Towards improving treatment for childhood OCD: Analyzing mediating mechanisms & non-response
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Chapter 6

Non-response to cognitive behavioral therapy for childhood OCD: Adding treatment modalities not always necessary

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Abstract

Cognitive behavioral therapy (CBT) is the first-line treatment for childhood OCD. Although there are large individual differences in treatment effect, partial and non-response to treatment receives little attention in research. In the present study we examined several potential predictors of treatment effect: severity of OCD, the rate of improvement during the first eight treatment sessions, and co-morbid autistic traits. Furthermore, we examined whether patients with moderate to severe OCD can be effectively treated with CBT monotherapy, and whether continuation of CBT was an effective strategy for partial and non-responders to first-line CBT. Methods: The first part of the study was a randomized controlled trial on the effect of CBT monotherapy versus waitlist. In the second part, an open study, we examined the effect of continuation of CBT for partial and non-responders. Participants were 58 children (8–18 years) with a primary diagnosis of OCD. Results showed that CBT was associated with a significant decrease in OCD severity. More severe OCD at baseline and autistic traits predicted poorer treatment outcome. OCD severity and autistic traits were not predictive for the rate of improvement (the slope of the improvement curve) during CBT and follow-up. Low initial treatment response after eight treatment sessions was related with poorer treatment outcome after 16 sessions of CBT. However, at one-year follow-up the low and high response group showed comparable levels of OCD severity. Continuing CBT after the protocol had been completed (16 sessions CBT) proved to be effective. In conclusion, these results suggest that CBT is an effective treatment for childhood OCD, also for patients with moderate to severe OCD and for patients with autistic traits. Furthermore, low response at the start of CBT does not necessarily predict low or non-response in the end. Finally, continuing CBT after the protocol (16 sessions of CBT) may lead to further improvement, at least for a considerable number of patients.
Introduction

Obsessive-compulsive disorder (OCD) in children and adolescents can be treated effectively. Cognitive behavioral therapy (CBT) or a combination of CBT and pharmacotherapy (SSRIs) are the evidence-based treatments (Geller et al., 2012), and reach improvement rates varying between 40–65% (e.g., Barrett, Healy-Farrell, & March, 2004; Bolton & Perrin, 2008; De Haan, Hoogduin, Buitelaar, & Keijsers, 1998; Freeman et al., 2008; The Pediatric OCD Treatment Study (POTS) Team, 2004). However there are large individual differences in treatment effect. Some children benefit substantially, whereas others do not. Usually this is referred to as the number of responders versus non-responders. A responder rate between 67–86% has been reported for CBT (combined with medication) for childhood OCD (De Haan et al., 1998; Franklin et al., 1998; March, Mulle, & Herbel, 1994). However, the criterion for responder varies between studies. Where in some studies a criterion of at least 30% improvement on the Yale-Brown Obsessive Compulsive Scale- Child Version (CY-BOCS) has been used (e.g., De Haan et al., 1998; March et al., 1994), other studies use a more stringent criterion of at least 50% improvement (e.g., Franklin et al., 1998). A disadvantage of defining non-response in terms of percentage improvement is that patients, especially those with a high initial CY-BOCS score, can be responders and still have obsessive-compulsive (OC) symptoms at a clinical level (De Haan, 2006). This raises questions about the clinical significance of the distinction between responders and non-responders. For example, results showed that in only 40–45% of the patients OC symptoms were in remission post-treatment (CY-BOCS ≤ 10) (e.g., The POTS Team, 2004; Piacentini et al., 2011). This implicates that 67–86% of the patients are qualified as responders, while 55–60% may still have clinically significant symptoms.

Partial and non-response to treatment receives little attention in research. We are not able to predict which patients will become partial or non-responders. Even worse, little is known about effective treatment strategies for these patients, leaving clinicians uncertain about the best strategy to follow.

Non-responders

To improve treatment and prevent non-response, knowledge is needed about predictors of treatment effect. Only a few studies have addressed this issue in childhood OCD (e.g., Garcia et al., 2010; Ginsburg, Kingery, Drake, & Grados,
2008). Results of a review of six CBT studies examining potential predictors suggest that more severe OCD predicted poorer treatment outcome (Ginsburg et al., 2008). This finding was replicated in the more recent POTS study with 112 patients (7–17 years of age): higher levels of OCD severity and of OCD-related functional impairment predicted poorer treatment effect across all conditions (CBT, SSRI, and CBT+SSRI) (Garcia et al., 2010). Poor insight in OC symptoms also predicted poorer treatment effect, but results were not convincing as a post-hoc analysis showed no significant differences in treatment outcome between children arranged by their level of insight (Garcia et al., 2010). Results regarding family factors were equivocal. Parental psychopathology did not affect treatment outcome for CBT, whereas higher levels of family dysfunction predicted poorer treatment outcome at 18-month follow-up (Ginsburg et al., 2008). Results from the POTS study showed that family accommodation predicted poorer treatment outcome across all treatment conditions (Garcia et al., 2010). With regard to co-morbid problems, results suggest that externalizing symptoms, including disruptive disorders and ADHD, may negatively affect (long-term) treatment outcome (Farrell, Waters, Milliner, & Ollendick, 2012; Garcia et al., 2010; Storch et al., 2008). Results concerning internalizing symptoms were mixed (Ginsburg et al., 2008). Co-morbid tics were not predictive for CBT outcome, although it was for the effect of pharmacological treatment (Ginsburg et al., 2008). Contrary to what was expected, presence of a pervasive development disorder (PDD) was not related to treatment outcome (Farrell et al., 2012). Furthermore, patients with a positive family history of OCD (defined as a parent and/or sibling who had been diagnosed with OCD) showed smaller effect sizes in all treatment conditions, and this effect was most pronounced for CBT (Garcia et al., 2010). Children’s age, sex, and duration of illness or age at onset did not affect treatment outcome in CBT (Ginsburg et al., 2008).

Overall, research on predictors of treatment effect in childhood OCD is scarce and fragmented. Most predictor variables are investigated in no more than two studies. More systematic research is needed to shed light on predictors of treatment effect in childhood OCD. Furthermore, some factors are assumed to be predictive in clinical practice, but have never been examined. For example, the degree to which OC complaints can be influenced by therapeutic strategies during the first treatment phase is often considered a predictor for further success. If there is hardly any improvement in symptomatology during
the first sessions, not only patients and parents, but also therapists may lose their faith in the present treatment, and often treatment policy is changed (i.e., adding medication or referring to inpatient treatment). It is questionable whether a change of treatment strategy is justified in this early stage.

In addition, CBT is expected to be more difficult to deliver to children with PDD due to poor emotional understanding and cognitive rigidity (Krebs & Heyman, 2010). Although autistic traits or PDD are common co-morbid conditions of OCD in children and adolescents (Ivarsson & Melin, 2008), patients with co-morbid PDD are often excluded from randomized controlled treatment trials (e.g., The POTS Team, 2004). Until now, in only one pilot study PDD has been investigated as a potential predictor of treatment outcome. It was found that PDD did not negatively affect treatment outcome in group CBT for children with OCD (Farrell et al., 2012). However, due to the small sample size in this study, it is still questionable whether co-morbid PDD is a predictor of the effect of CBT.

In the present study, we investigated several potential predictors for the effectiveness of CBT. Severity of OCD was included as this is a highly probable predictor based on previous research. Improvement during the first treatment phase and co-morbid autistic traits were examined as these variables are clinically relevant but with little empirical support.

