d). While effect sizes during standard treatment were predominantly in the moderate to large range, effect sizes during separate extended treatment phases were mainly small to moderate.

Despite (considerably) larger effect sizes on almost all secondary outcomes during standard treatment

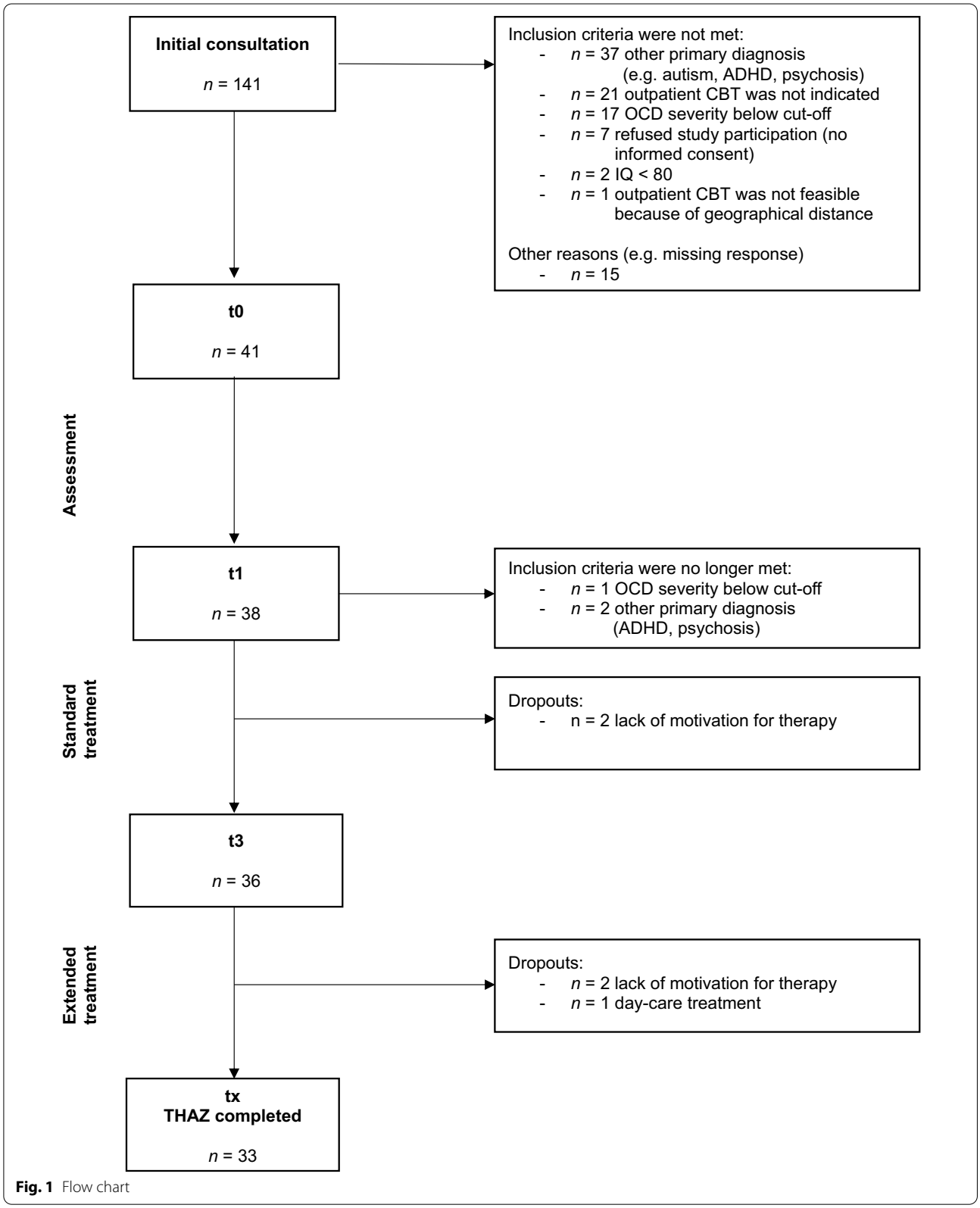


Fig. 1 Flow chart

Table 2 Description of the sample (n = 38)

Age in years: mean (*SD*), range	13.28 (3.56), 6.50–20.17
Male gender: *n* (%)	16 (42.1)
OCD diagnosis: *n* (%)	38 (100)
• Predominantly obsessional thoughts or ruminations (F42.0)	3 (7.9)
• Predominantly compulsive acts, obsessional rituals (F42.1)	8 (21.1)
• Mixed obsessional thoughts and acts (F42.2)	27 (71.1)
OCD severity (CY-BOCS-D rating scale total score): mean (*SD*), range	25.05 (4.26), 17–33
Comorbid diagnoses: *n* (%)	9 (23.7)
• Mild or moderate depressive episode (F32.0, F32.1)	5 (13.2)
• Attention deficit disorder (F98.8)	2 (5.3)
• Combined vocal and multiple motor tic disorder (F95.2)	1 (2.6)
• Separation anxiety disorder of childhood (F93.0)	1 (2.6)
OCD-specific medication: *n* (%)	4 (10.5)

compared to the assessment phase (Δ $ES_{A\text{-}ST}$), significant differences in growth rates (mean change per week) were only found for some outcomes (parent-ratings of OCD symptom frequency and psychosocial impairment [OCD-PL], patient-rated extent of negative emotions on weekdays, patient-rated strain on weekdays and weekends, patient- and parent-rated OCD duration on weekdays, and patient-rated OCD duration on weekends [Daily Observation]). Conversely, on several outcomes regarding strain and psychosocial impairment, the mean change per week (growth rate) was even significantly larger during assessment than during the standard treatment phase (patient-rated strain [OCD-PL], patient- and parent-rated psychosocial impairment [OCD-FL, OCD-PL], parent-rated extent of negative emotions on weekends, and parent-rated strain on weekdays and weekends [Daily Observation]).

The comparison of the course of patient-rated and parent-rated OCD symptoms and related problems during standard treatment and extended treatment (phase 2 vs. phase 3a-3d) revealed the following: Considering the entire extended treatment phase, additional absolute effects were comparable to the absolute effects of the standard treatment. Considering extended treatment phases separately, the only phase that partially kept up with the mean change per week and absolute effects of the standard treatment was the extended treatment phase 3a (treatment weeks 12–24). On the whole, improvement (mean change per week) during extended treatment phases 3b-3d (treatment weeks 24–54) was significantly smaller than improvement during the standard treatment phase.

Overall, both for the primary outcome and for most complementary analyses of OCD-related variables, moderate to strong effects were found during the standard treatment phase, while small to moderate effects emerged during the extended treatment phases. Most of the improvement in OCD symptoms and related problems occurred during standard treatment and the first 12 extended treatment weeks. During the subsequent extended treatment weeks (phase 3b – phase 3d), the mean change per week and therefore change and absolute effects were mainly much smaller.

Further complementary analyses of pre- and post-ratings (Table 4) of comorbid symptoms showed a significant reduction across the entire treatment phase (with individually tailored treatment duration) on the following: clinician-rated OCD-associated personality traits; patient- and parent-rated overall comorbid problems (CBCL, YSR total problems), and particularly internalizing problems (CBCL, YSR); patient- and parent-rated anxiety and depressive symptoms according to ICD-10/DSM-IV; and parent-rated competences (FBB-/SBB-ANZ, FBB-/SBB-DES), with effect sizes in the small to large range.

Results of comparisons between CBT components ($\beta_{\text{non-exposure CBT}}$ vs. $\beta_{\text{exposure CBT}}$) are presented in Additional files 6, 7 and 8.

On the primary outcome (CY-BOCS-D rating scale), there was a significant decrease in clinician-rated total OCD severity during both phases (non-exposure CBT [NE]: $\beta = -0.46$, $p = 0.016$; exposure CBT [E]: $\beta = -0.62$, $p \leq 0.001$), while no significant difference regarding growth rates was found. However, considering the total effects, compared to the moderate effect during non-exposure CBT ($ES = -0.65$), a large effect during exposure CBT ($ES = -0.87$, $\Delta\ ES_{NE\text{-}E} = 0.22$) was found. Regarding CY-BOCS-D subscales, there were no differences in growth rate and effect sizes on the clinician-rated obsession severity subscale, but differences did emerge on the clinician-rated compulsion severity

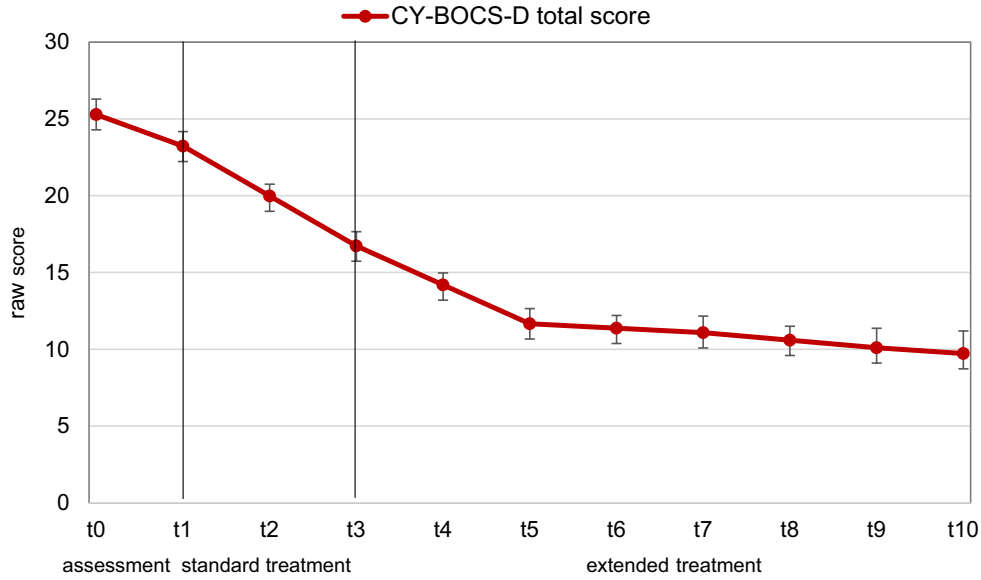
Table 3 Results of multilevel analyses: Assessment (t0-t1) vs. standard treatment (t1-t3) vs. extended treatment (t3-t10)

		Change during assessment		**Change during standard treatment**		**Change during extended treatment**							
		Phase 1: t0-t1		**Phase 2 and 3: t1-t3**		**Phase 3a: t3-t5**		**Phase 3b: t5-t7**		**Phase 3c: t7-t9**		**Phase 3d: t9-t10**	
Outcome	***n***	***β (CI 95%)***	***ES***	***β (CI 95%)***	***ES***	***β (CI 95%)***	***ES***	***β (CI 95%)***	***ES***	***β (CI 95%)***	***ES***	***β (CI 95%)***	***ES***
CY-BOCS-D rating scale													
	38	**− 0.34[a] (− 0.69 to 0.01)**	**− 0.48**	**− 0.54***[b,c] **(− 0.72 to − 0.36)**	**− 1.53**	**− 0.42***[a,c] **(− 0.61 to − 0.24)**	**− 1.19**	**− 0.05[b,d] (− 0.25 to 0.16)**	**− 0.14**	**− 0.08[b,d] (− 0.33 to 0.16)**	**− 0.23**	**− 0.06[a,c] (− 0.62 to 0.49)**	**− 0.09**
Obsession severity	38	− 0.18[a] (− 0.40 to 0.04)	− 0.25	− 0.23*[a,c] (− 0.35 to − 0.12)	− 0.66	− 0.17*[a,c] (− 0.28 to − 0.05)	− 0.47	− 0.07[a,d] (− 0.19 to 0.06)	− 0.18	0.01[b,d] (− 0.14 to 0.16)	0.03	− 0.13[a,c] (− 0.47 to 0.21)	− 0.18
Compulsion severity	38	− 0.18*[a] (− 0.36 to − 0.00)	− 0.49	− 0.29*[b,c] (− 0.38 to − 0.20)	− 1.56	− 0.22*[a,c] (− 0.32 to − 0.13)	− 1.21	0.01[b,d] (− 0.09 to 0.11)	0.05	− 0.06[b,d] (− 0.18 to 0.07)	− 0.31	− 0.05[a,c] (− 0.32 to 0.23)	− 0.12
OCD-CA													
Total OCD symptoms	[31]	[− 0.32[a]] [(− 1.20 to 0.56)]	[− 0.11]	[− 0.53*[a,c]] [(− 0.97 to − 0.10)]	[− 0.38]	[− 0.65**[a,c]] [(− 1.09 to − 0.21)]	[− 0.46]	[− 0.42[a,c]] [(− 0.91 to 0.06)]	[− 0.30]	[− 0.03[a,c]] [(− 0.59 to 0.53)]	[− 0.02]	[0.70[a,c]] [(− 0.61 to 2.01)]	[0.25]
	{37}	{− 0.72[a]} {(− 1.48 to 0.04)}	{− 0.25}	{− 0.56**[a,c]} {(− 0.96 to − 0.16)}	{− 0.40}	{− 0.73***[a,c]} {(− 1.13 to − 0.32)}	{− 0.51}	{− 0.03[b,d]} {(− 0.48 to 0.43)}	{− 0.02}	{− 0.09[b,c]} {(− 0.62 to 0.45)}	{− 0.06}	{0.25[a,c]} {(− 0.98 to 1.49)}	{0.09}
OCD-related problem list													
Frequency	[31]	[− 0.04*[a]] [(− 0.08 to − 0.00)]	[− 0.23]	[− 0.05***[a,c]] [(− 0.06 to − 0.04)]	[− 0.57]	[− 0.04***[a,c]] [(− 0.05 to − 0.03)]	[− 0.47]	[− 0.02***[b,d]] [(− 0.03 to − 0.01)]	[− 0.25]	[− 0.01[b,d]] [(− 0.03 to 0.00)]	[− 0.17]	[0.06**[b,d]] [(0.02 to 0.10)]	[0.36]
	{32}	{− 0.01[a]} {(− 0.05 to 0.04)}	{− 0.04}	{− 0.06***[b,c]} {(− 0.08 to − 0.04)}	{− 0.90}	{− 0.04***[b,d]} {(− 0.06 to − 0.02)}	{− 0.62}	{0.00[a,d]} {(− 0.02 to 0.02)}	{− 0.05}	{− 0.01[a,d]} {(− 0.03 to 0.01)}	{− 0.16}	{− 0.02[a,c]} {(− 0.08 to 0.05)}	{− 0.14}
Strain	[31]	[− 0.12**[a]] [(− 0.21 to − 0.03)]	[− 0.39]	[− 0.07***[b,c]] [(− 0.10 to − 0.04)]	[− 0.46]	[− 0.11***[a,d]] [(− 0.14 to − 0.09)]	[− 0.73]	[− 0.04**[b,c]] [(− 0.07 to − 0.01)]	[− 0.28]	[− 0.01[b,d]] [(− 0.05 to 0.02)]	[− 0.09]	[0.01[b,d]] [(− 0.05 to 0.16)]	[0.18]
	{32}	{− 0.13*[a]} {(− 0.25 to − 0.01)}	{− 0.49}	{− 0.11***[a,c]} {(− 0.15 to − 0.06)}	{− 0.81}	{− 0.10***[a,c]} {(− 0.14 to − 0.06)}	{− 0.77}	{0.00[b,d]} {(− 0.04 to 0.05)}	{0.04}	{− 0.03[b,d]} {(− 0.09 to 0.03)}	{− 0.25}	{0.09[b,d]} {(− 0.07 to 0.25)}	{0.34}
Psychosocial impairment	[30]	[− 0.06***[a]] [(− 0.10 to − 0.03)]	[− 0.36]	[− 0.03***[b,c]] [(− 0.04 to − 0.02)]	[− 0.36]	[− 0.02***[b,c]] [(− 0.03 to − 0.01)]	[− 0.25]	[− 0.01[b,d]] [(− 0.02 to 0.01)]	[− 0.06]	[0.00[b,d]] [(− 0.01 to 0.01)]	[0.00]	[0.00[b,c]] [(− 0.03 to 0.04)]	[0.03]
	{36}	{− 0.03[a]} {(− 0.07 to 0.01)}	{− 0.26}	{− 0.05***[b,c]} {(− 0.07 to − 0.04)}	{− 0.82}	{− 0.02*[b,d]} {(− 0.03 to − 0.00)}	{− 0.28}	{0.00[b,d]} {(− 0.02 to 0.02)}	{0.05}	{0.00[b,d]} {(− 0.02 to 0.03)}	{0.04}	{− 0.04[a,c]} {(− 0.10 to 0.02)}	{− 0.29}

Table 3 (continued)

