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The effectiveness of metacognitive therapy in comparison to exposure and response prevention for obsessive-compulsive disorder: A randomized controlled trial

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ABSTRACT

Background: The recommended psychological treatment of choice for obsessive-compulsive disorder (OCD) is exposure with response prevention (ERP). Although this treatment is quite effective, recovery rates are modest and attrition rate is relatively high. Also, ERP treatment requires amounts of therapist time. A possible way to improve OCD treatment is by taking into account key cognitive processes involved in the development and maintenance of the disorder. The metacognitive model is such an account and pilot findings suggest that the associated metacognitive therapy (MCT) might be an effective treatment for OCD.
Methods: In the present study, a randomized controlled trial (RCT) is used to assess the effectiveness of MCT in comparison to ERP in an outpatient clinical sample of patients with OCD.
Results: Both MCT and ERP produced significant pre-treatment to post-treatment decreases in obsessive-compulsive, comorbid psychological symptoms and metacognitive beliefs, both with moderate to large within-group effect sizes and high proportions of significant clinical change. Drop-out rates were low and treatment gains were maintained at six-month follow-up. There were no differences in efficacy observed between MCT and ERP treatments.
Conclusions: MCT proves to be a promising treatment of OCD.

1. Introduction

Obsessive-compulsive disorder (OCD) is a severe mental condition which is characterized by intrusive thoughts (obsessions) and repetitive behaviors (compulsions) intended to neutralize anxiety or suffering induced by these thoughts (American Psychiatric Association, 2013). OCD is a relatively common condition. The lifetime prevalence of OCD worldwide is estimated to be 2–3%, the 12-month prevalence almost 1%. OCD has been ranked among the most debilitating disorders by the World Health Organization and is associated with loss of performance and poor quality of life (WHO, 2004). Also, symptoms tend to increase or eventually can become chronic if left untreated (WHO, 2004). Yet, adequate treatment for OCD is crucial.

The standard psychological treatment for OCD in primary care is exposure and response prevention (ERP), a specific procedure within cognitive behavioral therapy (CBT). Many studies and meta-analysis have established the effectiveness of ERP (Skapinakis et al., 2016; Öst, Havnen, Hansen, & Kvale, 2015). Therefore, ERP is regarded as the psychological treatment of first choice in many treatment guidelines (Trimbos-institute, Multidisciplinary Guideline Anxiety Disorders,

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2013; National Institute for Health and Care Excellence [NICE], 2005).

The core principle of ERP is to expose patients to anxiety-provoking stimuli (objects, situations, thoughts) combined with the strict prevention of performing ritual behavior (Meyer, 1966). Although the prognosis of OCD improved substantially since the introduction of ERP (Skapinakis et al., 2016; Öst et al., 2015), there is a discrepancy between statistically and clinically significant change. While several studies and meta-analyses have shown ERP to lead to statistically significant improvements in 75% of patients, only about 60% of treatment completers achieve recovery, whereas only approximately 25% of patients is asymptomatic (a more stringent criterion for defining recovery) following treatment (Fisher & Wells, 2005). Overall recovery rates may be lower as only treatment completers were included in these analyses. Approximately 15% of OCD patients refuse ERP (Ong, Clyde, Bluett, Levin, & Twohig, 2016), and a further 15% drop out of treatment prematurely (Leeuwerik, Cavanagh, & Strauss, 2019). These findings illustrate that ERP might be hard to tolerate (Olatunji, Cisler, & Deacon., 2010) which might be due to the requirements of treatment (Whittal, Thordarson, & McLean, 2005). As most ERP manuals are based on the premise that fear reduction during an exposure exercise is necessary to achieve treatment results, ERP is a time-consuming method, with typically 15 to 20 sessions of 90 min duration (Foa & Kozak, 1996). Furthermore, therapists might be reluctant in the continuation of exposure exercises due to ethical considerations (Olatunji, Deacon, & Abramowitz, 2009). Clearly, there is room for improvement regarding the psychological treatment of OCD, both in terms of tolerance, effectiveness and cost-effectiveness.

Recently, a shift has taken place in our knowledge of the proposed underlying working mechanism of ERP. Although most ERP protocols are still based on habituation (the passive process of anxiety reduction due to prolonged exposure to a feared stimulus; Foa & Kozak, 1986; Foa & McNally, 1996), more recently the inhibitory learning model of extinction was developed (Baker, Mystkowski, Culver, Mortazavi, & Craske, 2010; Deacon et al., 2013). This theory states that fear reduction results from the learning of new non-threat (i.e., inhibitory) associations that compete with older threat associations (e.g. shaking hands and not washing afterwards in order to learn the new non-threat association of not getting sick). Exposure therapy therefore should focus on the mismatch between expectancies and actual outcomes so that the inhibitory associations become sufficiently strong and retrievable to compete with excitatory fear memories. Resulting from this model, an exposure exercise does not have to be maintained until feelings of anxiety are decreased, but should last as long as is necessary to reach a conclusion on the validity of the expectancies of patients. It is assumed that framing exposure within this modern learning theory perspective holds promise for improving the efficacy of exposure-based procedures. More research is necessary for enhancing the translation of this modern perspective in routine clinical care.