**Treatment for non-responders**

If non-response could be predicted, treatment can be adjusted from the beginning. Given the above-mentioned results, adjusting treatment for patients with severe OCD seems warranted. According to the guideline of the AACAP (recommendations 5 and 6; Geller et al., 2012), patients with moderate to severe OCD should be treated with the combination of CBT and an SSRI, instead of CBT monotherapy. More precisely, patients with a pre-treatment CY-BOCS score more than 23 should receive the combined treatment. Noteworthy, it has not yet been examined whether the combination of CBT and medication is indeed more effective than CBT monotherapy for patients with moderate to severe OCD.

As long as treatment for potential non-responders cannot be adjusted from the beginning, clinicians need guidelines for treatment policy in case of non-response after the first-line treatment. The AACAP guideline prescribes a combination of CBT and an SSRI as second-line treatment for non-responders.
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(recommendation 9; Geller et al., 2012). However the effectiveness of this guideline also has never been established. In the second POTS study the second-line treatment of the combination of CBT and an SSRI was following SSRI monotherapy instead of CBT monotherapy (Franklin et al., 2011). In the study of Neziroglu et al. (2000), second-line treatment for CBT non-responders consisted of SSRI monotherapy versus combined therapy (CBT + SSRI), while continuing CBT monotherapy was not examined. Furthermore, this study was based on a very small sample (10 patients).

To conclude, although adding treatment modalities (CBT + SSRI) in cases of more severe OCD and non-response to CBT may intuitively be sensible, there is no empirical support to justify this strategy. This is even more remarkable as in both cases the extra treatment modality consists of medication. The decision to add medication to CBT should be well-founded, because of possible adverse effects and unknown effects in the long term (Geller et al., 2012; Storch et al., 2010). Thus, if alternative (non-pharmacological) possibilities are available, these options should be considered first.

One of these options is to extend the number of CBT sessions. As a rule, CBT treatment protocols consist of 12 to 20 treatment sessions (O’Kearney, Anstey, Von Sanden, & Hunt, 2010). We do not know whether this is, indeed, the optimal treatment duration. In the meta-analysis of Olatunji et al. (2013), the number of sessions was unrelated to CBT effect sizes. However, these studies address the effectiveness of the number of CBT sessions in all patients, regardless whether they are treatment completers or partial and non-responders.

To examine what would be the best treatment policy for partial and non-responders to CBT, a randomized controlled trial is needed in which continuation of CBT is compared to a combination of CBT + SSRI. We had planned to do so, but after 16 sessions of CBT most partial and non-responders (i.e., CY-BOCS total score ≥ 12 and CY-BOCS interference score ≥ 3) refused to be randomized over CBT versus CBT + SSRI; they preferred to continue CBT monotherapy. When after three years only three patients were randomized, we decided to change the second part of the study design into an open study.

The present study consists of two parts. The first part is a randomized controlled trial examining the effect of CBT versus a waitlist control condition. The primary outcome is severity of OCD, secondary outcomes are anxiety, depression, general psychopathology, and quality of life. In the second part,
we examined the effectiveness of continuation of CBT for partial and non-responders. The clinician in consultation with the patient and the patient’s parents decided about further treatment policy after 16 sessions of CBT: when more treatment was needed based on clinical judgment, CBT was continued. Only when complaints were untenable for the patient or the family, or in case of deterioration of complaints or severe depression, the combination of CBT + SSRI was indicated.

We aimed to answer the following questions: (1) Can patients with moderate to severe OCD (CY-BOCS > 23) effectively be treated with CBT monotherapy?; (2) Is severity of symptoms a predictor of treatment effect?; (3) Is rate of improvement during the first part of treatment (i.e., after eight sessions CBT) predictive for treatment effect?; (4) Are co-morbid autistic traits predictive for treatment effect?; and (5) Is continuation of CBT an effective strategy for partial and non-responders?

Methods

**Design and procedure**
The present study is part of a larger trial intended to study psychological and neurobiological processes, and mediators of treatment outcome in childhood OCD. The trial was approved by the Medical Ethics Committee of the Academic Medical Center (MEC 06/053), and registered in the Dutch Trial Register (NTR 717, ISRCTN 07851536). Participants were children and adolescents (8–18 years) who were referred for treatment for OCD to an academic centre for child and adolescent psychiatry (the Bascule, Amsterdam, n = 50; Curium, Leiden, n = 3; Accare, Groningen, n = 5), or a mental health care agency (Altrecht, Utrecht, n = 3). Inclusion criteria were a primary diagnosis of OCD according to DSM-IV TR criteria, complaints for at least six months, and a score of 16 or more on the Children’s Yale-Brown Obsessive Compulsive Scale (CY-BOCS; see below). Exclusion criteria were medication for OCD (SSRI, TCA or antipsychotic medication), CBT for OCD during the past six months, IQ below 80, and psychosis. During intake obsessive-compulsive complaints and other psychiatric symptoms were evaluated by senior clinicians. A semi-structured interview (Anxiety Disorder Interview Schedule for DSM-IV - Child and Parent Version (ADIS-C/P); Silverman & Albano, 1996a, 1996b) was administered to
the child and parents independently by trained clinicians. IQ above 79 was indicated by a mean raw score ≥ 6 on the subtests Block design and Vocabulary of the Wechsler Intelligence Scale for Children (WISC-III; Kort et al., 2005), or – when available – a total IQ score. After informed consent was obtained, participants were randomized over two conditions: an active treatment condition (individual CBT), and an eight-week waitlist condition followed by CBT. Randomization (50% waitlist, 50% CBT) was accomplished by the first author using a computer program with site, age (8–11 vs. 12–18 years) and gender as stratification factors. Children and their parents were immediately informed about the outcome. CBT did not differ across conditions. The duration of the waitlist was set at eight weeks instead of 16 weeks for ethical reasons.

**Participants**

Between January 2007 and June 2010, 73 children were screened for eligibility in the study and 61 children (84%) were included. Forty-four children were randomized: 24 children were allocated to the waitlist condition, 20 children to the immediate treatment condition. Seventeen children were not randomized because a waitlist could not be justified on ethical grounds because of severity of complaints (n = 7), or due to practical problems (n = 10) such as that children were already in treatment for other problems and treatment was continued for OCD, or patients had already waited for a considerable period before the intake procedure. Two children dropped out at the first assessment (T0 and T1) because OC symptoms were reduced significantly and were in remission. As they did not meet inclusion criteria any longer, they were excluded from further analyses. One child dropped out at the pre-treatment assessment because he was not able to visit the clinic due to family circumstances. As he had not received CBT and no pre-treatment assessment was available, he was also excluded from analyses.

A total of 58 children (the waitlist condition, the immediate CBT condition, and the non-randomized group combined) received CBT, and 46 children (79%) completed the full 16 sessions. Three children dropped out at session eight or earlier as they reported no complaints anymore, four children dropped out because they were not able or unwilling to come to the clinic, two children dropped out due to referral to inpatient treatment for OCD and/or co-morbid problems, for one child medication was added to the CBT, and two children dropped out because OC symptoms were in remission before the 16th treatment session and they went over to treatment for other problems.
Forty-three children completed the 16-week follow-up (T4) assessment: 41 of the 46 treatment completers and two children for whom treatment was ended at session eight because complaints were in remission at that time. The one-year follow-up assessment (T5) was completed by 44 children (see Figure 1 for the flow chart). The trial was ended because the intended number of participants was reached.