		Change during assessment		Change during standard treatment		Change during extended treatment							
		Phase 1: t0-t1		Phase 2 and 3: t1-t3		Phase 3a: t3-t5		Phase 3b: t5-t7		Phase 3c: t7-t9		Phase 3d: t9-t10	
Outcome	***n***	***β (CI 95%)***	***ES***	***β (CI 95%)***	***ES***	***β (CI 95%)***	***ES***	***β (CI 95%)***	***ES***	***β (CI 95%)***	***ES***	***β (CI 95%)***	***ES***
OCD-functional impairment list													
Total psychosocial impairment	[30]	[− 1.35***[a]] [(− 1.64 to − 1.05)]	[− 0.57]	[− 0.36***[b,c]] [(− 0.46 to − 0.27)]	[− 0.31]	[− 0.26***[b,d]] [(− 0.35 to − 0.18)]	[− 0.22]	[− 0.10*[b,d]] [(− 0.19 to − 0.01)]	[− 0.09]	[− 0.17**[b,d]] [(− 0.28 to − 0.05)]	[− 0.14]	[0.27[b,d]] [(− 0.08 to 0.61]	[0.11]
	{35}	{− 1.52***[a]} {(− 2.01 to − 1.03)}	{− 0.80}	{− 0.56***[b,c]} {(− 0.75 to − 0.37)}	{− 0.59}	{− 0.19*[b,d]} {(− 0.38 to 0.00)}	{− 0.20}	{− 0.03[b,d]} {(− 0.25 to 0.18)}	{− 0.04}	{− 0.43**[b,c]} {(− 0.70 to − 0.16)}	{− 0.45}	{0.13[b,c]} {(− 0.60 to 0.86)}	{0.07}

n sample size, *β* slope, *CI* confidence interval, *ES* effect size; bold values show the results of the primary outcome; clinical rating, [self-report], {parent report};*p≤.05, **p≤.01, ***p≤.001; [a,b,cd]slopes with superscripts (a) do not differ significantly from assessment phase, slopes with superscript (b) differ significantly at a level of ≤.05 from assessment phase; slopes with superscripts (c) do not differ significantly from standard treatment phase, slopes with superscript (d) differ significantly at a level of ≤.05 from standard treatment phase



	t0	t1	t2	t3	t4	t5	t6	t7	t8	t9	t10
EMM	25.29	23.23	19.98	16.73	14.19	11.66	11.37	11.08	10.59	10.10	9.72
SE	1.00	0.95	0.77	0.93	0.78	0.99	0.83	1.08	0.91	1.27	1.47

Fig. 2 Estimated course of OCD severity (CY-BOCS-D). *EMM* estimated marginal mean, *SE* standard error

Table 4 Results of complementary pre-post comparisons on comorbid symptoms

Outcome		*n*	Pre *M (SD)*	Post *M (SD)*	*t*	*ES*
Personality traits DCL-ZWA	Personality traits	20	0.90 (0.59)	0.32 (0.54)	3.59**	− 0.98
Overall comorbid symptoms [YSR] {CBCL}	Internalizing problems	[22]	[9.91 (9.33)]	[7.23 (8.82)]	[2.38*]	[− 0.29]
		{25}	{12.60 (7.36)}	{7.96 (6.94)}	{3.85***}	{− 0.63}
	Externalizing problems	[22]	[6.41 (4.94)]	[5.95 (7.44)]	[0.46]	[− 0.09]
		{25}	{8.20 (5.45)}	{6.04 (6.62)}	{1.84}	{− 0.40}
	Total problems	[22]	[30.68 (20.95)]	[22.86 (22.43)]	[2.91**]	[− 0.37]
		{25}	{35.96 (19.48)}	{24.72 (20.33)}	{3.58**}	{− 0.58}
Anxiety symptom severity & competences [SBB-ANZ] {FBB-ANZ}	Total anxiety	[24]	[0.54 (0.42)]	[0.29 (0.29)]	[4.03***]	[− 0.60]
		{26}	{0.57 (0.39)}	{0.33 (0.33)}	{4.13***}	{− 0.62}
	Competences	[24]	[1.60 (0.62)]	[1.60 (0.81)]	[0.04]	[0.00]
		{25}	{1.56 (0.51)}	{1.82 (0.63)}	{− 2.84**}	{0.51}
Depressive symptom severity & competences [SBB-DES] {FBB-DES}	Total depressive symptoms	[25]	[0.39 (0.42)]	[0.21 (0.34)]	[3.47**]	[− 0.43]
		{27}	{0.39 (0.25)}	{0.23 (0.22)}	{3.81***}	{− 0.64}
	Competences	[25]	[1.96 (0.77)]	[1.98 (0.86)]	[− 0.12]	[0.03]
		{27}	{1.75 (0.63)}	{1.96 (0.68)}	{− 3.19**}	{0.33}

n sample size, *M* mean, *SD* standard deviation, *t* t-test for dependent samples, *ES* effect size, clinical rating, [self-report], {parent report}, ***$p \leq 0.001$ **$p \leq 0.01$ *$p \leq 0.05$

subscale, suggesting that exposure CBT has particular effects on compulsions.

When significant differences in secondary outcomes were found between phases, these were in favor of the exposure CBT (with the only exception being patient-rated duration of OCD symptoms on weekdays with the Daily Observation). The clearest result emerged regarding the extent of negative emotions (Daily Observation; Additional file 7): In particular, the decrease in the extent of negative emotions was significantly larger in patient- and parent-ratings during exposure CBT than during non-exposure CBT.

Clinical significance and reliable change

The mean percentage reduction in the CYBOCS-D rating scale total score (primary outcome) from baseline (t0; $M=25.05$, $SD=4.26$) to post-treatment (tx, individual treatment end; $M=7.82$, $SD=6.39$) was 68.8%. After 12 treatment weeks (t3, $M=16.53$, $SD=6.66$), percentage reduction in the CYBOCS-D rating scale total score was 34%.

As large effect sizes do not necessarily indicate subclinical posttest symptomatology, clinical significance was investigated in order to assess patients' end-state functioning and recovery. The results are presented in Fig. 3.

None of the children and adolescents showed a clinically significant deterioration regarding clinician-rated OCD severity (CY-BOCS-D rating scale) after the standard treatment and at the individual end of treatment. While after the first 12 treatment weeks, 42.9% of the sample were still in a clinical range and unchanged, after extended treatment, this proportion lay at only 12.1%.

On the clinician-rated CY-BOCS-D rating scale, 57.1% of the sample were significantly improved after standard treatment, and 8.6% of the sample were also in a subclinical range. After extended treatment, the improvement rate (87.9%) and especially normalization (57.6% subclinical) was considerably higher.

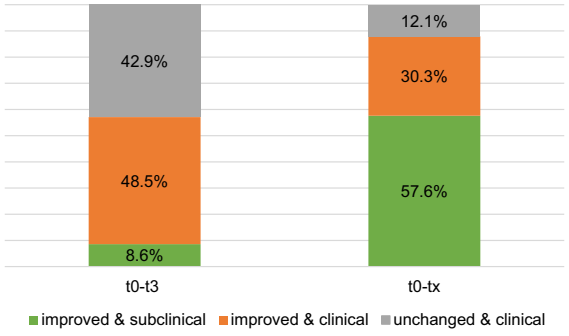


Fig. 3 Clinical significance of change in clinician-rated OCD severity (CY-BOCS-D)

Discussion

The present effectiveness study aimed to investigate the course of OCD symptoms as well as psychosocial impairment and comorbid symptoms during a cognitive behavioral intervention for children and adolescents diagnosed with OCD within a regular outpatient setting. A special focus was on the effects of differential CBT packages (non-exposure CBT vs. exposure CBT) and individually tailored treatment duration (standard treatment vs. extended treatment). Moreover, clinical significance was investigated.

Overall, the results revealed a significant improvement during the standard treatment phase (first 12 weekly sessions) and the first extended treatment phase (treatment weeks 12–24) on the primary outcome (clinician-rated CY-BOCS-D) and on almost all OCD-specific and OCD-related outcomes, including functional impairment and strain. Effect sizes during the standard treatment phase and the entire extended treatment phase were mainly moderate to large, while effects during separate extended treatment phases were small to moderate. Benchmarking (Table 5) shows that changes in clinician-rated total OCD symptoms during standard treatment ($ES=1.53$) and the entire extended treatment ($ES=1.65$) are widely comparable to within-group effect sizes reported in other effectiveness studies [26–28] and to effect sizes that considered effects of control groups reported in efficacy studies [2, 3]. In contrast to other effectiveness studies [25–28] as well as efficacy studies [2, 3], the outcome measures in the current study were not only clinician-administered. Rather, we computed effect sizes separately for the clinician-, patient-, and parent-ratings. With regard to OCD symptoms, changes based on clinician-ratings ($ES=-1.53$, -1.65; overall: $ES=-3.18$) were considerably higher than those based on patient-ratings ($ES=-0.38$, -0.53; overall: $ES=-0.91$) and parent-ratings ($ES=-0.40$, -0.50; overall: $ES=-0.90$). Rosa-Alcázar et al. [15] found comparable differences in their meta-analysis when computing effect sizes separately for rater perspectives (clinician-report: $ES=2.02$; patient-report: $ES=0.82$). There are several potential explanations for these findings. Patients might show dissimulation tendencies or may not report their symptoms accurately due to embarrassment about their OCD, in particular at pre-treatment [20]. Parents may underestimate their children's symptoms, because some symptoms (in particular obsessions) are more difficult for them to notice [48]. Furthermore, as the treating therapist in the present study was also the clinician rater, a rater bias may have occurred due, for instance, to justifying one's own

Table 5 Benchmarking: Comparison of study results with findings of different efficacy studies (meta-analyses) and effectiveness studies

	Efficacy studies (Meta-analyses)		Effectiveness studies				
Study	**Sánchez-Meca et al. [2]**	**McGuire et al. [3]**	**Valderhaug et al. [25]**	**Nakatani et al. [26]**	**Farrell et al. [27]**	**Torp et al. [28]**	**Current study**
Completers %	$M = 91.4$ (treatment group)	Range of means: 73 – 100 (treatment group)	86.0	Not available	94.3	89.6	86.8
Mean reduction in CY-BOCS total score %	Not investigated	Not investigated	After 12 sessions: 60.6	After 5–28 sessions: 51.8	After 8–14 sessions: 61	After 14 sessions: 52.9 (SD = 30.9)	After 12 sessions: 34.0 after 18–54 sessions: 68.8
Effect size on total OCD symptoms	Global: after $M = 11.8$ weeks: 1.7[1]	Clinician-rated: after 9–14 sessions: 1.2[1]	Clinician-rated: after 12 sessions: 3.5[2]	Clinician-rated: after 5–28 sessions: 2.3[2]	Clinician-rated: after 8–14 sessions: 2.1[2]	Clinician-rated: after 14 sessions: 1.6[2]	Clinician-rated: after 12 sessions: 1.5[2] after further 42 sessions: 1.7[2] child-rated: after 12 sessions: 0.4[2] after further 42 sessions: 0.5[2] parent-rated: after 12 sessions: 0.4[2] after further 42 sessions: 0.5[2]
Remission criteria & rate %	Not investigated	Criteria: no consistent remission criteria among RCTs (e.g. CY-BOCS $\leq$ 10 or CY-BOCS $\leq$ 14)	Criteria: CY-BOCS $\leq$ 9	Criteria: CY-BOCS $\leq$ 11	Criteria: CY-BOCS $\leq$ 10	Criteria: CY-BOCS $\leq$ 10	Criteria: CY-BOCS $\leq$ 7 (CY-BOCS $\leq$ 10)
		Remission rate: after 9–14 sessions: 57	Remission rate: after 12 sessions: 50	Remission rate: after 5–28 sessions: 60	Remission rate: after 8–14 sessions: 63	Remission rate: after 14 sessions: 49.4	Remission rate: after 12 sessions: 8.6 (16.7) after 18–54 sessions: 57.6 (57.6)
Reliable change % based on CY-BOCS	Not investigated	Not investigated	Not investigated	Not investigated	After 8–14 sessions: 86	After 14 sessions: 70.1	After 12 sessions: 57.1 after 18–54 sessions: 87.9
Effects on comorbid symptoms	After $M = 11.8$ weeks: Anxiety: Global: $ES = 0.6$[1] ($n = 6$ studies) Depression: Global: $ES = 0.4$[1] ($n = 6$ studies)	Not investigated	Not investigated	Not investigated	After 8–14 sessions: Overall comorbid symptoms: Clinician-rated: 45% reduction in secondary diagnoses Anxiety: Child-rated: $ES = 0.2$[2], 0.4[2] Depression: Child-rated: $ES = 0.3$[2]	Not investigated	After 18–54 sessions: Overall comorbid symptoms: child-rated: $ES = 0.4$[2] parent-rated: $ES = 0.6$[2] Anxiety: child-rated: $ES = 0.6$[2] parent-rated: $ES = 0.6$[2] Depression: clinician-rated: $ES = 0.5$[2] child-rated: $ES = 0.4$[2] parent-rated: $ES = 0.6$[2]

Table 5 (continued)

Study	Efficacy studies (Meta-analyses)		Effectiveness studies				
	Sánchez-Meca et al. [2]	**McGuire et al. [3]**	**Valderhaug et al. [25]**	**Nakatani et al. [26]**	**Farrell et al. [27]**	**Torp et al. [28]**	**Current study**
Effects on psychosocial impairment	Global: after $M = 11.8$ weeks: $ES = 0.8$[1] ($n = 4$ studies)	Not investigated	Child-rated: after 12 sessions: 49.6% mean reduction Parent-rated: after 12 sessions: 60.8% mean reduction	Not investigated	Child-rated: after 8–14 sessions: $ES = 0.5$[2] Parent-rated: after 8–14 sessions: $ES = 0.5$[2]	Not investigated	Child-rated: after 12 sessions: $ES = 0.3$[2] after further 42 sessions: $ES = 0.3$[2] Parent-rated: after 12 sessions: $ES = 0.6$[2] after further 42 sessions: $ES = 0.6$[2]

[1] Standardized mean difference between the change scores of the treatment and the control groups, [2]Standardized mean difference pre-post-treatment

efforts but also due to higher sensitivity of therapist-rating. Moreover, differences between outcome measures have to be taken into account. While the clinician-rated CY-BOCS-D focuses on global OCD severity (including impairment, resistance and control), the patient- and parent-rated OCD-CA focuses on OCD symptoms in different domains without considering impairment, resistance and control [49].

While changes in clinician-rated OCD symptoms during standard treatment are comparable to benchmarks (see Table 5), the mean reduction in the CY-BOCS total score (34%) is considerably lower than the values reported in the other effectiveness studies (e.g. 60.6%; [25]). However, the mean reduction in the CY-BOCS-D total score reached at individual end of treatment (68.8%) is even higher than the values reported in other effectiveness studies (Table 5).

It is generally problematic to compare remission rates across different studies. Despite efforts to standardize the criteria for remission (e.g. [50, 51]), the criteria employed vary across studies. The CY-BOCS cut-off criterion of ≤ 7 used in the current study is stricter than that used in other studies. Thus, we additionally computed the remission rate based on a CY-BOCS cut-off criterion of ≤ 10 for comparison. To summarize, even with this less strict cut-off, the remission rate after standard treatment was considerably lower than those derived from studies within benchmarking, but the remission rates at the individual end of treatment were comparable (see Table 5). Reliable change after individual extended treatment was in line with the results reported by Farrell et al. [27] and Torp et al. [28].

As mentioned above, the mean reduction in the CY-BOCS-D total score and the clinician-rated remission rate after the first 12 treatment weeks were lower than the results of other internationally published studies. This may be attributable to therapist, sample or treatment characteristics. Overall, when comparing the present study with other efficacy and effectiveness studies, some discrepancies are apparent (see Additional file 9). In the present study, exclusion criteria were kept to a minimum. Thus, in contrast to Torp et al. [28], patients with previous CBT attempts were also included, and unlike Valderhaugh et al. [25], no specific psychiatric disorder was excluded. The main differences pertain to the therapist's experience, which was lower in the present study than in the cited effectiveness studies (with the exception of Farrell et al. [27], in which the level of therapists' experience was roughly comparable). Furthermore, pretreatment mean OCD symptoms in the current study were severe ($M = 25.05$), while the assessed OCD severity in the other effectiveness studies (with the exception of Torp et al. [28]; $M = 24.6$) was somewhat lower and in a moderate range (CY-BOCS total score < 24; cut-off criterion according to Bossert-Zaudig & Niedermeier [36]; AACAP [7]). A further key difference lies in the notably longer overall treatment duration (18–54 sessions) in the current study. For example, knowing that a maximum of 54 sessions was possible may have led the therapist to choose smaller steps within graduated ERP, which may have resulted in a slower improvement.

Concerning changes during the treatment of overall comorbid symptoms, significant small to moderate effects were found for total problems and internalizing problems, including anxiety and depressive symptoms ($-0.29 \leq ES \leq -0.64$). These findings are in line with Sánchez-Meca et al. [2] and Rosa-Alcázar et al. [15], but the effects are higher than those reported by Farrell et al. [27], and in contrast to Abramowitz et al. [9], whose combined effect size for anxiety and depressive symptoms was not statistically significant. As expected, no significant effects were found on externalizing problems. Effects on psychosocial impairment are broadly in accordance with previous findings (Table 5).

During the assessment phase, a stable course or increase of OCD symptoms and functional impairment was expected, and this expectation applied to most outcomes. However, the clinician-rated compulsion severity (CY-BOCS-D) decreased significantly during the assessment phase, and this was also the case for the majority of patient- and parent-rated strain and psychosocial impairment outcomes. When comparing growth rates between assessment and standard treatment phase, significant differences in favor of the standard treatment phase for clinician-rated total OCD severity (CY-BOCS-D) and some other outcomes (e.g. OCD duration on weekdays) were found, as well as greater absolute effects. This result did not emerge, for instance, for the patient- and parent-rated total psychosocial impairment with the OCD-PL (on which significant differences in favor of the assessment phase were found) and total OCD symptoms (no significant differences between phases were found). These findings lead to the impression that unspecific effects were active during the assessment phase. The significant decrease especially in functional impairment and strain during the assessment phase might be explained, for instance, by the feeling of being understood by the therapist or by positive expectations of treatment (e.g. [52]). Nevertheless, it is unlikely that the described unspecific effects occurring during the assessment phase would continue for a further 18 to 54 weeks and that only conducting assessment sessions would therefore be as effective as treatment sessions.

The comparison of CBT packages revealed some significant differences in favor of exposure CBT. Accordingly, there is at least some support for an additional effect of

ERP. The clearest findings emerged from the analyses regarding the extent of negative emotions. This was to be expected given that ERP aims especially at habituation, and thus a correction of physiological components of the negative emotion (extinction processes) caused by the OCD-triggering situations or thoughts, but also aims at fear tolerance [53]. As only six treatment weeks of each CBT package were compared within this study, it can only be assumed that the tendency found might be even clearer when comparing longer treatment durations of each package.