It has also been suggested that further progress in improving the efficacy of the treatment for OCD might be made by taking into account key cognitive processes involved in the development and maintenance of OCD (Frost & Steketee, 2002), such as metacognition (Purdon & Clark, 1999; Wells, 1997)".

Metacognition refers to knowledge and cognitive processes that are involved in the interpretation, monitoring and control of thinking processes (Flavell, 1979). Wells (1997, 2000) developed a theoretical model based on metacognition, in order to explain the maintenance of OCD symptoms (see Fig. 1). In this so-called metacognitive model, it is proposed that two domains of metacognitive beliefs are fundamental in the development and maintenance of OCD. The first domain contains metacognitive beliefs about the significance and consequences of intrusive thoughts and feelings, also called fusion beliefs. Three classes of fusion beliefs are highlighted: (1) Thought action fusion (TAF; Rachman, 1993) refers to the belief that obsessional thoughts can lead to the commission of an action (e.g. "If I think about stabbing my children, I will probably stab them"), (2) Thought event fusion (TEF; Wells, 1997) refers to the belief that obsessional thoughts can make certain events happen (e.g. "Thinking of a plane crash means I will be involved in a plane crash") or mean that an event has already occurred (e.g. "If I think I ran into someone with my car, I probably did it") and (3) Thought object fusion (TOF; Wells, 2000) refers to the belief that thoughts or negative feelings can be passed into objects (e.g. "My thoughts and feelings can contaminate objects"). These misinterpretations of obsessive thoughts and images cause worrying and anxiety. This consequently primes the second domain of metacognitive beliefs: beliefs about the necessity of performing ritual behaviours in order to reduce the perceived threat (e.g. "Counting to seven will restrain me from acting on my thoughts"). As a result, patients with OCD engage in both overt and covert ritual behaviours (e.g., checking, washing, ordering, repeating particular words). These behaviours serve the function of reducing threat and controlling feelings of distress and anxiety. Since the importance and danger of intrusive thoughts is determined by metacognitions, there is no objective evidence that a situation is safe. Therefore, ritual behaviors are performed until specific internal rules, the so-called stop signals, are met. For example, an OCD patient with contamination fears might stop washing when she can wash her hands for 2 min without feeling anxious. A key problem with ritual behaviours is that they prevent the OCD patient from learning that their metacognitive beliefs about the intrusive thoughts and ritual behaviours are inaccurate. Moreover, patients often fail to notice that their ritual behavior backfires by causing an increase in the awareness and frequency of intrusive thoughts.

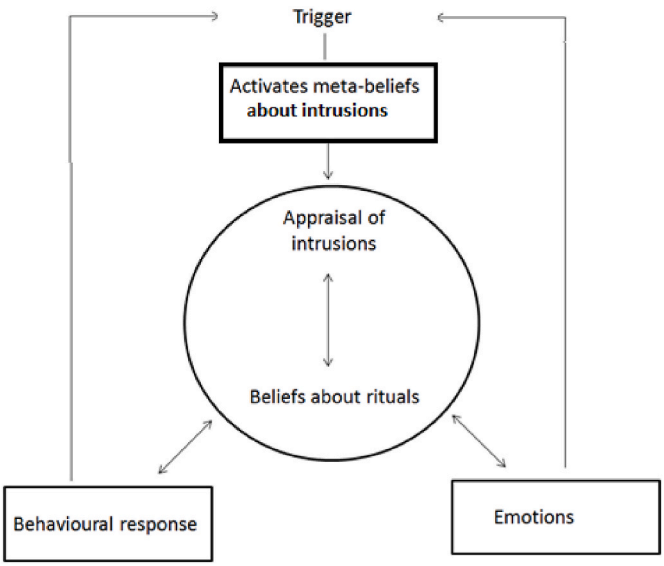

Fig. 1. Metacognitive model for OCD (Wells, 1997).

Following from this metacognitive model, treatment should focus on modifying patients' beliefs about the importance and power of intrusive thoughts and the necessity of performing rituals, instead of challenging the actual content of the obsessions and compulsions (Fisher & Wells, 2008). Although MCT also uses techniques that are more or less similar to CBT for this purpose, such as Socratic Questioning and exposure exercises, there are some important differences (Fisher, 2009). First, within MCT it is assumed that disordered higher-order metacognitive processes, such as beliefs about the importance and the power of thoughts, are responsible for the development and maintenance of OCD. As a result, MCT focuses on the process (meta-level) rather than the content of thinking (object level), whereas CBT is primarily focused on the object level. Instead of addressing obsessive thoughts by reality testing as is the case in CBT, MCT focuses solely on challenging metacognitive (high-order) beliefs about obsessions or compulsions and does not aim to modify lower order appraisals such as perfectionism or inflated responsibility, as these belief domains are thought to be products of metacognitive beliefs (Gwilliam, Wells, & Cartwright-Hatton,

2004). As such, in CBT exposure exercises are used as a way to violate expectations regarding the possible occurrence of negative outcomes and the need to engage in ritual behaviors to prevent these outcomes from happening. In MCT, exposure exercises are used to challenge metacognitive beliefs. A second difference is that MCT uses a novel technique called *detached mindfulness*, to enhance flexible control over reactions to intrusive thoughts, instead of challenging them as is done in CBT. In detached mindfulness patients are asked to be aware of their intrusive thoughts and try not to respond to them, instead of engaging like they normally would do (e.g., by worrying about consequences; Wells, 2009). The main aim is for patients to be able to notice the intrusive thoughts as "just mental events in the mind".