**Treatment**

The treatment consisted of 16 weekly sessions of individual CBT described in the Dutch treatment manual ‘Bedwing je dwang’ (‘Control your OCD’; De Haan & Wolters, 2009), and involves psychoeducation, an inventory and hierarchy of the obsessions and compulsions, exposure with response prevention (ERP), cognitive interventions (CT), and relapse prevention. ERP is introduced early in treatment (second session), followed by and combined with cognitive interventions (second or third session). Parents were involved in the therapy varying from attending part of some sessions to fully attending each session, dependent on the child’s developmental level, preferences of the child and the parents, and clinical considerations. Treatment sessions lasted 45–60 minutes. CBT was delivered by master level clinicians certified as cognitive behavioral therapists and experienced in treating OCD in children. Most therapists had several years of experience with this treatment protocol and had been closely associated with its refinement. All therapists were trained in the protocol and had previously treated at least one patient with OCD outside the study under supervision of one of the authors (EdH). Therapists attended group supervision every two weeks and optional individual supervision.

**Treatment adherence**

To examine treatment adherence, 25% of the session reports of each participant were evaluated by two independent raters. Raters scored whether the following components were implemented: psychoeducation, inventory/hierarchy of complaints, ERP, CT, homework exercises, and relapse prevention. Criteria for adequate treatment adherence were: psychoeducation and an inventory of complaints during the first session, ERP and/or CT and homework exercises during session 2–15, and relapse prevention for the last session. For 98.5% of the sessions these criteria were met. Raters agreed for 99% of the session reports, Cohen's kappa was .75.
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Figure 1. Flowchart

Assessed for eligibility (N=73)
- Excluded (n=12)
  - Not meeting inclusion criteria (n=7)
  - Declined to participate (n=1)
  - Decided not to go in treatment (n=1)
  - Other / reason not reported (n=3)

Included (N=61)

Waitlist (n=24)
- T0: pre-waitlist (n=22)
  - Lost to T0 (n=1)
  - Not meeting inclusion criteria anymore
  - Missing data (n=1)

Immediate CBT (n=20)
- T1: pre-CBT (n=22)
  - Lost to T1 (n=1)
  - Not able to come due to family problems

Not randomised (n=17)
- Severity OCD (n=7)
- Practical reasons (n=10)

T0: pre-waitlist (n=22)
- Lost to T0 (n=1)
  - Not meeting inclusion criteria anymore
  - Missing data (n=1)

T1: pre-CBT (n=22)
- Lost to T1 (n=1)
  - Not able to come due to family problems

T1: pre-CBT (n=19)
- Lost to T1 (n=1)
  - Not meeting inclusion criteria anymore

T2: mid-CBT (n=53)
- Lost to T2 (n=5)
  - Discontinued CBT: no complaints anymore (n=1) [back at T5]
  - Failed to turn up at treatment appointments (n=1)
  - Refused CBT (n=1)
  - Medication added to CBT because unbearable situation at home (n=1)
  - Referred to inpatient treatment (n=1)

T3: post-CBT (n=46)
- Lost to T3 (n=5)
  - Discontinued CBT, not able to come due to family reasons (n=1)
  - Failed to turn up at treatment appointments (n=1)
  - Switch of treatment focus to anxiety (n=2)
  - Inpatient treatment because of increasing (co-morbid) complaints (n=1) [back at T5]
  - Missing data T3 (n=2)
  - Discontinued CBT, no OCD anymore (n=2) [back at T4]

T4: 16-week follow-up (n=43)
- Lost to T4 (n=5)
  - Study drop out (postponed from study, CBT continued) (n=1)
  - Inpatient treatment (n=2) [back at T5 n=1]
  - Organizational reasons (n=2)
  - Back at T4 (n=2)

T5: one-year follow-up (n=44)
- Lost to T5 (n=2)
  - Inpatient treatment (n=1)
  - Study drop out (postponed from study, CBT continued; n=1)
  - Back at T5 (n=3)
Measures

The Anxiety Disorder Interview Schedule for DSM-IV - Child and Parent Version (ADIS-C/P; Silverman & Albano, 1996a, 1996b) is a widely used, reliable and valid semi-structured interview evaluating prevalence and severity of DSM-IV diagnoses of anxiety disorders, mood disorders, ADHD and disruptive disorders. The ADIS-C/P was administered to parents and children independently by trained clinicians. When children fulfilled the criteria for a particular diagnosis, clinicians rated the severity of the complaints based on internal distress, interference in school, peer relationships and family life on a nine-point scale ranging from 0 to 8. A clinician severity rating (CSR) of at least four is indicative of a diagnosis. The combined score was used, which was composited of the highest value of the child and the parent interview. To examine inter-rater reliability, interviews were videotaped and 19 interviews (random selection) were independently rated by two raters. Inter-rater reliability (Cohen's kappa) was .93.

Primary outcome measure

The Children's Yale-Brown Obsessive Compulsive Scale (CY-BOCS; Scahill et al., 1997) is a clinician-rated semi-structured interview evaluating the severity of OC symptoms. The CY-BOCS contains a symptom checklist and a severity scale. The severity scale is divided into an obsession and a compulsion subscale. Each subscale contains five items concerning frequency/time, interference, distress, resistance, and control. Items are rated by the clinician on a five-point scale from 0 to 4. The total score, the sum of both subscales, ranges from 0 to 40. A total score of 16 or more is considered as clinically significant (e.g., The POTS Team, 2004). The CY-BOCS demonstrated good reliability (Cronbach's $\alpha = .87$) and adequate divergent and convergent validity (Scahill et al., 1997). Cronbach's $\alpha$ in the present study ranged from .81 to .97. To examine inter-rater reliability, interviews were videotaped and 46 interviews (random selection) were independently rated by three raters (investigators and therapists). Inter-rater reliability (intraclass correlation coefficient) was .98.

Secondary outcome measures

The Revised Child Anxiety and Depression Scale - Child Version (RCADS-C; Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000) is a 47-item self-report questionnaire concerning symptoms of anxiety and depression. The questionnaire is composed of six subscales: separation anxiety disorder (SAD),
social phobia (SP), generalized anxiety disorder (GAD), panic disorder (PD), obsessive-compulsive disorder (OCD) and major depression disorder (MDD). Items are scored on a four-point scale ranging from 0 (never) to 3 (always), higher scores reflect more symptoms. Internal consistencies of the subscales were generally good with Cronbach’s $\alpha$ varying between .78 and .88 (Chorpita, Moffitt, & Gray, 2005). Cronbach’s $\alpha$ for the RCADS-C subscales in the present study ranged from .76 to .91. Parents completed the parent version (RCADS-P). Cronbach’s $\alpha$ for RCADS-P subscales in the present study ranged from .60–.93.

The *Children’s Depression Inventory* (CDI; Kovacs, 1992) is a 27-item self-report questionnaire about depressive symptoms. For every item, children have to choose one out of three answers. Total scores range from 0 to 54, higher scores indicate more depressive symptoms. Internal consistency (Cronbach’s $\alpha$) in a Dutch sample was .85 (Timbremont, Braet, & Roelofs, 2008). Cronbach’s $\alpha$ in the present study varied between .83–.91. A cut off score of 16 was found to have good sensitivity (92%) and specificity (95%) for depression (Roelofs et al., 2010).

The *Child Behavior Checklist* (CBCL; Achenbach, 2001; translated by Verhulst & Van der Ende) is an internationally used parent-rated questionnaire to assess problem behavior and skills in children and adolescents. The CBCL contains 120 items with a three-point response scale. This results in a total score evaluating problem behavior, two broadband scales evaluating internalizing and externalizing problems, and eight syndrome scales (anxious/depressed, withdrawn/depressed, somatic complaints, social problems, thought problems, attention problems, rule-breaking behavior, and aggressive behavior). The CBCL shows good psychometric properties (Verhulst, Van der Ende, & Koot, 1996). The *Youth Self Report* (YSR; Achenbach, 2001; translated by Verhulst & Van der Ende) is a self-report questionnaire for youth (11–18 years) similar to the CBCL. The scoring is comparable to the CBCL.