The main conclusion derived from the comparison of CBT durations was that absolute effects of the standard treatment are comparable with the additional absolute effects of the extended treatment (treatment weeks 12–54; phase 3a – phase 3d). However, most change / improvement in OCD symptoms and related problems occurred during standard treatment and the first 12 extended treatment weeks. During the following extended treatment weeks, the mean change per week and therefore change and absolute effects were mainly much smaller.

Overall, these findings regarding treatment duration support the relevance of individually tailored and extended treatment. In line with the findings of Torp and Skarphedinsson [31] and Skarphedinsson et al. [32], the present results suggest that improvement after the initial course of CBT may not allow for treatment termination. Rather, our findings suggest that substantial improvement mainly occurs during the first 24 weekly CBT sessions. Accordingly, improvement and potential further extension of treatment should particularly be found after about six months of treatment. If a patient has not substantially improved by treatment week 24, for instance, treatment motivation or strategies should be questioned. Corresponding to our findings, in particular after 48 weekly sessions, there is a tendency that may suggest that no further (substantial) improvement can be expected. In the present study, we did not investigate potential factors that may explain and predict individually required treatment duration as well as treatment success. Further research to investigate this issue would be interesting. Skarphedinsson et al. [32] identified barriers to treatment success during the initial course of CBT, for example, "patient took long time to engage and start exposure exercises due to high levels of anxiety or low motivation" or "family factors, such as high initial accommodation". Melin et al. [33] found a higher level of symptoms at baseline in non-responders than in responders to be the only significant group difference in an initial course of CBT.

A main limitation is that the clinician rater was the treating therapist. The lack of blinded and independent clinician-ratings should not only be noted when comparing rater perspectives, but above all, when comparing effects to other effectiveness studies, which used predominantly blinded or at least independent evaluators [25, 27, 28]. However, patients and parents were blinded to the specific hypotheses regarding treatment contents and duration. Moreover, Lewin et al. [54] showed that therapists might even represent a reasonable alternative to blind and independent evaluators to rate pediatric OCD improvement.

Although the exclusion criteria were kept to a minimum, the rate of comorbid disorders in the present sample (23.7%) does not correspond to the high comorbidity rates, ranging from 62 to 97%, found in children and adolescents with OCD [17, 55]. This low comorbidity rate may be due on the one hand to the inclusion criterion that OCD had to be the primary diagnosis, or on the other hand to the lack of systematic assessment of comorbidities. While individual comorbid symptoms were assessed by parent- and patient-ratings, clinical diagnoses of comorbid disorders were not systematically confirmed by structured interviews. Considering the parent- and patient-ratings revealed the following: While patients > 11 years reported low comorbidity within the YSR assessment (12.9%, valid percentage: 15.4%), the comorbidity rate reported by parents was much higher. Within the CBCL, 47.4% (valid percentage: 58.1%) of the patients showed comorbid symptoms in a clinical range (at least one subscale or the total scale was in a clinical range; the subscale thought problems was excluded from this analysis because it comprises items regarding OCD symptoms). This parent-reported comorbidity rate is widely comparable to those reported by other effectiveness studies (Additional file 9).

To conclude, the comorbidity rate in the study sample may presumably be higher than reported. Nevertheless, the representativeness regarding comorbidities remains questionable.

Another principal limitation of this study is that it does not constitute an RCT. As such, it cannot be ruled out that external factors may have been responsible for the treatment outcome. However, given that the explicit aim of this study was to evaluate the effectiveness of manualized CBT, the fact that it was not an RCT, and the effects were not investigated under laboratory conditions, constitutes a strength at the same time. In contrast to RCTs, the emphasis was on external validity and not on internal validity [23]. Moreover, the chosen within-subject control group design maintained at least a certain level of internal validity, and patients served as their own control group, leading to a reduced error variance [56]. The within-subject analyses are also conservative, since they assume that a trend observed during the waiting phase

would also continue during the consecutive treatment phases.

While the present study aimed to evaluate manual-based treatment under routine care conditions, it is rather questionable whether the supervision conducted within this study (and other effectiveness studies) can be achieved under non-research or routine conditions [28]. Thus, it remains unclear whether the treatment conditions of effectiveness studies are entirely comparable to non-research and "real-life" conditions.

Another limitation is that the research team included authors of the evaluated treatment program. Therefore, the possibility of researcher allegiance cannot be ruled out, and a replication of the findings by other researchers is therefore warranted.

Finally, the large number of outcome variables in the exploratory analyses increases the likelihood of incidental findings. However, besides treatment effects on OCD, effects on impairment and comorbidities were hypothesized, and a respective number of measures was required to test these hypotheses across different rater perspectives.

Conclusion

Overall and despite some limitations, the present study contributes further to "bridging the gap between laboratory and clinic" [21]. The results support the effectiveness of manualized exposure-based CBT in children, adolescents, and young adults with OCD in terms of reducing OCD symptoms, psychosocial impairment, overall comorbid symptoms, and in particular internalizing problems, including anxiety and depressive symptoms. Moreover, the effectiveness was confirmed by multiple informants. To conclude, results from RCTs seem to be transferrable to "real-world" clinical settings and generalizable to routine clinical practice. Importantly, the present findings provide evidence in favor of individually tailored treatment durations.

Abbreviations

OCD:: Obsessive–compulsive disorder; CBT:: Cognitive behavioral therapy; RCT:: Randomized controlled trials; ERP:: Exposure with response prevention; POTS:: Pediatric OCD Treatment Study; AACAP:: American Academy of Child and Adolescent Psychiatry; NICE:: National Institute for Health and Care Excellence; ICD-10:: Tenth edition of the International Statistical Classification of Diseases and Related Health Problems; DCL-ZWA:: Diagnostic Checklist for OCD; CY-BOCS-D:: German version of the Children's Yale-Brown Obsessive–Compulsive Scale; DSM-IV:: Fourth edition of the Diagnostic and Statistical Manual of Mental Disorders; DISYPS-II:: Diagnostic System for the Assessment of Mental Disorders in Children and Adolescents based on the ICD-10 and DSM-IV; OCD-CA:: German OCD Inventory for Children and Adolescents; OCD-PL:: OCD-related problem list; OCD-FL:: OCD-functional impairment list; CBCL:: Child Behavior Checklist; YSR:: Youth Self Report; FBB-/SBB-ANZ:: Parents- and patient-rated German Symptom Checklists for Anxiety Disorders and Obsessive–Compulsive Disorders; FBB-/SBB-DES:: Parents- and patient-rated German Symptom Checklists for Depressive Disorders; ES:: Effect size; RCI:: Reliable change index; A:: Assessment phase; ST:: Standard treatment; ET:: Entire extended treatment; NE:: Non-exposure CBT; E:: Exposure CBT.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s13034-022-00537-z.

Additional file 1. Details of the treatment. Details of the CBT treatment are described.

Additional file 2. Within-subject design clinical trial. The research design is presented in a figure.

Additional file 3. Outcome measures. The outcome measures used within the study are described.

Additional file 4. Individual end of treatment. The individual end of treatment as well as dropouts are presented in a figure.

Additional file 5. Results of multilevel analyses: Assessment (t0-t1) vs. treatment (t1-t3) vs. extended treatment (t3-t10). Changes during assessment phase and the treatment phases regarding the daily observation are shown in a table.

Additional file 6. Results of multilevel analyses: Assessment (t0-t1) vs. non-exposure CBT (t1-t2) vs. exposure CBT (t2-t3) vs. extended treatment (t3-t10). Changes during assessment phase and the treatment phases as well as effects regarding the clinician-rated OCD severity, patient- and parent-rated OCD symptoms and OCD-related problems are presented in a table.

Additional file 7. Results of multilevel analyses: Assessment (t0-t1) vs. non-exposure CBT (t1-t2) vs. exposure CBT (t2-t3) vs. extended treatment (t3-t10). Changes during assessment phase and the treatment phases as well as effects regarding daily observation are shown in a table.

Additional file 8. Results of multilevel analyses: Assessment (t0-t1) vs. non-exposure CBT (t1-t2) vs. exposure CBT (t2-t3) vs. extended treatment (t3-t10). Changes during assessment phase and the treatment phases as well as effects regarding OCD functional impairment are presented in a table.

Additional file 9. Benchmarking: Study characteristics. Characteristics of efficacy studies (Meta-analyses) and effectiveness studies are summarized in a table for benchmarking.

Acknowledgements

Not applicable.

Author contributions

MD, HG and JA conceptualized the study. JA, SD, NK, SK, CV collected, and JA managed the data. CH, MH, JP and MD supervised data management and analysis. JA analyzed and JA, MD and HG interpreted the data. JA was the major contributor in writing the manuscript. HG and MD revised the manuscript critically. All authors read and approved the final manuscript.

Funding

Open Access funding enabled and organized by Projekt DEAL and we acknowledge support for the Article Processing Charge from the DFG (German Research Foundation, 491454339). This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

All procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional and/or national

research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The present study was approved by the ethics committee of the University of Cologne. Informed consent was obtained from all individual participants included in the study. This article does not contain any studies with animals performed by any of the authors.

Consent for publication
Not applicable.

Competing interests
JA, HG, JP, MD are authors of the evaluated treatment manual and/or books about OCD and/or diagnostic instruments used within this study, for which they receive royalties from Hogrefe Publishing. All other authors have no potential conflict of interest.

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Received: 10 October 2022 Accepted: 25 November 2022
Published online: 09 December 2022

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Publisher's Note

4 Discussion

OCD often has its onset in childhood and adolescence. The consequences are serious for the affected child or adolescent and his or her environment (e.g., Storch et al., 2018; Piacentini et al., 2007; Futh, Simonds & Micali, 2012). So, the importance of early detection and treatment, also for a further favorable course of symptoms (e.g., Perris et al., 2021; Liu et al., 2021) is quite clear. As described in chapter 1, dealing with treatment always means dealing with diagnosis at the same time (e.g., Rapp et al., 2016).

The current state of research regarding assessment and treatment (chapter 1) showed limitations that also have an impact on psychotherapeutic practice (e.g., the lack of availability of psychometrically evaluated self- and parent-report forms in German-language to assess OCD symptoms in terms of multimodal diagnosis), or which mean that information also relevant to care in our healthcare system has not yet been clarified (e.g., is the usual treatment duration > 12 sessions in routine care helpful and necessary at all?). This doctoral thesis addressed these limitations.

Overall, the doctoral thesis extended the research in the field of diagnosis and treatment in pediatric OCD. The thesis aimed to contribute to further improving the multimodal assessment and treatment of OCD in children and adolescents.

Study 1 (Adam et al., 2019; chapter 2) comprises the first comprehensive psychometric evaluation of a German-language OCD-specific diagnostic instrument for children and adolescents that records both self- and parent-reports and that assesses OCD across symptom domains – the *German OCD Inventory for Children and Adolescents* (OCD-CA; German: Zwangsinventar für Kinder und Jugendliche; Goletz, Adam & Döpfner, 2020).

Within **study 2** (Adam et al., 2022; chapter 3) for the first time the course of OCD over a longer period of CBT using multimodal assessment was investigated. Moreover, for the first time a German-language treatment manual was evaluated – *the treatment program for children and adolescents with anxiety and obsessive-compulsive disorder: OCD* (German: Therapieprogramm für Kinder und Jugendliche mit Angst- und Zwangsstörungen: Zwänge, THAZ; Goletz & Döpfner, in prep.).

Main findings of both publications are summarized and discussed below along with their strengths, limitations, clinical implications, and future directions.

4.1 Summary

Within **study 1** (Adam et al., 2019), in a first step the psychometric evaluation of the OCD-CA, the factor structure was examined. The factor structure found in the COS in a previous study by Waclawiak (2006, unpublished) could not be replicated for the CLIN and OCDS. Therefore, exploratory principal component analysis with varimax rotation was conducted in the CLIN.

The parent form and the self-report form were analyzed separately. Results showed a four factor-solution: (1) *Contamination & Washing*, *(2) Catastrophes & Injuries*, *(3) Checking*, and *(4) Ordering & Repeating*. In terms of content, three items regarding “counting”/“certain number”, “hoarding and saving”, and “not getting ready” did not match to any of the found factors (Adam et al., 2019). Thus, they were not considered for subscales but included in the total scale. As the parent form showed a clearer factor structure than the self-report form (and there were at least broad similarities in factor structure of both rating forms), scale formation was based on the factor structure of the parent form. The variance explained by the four-factor solution was about 50% (parent-report: 54.04%, self-report: 50.05%). The same factorial solution was found when conducting exploratory principal component analyses with varimax rotation in den OCDS. Within confirmatory factor analyses the four-factor solution could be confirmed for the parent-form in the CLIN and OCDS. Values resulting from the confirmatory factor analysis were mostly borderline (used cut-off: Hu & Bentler, 1999) but indicated at least an acceptable factorial validity. For the self-report, fit indices did not meet cut-off criteria in the CLIN and OCDS. This result was to be expected as the model was based on the parent-report factor solution (Adam et al., 2019).

To compare, exploratory factor analyses conducted with the OCI-CV (Foa et al., 2010) and the TOCS (Burton et al., 2018), both also questionnaires that assess OCD across symptom domains, found six-factor solutions accounting for 72.65% and 75% respectively of the variance overall. As the TOCS (Park et al., 2016) was developed from two previously published scales of which one was the OCI-CV (Foa et al., 2010), similar results regarding the factor structure of the OCI-CV and TOCS are not surprising. Nevertheless, analysis strategies were different. Foa et al. (2010) conducted exploratory common factor analysis with promax rotation, to allow correlations between the factors with regard to all measuring the larger construct of OCD symptoms. Burton et al. (2018) used a mixed sample including self-reports (18.2%) and mostly parent-reports (81.8%). In addition to their exploratory factor analysis with varimax rotation, the research team conducted exploratory factor analysis with promax rotation. Findings were similar. Using promax rotation was also tested but not reported in the OCD-CA publication. Using promax rotation did not change findings regarding the factor structure of the OCD-CA parent-report. But with changing rotation strategy, the factor structure of the self-report changed. Overall, it was still less clear and interpretable than the structure found in the parent-rating.

While Foa et al. (2010) established their six-factor structure on parallel analysis, Burton et al. (2018) chose a six-factor solution because it minimized crossloading between factors, accounted for the most variance, and showed the same factor structure regarding both rating forms data. Comparing subscales of the OCI-CV and the TOCS with the ones found for the

OCD-CA, they both have, for example, an additional scale regarding hoarding. This scale includes two and three items, respectively, describing corresponding symptoms. The OCD-CA, in this respect, only includes one item assessing hoarding and saving which was assigned to no subscale but the total scale (Adam et al., 2019). Furthermore, the scales "superstition" (example item: "Has special numbers or words") and "rumination" (example item: "Feels guilty about doing something wrong") of the TOCS (Park et al., 2016) are content-related and summarized in one OCD-CA scale named "Catastrophes & Injuries" (example items: "Fear of being to blame for catastrophes", "Certain numbers or words to keep away bad luck") (Adam et al., 2019).

Internal consistency (Cronbach's alphas) for the OCD-CA subscales which were developed based on the factor analyses was acceptable to excellent for all subscales (exception: the self-report subscale Ordering & Repeating in the COS) and for the total scale across samples (CLIN, OCDS, COS) (Adam et al., 2019). Therefore, internal consistency was in line with other OCD-specific diagnostic instruments investigated in children and adolescents with OCD (e.g., Storch et al., 2006, Scahill et al., 1997). In contrast to the TOCS (Lambe et al., 2021), the OCD-CA's internal consistency was investigated and confirmed for both rating perspectives (not only the parent-report form) in OCD patients. In line with the OCI-CV (Foa et al. 2010; Jones et al., 2013; Rosa-Alcázar et al., 2014; Pozza, Barcaccia & Dèttore, 2017) and the TOCS (Park et al., 2016) internal consistency was also good when analyzing scales within community sample.

Intercorrelations between the subscales mainly comprised values of $r \leq .70$, supporting that subscales of the OCD-CA are related but generally sufficiently independent of each other (Bortz & Döring, 1995; Adam et al., 2019). The intercorrelations were similar (or higher) to the ones found within comparable assessment analyses of the OCI-CV (Jones et al., 2013) and TOCS (Burton et al., 2018).

Regarding *convergent validity*, significant moderate correlation was found between the self-rated OCD-CA Total Score and the clinician-rated Total Score of the CY-BOCS-D Rating Scale. The OCD-CA parent ratings did not correlate significantly with the CY-BOCS-D Rating Scale at all (Adam et al., 2019). As both measures assess the construct OCD, large correlations may have been expected. But there are different possible explanations for the findings described (Adam et al., 2019): The construct OCD is recorded differently. The CY-BOCS-D Rating Scale assesses primarily OCD symptom severity (including e.g., impairment) while the OCD-CA assesses the presence and frequency of OCD symptoms. This corresponds to state of research, showing moderate to large correlations between pediatric OCD diagnostic instruments and the CY-BOCS when the investigated instruments also focused on more global severity, unrelated to the type, frequency and number of symptoms (e.g., CHOCI Impairment Scale; Shafran et al., 2003). Measures assessing OCD symptoms, like the OCD-CA, across

different domains usually demonstrated lower correlations with the CY-BOCS Rating Scale (Foa et al., 2010; Jones et al., 2013; Piqueras et al., 2017). Matching this, the correlations between the OCD-CA scales and the corresponding CY-BOCS-D Checklist scales (also focusing on OCD symptom dimensions) were higher than correlations with the Rating Scale. The ones found within the parent-report form analyses were again lower than the ones found for the self-report (Adam et al., 2019). Another possible explanation for lower correlations between the OCD-CA and the CY-BOCS-D than one might expect relates to the rater perspectives. Rater perspectives vary. While the CY-BOCS-D is clinician-rated, the OCD-CA is self- and parent-rated. And the generally low correlations between informants are well known (e.g., Döpfner, Görtz-Dorten & Petermann, 2024; De Los Reyes et al., 2015). Subsequently, this may also be a reason for the difference between OCD-CA parent- and self-report regarding correlations with the CY-BOCS-D as the clinician ratings of the CY-BOCS-D were primarily based on an interview with the child or adolescent (Adam et al., 2019).

Regarding *divergent validity*, correlations between the OCD-CA Total scores in both ratings and measures of internalizing problems, depressive symptoms, and anxiety symptoms were predominantly moderate to high across samples (Adam et al., 2019). These results correspond to previous findings (Foa et al., 2010; Storch et al., 2009; Piqueras et al., 2017). Possibly, these associations also reflect the often-simultaneous occurrence of the symptoms (high comorbidity rates, e.g., Jans et al., 2007; Sharma et al., 2021) in the analyzed sample.

In line with other studies (e.g., Storch et al., 2009; Park et al., 2016; Lambe et al., 2021) (negative) low to moderate correlations between the OCD-CA and the externalizing problems (Concrete: Scale Externalizing Problems of the CBCL and Youth Self Report [YSR]; Döpfner et al., 2014) were found.

Overall, convergent and divergent validity of the OCD-CA was supported. Moreover, *discriminant validity* was, as expected, confirmed by significantly higher OCD-CA scores in the OCD subsample than in the non-OCD subsample and the COS sample (Adam et al., 2019).

In the OCD subsample, child/adolescent-parent agreement was high. Significant mean difference between self-rated and parent-rated corresponding scales were only found on two scales with opposite ratings (Adam et al., 2019). In contrast, Storch et al. (2009) found significantly lower self- than parent-rated scores in an OCD sample. However, in the COS significant mean differences between raters were found across all scales (Adam et al., 2019). In line with analyses regarding child/adolescent-parent agreement by Park et al. (2016) with children/adolescents showing higher scale scores than their parents. One reason for these contrasting results regarding child/adolescent agreement could be that children/adolescents from a predominantly healthy population have not talked with their parents about assessed symptoms while those affected by OCD and present to clinics have already exchanged with their parents about symptoms. Another possible explanation could be the general difficulty of detecting and observing

OCD symptoms, especially obsessions, for non-affected people (Rapoport et al., 2000; see also Adam et al., 2019). Interestingly, the differences between self- and parent-reported OCD symptoms demonstrated by Park et al. (2016) were not dependent on whether items comprised covert or overt behaviors.

As the OCD-CA was shown to be a promising, reliable and valid questionnaire to measure OCD symptoms with regard to a multimodal (multi-informants) assessment based on the analyses in study 1 (Adam et al., 2019), it could be (as planned) used for the treatment evaluation aimed for in study 2 of the doctoral thesis.

Within **study 2** (Adam et al., 2022), the *course of OCD symptoms as well as co-existing symptoms and psychosocial functioning* during CBT was examined. Overall, results showed a significant improvement on the primary outcome, the clinician-rated CY-BOCS-D, and on almost all OCD-specific and OCD-related outcomes comprising functional impairment and strain during the first 12 weekly sessions (standard treatment) and the extended treatment weeks 12-24. Effects during the standard treatment phase and the entire extended treatment phase (treatment weeks 12-54) were mainly moderate to large. Effects based on patient- and parent-rated OCD symptoms were lower, but for the entire treatment also large. Differences in rater perspectives were expected, and confirmed the relevance of multi-informant assessment. Potential explanations for rater difference might be patients' dissimulation tendencies, underestimations by parents as symptoms are not always easy to observe, rater bias as in the presented study the treating therapist was the clinician rater at the same time, or the differences already discussed (in the context of the OCD-CA analyses) between outcome measures (CY-BOCS-D vs. OCD-CA) (Adam et al., 2022).

Benchmarking (see Adam et al., 2022) showed effect sizes reached after the entire CBT treatment (up to 54 weeks), as well as after 12 weeks of treatment, are widely comparable to internationally published effectiveness (Nakatani et al., 2009; Farrell, Schlup & Boschen, 2010; Torp et al., 2015) and efficacy studies (Sánchez-Meca et al., 2014; McGuire et al., 2015). The remission rate of 57.6% (based on CY-BOCS cut-off score < 8) at the individually-tailored end of treatment was also comparable to other studies using mostly CY-BOCS cut-off scores as remission criteria (e.g., McGuire et al., 2015: 57%; Farrell, Schlup & Boschen, 2010: 63%). The CY-BOCS reduction (also commonly used to define remission status) at individually tailored treatment end was with 68% even higher than the ones found in other effectiveness studies (for comparison: e.g., Valderhaug et al., 2007: 60.6%). However, after 12 treatment weeks neither remission rate (criteria CY-BOCS-D < 8: 8.6%/criteria CY-BOCS-D < 11: 16.7%) nor mean CY-BOCS reduction (34%) showed nearly comparable results to the current state of research. The study conducted within this doctoral thesis differs from others regarding sample (less strict exclusion criteria, more severe OCD symptoms), therapist (lower level of experience), and treatment characteristics (therapists might choose smaller steps within graduated

ERP due to the knowledge that a maximum of 54 sessions was possible and this may have resulted in a slower improvement) (Adam et al., 2022). Questionable is whether this can explain comprehensively why – in international comparison – more sessions are needed overall for comparable treatment success regarding remission rate. To anticipate this, this is certainly a relevant question for future research.

Regarding comorbid symptoms and psychosocial functioning, in line with expectation, effects on total problems, internalizing problems (anxiety and depressive symptoms), and psychosocial functioning were significant and small to moderate. No significant effects were found on externalizing problems (Adam et al., 2022).

Results regarding the *comparison of CBT packages* were not as clear as expected. Only some significant differences in favor of exposure CBT were found (Adam et al., 2022). It can only be assumed that the additive benefit of exposure-based CBT might take longer to emerge than the investigated comparison of six weeks (Mendez et al., 2023). Therefore, results in favor of the exposure-based CBT would have been clearer when comparing more treatment sessions.

Regarding the *comparison of CBT durations*, the main conclusion was that most change/improvement in OCD symptoms and related problems has been achieved during the first 12 treatment sessions (standard treatment) and the first 12 weeks of extended treatment. During the following extended treatment weeks, the mean change per week and accordingly change and absolute effects were mostly much smaller. After 48 weekly sessions, improvement stagnated (Adam et al., 2022).

Placed in the context of CBT manual evaluation (see 1.3.5), there is, as described, no German-speaking treatment manual that has been evaluated yet. The situation is different in English-speaking countries. The presented published treatment manuals have been evaluated. All (except for McKenney, Simpson & Stewart [2020]) have been evaluated in RCTs. The ones published by March & Mulle (1998) and McKenney, Simpson & Stewart (2020) have (additionally) been evaluated in open effectiveness trials by March, Mulle & Herbel (1994) and Selles et al. (2018), respectively. Between-group effects on clinician-rated OCD symptoms found for the treatment programs by March & Mulle (1998) and Freeman & Garcia (2009a,b) were moderate and large, respectively (*ES* = 0.53; Freeman et al., 2008; *ES* = 0.97; POTS Team, 2004). In contrast between-group effect found for the CBT manual by Piacentini, Langley & Roblek (2007a,b) was small (*ES* = 0.40; Piacentini et al., 2011). But in line with the results regarding treatment effects based on the THAZ manual investigated within this doctoral thesis (*ES* = 3.18) within-group effects were large (ES = 2.37; Piacentini et al., 2011). Overall, the remission rate (57.6%) as well as the CY-BOCS mean reduction (68.8%) found following the THAZ treatment was considerably higher than the findings (also based on CY-BOCS cut off criteria) within other CBT manual evaluations (remission rate: e.g., POTS Team, 2004: 39.2%; Piacentini et al., 2011: 42.5%; mean CY-BOCS reduction: e.g., Freeman et al., 2008: 37.03%; Piacentini et

al., 2011: 46.2%). Selles et al. (2018) were the only one that also collected parent-ratings regarding OCD severity. In contrast to the findings within the THAZ treatment evaluation, the effects found based on clinician- and parent-ratings were comparable (clinician-rated *ES* = 1.47, parent-rated *ES* = 1.32). This can be explained by the fact that the corresponding version of the CY-BOCS was used for both assessments (CY-BOCS; Scahill et al., 1977 and CY-BOCS-PR; Storch et al., 2006). Piacentini et al. (2011) and Selles et al. (2018) were the only ones that examined effects on psychosocial impairment considering child/adolescent and parent rating, too. Findings showed also predominately large within-group effects sizes (child-rated *ES* = 0.81, 0,87; parent-rated *ES* = 1.01, 0.67).

4.2 Strengths and limitations

Within **study 1** (Adam et al., 2019) a new pediatric OCD-specific measure was evaluated. The results demonstrate the test quality criteria of reliability and validity across three samples (CLIN, OCDS, COS) with large sample sizes. This psychometric evaluation across varying samples meets a relevant EBA criteria which says that because psychometric evidence is conditional (can vary depending on assessment purpose and sample characteristics), psychometric evidence must be available for the purpose and population it is developed for (La Greca & Lemanek, 1996; Hunsley & Mash, 2007). However, limitations regarding the samples analyzed should also be mentioned. The COS was not a representative sample, and the CLIN included mainly patients with tic disorders and OCD, as the data used for analyses were collected as standard in special outpatient departments for these disorders (Adam et al., 2019).
Placed in the international context (see also chapter 1.2.1, Table 3), there are a variety of evaluated OCD-specific measures comprising self-report and parent-report forms in the English-speaking areas. Those are mostly providing global scores for total OCD symptoms, obsessive symptoms, compulsive symptoms, and impairment. Regarding measures assessing symptom frequency across common symptom domains, there is only the OCI-CV and its revision and screening version (Foa et al., 2010; Abramovitch et al., 2022a; Abramovitch et al., 2022b). But they exist only in self-report forms. And there is the TOCS (Park et al., 2016), existing in a self- and parent-report form, assessing the extent to which the child or adolescents shows obsessive-compulsive thoughts or behaviors. The TOCS was originally developed for the purpose of genetic research to measure OCD traits in general populations (Park et al., 2016, Burton et al., 2018). Lambe et al. (2021) confirmed the instrument – or to be more precise, just the parent-report (self-report was not investigated) – as also reliable and valid for clinical purpose. So, in contrast to the OCD-CA (Adam et al., 2019), it is not the case that both rater versions have been evaluated in an OCD and community sample yet (Park et al., 2016; Lambe et al., 2021).

Other limitations of study 1 (Adam et al., 2019) refer to the factorial validity, which could not be confirmed for the OCD-CA self-report form. Moreover, no specific analyses regarding test sensitivity and specificity were conducted. Incremental validity (predictive power) was not investigated either. In the context of incremental validity and EBA, "suitability" (Bickman et al., 1999) and economic aspects regarding implementation, evaluation, and interpretation, are also discussed (Hunsley & Mash, 2007; Stieglitz, Freyberger & Hiller, 2018). So, considering time and money: Is it worthwhile to use the diagnostic instrument? (Hunsley & Mash, 2007) As the OCD-CA is a questionnaire, it is an economic way, cheap and quickly administered, to get an overview of the patient's problems. As it is available in a self- and parent-report version, it enables the comparison of rater perspectives. Besides these economic advantages, the OCD-CA and questionnaires in general, have the following strengths: Due to embarrassment, it can be easier for children and adolescents to fill in questionnaires in absence or without direct contact with the clinician. Questionnaires can also help to normalize symptoms; patients may recognize similar OCD symptoms to their own. A weakness of this way to collect data is that the information is collected retrospectively (e.g., Döpfner, 2000; Döpfner, Görtz-Dorten & Petermann, 2024; Bennett et al., 2017).

Another limitation to mention is the possibility of researcher allegiance that cannot be ruled out as the research team included authors of the OCD-CA.

To sum up, according to EBA criteria (e.g., Hunsley & Mash, 2007) the OCD-CA is a psychometrically sound instrument (with the described limitations). It is standardized and shows appropriate levels of reliability and validity. EBA also requires norms for norm-referenced interpretation (Hunsley & Mash, 2007). These were calculated beyond this publication (see Goletz, Adam & Döpfner, 2020). Consequently, study 1 (Adam et al., 2019) has a high relevance also for clinical practice. The OCD-CA is the first German-language OCD-specific self-report and parent-report form, that was confirmed as psychometrically strong measure. It is also the first that provides scales across OCD symptom domains based on frequency ratings. It can be used within multimodal assessment for initial diagnosis or to monitor or evaluate treatment process within research and clinical practice.

The strength (and innovation) of **study 2** (Adam et al., 2022) is the examination of the course of CBT over a longer therapy period using multiple measures of success. Besides OCD symptoms, other outcomes that are relevant to the lives of children and adolescents like their psychosocial functioning were investigated. Assessing clinical significance of symptom change as well, also enabled the study to determine the impact of CBT treatment outcomes on the children's and adolescent's everyday life (La Greca, Silverman & Lochman, 2009). Moreover, and in contrast to other effectiveness studies (Valderhaug et al., 2007; Nakatani et al., 2009; Farrell, Schlup & Boschen, 2010; Torp et al., 2015) as well as efficacy studies (Sánchez-Meca et al., 2014; McGuire et al., 2015) not only the clinician perspective was considered. Accordingly,

in terms of evidence-based and multimodal assessment (e.g., Lewin, 2019; Döpfner, Görtz-Dorten & Petermann, 2024) besides OCD symptoms and severity, impairment, strain, and comorbidities were assessed using different measures with (mostly) strong psychometric properties integrating child/adolescent and parent ratings. Teachers' perspectives as possibly another relevant source of information (Lewin, 2019) were also collected but could not be included in analyses because of low return rates at pre- and post-treatment (*n* = 5-7). The main reason for this was that patients and parents did not consent. In many cases, teachers were not informed about the symptoms and therapy and most children and adolescent did not want to involve them. Shame played a role here. But affected children or adolescents also did not necessarily showed OCD symptoms to the same extent they showed them especially at home. So, OCD did not necessarily play a huge role at school. Children and adolescents do not always conduct compulsions in the classroom, or they do it covertly. Mental rituals are generally difficult to observe. Some children and adolescents can appear unfocused and inattentive, others demonstrate appropriate behavior at school, are inconspicuous, rather e.g., very organized and adapted. For teachers, there are sometimes more hidden indicators for OCD (e.g., very rough and red skin on hands, inability to make a decision) (Fischer-Terworth, 2010).

Within study 2, CBT based on a German-language OCD-specific treatment manual (Goletz & Döpfner, in prep.) was evaluated using multi-informant ratings. Overall, most evaluations of other treatment programs (e.g., Piacentini et al., 2011; Freeman et al., 2008) only comprise change of clinician-rated OCD, other rating perspectives were not considered. Furthermore, only very few focus on secondary outcomes. Only Piacentini et al. (2011) and Selles et al. (2018) also collected child- and parent-ratings regarding functional impairment.

A main limitation refers to clinician raters. Bias cannot be ruled out. The clinician rater was the respective treating therapist and, therefore, neither blind nor independent. Furthermore, the research team included authors of the evaluated CBT manual (which meant the possibility of researcher allegiance) (Adam et al., 2022).

Another limitation but strength at the same time is the study design. It is not a RCT (considered as gold-standard) but or because the study explicitly aimed to evaluate CBT effectiveness in children and adolescents with OCD. Therefore, the emphasis was on external validity, while the within-subject control group design ensured at least a certain level of internal validity (Adam et al., 2022). The following should certainly be questioned to classify the study as effectiveness study: How much did sample and treatment conditions correspond to real-life conditions? Even though it could be shown (see Adam et al., 2022) that sample comorbidity rate assessed by parents based on the CBCL (Döpfner et al., 2014, criteria: one subscale [except for "thought problems"] or total scale in a clinical range) was, at 58.1% (and in contrast to the comorbidity rate of 23.7% based on diagnosis), at least roughly comparable to comorbidity rates (62 to

97%; Geller et al., 1998; Wewetzer & Klampfl, 2004) found in OCD samples, comorbid disorders were not systematically confirmed by clinical structured interviews. Consequently, it remained questionable whether the sample's comorbidities were representative for patients who receive treatment within routine care (Adam et al., 2022). The setting and conditions under which the study was conducted also need to be discussed. Wergeland et al. (2021), for instance, determined for their systematic review and meta-analysis as inclusion criteria for being an effectiveness study, that among others the study was carried out in a non-university setting. The reason for this was the special access to supervision, extensive training and treatment monitoring therapists in university more often have than those under non-research conditions (Smith et al., 2017). On one hand, weekly supervision was conducted within study 2, but on the other hand the level of practical experience therapists had (as all trainees in child and adolescent therapy) was overall lower than in usual care (Adam et al., 2022).

Basically, when dealing with the topic of efficacy and effectiveness research, there is a dichotomy between efficacy/explanatory trials and effectiveness/pragmatic trials (e.g., Porzsolt et al., 2020) assumed or a continuum along internal and external validity, assuming that the studies cannot be easily classified into the two categories (e.g., La Greca, Silverman & Lochmann, 2009). Based on this, study 2 may not be at the end/maximum of the continuum but can be embedded in the area of effectiveness research due to its characteristics (e.g., sample recruitment through usual appointments, study duration, intention to treat analyses).