Quality of Life was assessed using the *KIDSCREEN-27* child version (The KIDSCREEN Group Europe, 2006). The KIDSCREEN-27 evaluates five aspects of quality of life: physical well-being, psychological well-being, autonomy and parent relation, social support and peers, and school environment. The KIDSCREEN-27 consists of 27 items which are scored on a five-point scale. Scores for each scale are calculated using Rasch analysis and transformed into T-values ($M = 50, SD = 10$). Higher scores reflect better quality of life. Scores are based on data from an international sample from twelve European countries.
The KIDSCREEN-27 is an internationally used, reliable and valid instrument with adequate test-retest reliability. Cronbach's $\alpha$ for the KIDSCREEN subscales in the present study ranged from .70–.95.

**Predictor**

The *Children's Social Behavior Questionnaire* (CSBQ; Hartman, Luteijn, Serra, & Minderaa, 2006; Hartman, Luteijn, Moorlag, De Bildt, & Minderaa, 2007) is a parent-rated questionnaire about a broad range of features that are typical of PDD in children (4–18 years). In addition to most other questionnaires, the CSBQ also examines problems associated with milder forms of PDD. The questionnaire contains 49 items covering six domains: behavior/emotions not optimally tuned to the social situation; reduced contact and social interest; orientation problems in time, place, or activity; difficulties in understanding social information; stereotyped behavior; and fear of and resistance to changes. Item scores range from 0 (does not apply) to 2 (clearly or often applies). Higher scores indicate more problems. Raw scores can be converted into normscores ranging from 0 (very low) to 6 (very high), 3 indicates an average score. The CBSQ proved to be valid and reliable (internal consistency: Cronbach's $\alpha = .94$; inter-rater reliability: ICC = .86; test-retest reliability: $r = .90$; Hartman et al., 2006). Cronbach's $\alpha$ for the CBSQ subscales in the present study ranged from .78–.92.

**Assessments**

In the waitlist condition, children were assessed pre-waitlist (T0), post-waitlist/pre-treatment (T1), mid-treatment (eight sessions of CBT; T2), post-treatment (16 sessions of CBT; T3), at 16-week follow-up (T4), and at one-year follow-up (T5). Children allocated to the CBT condition similarly were assessed at T1, T2, T3, T4 and T5. During the assessments, the CY-BOCS was administrated, children and their parents filled out questionnaires, and children completed two computer tasks for the purpose of a study on mediators of treatment outcome in CBT. These additional measures are not further described here. Table 1 provides an overview of the relevant measures for the present study.
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### Table 1. Overview of assessments

<table>
<thead>
<tr>
<th>Time</th>
<th>Measure 1</th>
<th>Measure 2</th>
<th>Measure 3</th>
<th>Measure 4</th>
<th>Measure 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0 Pre-waitlist</td>
<td>CY-BOCS</td>
<td>RCADS-C/P</td>
<td>CDI</td>
<td>CBCL</td>
<td>YSR</td>
</tr>
<tr>
<td>T1 Post-waitlist / Pre-treatment</td>
<td>CY-BOCS</td>
<td>RCADS-C/P</td>
<td>CDI</td>
<td>CBCL</td>
<td>YSR</td>
</tr>
<tr>
<td>T2 Mid-treatment (8 sessions)</td>
<td>CY-BOCS</td>
<td>RCADS-C/P</td>
<td>CDI</td>
<td>CBCL</td>
<td>YSR</td>
</tr>
<tr>
<td>T3 Post-treatment (16 sessions)</td>
<td>CY-BOCS</td>
<td>RCADS-C/P</td>
<td>CDI</td>
<td>CBCL</td>
<td>YSR</td>
</tr>
<tr>
<td>T4 Follow-up (16 weeks)</td>
<td>CY-BOCS</td>
<td>RCADS-C/P</td>
<td>CDI</td>
<td>CBCL</td>
<td>YSR</td>
</tr>
<tr>
<td>T5 Follow-up (1 year)</td>
<td>CY-BOCS</td>
<td>RCADS-C/P</td>
<td>CDI</td>
<td>CBCL</td>
<td>YSR</td>
</tr>
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### Statistical analyses

The analyses were conducted on an intention-to-treat basis. Fifty-eight participants were included in the analyses. Missing values for drop-outs (participants that did not complete all assessments) were imputed using the expectation-maximization (EM) algorithm in LISREL version 8.8. Children with missing assessments did not significantly differ at baseline CY-BOCS score from the other children based on independent t-tests for missings at T3, T4 and T5.

At the level of missing items within measures, missing data was handled according to the manual (CDI, CBCL, YSR, KIDSCREEN). KIDSCREEN scores were not computed when more than one item per subscale was missing, for the CDI a cut off rule of a maximum of two missing items was applied. For the RCADS, no guideline for missing values was available. We allowed one missing item per subscale, and replaced the missing by the individual mean of the valid items of the subscale. In cases of more missing items, the subscale or measure was considered as missing completely.

To examine the efficacy of CBT, the effect of eight sessions CBT was compared to eight weeks waitlist using a mixed design ANOVA. The effect of CBT over time was further tested using linear mixed model analyses in SPSS 19.0 with time (assessment 1 to 5) as independent variable and CY-BOCS as dependent variable. An advantage of linear mixed model analyses is that all available data are taken into account (a baseline score is necessary), making missing data less problematic. Imputing missing data was not needed for these analyses. However, only participants with a baseline score can be included. Analyses were performed with both an unstructured covariance matrix and an autoregressive heterogeneous matrix. Fit of both models were compared using the -2 log likelihood values. When results reveal no significant difference in fit between models, preference is given to the autoregressive heterogeneous matrix as this
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matrix provides a more parsimonious model.

We calculated the percentage of patients with OC symptoms in the clinical range (CY-BOCS ≥ 16) and in remission (CY-BOCS ≤ 10). Furthermore, the percentage of responders was calculated according to the criterion of at least 50% symptom reduction. Effect size for CBT post-treatment was calculated by subtracting the mean CY-BOCS post-CBT (T3) from the mean CY-BOCS pre-CBT (T1), and dividing this value by the standard deviation pre-CBT (Durlak, 2009).

Secondary outcome measures were anxiety (RCADS-C/P), depression (CDI), problem behavior (CBCL, YSR), and quality of life (KIDSCREEN-27). To reduce the number of tests, the RCADS SAD, SP, GAD and PD subscales were summed up, resulting in an anxiety sumscore. RCADS OCD scores were not included in the analyses as OCD complaints are more thoroughly examined with the CY-BOCS. RCADS MDD scores were excluded because depressive symptoms are more comprehensively measured with the CDI. Linear mixed model analyses were performed with time (assessment) as independent variable and outcome measure as dependent variable to examine changes over time during CBT and follow-up.

To investigate whether OCD severity at baseline, improvement during the first eight sessions of CBT, and autistic traits predicted treatment effect, a series of linear mixed models was run with the predictor, time, and the interaction between the predictor and time as independent factors, and CY-BOCS as dependent factor.

The effect of continued CBT was examined with a linear mixed model analysis with time (assessment) as independent variable and CY-BOCS as dependent variable for the subsample that received continued CBT monotherapy.

**Calculation of sample size**

In a review of the effect of CBT for childhood OCD a weighted mean difference of -10.71 on the CY-BOCS in favor of CBT compared to waitlist is reported (O’Kearney et al., 2010). Based on this result, we estimated the effect of eight sessions of CBT (T2, mid-treatment) at a mean difference of -5.0 on the CY-BOCS. No change in CY-BOCS score was expected for the waitlist condition (eight weeks). Based on these estimations, a sample size calculation showed that 17 participants per condition resulted in 80% power to detect a mean difference of -5.0 on the CY-BOCS in the CBT condition compared to the waitlist. Given an anticipated drop-out rate of 10%, we decided to include 20 participants per condition. With regard to the predictors, a rule of thumb for regression analyses
Towards improving treatment for childhood OCD

is 10–20 observations per predictor. For three predictor variables a sample size of at least 30–60 participants is considered to be sufficient.

Results

Demographic and clinical characteristics
Clinical characteristics of the sample are shown in Table 2. Our sample was comparable to samples in other studies (e.g., The POTS Team, 2004). There were no significant differences between the waitlist, CBT and the non-randomized group in baseline characteristics.

Table 2. Baseline characteristics of participants

<table>
<thead>
<tr>
<th></th>
<th>Total sample</th>
<th>Waitlist</th>
<th>CBT</th>
<th>Not randomized</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
</tr>
<tr>
<td>12.8 (2.6)</td>
<td>13.0 (2.6)</td>
<td>11.9 (2.5)</td>
<td>13.6 (2.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>♂ (41.4%)</td>
<td>♂ (45.5%)</td>
<td>♂ (31.6%)</td>
<td>♂ (47.1%)</td>
<td></td>
</tr>
<tr>
<td>♀ (58.6%)</td>
<td>♀ (54.5%)</td>
<td>♀ (68.4%)</td>
<td>♀ (52.9%)</td>
<td></td>
</tr>
<tr>
<td><strong>Cultural background</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dutch</td>
<td>46 (79.3%)</td>
<td>14 (63.6%)</td>
<td>18 (94.7%)</td>
<td>14 (82.4%)</td>
</tr>
<tr>
<td>Non-western</td>
<td>3 (5.2%)</td>
<td>2 (9.1%)</td>
<td>0 (0%)</td>
<td>1 (5.9%)</td>
</tr>
<tr>
<td>Other/combined</td>
<td>4 (6.9%)</td>
<td>3 (13.6%)</td>
<td>1 (5.3%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Missing</td>
<td>5 (8.6%)</td>
<td>3 (13.6%)</td>
<td>0 (0%)</td>
<td>2 (11.8%)</td>
</tr>
<tr>
<td><strong>IQ</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>subtests block</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>design</td>
<td>10.5 (2.2)</td>
<td>10.1 (2.8)</td>
<td>10.1 (1.7)</td>
<td>11.4 (1.6)</td>
</tr>
<tr>
<td>vocabulary</td>
<td>Range 6–15</td>
<td>Range 6–15</td>
<td>Range 6–13</td>
<td>Range 8–14</td>
</tr>
<tr>
<td>n = 50</td>
<td>n = 19</td>
<td>n = 18</td>
<td>n = 13</td>
<td></td>
</tr>
<tr>
<td>Total IQ</td>
<td>97.7 (13.6)</td>
<td>101.0 (15.5)</td>
<td>110</td>
<td>86.5 (2.1)</td>
</tr>
<tr>
<td>n = 6</td>
<td>n = 3</td>
<td>n = 1</td>
<td>n = 2</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>n = 0</td>
<td>n = 0</td>
<td>n = 2</td>
<td></td>
</tr>
<tr>
<td><strong>CY-BOCS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
</tr>
<tr>
<td>24.8 (4.1)</td>
<td>24.1 (4.0)</td>
<td>24.2 (3.6)</td>
<td>26.3 (4.6)</td>
<td></td>
</tr>
<tr>
<td>range 16–35</td>
<td>range 16–31</td>
<td>range 18–31</td>
<td>Range 18–35</td>
<td></td>
</tr>
<tr>
<td>ADIS co-morbidity</td>
<td>38 (65.5%)</td>
<td>14 (63.6%)</td>
<td>13 (68.4%)</td>
<td>11 (64.7%)</td>
</tr>
<tr>
<td>anxiety disorder</td>
<td>31 (53.4%)</td>
<td>12 (54.5%)</td>
<td>12 (63.2%)</td>
<td>7 (41.2%)</td>
</tr>
<tr>
<td>mood disorder</td>
<td>9 (15.5%)</td>
<td>3 (13.6%)</td>
<td>5 (26.3%)</td>
<td>1 (5.9%)</td>
</tr>
<tr>
<td>ADHD/ODD</td>
<td>9 (15.5%)</td>
<td>5 (22.7%)</td>
<td>1 (5.3%)</td>
<td>3 (17.6%)</td>
</tr>
<tr>
<td>CSBQ normscore</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>4.3 (1.6)</td>
<td>4.3 (1.6)</td>
<td>4.2 (1.6)</td>
<td>4.4 (1.5)</td>
<td></td>
</tr>
<tr>
<td>Range 1–6</td>
<td>Range 1–6</td>
<td>Range 2–6</td>
<td>Range 2–6</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>n = 3</td>
<td>n = 2</td>
<td>n = 0</td>
<td>n = 1</td>
</tr>
</tbody>
</table>

Note. There were no significant differences between patients randomized to the waitlist condition, those randomized to the CBT condition, and patients that were not randomized at p < .05.

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Waitlist versus CBT
We compared the effect of eight sessions of CBT (T1, T2) to eight weeks waitlist (T0, T1). Only participants who were randomly allocated to one of both conditions were included in these analyses. A mixed design ANOVA was performed with CY-BOCS as dependent variable, time (pre, post) as within subjects factor, and condition (waitlist, CBT) as between subjects factor. The results showed a significant main effect of time, $F(1, 39) = 8.24, p < .01$, and a significant interaction effect between time and condition on CY-BOCS scores, $F(1, 39) = 5.20, p < .05$. There was a trend for a main effect of condition, $F(1, 39) = 2.99, p = .07$. These results showed that post-scores differed from pre-scores, and this effect varied across conditions (waitlist, CBT). Paired-samples $t$-tests revealed a significant decrease in CY-BOCS scores during CBT, $t(18) = 3.41, p < .01$, whereas no significant difference between pre and post CY-BOCS scores was found for the waitlist condition, $t(21) = 0.45, p > .05$.

Effect of CBT: primary outcome measure
Results of the linear mixed model analysis based on an unstructured covariance matrix revealed a main effect of time (T1–T5) on CY-BOCS score, $F(4, 46.18) = 69.36, p < .001$. Table 3 shows the parameter estimates for each measurement compared to baseline (T1). CY-BOCS scores significantly decreased during CBT (13.0 points), and slightly further decreased until one-year follow-up, as shown in Figure 2.

### Table 3. CY-BOCS: parameter estimates compared to baseline (T1)

<table>
<thead>
<tr>
<th>Time</th>
<th>$b$</th>
<th>SE b</th>
<th>95% CI</th>
<th>Pairwise comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2 (eight sessions CBT)</td>
<td>-6.27</td>
<td>0.84</td>
<td>-7.96; -4.58</td>
<td>T2 &lt; T1 ($p &lt; .001$)</td>
</tr>
<tr>
<td>T3 (16 sessions CBT)</td>
<td>-12.97</td>
<td>1.17</td>
<td>-15.32; -10.62</td>
<td>T3 &lt; T2 ($p &lt; .001$)</td>
</tr>
<tr>
<td>T4 (16-week follow-up)</td>
<td>-14.73</td>
<td>0.99</td>
<td>-16.73; -12.74</td>
<td>T4 &lt; T3 ($p = .09$)</td>
</tr>
<tr>
<td>T5 (one-year follow-up)</td>
<td>-15.70</td>
<td>1.22</td>
<td>-18.16; -13.23</td>
<td>T5 &lt; T3 ($p &lt; .05$)</td>
</tr>
</tbody>
</table>
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**Figure 2.** CY-BOCS scores during CBT and follow-up

![Graph showing CY-BOCS scores during CBT and follow-up](image)

Table 4 shows the effect of CBT in terms of mean symptom reduction, clinical level of complaints, remission rate, and treatment response based on the CY-BOCS. Effect size for CBT post-treatment ($N = 58$) was 2.49.