Overall and regarding strengths, study 2 (Adam et al., 2022) also has high relevance for clinical practice. It could be shown that continuing CBT makes sense beyond the short treatment periods examined in the mostly Anglo-American studies, which is highly relevant for the care of patients in the German healthcare system. And the study supported evidence for a German-language CBT treatment manual. It remains unclear how much of this decrease can be attributed to the extended treatment or how much is a possible carry-over effect from the initial standard treatment (Skarphedinsson et al., 2015b).

4.3 Conclusion, clinical implications & future directions

Addressing the lack of self- and parent-reports assessing OCD symptoms across common domains, **study 1** (Adam et al., 2019) aimed to evaluate a German version of the PI-WSUR (Burns et al., 1996) for measuring self- and parent-rated pediatric OCD regarding common symptom domains. Overall, the results of the present study (Adam et al., 2019) showed that the OCD-CA is a promising, reliable, and valid instrument to measure OCD symptoms in children and adolescents in self- and parent-ratings in clinical and non-clinical (community) populations. Consequently, the OCD-CA is now a psychometrically strong measure available that supports multi-informant, and therefore multimodal, assessment to achieve a comprehensive clinical picture of the disorder within research or clinical practice. The instrument can be used

for different purposes like initial diagnosis or treatment evaluation. However, further analyses regarding sensitivity, specificity, and incremental validity should be conducted. And overall, the evidence of the OCD-CA should be replicated by other research teams based on the EBA criteria (Hunsley & Mash, 2007).

Generally, diagnosis appears to be rather of secondary importance. And this although a close interaction between diagnosis and treatment in the form of “Assess-Treat-Reassess-Adjust Treatment” (Weisz, Chu & Polo, 2004, p. 303) is so important for an effective treatment (Stieglitz, Freyberger & Hille, 2018). EBA is the basis for evidence-based treatment, and this applies to research and psychotherapeutic practice (Achenbach, 2005). EBA comprises the whole diagnosis process, not only the use of psychometrically strong measures. Nevertheless, the use of psychometrically sound measures is a relevant component (e.g., Hunsley & Mash, 2007).

The rather subordinate role of diagnosis is also reflected in disorder-specific guidelines. Assessment is often only more or less integrated into the treatment guidelines (Stieglitz, Freyberger & Hille, 2018). Regarding OCD-specific guidelines also apply to childhood and adolescence shows the following: The British NICE guidelines (NICE, 2005) focus on treatment, assessment is only briefly mentioned. Clinicians are recommended to use “standardized measures of symptoms, quality of life, social and personality function as well as comprehensive neuropsychological tests” (NICE, 2005) in order to evaluate the intervention at pre- and post-treatment and at follow-ups. Diagnostic instruments are not specified and named. In the American guidelines (AACAP, 2012) formulated practice parameters also relate to assessment. Clinicians are recommended to use DSM criteria and scalar assessment to evaluate the child or adolescent. The CY-BOCS (Scahill et al., 1997) and its cut-off scores for interpretation are described, and other potentially helpful diagnostic tools are mentioned solely as examples (e.g., the Leyton Obsessional Inventory [LOI]; Berg et al., 1986). Other assessment-relevant recommendations relate to information that should be assessed, like comorbid symptoms or family accommodation. In the German guidelines (DGKJP, 2021), there is a specific chapter for assessment integrated, describing (based on expert consensus) the required diagnostic process in relative detail (e.g., behavior analyses, information and persons that should be explored). This is analogous to the American guidelines (AACAP, 2012) the CY-BOCS (Goodman et al., 1986; Steinhausen, 2019; Goletz & Döpfner, 2018) as clinical rating is described in detail, options to assess self- and parent-report forms are mentioned as examples (e.g., the OCD-CA; Goletz, Adam & Döpfner, 2020; Adam et al., 2019).

What these guidelines have in common is that in the context of diagnosis recommendation or recommendations regarding specific instruments (if they exist at all), no study results regarding, for example, test quality criteria like reliability and validity are reported. Clinicians do not get, for instance, an overview of useful instruments including their psychometric properties. An extension of the assessment guidelines, including among others the exemplary mentioned

information, would have advantages for research (standardization and thus better comparability of study results; adequate instruments allow valid conclusions) and clinical practice (practitioners do not have to research instruments and assess their psychometric properties themselves) (Freyberger & Stieglitz, 2006). Another question is then of course how to implement multimodal and EBA as routines in clinical practice (e.g., how to motivate practitioners?) (e.g., Jensen-Doss & Hawley, 2010; Cook et al., 2017).

Overall, the importance of appropriate diagnosis in children and adolescents with OCD, and the current limitations, show the relevance of continuing to deal with assessment and psychometric evaluation in research and clinical practice.

Addressing limitations regarding CBT treatment evaluation in pediatric OCD, **study 2** (Adam et al., 2022) contributed further (despite the described limitations) to "bridging the gap between laboratory and clinic" (Weisz et al., 1995). The findings support the effectiveness of manual-based CBT in children, adolescents, and young adults with OCD. They indicate CBT including psychoeducation, family/environment-based interventions, cognitive interventions, ERP, and relapse prevention to be effective as a routine treatment. Adding ERP during course of treatment has an additional positive effect. The treatment leads to a reduction in OCD symptoms, psychosocial impairment, overall comorbid symptoms, especially internalizing problems, including depressive and anxiety symptoms, confirmed by multi-informants. Overall, findings from RCTs seem to be generalizable and transferrable to routine clinical practice ("real-world" conditions). In particular, the results emphasize the relevance of extended and individually tailored treatment (Adam et al., 2022).

Regarding treatment duration, in Germany the number of treatment sessions is limited under the statutory health insurance scheme to a maximum of 80 child-centered sessions, and 20 parent-centered sessions (Kassenärztliche Bundesvereinigung, 2024). What do OCD-specific treatment guidelines say? The NICE guidelines (NICE, 2005) say that an adequate response within 12 weeks to a full trial of CBT comprising ERP and involving family must be expected. If not, a multidisciplinary review should be conducted. According to the American guidelines (AACAP, 2012) improvement must be seen after 8-10 CBT sessions or 6-8 ERP sessions. No recommendations are made about how long to continue CBT. Probably, this is because this has not been addressed by research yet.

The German guidelines (DGKJP, 2021) recommend (based on expert consensus) to individually tailor treatment duration and intensity with the aim to achieve remission. More detailed information is not available. However, it is pointed out that the duration of treatment is usually longer than the course of studies.

In this context further questions arise. First of all: How to define remission and response? What does improvement mean? And what does successful treatment actually mean? No symptoms

or residual symptoms? The problem or difficulty here is the varying criteria assessing successful treatment. Criteria vary within childhood OCD literature. There are different methodologies used for assessing treatment outcome (for a more detailed overview see Lewin & Piacentini, 2010; Lewin, 2019):

To assess responder status, the Clinical Global Impression-Improvement (CGI-I; Guy 1976) with its 7-point scale (1 = “very much improved” to 7 = “very much worse”), for instance, is used. Scores of 1 (“very much improved”) and 2 (“much improved”) usually indicate response to treatment. Another criterion to identify clinical response employed in studies is the reduction in OCD symptom severity (pre-post comparison), rated with the CY-BOCS (e.g., 25-30% or 50%).

To assess remission status, diagnostic criteria can be used. No longer meeting diagnostic criteria for OCD at post-treatment (or follow-up) accordingly means treatment success. Also used is the Clinical Global Impression-Severity (CGI-S; Guy 1976) to indicate remission on its according 7-point scale (1 = “normal, not at all ill” to 7 = “extremely ill”). Commonly ratings of 1 (“normal, not at all ill”) and 2 (“borderline ill”) are defined as remission. Frequently employed are CY-BOCS (Scahill, 1997) cut-off scores (e.g., post-treatment score of ≤10 or ≤ 12), that vary despite efforts to standardize the criteria for remission (e.g., Storch et al., 2010; Skarphedinsson et al., 2017; Farhat et al., 2022). Some studies have employed multiple criteria to rate response or remission rate. Calculating reliable change index is not standard, also this suggests findings to be reliable and clinically significant and not result of random measurement error alone (Guhn, Forer & Zumbo, 2014).

Overall, treatment success is usually determined by OCD symptom reduction. Combined criteria considering also psychosocial functioning and distress would also be conceivable, especially as those are relevant criteria making cognitions and behaviors pathological, defining them as disorders and in need of treatment. Within the CY-BOCS (Scahill et al., 1997) at least psychosocial impairment is considered besides, e.g., time spent with symptoms, to determine total score. Psychosocial impairment and distress are also considered using diagnostic criteria according to ICD-10 (WHO, 1993), ICD-11 (WHO, 2019) and DSM-5 (APA, 2013) to assess remission status.

All described commonly-used criteria have in common that remission or diagnosis-free does not mean symptom-free or lack of impairment (e.g., Farhat et al., 2022). Subclinical symptoms may remain. As relapse is more likely with residual symptoms (Goletz, Döpfner & Roessner, 2018), it is questionable if these criteria are sufficient and satisfactory to define successful treatment.

Concluding, how to define and assess response and remission is an important topic to further discuss. And here again the close link between assessment and treatment becomes clear. To make study results regarding response and remission comparable and to facilitate clinicians

to assess treatment outcomes, an option could be to include standardized criteria in treatment and assessment guidelines (Stieglitz, Freyberger & Hille, 2018). Currently, remission is not defined. In the German guidelines (DGKJP, 2021), remission is formulated as the primary aim of treatment. But remission criterion is, just as in the American guidelines (AACAP, 2012), not defined, and only criteria used in studies are described. The British NICE guidelines (NICE, 2005) describe remission: "that is, symptoms are not clinically significant, and the child or young person is fully functioning for at least 12 weeks". What clinically significant means remains unanswered.

To come back to treatment duration, no specification of treatment length can be derived from guidelines. Based on results of study 2 (Adam et al., 2022) more concrete recommendations for the duration of CBT treatment can be derived. In contrast to international guidelines (NICE, 2005; AACAP, 2012) and in line with Skarphedinsson et al. (2015b), the findings suggest that a "12-week course of treatment may not allow for the prediction of non-responders/non-remitters". The results show substantial improvement during the first 24 weekly CBT sessions. Overall, remission rates and clinical improvement considerably increased when continuing individually tailored CBT. The study also showed that, on average, hardly any further therapeutic gains could be achieved towards the end of the study period (after treatment week 48).

Treatment guidelines (e.g., AACAP, 2012) recommend pharmacological augmentation when CBT proves to be ineffective. So far it is not quite clear how CBT and pharmacotherapy combined perform against both therapies as stand-alone treatments (although there are at least some studies supporting that CBT+SSRI outperforms pharmacotherapy as monotherapy [e.g., Tao et al., 2022], others did not find this superiority [Mendez et al., 2023]). Evidence for the recommendation to treat children and adolescents with more severe OCD symptoms with a combination of CBT and pharmacotherapy is still missing, but at the same time nothing to the contrary is supported (Cervin et al., 2024). Skarphedinsson et al. (2015b) could show that switching to SSRI, specifically sertraline (SRT), after initial ineffective CBT treatment can be efficacious. The authors also showed that continued CBT (over 16 weeks) reached comparable large effect size estimates on the CY-BOCS total score (CBT: *ES* = 1.04, *95% CI* = 0.47-1.61, SRT: *ES* = 1.19, *95% CI* = 0.54-1.83) among children and adolescents with OCD who did not benefit from an initial course of CBT. Consequently, results of Skarphedinsson et al. (2015b) and study 2 (Adam et al., 2022) suggest continuing CBT to be equally an option for non-responding patients. Identifying possible treatment success barriers and accordingly, adjusting case conceptualization after initial course of treatment should be recommended (Skarphedinsson et al., 2015b). So this can, for example, mean to increase family-centered intervention in the further course of treatment, which has been generally supported to be effective for complex childhood OCD (Peris et al., 2017b).

So, tailoring treatment duration individually is one option to increase remission rates. Not investigated within the doctoral thesis were factors that potential influence treatment duration.
It is generally of interest to understand which factors influence treatment response and which children and adolescents do profit from CBT, which do not, and accordingly, how can treatment interventions be adapted, augmented, or tailored for non-responders. Thus, identifying predictors, moderators, and mediators is important, as they account for treatment outcome, and can explain under what circumstances and on whom treatment have effects and how and why treatments work (La Greca, Silverman & Lochman, 2009; Kraemer et al., 2002).
Regarding the research field outcome predictors of CBT in pediatric OCD, reviewed by Ginsburg et al. (2008) and Turner et al. (2018), several predictors regarding e.g., demographic, OCD-related variables, concurrent treatment, comorbidity and family functioning have been investigated, mostly in uncontrolled trials. Treatment duration of included studies was 4-18 weeks and sample sizes ranged from n = 12 to n = 269. Studies not only reported associations between e.g., OCD-related characteristics at baseline and CBT effect at post-treatment, but also at follow-up or across time (Turner et al., 2018). Overall, studies show heterogenous results. Ginsburg et al. (2008) and Turner et al. (2018) summarized, based on their review and meta-analysis, that among all these examined possible predictors, there were only baseline OCD severity, comorbidity, and family dysfunction associated with poorer responsiveness to CBT. Turner et al. (2018) also identified, by calculating pooled effect sizes, the initial level of functioning impairment and older age as predictors for poorer response to CBT treatment. More recent studies confirm these associations (e.g., Monzani et al., 2020), some show different results in parts (e.g., Riise et al., 2019). Not so much is known about moderators and mediators (Goletz, Döpfner & Roessner, 2018): McGuire et al. (2015) e.g., identified a greater number of therapeutic contacts, lower treatment attrition, and greater co-occurring anxiety as moderators, associated with greater CBT treatment effects. Chu et al. (2015) found in their analyses regarding mediators of exposure therapy that youth coping strategies (e.g., identifying anxious thoughts, problem solving) and therapist interventions (e.g., extensive exposures) significantly mediated anxiety change across ERP.
Moreover, to improve CBT treatment outcome an increasing focus was set in the past years on delivering CBT in other formats or new and innovative ways. Intensive CBT approaches (increased session intensity) are to be mentioned here (see also Giridharan et al., 2023). Those intensive CBT programs (e. g., 5-day intensive ERP treatment; Whiteside & Jacobson, 2010; Whiteside et al., 2014, 2018; see also Adam et al., 2023) may be useful for treatment-resistant OCD or may lead to a more rapid relief (e.g., AACAP, 2012; Farrell, Sluis & Waters, 2016). Another focus was put on the use of digital technology. Especially, the potential of CBT via video teleconferencing has been supported in effectiveness (Comer et al., 2014; Farrell, Sluis & Waters, 2016; Hollmann et al., 2021) and efficacy (Comer et al., 2017; Storch et al.,

2011; Cervin et al., 2024) studies. A blended treatment option, specifically the combination of face-to-face CBT and ERP via VTC (and additionally using an app system), seem particularly promising (Adam et al., 2023; Babiano-Espinosa et al., 2021; Wang et al., 2024) but not necessarily more effective than traditional face-to-face CBT (Babiano-Espinosa et al., 2023).
Overall, CBT achieves large effects and is first-choice method to treat OCD. To increase the currently still not satisfactory remission rates, a direction for future research is certainly to further move to personalized mental health care, to investigate which children or adolescents benefit most from which treatment delivery option, and how CBT can be tailored individually.

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Appendix

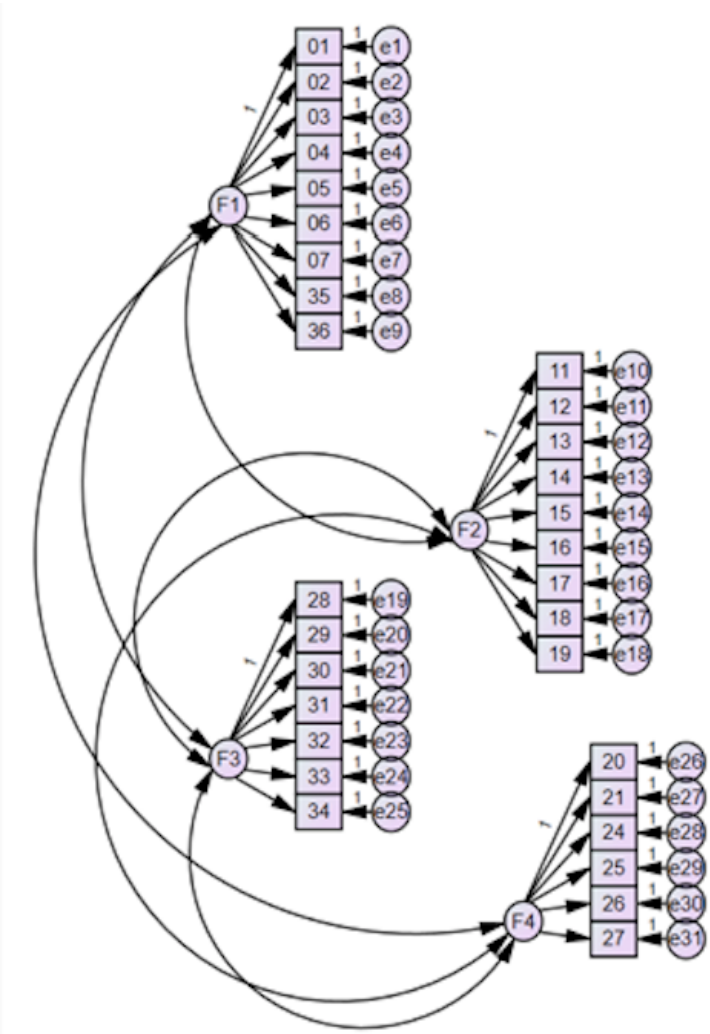
Appendix 1 Supplementary information of study 1 (Adam et al., 2019)

Appendix 2 Supplementary information of study 2 (Adam et al., 2022)

Additional File 1

Results from confirmatory factor analyses based on the four-factor solution by Waclawiak (2006, unpublished)

The tested model/ four-factor solution found by Waclawiak (2006, unpublished)



F1 = Factor 1	**F2** = Factor 2	**F3** = Factor 3	**F4** = Factor 4
Item **01**: Hands feel dirty	Item **11**: Doing things several times	Item **28**: Unnecessary concerns	Item **20**: Certain number
Item **02**: Difficulties to touch certain objects	Item **12**: Repetitive checking more often than necessary	Item **29**: Fear of something bad happening	Item **21**: Counting
Item **03**: Difficulties to touch garbage	Item **13**: Checking and re-checking water taps or light switches	Item **30**: Worrying about having hurt someone	Item **24**: Certain actions to avoid misfortune
Item **04**: Avoiding using public toilets	Item **14**: Checking doors, windows or drawers	Item **31**: Fear of being to blame for catastrophes	Item **25**: Certain numbers or words to keep away bad luck
Item **05**: Intensive hand-washing	Item **15**: Checking homework	Item **32**: Worrying about having a disease	Item **26**: Recurrent thoughts
Item **06**: Hand-washing due to fear of contamination	Item **16**: Checking matches, candles etc.	Item **33**: Getting worried at the sight of pointed objects	Item **27**: Reassurance-seeking
Item **07**: Washing due to thoughts of being dirty	Item **17**: Counting and re-counting money	Item **34**: Getting upset when hearing about a crime	
Item **35**: Useless worries about germs or toxins	Item **18**: Rereading texts several times		
Item **36**: Disgust for perspiration or urine	Item **19**: Repeating actions		

Note: The model was tested using AMOS [Arbuckle JL. Amos (Version 23.0) [Computer Program]. IBM SPSS: Chicago; 2014.]