**Table 4.** Treatment outcome based on CY-BOCS scores

<table>
<thead>
<tr>
<th></th>
<th>Mean symptom reduction</th>
<th>Non-clinical CY-BOCS &lt; 16</th>
<th>Remission CY-BOCS ≤ 10</th>
<th>Responders ≥ 50% reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>T3 post-CBT</td>
<td>52.3%</td>
<td>70.7%</td>
<td>41.4%</td>
<td>50%</td>
</tr>
<tr>
<td>T4 FU 1</td>
<td>61.7 %</td>
<td>82.8%</td>
<td>51.7%</td>
<td>67.2%</td>
</tr>
<tr>
<td>T5 FU 2</td>
<td>67.4 %</td>
<td>84.5%</td>
<td>67.2%</td>
<td>75.9%</td>
</tr>
</tbody>
</table>

Note: Missing values were imputed using the expectation-maximization (EM) algorithm in LISREL ($N = 58$).

**Secondary outcome measures**

Because the RCADS-C anxiety and CDI scores showed serious deviations from normality, analyses were performed with square root transformed data. Table 5 presents the untransformed data of the secondary outcome measures.

Separate linear mixed model analyses were performed for these measures to examine change over time during CBT and follow-up. Results for the RCADS-C anxiety sumscore (SAD, SP, GAD and PD) revealed a main effect of time on anxiety, $F(3, 42.73) = 9.00$, $p < .001$. Pairwise comparisons revealed that there was a significant decrease in anxiety scores between T1 and T3 ($p < .001$), T1 and T4 ($p < .001$), and T1 and T5 ($p < .05$). Results for the RCADS-P anxiety sumscore
revealed a main effect of time on anxiety, $F(3, 43.38) = 17.39, p < .001$. Pairwise comparisons revealed a significant decrease in the anxiety sumscore between T1 and T3 ($p = .001$), T1 and T4 ($p < .001$), T1 and T5 ($p < .01$), and T3 and T4 ($p = .001$).

There was a significant main effect of time on CDI score, $F(3, 97.53) = 5.65, p = .001$. Pairwise comparisons showed a significant decrease in CDI scores between T1 and T3 ($p < .001$), T1 and T4 ($p < .01$), and T1 and T5 ($p < .01$).

Results for the CBCL total score showed a main effect of time, $F(3, 46.05) = 25.41, p < .001$. Pairwise comparisons revealed a significant decrease in CBCL total score between T1 and T3 ($p < .001$), T1 and T4 ($p < .001$), T1 and T5 ($p < .001$), T3 and T4 ($p < .05$), and T3 and T5 ($p < .05$).

There was also a main effect of time on YSR total score, $F(3, 84.06) = 4.61, p < .01$. Pairwise comparisons showed a significant decrease of YSR total score between T1 and T3 ($p < .05$), T1 and T4 ($p < .001$), T1 and T5 ($p < .01$), T3 and T4 ($p = .05$), and a trend for a decrease between T3 and T5 ($p = .10$).

Results for the KIDSCREEN subscales showed no main effect of time.

Table 5. Primary and secondary outcomes

<table>
<thead>
<tr>
<th>Measure</th>
<th>T1 pre-CBT</th>
<th>T3 post-CBT</th>
<th>T4 16 weeks FU</th>
<th>T5 1 year FU</th>
<th>Pairwise comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY-BOCS</td>
<td>n = 58</td>
<td>n = 46</td>
<td>n = 43</td>
<td>n = 44</td>
<td>T1 &gt; T3 = T4, T3 = T5</td>
</tr>
<tr>
<td></td>
<td>24.7 (5.0)</td>
<td>12.0 (9.2)</td>
<td>9.4 (6.6)</td>
<td>8.3 (8.6)</td>
<td></td>
</tr>
<tr>
<td>RCADS-C anxiety sumscore</td>
<td>n = 56</td>
<td>n = 47</td>
<td>n = 42</td>
<td>n = 36</td>
<td>T1 &gt; T3 = T4, T3 = T5</td>
</tr>
<tr>
<td></td>
<td>29.2 (14.9)</td>
<td>21.6 (13.8)</td>
<td>19.7 (14.5)</td>
<td>24.5 (15.2)</td>
<td></td>
</tr>
<tr>
<td>RCADS-P anxiety sumscore</td>
<td>n = 52</td>
<td>n = 45</td>
<td>n = 42</td>
<td>n = 37</td>
<td>T1 &gt; T3 &gt; T4, T3 = T5</td>
</tr>
<tr>
<td></td>
<td>29.0 (12.9)</td>
<td>22.3 (14.0)</td>
<td>17.7 (10.3)</td>
<td>21.1 (13.3)</td>
<td></td>
</tr>
<tr>
<td>CDI</td>
<td>n = 56</td>
<td>n = 46</td>
<td>n = 42</td>
<td>n = 34</td>
<td>T1 &gt; T3 = T4, T3 = T5</td>
</tr>
<tr>
<td></td>
<td>10.8 (6.3)</td>
<td>7.6 (6.7)</td>
<td>7.8 (7.5)</td>
<td>7.0 (7.2)</td>
<td></td>
</tr>
<tr>
<td>% clinical</td>
<td>16.1%</td>
<td>13.0%</td>
<td>14.3%</td>
<td>11.8%</td>
<td></td>
</tr>
<tr>
<td>CBCL total</td>
<td>n = 52</td>
<td>n = 48</td>
<td>n = 41</td>
<td>n = 36</td>
<td>T1 &gt; T3 &gt; T4, T3 &gt; T5</td>
</tr>
<tr>
<td></td>
<td>64.0 (8.7)</td>
<td>58.0 (9.7)</td>
<td>55.5 (9.5)</td>
<td>53.9 (10.8)</td>
<td></td>
</tr>
<tr>
<td>YSR total</td>
<td>n = 43</td>
<td>n = 37</td>
<td>n = 33</td>
<td>n = 29</td>
<td>T1 &gt; T3 &gt; T4, T3 &gt; T5</td>
</tr>
<tr>
<td></td>
<td>56.5 (7.8)</td>
<td>52.8 (8.7)</td>
<td>50.4 (9.2)</td>
<td>50.5 (11.1)</td>
<td></td>
</tr>
<tr>
<td>KIDSCREEN</td>
<td>n = 53</td>
<td>n = 46</td>
<td>n = 42</td>
<td>n = 37</td>
<td>ns</td>
</tr>
<tr>
<td>physical</td>
<td>47.8 (9.3)</td>
<td>55.5 (30.9)</td>
<td>50.9 (9.9)</td>
<td>51.5 (12.0)</td>
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<td>psychological</td>
<td>n = 53</td>
<td>n = 45</td>
<td>n = 41</td>
<td>n = 36</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>50.7 (31.7)</td>
<td>48.4 (10.3)</td>
<td>50.5 (12.1)</td>
<td>53.0 (23.0)</td>
<td></td>
</tr>
<tr>
<td>parents</td>
<td>n = 53</td>
<td>n = 44</td>
<td>n = 40</td>
<td>n = 36</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>51.9 (8.0)</td>
<td>52.8 (9.6)</td>
<td>54.2 (10.9)</td>
<td>60.6 (43.6)</td>
<td></td>
</tr>
<tr>
<td>peers</td>
<td>n = 53</td>
<td>n = 45</td>
<td>n = 42</td>
<td>n = 37</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>49.5 (19.5)</td>
<td>47.9 (12.9)</td>
<td>46.5 (14.5)</td>
<td>50.2 (10.7)</td>
<td></td>
</tr>
<tr>
<td>school</td>
<td>n = 52</td>
<td>n = 45</td>
<td>n = 40</td>
<td>n = 36</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>52.0 (18.3)</td>
<td>50.7 (10.2)</td>
<td>53.4 (18.5)</td>
<td>51.7 (9.8)</td>
<td></td>
</tr>
</tbody>
</table>

Note: ns = not significant ($p > .05$).
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**Predictors of treatment effect**

There was no effect of age or gender on treatment outcome.

To test whether severity of OCD at baseline (first assessment) was a predictor of treatment effect, we divided the sample into three groups based on baseline CY-BOCS score (percentile 33 and 67): the mild group \((n = 21)\) reported a mean CY-BOCS score of 20.6 (range 16–23), the moderate group \((n = 21)\) reported a mean score of 25.0 (range 24–26), and the severe group \((n = 16)\) reported a mean score of 30 (range 27–35). The last two groups represent the moderate to severe patients \((\text{CY-BOCS} > 23)\) referred to in the AACAP guidelines. Results of the linear mixed model analysis revealed a main effect of time, \(F(4, 44.49) = 69.53, p < .001\), and a main effect of baseline CY-BOCS score, \(F(2, 43.77) = 20.66, p < .001\). CY-BOCS scores significantly decreased over time, and overall CY-BOCS score were lower for the mild group versus the moderate group \((p < .01)\), and for the moderate group versus the severe group \((p = .001)\). The interaction effect between time and baseline CY-BOCS score did not reach significance (see Figure 3). A one-way ANOVA showed no significant difference between the mild and moderate group at T5. The severe group reported significant higher CY-BOCS scores than the mild and moderate group. (Note: seven children in the severe group and two children in the moderate group received the combination of CBT + SSRI or inpatient treatment between T3 and T5.)

**Figure 3.** Effect of CBT and follow-up for mild, moderate and severe OCD
Improvement during the first part of CBT was defined as percentage change on the CY-BOCS between T1 and T2 (first eight sessions of CBT). CY-BOCS score (T2 to T5) was included in the analysis as dependent variable. Results revealed a main effect of time, $F(3, 45.21) = 33.13, p < .001$, a main effect of initial improvement, $F(1, 51.14) = 19.61, p < .001$, and an interaction effect between time and initial improvement, $F(3, 43.81) = 3.46, p < .05$. These results suggest that symptom reduction during treatment and follow-up differed between groups. To get more insight into the interaction, we divided the sample into two groups: low versus high initial improvement (median split 18% improvement). Figure 4 shows the effect of CBT for both groups. Groups did not significantly differ on baseline CY-BOCS score, $t(51) = -1.71, p = .09$. An independent samples t-test revealed no significant difference between both groups in CY-BOCS score at T5, $t(51) = .67, p = .50$. (Note: six children in the low change group and three children in the moderate group received the combination of CBT + SSRI or inpatient treatment between T3 and T5.)

Figure 4. Effect of CBT and follow-up for children showing low and high initial improvement

To examine whether the presence of autistic traits was a predictor of treatment effect, we included CSBQ total score as a covariate in the linear mixed model analysis. Results revealed a significant main effect of time, $F(4, 46.04) = 10.69, p < .01$, and a main effect of CSBQ score, $F(1, 46.07) = 4.18, p < .05$. The
interaction effect between time and CSBQ on CY-BOCS score was not significant. These results suggest that children with higher CSBQ scores had also higher CY-BOCS scores during treatment and follow-up. There was no significant effect of CSBQ score on change in CY-BOCS scores throughout CBT and follow-up. Figure 5 shows the results for children with low to average \( (n = 18) \), high \( (n = 21) \), and very high \( (n = 16) \) CSBQ scores. (Note: two children in the low-average group, three in the high group, and four in the very high group received the combination of CBT + SSRI or inpatient treatment between T3 and T5.)

**Figure 5.** Effect of CBT and follow-up for children with low to very high rates of autistic traits

![Graph showing CY-BOCS scores for children with low-average, high, and very high CSBQ scores.]

After the CBT protocol

At the end of the treatment protocol, after 16 sessions CBT, the clinician, patient and the patient’s parents decided about further treatment policy: no further treatment needed, continuing CBT, combining CBT and medication, inpatient treatment, or treatment for other complaints. Treatment was ended at T3 (or before; \( n = 2 \)) for 18 of the 48 patients who completed treatment (37.5%). However, in the period between T4 and T5, two of them received another 3–4 sessions CBT because of a relapse. In addition, three participants had received treatment for other problems than OCD between T3 and T5.

For 25 children (52.1%) CBT was continued, of whom six children received the combination CBT + SSRI. Three children also received treatment for other problems than OCD.

Three participants (6.3%) were referred for inpatient treatment between
Non-response to CBT for childhood OCD

T3 and T5. For two participants (4.2%) no information was available about what happened after T3 (see Table 6).

**Table 6.** After the CBT protocol

<table>
<thead>
<tr>
<th>Policy after the CBT protocol</th>
<th>Specification of treatment between T3 and T5</th>
</tr>
</thead>
<tbody>
<tr>
<td>No further treatment for OCD (n = 18)</td>
<td>No treatment for OCD (n = 16)</td>
</tr>
<tr>
<td>CBT continued (n = 19)</td>
<td>CBT for OCD because of a relapse (3–4 sessions; n = 2)</td>
</tr>
<tr>
<td>CBT + SSRI (n = 6)</td>
<td>2–34 sessions CBT (M = 10.5; SD = 9.2) (n = 17)</td>
</tr>
<tr>
<td>Inpatient treatment (n = 3)</td>
<td>Number of sessions unknown (n = 2)</td>
</tr>
<tr>
<td>No information available (n = 2)</td>
<td></td>
</tr>
</tbody>
</table>

**Effects of continued CBT**

To examine the effect of continued CBT for children who were still symptomatic after the treatment protocol, a linear mixed model analysis was performed for the continued CBT monotherapy group (n = 19). There was a significant main effect of time on CY-BOCS score, \( F(4, 18.96) = 56.88, p < .001 \). Pairwise comparisons showed that CY-BOCS scores significantly decreased during standard CBT (T3 < T2 < T1; \( p < .001 \)), and continued CBT (T4 < T3, \( p < .01; T5 < T3, p = .001 \)) (see Figure 6). At one-year follow-up, 17 children (90%) reported complaints below the clinical level (CY-BOCS < 16) and 13 children (68%) met the remission criterion (CY-BOCS ≤ 10). One participant (5%) was lost to follow-up.

**Figure 6.** Effect of continued CBT
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Adverse events
No serious adverse events were reported.