Results from confirmatory factor analyses based on the four-factor solution by Waclawiak (2006, unpublished)

Sample	**x^2 test**	**RMSEA**	**90%CI**	**SRMR**	**CFI**	**TLI**
CLIN	$x^2_{(df=428)}$= 1553.380, p=.001	.09	.08-.09	**.08**	**.81**	**.80**
	($x^2_{(df=428)}$= 1205.661, p=.001)	(.09)	(.09-.10)	(**.08**)	(.75)	(.73)
OCDS	$x^2_{(df=428)}$= 1036.113, p=.001	.09	.08-.10	**.09**	.78	.76
	($x^2_{(df=428)}$= 1005.776, p=.004)	(.10)	(.09-.11)	(**.09**)	(.70)	(.67)

Note: CLIN: parent form: *n* = 342, (self-report form: *n* = 218); OCDS: parent form: *n* = 181, (self-report form: *n* = 134); values printed in bold met cut-off criteria for goodness of model fit.

Additional file 2

Exploratory principal component analysis with varimax rotation, four-factor solution

	Parent form: Factors				Self-report form: Factors			
Item	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Contamination & Washing								
1. Hands feel dirty	**.86**					**.78**		
2. Difficulties to touch certain objects	**.82**					**.73**		
3. Difficulties to touch garbage	**.82**					**.75**		
4. Avoiding using public toilets	**.76**					**.65**		
5. Intensive hand-washing	**.83**					**.73**	.32	
6. Hand-washing due to fear of contamination	**.85**					**.71**	.28	
7. Washing due to thoughts of being dirty	**.88**					**.71**		
35. Useless worries about germs or toxins	**.57**				.40	**.54**		
36. Disgust for perspiration or urine	**.72**	.50				**.61**		
Catastrophes & Injuries								
24. Certain actions to avoid misfortune		**.66**		.39	.51		.44	**.29**
25. Certain numbers or words to keep away bad luck		**.56**		.33	.31		.55	**.34**
26. Recurrent thoughts		**.62**	.25		.53			**.45**
27. Reassurance-seeking		**.67**	.27		**.67**			
28. Unnecessary concerns		**.75**	.29		.58			**.42**
29. Fear of something bad happening		**.66**	.41		.65			**.30**
30. Worrying about having hurt someone		**.50**	.33		.44			**.45**
31. Fear of being to blame for catastrophes		**.61**						**.63**
32. Worrying about having a disease		**.67**			.51			**.37**
33. Getting worried at the sight of pointed objects		**.43**						**.64**
34. Getting upset when hearing about a crime		**.69**						**.74**
Checking								
12. Repetitive checking more often than necessary			**.56**	.44	**.75**			
13. Checking and rechecking water taps or light switches			**.67**		**.72**			
14. Checking doors, windows or drawers			**.73**		**.65**			
15. Checking homework			**.70**	.25	**.39**			
16. Checking matches, candles etc.		.26	**.65**		**.49**			
17. Counting and recounting money			**.59**		**.26**		.25	.53
18. Rereading texts several times			**.58**				**.53**	.43
22. Hoarding and saving			.36					.64
Ordering & Repeating								
8. Following a particular order in washing	.40			**.65**		.32	**.63**	
9. Doing certain things in a certain order before going to sleep				**.61**			**.70**	
10. Hanging up or folding clothes in a special way				**.65**			**.72**	
11. Doing things several times			.42	**.69**	.57		**.40**	
19. Repeating actions		.31	.30	**.65**	.41		**.53**	
20. Certain number		.28		.67			.60	.33
21. Counting				.55			.53	.32
23. Not getting ready	.27			.43	.26			

Note: CLIN: parent form: $n = 342$, self-report form: $n = 218$; abbreviated item content; factor loadings > .25

Additional file 3

Parent form: Intercorrelations between the subscales

Scale	Parent form					
	CAT		CHECK		Ordering & Repeating	
	6-10 years old	11-18 years old	6-10 years old	11-18 years old	6-10 years old	11-18 years old
Contamination & Washing (CONT)	.56** {.47**}	.36** {.11} (.55**)	.23* {.05}	.29** {.06} (.65**)	.46** {.33*}	.35** {.08} (.60**)
Catastrophes & Injuries (CAT)			.31** {.15}	.54** {.41**} (.71**)	.40** {.25}	.45** {.27**} (.69**)
Checking (CHECK)					.61** {.51**}	.55** {.43**} (.71**)

Note: CLIN, {OCDS}, (COS); 6-10 years old: n = 110, {n = 46}; 11-18 years old: n = 232, {n = 134}, (n = 367); *p < .05, **p < .01

Additional file 4

Self-report form: Intercorrelations between the subscales

Self-report form, 11-18 years old			
Scale	**CAT**	**CHECK**	**Ordering & Repeating**
Contamination & Washing (CONT)	.43** {.32**} (.53**)	.46** {.32**} (.55**)	.44** {.28**} (.54**)
Catastrophes & Injuries (CAT)		.71** {.68**} (.63**)	.59** {.53**} (.55**)
Checking (CHECK)			.61** {54**} (.62**)

Note: CLIN: n = 218, {OCDS: n = 134}, (COS: n = 367); **p < .01

Additional file 5

OCDS: Correlations between the OCD-CA scales and internalizing and externalizing problems and symptoms

OCD-CA Scales	CBCL/ YSR		FBB-/SBB-DES Total Score	FBB-/ SBB-ANZ Total Score
	Internalizing Problems	Externalizing Problems		
Contamination & Washing	.55** [.23**] (.23**)	-.10 [.16] (.20*)	.45** [.15] (.18*)	.53** [.21*] (.28*)
Catastrophes & Injuries	.69** [.43**] (.55**)	-.09 [.22*] (.39**)	.49** [.26**] (.46**)	.63** [.63**] (.68**)
Checking	.10 [.23**] (.47**)	-.04 [.14] (.32**)	.06 [.16] (.34**)	.11 [.46**] (.52**)
Ordering & Repeating	.23 [.30**] (.33**)	-.17 [.33**] (.31**)	.28 [.32**] (.33**)	.25 [.27**] (.38**)
OCD Total	.61** [.48**] (.54**)	-.13 [.34**] (.43**)	.52** [.37**] (.45**)	.60** [.62**] (.61**)

Note: parent form: 6-10 years old and [11-18 years old] / (self-report form); parent form: CBCL: $n = 42$, FBB-DES: $n = 40$, FBB-ANZ: $n = 35$, [CBCL: $n = 132$, FBB-DES: $n = 127$, FBB-ANZ: $n = 101$]; self-report form: (YSR: $n = 130$, SBB-DES: $n = 126$, SBB-ANZ: $n = 101$); *$p < .05$, **$p < .01$

Additional file 6

COS: Correlations between the OCD-CA scales and internalizing and externalizing problems

OCD-CA scales	CBCL/ YSR	
	Internalizing Problems	**Externalizing Problems**
Contamination & Washing	.39**	.27**
	(.23**)	(.22**)
Catastrophes & Injuries	.65**	.47**
	(.43**)	(.37**)
Checking	.44**	.23**
	(.28**)	(.22**)
Ordering & Repeating	.45**	.24**
	(.22**)	(.19**)
OCD Total	.60**	.40**
	(.39**)	(.34**)

Note: parent form/ (self-report form); parent form: CBCL: n = 246-257; self-report form: (YSR: n = 354-357); *p < .05, **p < .01

Additional file 7

OCDS: Correlations between the OCD-CA scales of the parent form/ (self-report form) and the CY-BOCS-D

	CY-BOCS-D Rating Scale	**CY-BOCS-D Checklist Scales**				
OCD-CA scales	OCD total Severity	Obsessions regarding loss of control and religion	Checking, harm avoidance and sexual obsessions	Contamination and Cleaning	Repeating, ordering/arranging, hoarding and magical thinking	OCD Total
Contamination & Washing	.10	-.13	-.07	**.69****	-.15	.13
	(.27)	(-.01)	(.03)	**(.75**)**	(.01)	(.32**)
Catastrophes & Injuries	.19	**.32****	**.38****	-.08	**.12**	.28**
	(.41**)	**(.30**)**	**(.60**)**	(-.09)	**(.39**)**	(.49**)
Checking	.27	.02	**.43****	-.01	.20	.27**
	(.38*)	(.15)	**(.54**)**	(-.02)	(.37**)	(.44**)
Ordering & Repeating	-.03	-.13	.07	.10	**.23***	.12
	(.51**)	(.17)	(.28**)	(.11)	**(.48**)**	(.44**)
OCD-CA Total	.21	.04	.26*	.36**	.13	**.32****
	(.53**)	(.23*)	(.49**)	(.27**)	(.44**)	**(.60**)**

Note: OCDS: 11-18 years old; CY-BOCS-D Rating Scale: $n = 44$, ($n = 44$); CY-BOCS-D Checklist Scales: $n = 90$, ($n = 92$); *$p < .05$, **$p \leq .01$

Additional file 8

Comparison of OCD-CA parent ratings in the OCDS and non-OCD in children aged 6 to 10 years old

Scale	**OCDS** *M (SD)*	**Non-OCD** *M (SD)*	*t*
Contamination & Washing	8.37 (9.04)	1.98 (3.43)	4.56**
Catastrophes & Injuries	8.33 (8.96)	2.20 (3.03)	4.46**
Checking	3.50 (5.05)	0.70 (1.35)	3.66**
Ordering & Repeating	5.80 (5.12)	1.22 (2.41)	5.64**
OCD Total	29.63 (21.62)	8.17 (8.15)	6.41**

Note: OCDS: $n = 46$, Non-OCD: $n = 64$; **$p \leq .001$

Additional file 9

Comparison of means between self- and parent-report form

Scale	OCD-CA		
	Self-report *M (SD)*	**Parent report** *M (SD)*	*t*
Contamination & Washing	9.96 (8.40)	12.86 (10.90)	-4.01**
	(5.54 (4.77))	(2.89 (4.05))	(-9.47**)
Catastrophes & Injuries	9.72 (9.19)	8.98 (8.42)	0.91
	(5.49 (5.65))	(1.94 (3.50))	(-11.87**)
Checking	5.54 (5.43)	4.19 (5.12)	3.09*
	(4.59 (4.03))	(1.43 (2.54))	(-15.11**)
Ordering & Repeating	5.56 (4.50)	6.01 (5.24)	-0.99
	(1.51 (2.08))	(0.65 (1.67))	(-8.28**)
OCD Total	34.31 (23.26)	35.43 (20.56)	-0.56
	(19.39 (14.83))	(8.16 (11.01))	(-13.98**)

Note: OCDS: $n = 134$; (COS: $n = 367$); *$p < .01$, **$p < .001$

Additional file 10

CLIN: Comparison of means between age groups and gender in the parent form (ANOVA)

Scale	6-10 years old	N	M (SD)	11-18 years old N	M (SD)	Age effect F	Gender effect F	Interaction F
Contamination & Washing	*Overall*	110	4.65 (7.11)	232	8.86 (10.33)	14.15**	0.44	0.20
	Males	72	4.57 (7.50)	134	8.33 (10.79)			
	Females	38	4.82 (6.40)	98	9.59 (9.67)			
Catastrophes & Injuries	*Overall*	110	4.76 (6.90)	232	6.57 (8.03)	4.36*	2.79	1.12
	Males	72	4.57 (7.17)	134	5.51 (7.64)			
	Females	38	5.13 (6.43)	98	8.02 (8.34)			
Checking	*Overall*	110	1.87 (3.68)	232	3.00 (4.45)	4.51*	4.48*	0.09
	Males	72	1.56 (3.26)	134	2.48 (4.13)			
	Females	38	2.47 (4.34)	98	3.69 (4.79)			
Ordering & Repeating	*Overall*	110	3.14 (4.40)	232	3.94 (4.98)	1.85	2.55	0.12
	Males	72	2.89 (4.66)	134	3.47 (4.78)			
	Females	38	3.61 (3.87)	98	4.59 (5.19)			
OCD Total	*Overall*	110	17.15 (18.56)	232	25.04 (22.70)	9.72**	3.60	0.63
	Males	72	16.17 (20.36)	134	22.13 (23.53)			
	Females	38	19.00 (14.61)	98	29.03 (20.99)			

Note: age groups: 6-10 years old and 11-18 years old; *$p < .05$, **$p < .01$

Additional file 11

OCDS: Comparison of means between age groups and gender in the parent form (ANOVA)

Scale	6-10 years old	N	M (SD)	11-18 years old	N	M (SD)	Age effect F	Gender effect F	Interaction F
Contamination & Washing	*Overall*	46	8.37 (9.04)	*Overall*	135	13.06 (10.91)	7.35*	2.24	0.09
	Males	25	9.84 (10.29)	*Males*	66	14.15 (11.68)			
	Females	21	6.62 (7.14)	*Females*	69	12.01 (10.10)			
Catastrophes & Injuries	*Overall*	46	8.33 (8.96)	*Overall*	135	9.28 (8.53)	0.53	0.54	1.93
	Males	25	9.76 (9.93)	*Males*	66	8.79 (7.89)			
	Females	21	6.62 (7.52)	*Females*	69	9.75 (9.13)			
Checking	*Overall*	46	3.50 (5.05)	*Overall*	135	4.36 (5.08)	0.85	1.49	0.00
	Males	25	3.04 (4.92)	*Males*	66	3.79 (4.97)			
	Females	21	4.05 (5.27)	*Females*	69	4.90 (5.16)			
Ordering & Repeating	*Overall*	46	5.80 (5.12)	*Overall*	135	6.10 (5.32)	0.12	0.00	0.36
	Males	25	6.08 (5.95)	*Males*	66	5.85 (5.46)			
	Females	21	5.48 (4.04)	*Females*	69	6.33 (5.21)			
OCD Total	*Overall*	46	29.63 (21.62)	*Overall*	135	36.30 (20.70)	3.73	0.58	1.10
	Males	25	32.60 (26.48)	*Males*	66	35.77 (21.69)			
	Females	21	26.10 (13.64)	*Females*	69	36.80 (19.96)			

Note: age groups: 6-10 years old and 11-18 years old; ** $p < .05$

Additional file 12

Comparison of means between boys and girls

Scale	Parent form			Self-report form		
	Boys *M (SD)*	**Girls** *M (SD)*	*t*	**Boys** *M (SD)*	**Girls** *M (SD)*	*t*
Contamination & Washing				7.07 (8.16)	8.27 (7.81)	-1.10
				{10.05 (9.14)}	{9.88 (7.69)}	{0.11}
	(2.45 (3.71))	(3.19 (4.25))	(-4.21)	(5.82 (4.98))	(5.36 (4.63))	(0.91)
Catastrophes & Injuries				6.09 (7.43)	9.42 (8.95)	-2.93**
				{8.48 (8.80)}	{10.88 (9.47)}	{-1.52}
	(1.67 (3.05))	(2.12 (3.76))	(-2.23)	(5.58 (5.86))	(5.43 (5.52))	(0.25)
Checking				4.01 (4.95)	4.88 (4.74)	-1.32
				{5.22 (6.07)}	{5.86 (4.77)}	{-0.68}
	(1.28 (2.30))	(1.52 (2.68))	(-2.51)	(4.90 (3.99))	(4.39 (4.05))	(1.20)
Ordering & Repeating				3.34 (3.93)	4.81 (4.72)	-2.45*
				{4.83 (4.20)}	{6.25 (4.70)}	{-1.84}
	(0.45 (1.11))	(0.78 (1.94))	(-1.51*)	(1.74 (2.16))	(1.35 (2.01))	(1.75)
OCD Total				22.89 (22.45)	30.69 (22.38)	-2.55*
				{31.77 (25.02)}	{36.70 (21.39)}	{-1.23}
	(6.98 (9.72))	(8.93 (11.74))	(-3.38)	(20.26 (15.29))	(18.82 (14.52))	(0.91)

Note: CLIN, {OCDS}, (COS); parent form: COS: boys: n = 146 girls: n = 221;
self-report form: CLIN: boys: n = 123, girls: n = 95; OCD: boys: n = 65, girls: n = 69; COS: boys: n = 146, girls: n = 221; *p < .05, **p ≤ .01

Additional file 1

Details of the treatment

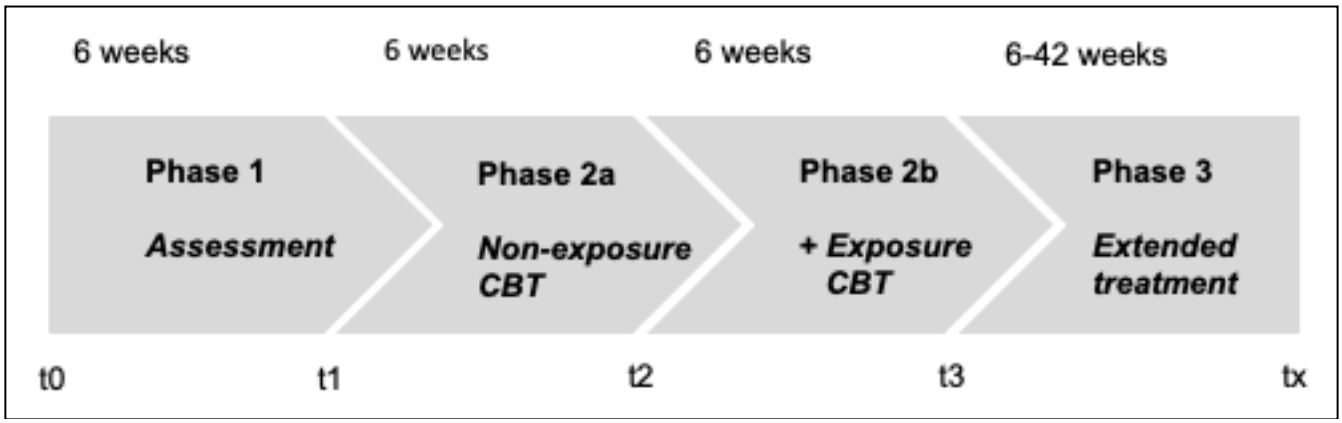
The treatment was based on the German *treatment program for children and adolescents with OCD* (Therapieprogramm für Kinder und Jugendliche mit Angst- und Zwangsstörungen – Zwänge [THAZ-Zwänge]; Goletz & Döpfner, in prep.).