Discussion

Results of the present study showed that CBT was associated with a significant reduction in OCD severity. Fifty percent of the sample was treatment responder according to the criterion of at least 50% symptom reduction post-CBT. After 16 sessions CBT, mean symptom reduction on the CY-BOCS was 52%; 41% of the patients were in full remission (CY-BOCS ≤ 10), and for 71% OCD severity was below the clinical level (CY-BOCS < 16). There were also favorable effects of treatment on co-morbid problems. Anxiety, depressive symptoms, and problem behavior in general significantly decreased during CBT, and effects were maintained or even strengthened during a one-year follow-up period. No changes in OCD severity were observed in the waitlist condition, suggesting that symptom reduction was not attributable to time. The results of the controlled part of the present study are consistent with previous studies (e.g., Barrett et al., 2004; Bolton & Perrin, 2008; De Haan et al., 1998; Freeman et al., 2008; The POTS Team, 2004).

No significant effect of CBT on quality of life was found. This could be due to the fact that baseline scores of quality of life were already within the normal range. However, average quality of life was unexpected as OCD most often is associated with considerable impairment in family, academic and social functioning (Piacentini, Bergman, Keller, & McCracken, 2003). Indeed, at baseline 93% of the participants in the present sample reported moderate to extreme interference of OC complaints on daily functioning on the CY-BOCS interference items. It may be that OCD-related impairment is not adequately expressed in a general questionnaire about quality of life such as the KIDSCREEN-27 (e.g., Valderhaug & Ivarsson, 2005).

More severe OCD at baseline predicted poorer treatment outcome. However, analyses revealed no significant interaction effect between time and severity. These results suggest that the change in OCD severity during CBT and follow-up (the slope of the improvement curve) does not differ between children varying in pre-treatment severity. This is consistent with the findings of Olatunji et al. (2013) that higher pre-treatment OCD was not associated with a smaller effect
size. It seems that all patients, independent of OCD severity, profited from CBT, but patients with more severe symptoms needed more time to improve.

Presence of autistic traits was also predictive of treatment outcome. A higher level of autistic traits was associated with higher levels of OCD severity during CBT and a one-year follow-up period. However, comparable to severity of OC symptoms, autistic traits was not predictive for the rate of improvement during CBT and follow-up. Furthermore, there was a significant correlation between CY-BOCS scores and the scores on the CBSQ ($r = .32$), indicating that autistic traits and severity of OCD were related.

Third, we examined whether the rate of improvement during the first part of treatment was predictive of treatment outcome. Results showed that patterns of change during CBT and follow-up differed between children who showed low initial treatment response (less than 18% symptom reduction after eight sessions of CBT), and children who showed better treatment response (at least 18% symptom reduction). Based on visual inspection, low initial treatment response may predict poorer treatment outcome at the end of standard CBT (16 sessions). However, during the follow-up period, the low-response group improved further, and after one-year follow-up both groups reached comparable levels of OCD severity. Although explorative and in need of controlled testing, these results suggest that low response at the start of CBT may not necessarily imply low or non-response in the end.

According to the guideline of the AACAP (recommendations 5 and 6; Geller et al., 2012), patients with moderate to severe OCD (CY-BOCS > 23) should be treated with the combination of CBT and an SSRI, instead of CBT monotherapy. This recommendation is, however, not based on empirical evidence. In the present study, we examined whether patients with moderate to severe OCD (CY-BOCS > 23) can effectively be treated with CBT monotherapy. Results suggest that (prolonged) CBT is effective for children with moderate and severe OCD. Similar treatment outcomes can be obtained for children with moderate OCD (CY-BOCS 24–26) and children with less severe complaints. Children with the highest severity scores (CY-BOCS 27–35) showed poorer treatment outcome after a one year follow-up period (despite addition of medication to CBT and/or inpatient treatment after the standard CBT monotherapy for seven of the seventeen children). Together, these results imply that the severity criterion of the AACAP guideline is too low and should be changed into a CY-BOCS score of at least 27 instead of 23. Furthermore, the present results suggest that
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continuing CBT can be an effective treatment strategy when complaints are not sufficiently disappeared after completing the standard treatment protocol (16 sessions of CBT).

From the present study is has become clear that moderate to severe symptoms, co-morbid autistic traits, and low response during the first treatment phase can be treated effectively with (continued) CBT monotherapy for a majority of patients. However, there was no direct comparison of CBT to the combination of CBT and an SSRI. Therefore we do not know whether the combination of CBT and an SSRI would have resulted in faster improvement in cases of severe complaints or for partial and non-responders. However, even if this would be the case, it is questionable whether the risks of medication (i.e., undesired side-effects, relapse by discontinuation, unknown long-term effects; e.g., Geller et al., 2012; Storch et al., 2010) are outweighed by the gain in time. Moreover, in the largest study until now in which CBT and the combination of CBT and an SSRI were compared, patients with higher CY-BOCS scores at baseline (≥ 24) did worse than those with lower baseline CY-BOCS scores in all treatment conditions (Garcia et al., 2010). Thus, whereas patients with more severe OCD still showed more complaints post-treatment in the CBT condition, they did so to the same extent in the combined treatment condition. In this context, it is unclear why medication should be considered for patients with moderate to severe OCD instead of CBT monotherapy.

The results of the present study should be interpreted in the light of several limitations. Although a sample size of 58 participants with multiple observations is considered acceptable for the analyses performed in the present study, a larger sample size would have strengthened the study. A second limitation is that not all participants were randomly allocated to CBT or waitlist. As a result, direct comparisons between CBT and waitlist conditions were based on a subsample. Although this is suboptimal, we found no significant differences in baseline characteristics and OCD severity between conditions (waitlist, CBT, and the non-randomized group). This indicates that the non-randomized group did not differ from the other participants and similar results could be expected for this subgroup. However, the possibility that selective randomization has influenced the results cannot be excluded. Third, the investigator administering the CY-BOCS was not blind to treatment condition, because the CY-BOCS was administered repeatedly. The investigator knew whether or not the child had been questioned before, which provided information about the
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treatment phase. Moreover, the CY-BOCS is a semi-structured interview and the investigator needs clinical information in order to formulate specific questions and gather relevant information in order to evaluate (treatment) process. In a recent study by Lewin and colleagues (2012) agreement between independent blind raters and therapists in a childhood OCD treatment trial was examined using the Clinician’s Global Impressions-Improvement Scale. It was concluded that therapists and blind raters rated improvement consistently. Therefore, we do not expect that the non-blinded design in the present study has produced biased ratings. Finally, preliminary results regarding the effects of continuing CBT after the treatment protocol are reported. It may be evident that as children were not randomly allocated to continued CBT versus no further treatment/other treatment, results of the present study are explorative. Continued CBT was not considered a sufficient treatment strategy for all children. Five children were referred to inpatient treatment and seven children received medication in addition to CBT. What would be the best treatment strategy for whom in case of partial or non-response to CBT has yet to be discovered.

The present study has several clinical implications. Based on our results, we conclude that CBT is an effective treatment for childhood OCD, also in cases of more severe OCD and for children with autistic traits. OC symptoms decreased significantly during CBT and follow-up, and the absolute decrease was independent of baseline OCD severity and of autistic traits. Children with severe OCD and high levels of autistic traits, however, may end treatment with somewhat more residual complaints.

In addition, low response at the start of CBT does not necessarily predict low or non-response at the end of treatment. Improvement may grow when the therapist carries on.

Finally, continuing CBT after the protocol had been completed (16 sessions CBT) proved to be effective. Treatment protocols are usually based on 12–20 sessions (O’Kearney et al., 2010). The optimal number of sessions, however, is unknown and present treatment protocols may not include sufficient sessions for everyone. Continuing CBT may lead to further improvement, at least for a considerable number of patients.

It may be clear that there is an urgent need for more research into treatment strategies for partial and non-responders. In addition, a systematic meta-analysis may shed more light on the fragmented literature on predictors of treatment effect in childhood OCD.