Contents of non-exposure CBT (phase 2a, t1-t2) were the development of a therapeutic relationship and activation of resources, psychoeducation and enhancement of motivation for therapy, treatment of problem-maintaining familial, school, and other conditions, as well as cognitive interventions regarding dysfunctional cognitions. During the further treatment phases (phase 2b and phase 3, t2-tx), exposure with response prevention (ERP) for the treatment of compulsive acts and obsessive thoughts were added. Furthermore, patients were instructed with weekly homework regarding ERP assignments. The final six weekly sessions also comprised multimodal relapse prevention, including emotion-focused interventions and social skills training. Therapeutic materials within the THAZ treatment program could be tailored individually to the patient according to the mentioned and planned interventions.

Reference

Goletz H, Döpfner M. (in Vorb.). *Zwangsstörungen: Ein Therapieprogramm für Kinder und Jugendliche mit Angst- und Zwangsstörungen (THAZ) – Band 3*. Göttingen: Hogrefe.

Additional file 2
Within-subject design clinical trial



Additional file 3
Outcome measures

German version of the Children's Yale-Brown Obsessive-Compulsive Scale (CY-BOCS-D; Goletz & Döpfner, 2018). The CY-BOCS-D is based on the English original version of the CY-BOCS (Goodman et al., 1986). OCD severity is rated based on a parent interview (patients < 11 years) or patient interview (patients ≥ 11 years). The CY-BOCS-D includes a checklist and a rating scale. Within this study, the rating scale (semi-structured interview) was used to measure obsession severity, compulsion severity, and the total OCD severity. The total OCD severity scale was derived by summing up the responses to items 1-10, and obsession and compulsion severity were derived by summing up the responses to items 1-5 and 6-10, respectively (items 1b and 6b were excluded). Items are rated on a 5-point Likert scale (0-4), with higher scores indicating greater symptom severity. The CY-BOCS-D has shown acceptable and good internal consistency, respectively. Sufficient support for the validity of the CY-BOCS-D has also been found (Goletz & Döpfner, 2018).

Diagnostic Checklist for OCD (DCL-ZWA; Döpfner et al., 2008). The checklist includes OCD diagnostic criteria according to ICD-10 and DSM-IV. OCD was diagnosed with this checklist. Furthermore, OCD-associated personality traits (eight items) were assessed on a 5-point scale ("0 = none" to "4 = extreme"). As the psychometric properties of this DCL-ZWA scale have not been evaluated so far, internal consistency was examined in the study sample, showing an acceptable result (α = .72).For scale formation, the item values are added up and divided by the number of items.

German OCD Inventory for Children and Adolescents (OCD-CA; Goletz, Adam & Döpfner, 2020).
The OCD-CA is a modified version of the Padua Inventory – Washington State University Revision (PI-WSUR; Burns et al., 1996 / PI-WSUR (German translation); Department for Neuropsychology of the University Hospital Bonn, 2002). It comprises two multidimensional questionnaires, a parent form (6 to 18 years) and a self-report form (11 to 18 years). Both questionnaires include the same 36 items for assessing various obsessions and compulsions on a 5-point scale from 0 (not at all) to 4 (very much). The OCD-CA total scale was used for the analyses. For scale formation, ratings of the items are added up. The OCD-CA was found to be a reliable and valid diagnostic instrument (Adam et al., 2019).

OCD-related problem list (OCD-PL; Goletz, Adam & Döpfner, 2020). The OCD-related problem list exists in a parent form (children ≥ 4 years) and self-report form (adolescents ≥ 11 years). At pre-treatment (t0), the therapist completed the OCD-PL together with the patient and parents. Individual obsessions, unpleasant feelings (e.g. anxiety) and compulsions were written down. These individual OCD symptoms were then rated by patient and parents regarding frequency ("0 = not at all" to "4 = very much"), strain ("0 = no problem at all" to "9 = it could not have been worse") and psychosocial impairment in school/job, leisure time and family life ("0 = not all" to "4 = extremely impaired") referring to the last week. To evaluate treatment effects, means of the weekly ratings regarding frequency, strain, and psychosocial impairment were used.

Daily Observation (Goletz, Döpfner & Roessner, 2018). This protocol includes columns regarding (1) time, (2) triggering events/obsessions, (3) extent of negative emotions (e.g. anxiety) on a scale from 0 to 100, (4) compulsions, (5) duration in minutes, (6) strain caused by OCD symptoms on a scale from 0 to 100. The OCD symptoms were recorded by patients (≥ 11 years) and parents separately on one weekday (*Daily Observation weekday*) and one day at the weekend (*Daily Observation weekend*) at pre-treatment (t0 and t1) and every treatment week. For the analyses, means of the extent of negative emotions, sum of duration, and means of strain of each rating were used.

OCD-functional impairment list (OCD-FL). The OCD-FL is based on the Weiss Functional Impairment Rating Scale – Parent Report (WFIRS-P, Canadian Attention Deficit Hyperactivity Disorder Resource Alliance (CADDRA), 2011). The OCD-FL includes 26 items and exists in a parent form (patient ≥ 6 years) and a self-report form (patients ≥ 11 years), which are constructed analogously to each other. Psychosocial impairment is assessed on a 4-point scale ranging from "0 = not at all" to "3 = very often or very much" with regard to five domains: (1) family, (2) learning &

school, (3) life skills, (4) self-concept, (5) social activities. The total score was used for the analyses. As psychometric properties of the OCD-FL have not been evaluated so far, Cronbach's alpha for the total scale was computed using the study sample. Internal consistencies were good to excellent (self-report form: α = .90, parent form: α = .84).

Youth Self Report – YSR/ 11-18R (YSR; Döpfner et al., 2014) & Child Behavior Checklist/ 6-18R (CBCL; Döpfner et al., 2014). These instruments were originally developed by Achenbach & Rescorla (2001). The self-report (YSR: 112 items; patients ≥ 11 years) and parent report (CBCL: 113 items; patients ≥ 6 years) assess a range of behavioral and emotional problems in children and adolescents. Each item is rated on a 3-point scale ("0 = not true", "1 = somewhat or sometimes true", "2 = very true or often true"). Items are assigned to two broad-band syndrome scales (externalizing and internalizing problems) and eight syndrome scales (aggressive behavior, anxious/depressed, attention problems, rule-breaking behavior, somatic complaints, social problems, thought problems, withdrawn/depressed) and a total scale. Research has demonstrated good reliability and factorial validity (Döpfner et al., 2014). To evaluate overall comorbid symptoms, the broad-band syndrome scales and the total scale were used.

German Symptom Checklists for Anxiety Disorders and Obsessive-Compulsive Disorders (FBB-/SBB-ANZ; Döpfner et al., 2008). These questionnaires include the same 33 items each, with 31 items assessing anxiety symptoms and two items assessing obsession and compulsion. All items are rated on a 4-point scale ("0 = not at all" to "3 =very much"). Furthermore, the questionnaires each include eight items assessing competences regarding sociability and confidence (scale: competences). Results from psychometric evaluations of the SBB-/FBB-ANZ supported reliability and validity (Döpfner et al. 2008). For the analyses, the total anxiety scale and the competence scale were used.

German Symptom Checklists for Depressive Disorders (FBB-/SBB-DES; Döpfner et al., 2008). The structure, implementation, and assessment are the same as described for the SBB-/FBB-ANZ. The total score scale includes 29 items, and a further eight items asked about competences regarding self-confidence and the ability to enjoy things (scale: competences). Research has yielded good results regarding reliability and validity (Döpfner et al. 2008). For the analyses, the total anxiety scale and the competence scale were used.

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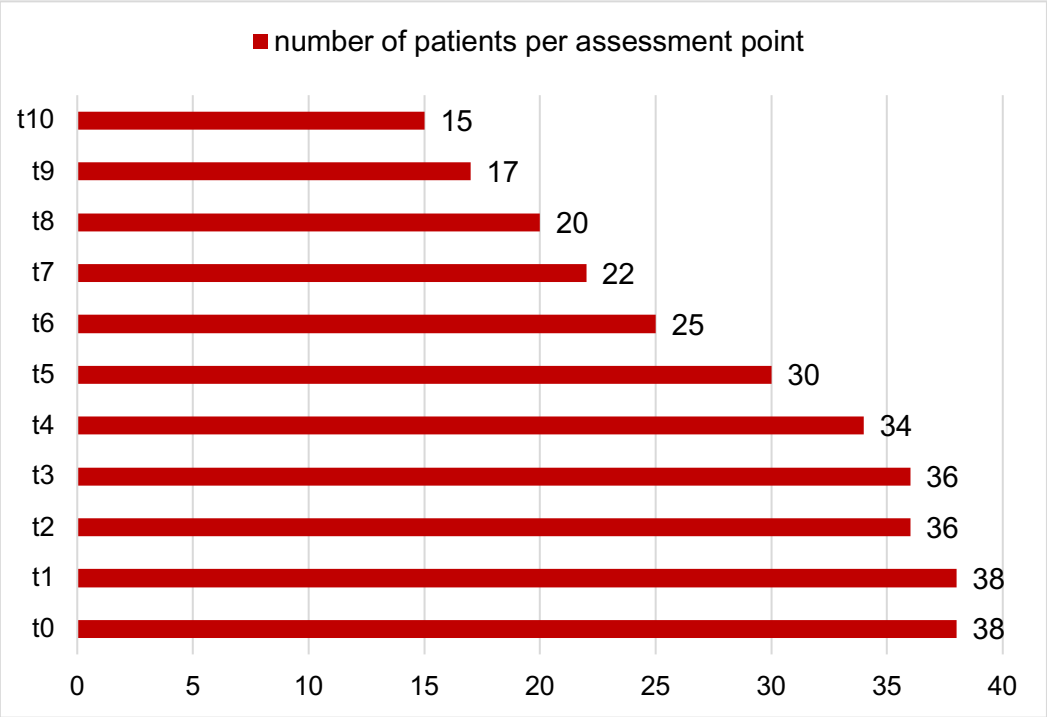
Additional file 4
Individual end of treatment



Note: *two dropouts at t2, two dropouts at t4, one dropout at t8*

Additional file 5: *Results of multilevel analyses: Assessment (t0-t1) vs. treatment (t1-t3) vs. extended treatment (t3-t10)*

		Change during assessment		Change during standard treatment		Change during extended treatment							
		phase 1: t0-t1		phase 2 and 3: t1-t3		phase 3a: t3-t5		phase 3b: t5-t7		phase 3c: t7-t9		phase 3d : t9-t10	
Outcome	*n*	*β (CI 95%)*	*ES*	*β (CI 95%)*	*ES*	*β (CI 95%)*	*ES*	*β (CI 95%)*	*ES*	*β (CI 95%)*	*ES*	*β (CI 95%)*	*ES*
Daily observation, weekday													
Extent of negative emotions	[29]	[-0.38^{a}] [(-2.06 to 1.30)]	[-0.09]	[-1.68***^{b,c}] [(-2.19 to -1.17)]	[-0.83]	[-0.50*^{a,d}] [(-0.94 to -0.06)]	[-0.25]	[-0.44^{a,d}] [(-0.92 to 0.05)]	[-0.22]	[-0.24^{a,d}] [(-0.85 to 0.36)]	[-0.12]	[1.11^{a,d}] [(-0.70 to 2.91)]	[0.27]
	{29}	{-0.67^{a}} {(-2.06 to 0.72)}	{-0.19}	{-0.78**^{a,c}} {(-1.33 to -0.23)}	{-0.45}	{-0.84***^{a,c}} {(-1.35 to -0.33)}	{-0.49}	{0.69*^{b,d}} {(0.13 to 1.25)}	{0.40}	{-0.56^{b,c}} {(-1.26 to 0.15)}	{-0.33}	{0.19^{a,c}} {(-1.93 to 2.31)}	{0.05}
Duration	[30]	[2.51^{a}] [(-2.20 to 7.22)]	[0.15]	[-3.71***^{b,c}] [(-5.19 to -2.23)]	[-0.44]	[-2.28***^{b,d}] [(-3.56 to -1.01)]	[-0.27]	[0.01^{b,d}] [(-1.39 to 1.42)]	[0.00]	[-0.78^{b,d}] [(-2.54 to 0.98)]	[-0.09]	[0.29^{a,c}] [(-5.02 to 5.59)]	[0.02]
	{33}	{-0.10^{a}} {(-3.66 to 3.45)}	{-0.01}	{-3.72***^{b,c}} {(-5.11 to -2.32)}	{-0.52}	{-0.53^{a,d}} {(-1.82 to 0.76)}	{-0.07}	{1.31^{a,d}} {(-0.15 to 2.76)}	{0.18}	{-1.91*^{b,d}} {(-3.72 to -0.11)}	{-0.27}	{0.88^{a,c}} {(-4.40 to 6.16)}	{0.06}
Strain	[29]	[0.91^{a}] [(-0.69 to 2.50)]	[0.21]	[-1.54***^{b,c}] [(-2.04 to -1.04)]	[-0.73]	[-0.91***^{b,d}] [(-1.35 to -0.48)]	[-0.43]	[-0.69**^{b,d}] [(-1.17 to -0.21)]	[-0.33]	[-0.37^{b,d}] [(-0.98 to 0.23)]	[-0.18]	[1.19^{a,d}] [(-0.63 to 3.00)]	[0.28]
	{32}	{-2.71***^{a}} {(-4.27 to -1.15)}	{-0.77}	{-0.93**^{b,c}} {(-1.54 to -0.33)}	{-0.53}	{-0.76**^{b,c}} {(-1.31 to -0.22)}	{-0.43}	{0.79**^{b,d}} {(0.16 to 1.42)}	{0.45}	{-1.22**^{b,c}} {(-2.05 to -0.39)}	{-0.69}	{-0.34^{a,c}} {(-2.77 to 2.09)}	{-0.10}
Daily observation, weekend													
Extent of negative emotions	[28]	[-1.12^{a}] [(-2.98 to 0.75)]	[-0.30]	[-1.20***^{a,c}] [(-1.71 to -0.68)]	[-0.65]	[-0.73***^{a,d}] [(-1.17 to -0.28)]	[-0.39]	[-0.61**^{b,d}] [(-1.10 to -0.12)]	[-0.33]	[-0.30^{b,d}] [(-0.92 to 0.32)]	[-0.16]	[0.37^{a,c}] [(-1.53 to 2.27)]	[0.10]
	{29}	{-1.68*^{a}} {(-3.23 to -0.13)}	{-0.43}	{-0.75*^{b,c}} {(-1.37 to -0.14)}	{-0.39}	{-0.15^{b,d}} {(-0.70 to 0.41)}	{-0.08}	{0.03^{b,d}} {(-0.55 to 0.62)}	{0.02}	{0.04^{b,d}} {(-0.70 to 0.78)}	{0.02}	{-1.40^{a,c}} {(-3.65 to 0.84)}	{-0.36}
Duration	[30]	[0.58^{a}] [(-5.15 to 6.32)]	[0.04]	[-2.20**^{b,c}] [(-3.74 to -0.65)]	[-0.33]	[-2.98***^{b,c}] [(-4.32 to -1.64)]	[-0.45]	[0.47^{a,d}] [(-1.01 to 1.96)]	[0.07]	[-1.00^{a,c}] [(-2.88 to 0.89)]	[-0.15]	[-0.31^{a,c}] [(-6.14 to 5.52)]	[-0.02]
	{31}	{-3.62^{a}} {(-7.72 to 0.48)}	{-0.27}	{-3.86***^{a,c}} {(-5.36 to -2.36)}	{-0.57}	{-0.50^{b,d}} {(-1.87 to 0.87)}	{-0.07}	{1.17^{b,d}} {(-0.36 to 2.70)}	{0.17}	{-1.34^{b,d}} {(-3.35 to 0.66)}	{-0.20}	{0.25^{a,c}} {-5.66 to 6.16}	{0.02}
Strain	[29]	[0.75^{a}] [(-1.25 to 2.77)]	[0.17]	[-1.48***^{b,c}] [(-1.20 to -0.97)]	[-0.65]	[-1.02***^{b,d}] [(-1.47 to -0.58)]	[-0.45]	[-0.68**^{b,d}] [(-1.18 to -0.18)]	[-0.30]	[-0.55^{b,d}] [(-1.18 to 0.08)]	[-0.24]	[0.69^{a,d}] [(-1.29 to 2.67)]	[0.15]
	{30}	{-2.94***^{a}} {(-4.72 to -1.17)}	{-0.97}	{-1.14***^{b,c}} {(-1.80 to -0.49)}	{-0.75}	{-0.32^{b,d}} {(-0.91 to 0.27)}	{-0.21}	{0.42^{b,d}} {(-0.24 to 1.09)}	{0.28}	{-0.87*^{b,c}} {(-1.76 to 0.01)}	{-0.57}	{-1.42^{a,c}} {(-4.03 to 1.20)}	{-0.47}

Note: *n* = sample size, *β* = slope, *CI* = confidence interval, *ES* = effect size; clinical rating, [self-report], {parent report}; *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$; ^{a,b,c,d} slopes with superscripts (a) do not differ significantly from assessment phase, slopes with superscript (b) differ significantly at a level of ≤ .05 from assessment phase; slopes with superscripts (c) do not differ significantly from standard treatment phase, slopes with superscript (d) differ significantly at a level of ≤ .05 from standard treatment phase

Additional file 6: *Results of multilevel analyses: Assessment (t0-t1) vs. non-exposure CBT (t1-t2) vs. exposure CBT (t2-t3) vs. extended treatment (t3-t10)*

		Change during assessment (phase 1: t0-t1)				Change during non-exposure CBT (phase 2a: t1-t2)				Change during exposure CBT (phase 2b: t2-t3)				Exposure CBT effect
Outcome	*n*	*β*	*CI (95%)*	*≤ p*	*ES*	*β*	*CI (95%)*	*≤ p*	*ES*	*β*	*CI (95%)*	*≤ p*	*ES*	*Δ ES$_{NE-E}$*
CY-BOCS-D rating scale														
Total OCD severity	**38**	**-0.37^{a}**	**-0.74 to -0.00**	**.050**	**-0.52**	**-0.46^{a,c}**	**-0.84 to -0.09**	**.016**	**-0.65**	**-0.62$^{a.c}$**	**-0.98 to -0.26**	**.001**	**-0.87**	**0.22**
Obsession severity	38	-0.18^{a}	-0.41 to 0.05	.119	-0.25	-0.24^{a,c}	-0.47 to -0.00	.047	-0.33	-0.24^{a,c}	-0.46 to -0.01	.041	-0.33	-0.00
Compulsion severity	38	-0.21^{a}	-0.40 to -0.03	.025	-0.57	-0.19^{a,c}	-0.38 to -0.00	.046	-0.52	-0.38^{a,d}	-0.56 to -0.20	.001	-1.03	0.50
OCD-CA														
Total OCD symptoms	[31]	[-0.38^{a}]	[-1.30 to 0.54]	[.414]	[-0.14]	[-0.34^{a,c}]	[-1.25 to 0.57]	[.466]	[-0.12]	[-0.72^{a,c}]	[-1.60 to -0.16]	[.108]	[-0.26]	[0.14]
	{37}	{-0.88^{a}}	{-1.67 to -0.09}	{.030}	{-0.31}	{-0.09^{b,c}}	{-0.89 to 0.71}	{.825}	{-0.03}	{-1.03^{a,d}}	{-1.82 to -0.24}	{.011}	{-0.36}	{0.33}
OCD-related problem list														
Frequency	[31]	[-0.05^{a}]	[-0.09 to -0.01]	[.025]	[-0.28]	[-0.03^{a,c}]	[-0.07 to 0.00]	[.056]	[-0.19]	[-0.06^{a,d}]	[-0.08 to -0.03]	[.001]	[-0.35]	[0.16]
	{32}	{-0.00^{a}}	{-0.05 to 0.04}	{.880}	{-0.03}	{-0.06^{b,c}}	{-0.10 to -0.02}	{.002}	{-0.49}	{-0.06^{b,c}}	{-0.09 to -0.02}	{.002}	{-0.42}	{-0.07}
Strain	[31]	[-0.14^{a}]	[-0.24 to -0.05]	[.003]	[-0.47]	[-0.02^{b,c}]	[-0.10 to 0.06]	[.665]	[-0.06]	[-0.11^{a,d}]	[-0.17 to -0.05]	[.001]	[-0.35]	[0.29]
	{32}	{-0.14^{a}}	{-0.27 to -0.02}	{.022}	{-0.55}	{-0.07^{a,c}}	{-0.18 to 0.03}	{.186}	{-0.27}	{-0.13^{a,c}}	{-0.22 to -0.04}	{.004}	{-0.51}	{0.24}
Psychosocial impairment	[30]	[-0.06^{a}]	[-0.10 to -0.02]	[.001]	[-0.36]	[-0.03^{b,c}]	[-0.06 to -0.00]	[.038]	[-0.18]	[-0.03^{b,c}]	[-0.05 to -0.01]	[.008]	[-0.18]	[-0.00]
	{36}	{-0.03^{a}}	{-0.07 to 0.01}	{.168}	{-0.24}	{-0.06^{a,c}}	{-0.10 to -0.02}	{.003}	{-0.47}	{-0.05^{a,c}}	{-0.08 to -0.01}	{.006}	{-0.36}	{-0.11}

Note: *n* = sample size, *β* = slope, *CI* = confidence interval, *p* = significance value, *ES* = effect size, *Δ ES$_{NE-E}$* = difference between the effect size of the non-exposure CBT phase (NE) and the effect size of the exposure CBT phase (E); clinical rating, [self-report], {parent report}; *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$; ^{a,b,c,d} slopes with superscripts (a) do not differ significantly from assessment phase, slopes with superscript (b) differ significantly at a level of ≤ .05 from assessment phase; slopes with superscripts (c) do not differ significantly from non-exposure CBT phase, slopes with superscript (d) differ significantly at a level of ≤ .05 from non-exposure CBT phase

Additional file 7: *Results of multilevel analyses: Assessment (t0-t1) vs. non-exposure CBT (t1-t2) vs. exposure CBT (t2-t3) vs. extended treatment (t3-t10)*

		Change during assessment (phase 1: t0-t1)				Change during non-exposure CBT (phase 2a: t1-t2)				Change during exposure CBT (phase 2b: t2-t3)				Exposure CBT effect
Outcome	*n*	*β*	*CI (95%)*	*≤ p*	*ES*	*β*	*CI (95%)*	*≤ p*	*ES*	*β*	*CI (95%)*	*≤ p*	*ES*	*Δ ES$_{NE-E}$*
Daily observation, weekday														
Extent of negative emotions	[29]	[-0.70^{a}]	[-2.49 to 1.10]	[.446]	[-0.17]	[-1.04^{a,c}]	[-2.41 to 0.33]	[.138]	[-0.26]	[-2.14^{b,d}]	[-3.18 to -1.10]	[.001]	[-0.53]	[0.27]
	{29}	{-0.94^{a}}	{-2.42 to 0.54}	{.212}	{-0.27}	{-0.14^{a,c}}	{-1.47 to 1.19}	{.836}	{-0.04}	{-1.31^{a,d}}	{-2.44 to -0.17}	{.024}	{-0.38}	{0.34}
Duration	[30]	[4.18^{a}]	[-0.84 to 9.20]	[.103]	[0.25]	[-7.19^{b,c}]	[-11.13 to -3.24]	[.001]	[-0.42]	[-1.20^{b,d}]	[-4.22 to 1.83]	[.438]	[-0.07]	[-0.35]
	{33}	{-0.34^{a}}	{-4.13 to 3.44}	{.859}	{-0.02}	{-3.14^{a,c}}	{-6.52 to 0.24}	{.069}	{-0.22}	{-4.18^{b,c}}	{-7.03 to -1.34}	{.004}	{-0.29}	{0.07}
Strain	[29]	[0.97^{a}]	[-0.73 to 2.66]	[.264]	[0.23]	[-1.66^{b,c}]	[-2.99 to -0.34]	[.014]	[-0.39]	[-1.45^{b,c}]	[-2.48 to -0.43]	[.006]	[-0.34]	[-0.05]
	{32}	{-2.98^{a}}	{-4.66 to -1.29}	{.001}	{-0.84}	{-0.34^{b,c}}	{-1.84 to 1.16}	{.654}	{-0.10}	{-1.38^{b,c}}	{-2.58 to -0.18}	{.024}	{-0.39}	{0.29}
Daily observation, weekend														
Extent of negative emotions	[28]	[-1.46^{a}]	[-3.43 to 0.51]	[.145]	[-0.40]	[-0.50^{a,c}]	[-1.86 to 0.87]	[.474]	[-0.13]	[-1.70^{a,d}]	[-2.74 to -0.66]	[.001]	[-0.46]	[0.32]
	{29}	{-2.00^{a}}	{-3.67 to -0.33}	{.019}	{-0.52}	{-0.04^{b,c}}	{-1.53 to 1.45}	{.955}	{-0.01}	{-1.32^{a,d}}	{-2.56 to -0.07}	{.038}	{-0.34}	{0.33}
Duration	[30]	[0.87^{a}]	[-5.14 to 6.88]	[.776]	[0.07]	[-2.81^{a,c}]	[-6.91 to 1.30]	[.180]	[-0.21]	[-1.75^{a,c}]	[-4.91 to 1.40]	[.276]	[-0.13]	[-0.08]
	{31}	{-3.68^{a}}	{-8.00 to 0.64}	{.095}	{-0.27}	{-3.71^{a,c}}	{-7.33 to -0.09}	{.045}	{-0.27}	{-3.99^{a,c}}	{-7.14 to -0.84}	{.013}	{-0.29}	{0.02}
Strain	[29]	[0.65^{a}]	[-1.45 to 2.74]	[.545]	[0.14]	[-1.24^{b,c}]	[-2.59 to 0.11]	[.073]	[-0.27]	[-1.66^{b,c}]	[-2.71 to -0.61]	[.002]	[-0.36]	[0.09]
	{30}	{-2.83^{a}}	{-4.72 to -0.93}	{.004}	{-0.93}	{-1.41^{a,c}}	{-3.07 to 0.25}	{.095}	{-0.46}	{-0.93^{b,c}}	{-2.31 to 0.45}	{.186}	{-0.31}	{-0.16}

Note: *n* = sample size, *β* = slope, *CI* = confidence interval, *p* = significance value, *ES* = effect size, *Δ ES$_{NE-E}$* = difference between the effect size of the non-exposure CBT phase (NE) and the effect size of the exposure CBT phase (E); clinical rating, [self-report], {parent report}; **p* ≤ .05, ***p* ≤ .01, ****p* ≤ .001; ^{a,b,c,d} slopes with superscripts (a) do not differ significantly from assessment phase, slopes with superscript (b) differ significantly at a level of ≤ .05 from assessment phase; slopes with superscripts (c) do not differ significantly from non-exposure CBT phase, slopes with superscript (d) differ significantly at a level of ≤ .05 from non-exposure CBT phase

Additional file 8: *Results of multilevel analyses: Assessment (t0-t1) vs. non-exposure CBT (t1-t2) vs. exposure CBT (t2-t3) vs. extended treatment (t3-t10)*

		Change during assessment (phase 1: t0-t1)				Change during non-exposure CBT (phase 2a: t1-t2)				Change during exposure CBT (phase 2b: t2-t3)				Exposure CBT effect
Outcome	*n*	*β*	*CI (95%)*	*≤ p*	*ES*	*β*	*CI (95%)*	*≤ p*	*ES*	*β*	*CI (95%)*	*≤ p*	*ES*	*Δ ES_{NE-E}*
OCD functional impairment list														
Total impairment	[30]	[-1.33[a]]	[-1.65 to -1.01]	[.001]	[-0.57]	[-0.39[b,c]]	[-0.65 to -0.14]	[.002]	[-0.17]	[-0.34[b,c]]	[-0.54 to -0.14]	[.001]	[-0.14]	[-0.02]
	{35}	{-1.51[a]}	{-2.03 to -0.98}	{.001}	{-0.79}	{-0.59[b,c]}	{-1.06 to -0.13}	{.013}	{-0.31}	{-0.54[b,c]}	{-0.94 to -0.13}	{.010}	{-0.28}	{-0.03}

Note: *n* = sample size, *β* = slope, *CI* = confidence interval, *p* = significance value, *ES* = effect size, *Δ ES_{NE-E}* = difference between the effect size of the non-exposure CBT phase (NE) and the effect size of the exposure CBT phase (E); clinical rating, [self-report], {parent report}; *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$; [a,b,c,d] slopes with superscripts (a) do not differ significantly from assessment phase, slopes with superscript (b) differ significantly at a level of ≤ .05 from assessment phase; slopes with superscripts (c) do not differ significantly from non-exposure CBT phase, slopes with superscript (d) differ significantly at a level of ≤ .05 from non-exposure CBT phase

Erklärung

Hiermit versichere ich an Eides statt, dass ich die vorliegende Dissertationsschrift selbstständig und ohne die Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe. Alle Stellen - einschließlich Tabellen, Karten und Abbildungen -, die wörtlich oder sinngemäß aus veröffentlichten und nicht veröffentlichten anderen Werken im Wortlaut oder dem Sinn nach entnommen sind, sind in jedem Einzelfall als Entlehnung kenntlich gemacht. Ich versichere an Eides statt, dass diese Dissertationsschrift noch keiner anderen Fakultät oder Universität zur Prüfung vorgelegen hat; dass sie - abgesehen von unten angegebenen Teilpublikationen - noch nicht veröffentlicht worden ist sowie, dass ich eine solche Veröffentlichung vor Abschluss der Promotion nicht ohne Genehmigung der / des Vorsitzenden des IPHS-Promotionsausschusses vornehmen werde. Die Bestimmungen dieser Ordnung sind mir bekannt. Die von mir vorgelegte Dissertation ist von Univ.-Prof. a.D. Dr. Manfred Döpfner betreut worden.

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Übersicht der Publikationen:

Adam, J., Goletz, H., Mattausch, S.K., Plück, J. & Döpfner, M. (2019). Psychometric evaluation of a parent-rating and self-rating inventory for pediatric obsessive-compulsive disorder: German OCD Inventory for Children and Adolescents (OCD-CA). *Child Adolesc Psychiatry Ment Health, 13*:25. https://doi.org/10.1186/s13034-019-0286-z

Adam, J., Goletz, H., Dengs, S., Klingenberger, N., Könnecke, S., Vonderbank, C., Hautmann, C., Hellmich, M., Plück, J. & Döpfner, M. (2022). Extended treatment of multimodal cognitive behavioral therapy in children and adolescents with obsessive-compulsive disorder improves symptom reduction: a within-subject design. *Child Adolesc Psychiatry Ment Health, 16(1):*99. https://doi.org/10.1186/s13034-022-00537-z

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Die im Rahmen der Dissertation durchgeführten Studien erhielten keine spezifischen Zuschüsse von Förderstellen aus dem öffentlichen, kommerziellen oder gemeinnützigen Sektor.

Geleistete Beiträge erste Publikation:
Julia Adam, Dr. Hildegard Goletz und Univ.-Prof. a.D. Dr. Manfred Döpfner haben die Studie konzipiert. Sie sind die Autoren des Diagnostikums für Zwangsstörungen im Kindes- und Jugendalter (DZ-KJ; Goletz, Adam & Döpfner, 2020), das auch das (im Rahmen der Studie analysierte) Zwangsinventar für Kinder und Jugendliche (ZWIK) enthält. Die Analysen wurden von Julia Adam durchgeführt, das Manuskript ebenso von ihr entwickelt. Dr. Hildegard Goletz war Ko-Koordinatorin, hat gemeinsam mit Univ.-Prof. a.D. Dr. Manfred Döpfner und Julia Adam die Daten interpretiert und das Manuskript überarbeitet. Svenja-Kristin Mattausch hat die Daten der Feldstichprobe erhoben. PD Dr. Julia Plück supervidierte das Datenmanagement und die Datenanalysen. Univ.-Prof. a.D. Dr. Manfred Döpfner war Hauptkoordinator des Projektes, hat Julia Adam bei den Analysen unterstützt und das Manuskript überarbeitet.

Geleistete Beiträge zweite Publikation:
Julia Adam, Dr. Stefanie Dengs, Nora Klingenberger, Dr. Sonja Könnecke und Christina Vonderbank haben die Psychotherapien durchgeführt und die Daten erhoben. Zudem hat Julia Adam die Daten eingegeben, das Manuskript entwickelt und alle Analysen durchgeführt. Dr. Hildegard Goletz hat das (im Rahmen der Studie) evaluierte THAZ-Manual entwickelt, die Therapien supervidiert, die Studie koordiniert und das Manuskript überarbeitet. PD Dr. Christopher Hautmann, Prof. Dr. Martin Hellmich und PD Dr. Julia Plück haben Julia Adam bei dem Datenmanagement und -analysen unterstützt. Univ.-Prof. a.D. Dr. Manfred Döpfner hat das evaluierte THAZ-Manual mitentwickelt, das gesamte Projekt koordiniert, Julia Adam bei den Analysen und der Dateninterpretation unterstützt und das Manuskript überarbeitet.

16.10.2024 Julia Adam