Only a few studies have examined the effectiveness of MCT for OCD. Using single case methodology, Fisher and Wells (2008) found clinically significant improvements for 4 OCD patients with different clinical presentations who were treated individually with MCT. At post-treatment, all 4 participants met standardized recovery criteria. Two out of 4 participants were asymptomatic at both post-treatment and six-month follow-up assessments. In an open trial of group MCT for OCD, Rees and van Koesveld (2008) found that 7 out of 8 participants (87.5%) achieved recovery on the Y-BOCS at three-month follow-up. Furthermore, a pilot study by Van der Heiden, Melchior, Dekker, Damstra, and Deen (2016) among 25 patients with OCD showed that after treatment, 74% of the treatment completers (n = 19) could be classified as recovered and 47% as asymptomatic. At three-month follow-up, these numbers were increased to 80% and 67%, respectively. Together, these findings suggest that MCT might be an efficacious treatment for OCD and, based on recovery rates, might outperform ERP.

Recently, Glombiewski et al. (2021) compared the efficacy of MCT with ERP in a pilot randomized trial among 37 patients with OCD. MCT and ERP appeared both effective with significant reductions in OCD symptoms and large effect-sizes. Both post-treatment and at three-month follow-up, 28.6% of the MCT treatment completers achieved clinically significant change. In the ERP condition, this was 50%. There were no significant differences between treatment conditions with regard to statistical or clinical significant change. Noteworthy, there was a significant difference in the face-to-face time spent with a therapist between the treatment conditions, namely 22.9 h within the ERP condition vs 13.1 in the MCT condition. More RCTs comparing MCT directly with ERP amongst larger groups of patients and with equally face-to-face time spent with a therapist between treatment conditions are needed to reach more definitive conclusions regarding the relative efficacy of both treatments. In the present paper, the design and results of a randomized controlled trial (RCT) comparing MCT and ERP in the treatment of OCD are described. Based on previous research available at the time we started our RCT (Fisher & Wells, 2008; Rees & van Koesveld, 2008; Van der Heiden et al., 2016), we hypothesized statistically and clinically significant improvements in both treatment conditions, and, based on recovery rates, we expected MCT to be more effective than ERP.

2. Method

The current RCT was carried out to assess the effectiveness of MCT as compared to ERP in a large outpatient clinical sample of patients with OCD. Assessments were carried out at pre-treatment, post-treatment, and six-month follow-up. Potential participants were screened for eligibility and received extensive information about the design and procedures of the study at the end of the intake phase. Following informed consent, patients were randomly allocated to either MCT or treatment as usual (ERP). Randomization was done by using *www.randomization.com*, an online generator which randomizes each subject to a treatment condition by using a method of randomly permuted blocks. The generator also randomizes the block sizes, to ensure that it is unknown when a block is finished and it is not possible to guess the remaining treatment allocation. Ethical approval was obtained from the Leiden University Medical Center (NL50201.058.14). The trial was registered in the Netherlands Trial Register (NTR4855). A detailed description of the research design is also found in the published study protocol of Melchior, Franken, Deen, and Van der Heiden (2019). Fig. 2 shows the patient flow through the trial.

2.1. Recruitment and eligibility criteria

Between June 2015 and February 2020, 133 patients were recruited from consecutive referrals to the Anxiety Disorders department of PsyQ, an outpatient community mental health center in the Netherlands. As structured diagnostic instruments based on the DSM-5 (American Psychiatric Association, 2013) were not yet available in the Dutch language at the development phase of the RCT, diagnosis was established using the Dutch version of the Structured Clinical Interview for DSM-IV (SCID-I; First, Spitzer, Gibbon, & Williams, 2002), which was administered by independent trained psychology master students. Lobbestael, Leurgans, and Arntz (2011) found adequate to good inter-rater reliability for the Dutch version of the SCID-I. The inclusion criteria were 1) primary diagnosis of OCD; and 2) age 18–65. Exclusion criteria were kept to a minimum to enhance the clinical representativeness of the sample. Patients were excluded if they currently 1) met DSM-IV criteria for severe major depressive disorder that requires immediate treatment, bipolar disorder, or psychotic disorder; 2) had substance abuse requiring specialized treatment; 3) had mental impairment or evidence of organic brain disorder; 4) were receiving a psychological treatment for any comorbid psychiatric disorder; or 5) had a change in medication type or dose in the six weeks before assessment or during treatment. The presence of other comorbid disorders or the continued use of psychopharmaca patients already used longer than six weeks before assessment were not exclusion criteria. The same was true for earlier psychological treatment for OCD that ended longer than three months before enrollment in the study. To prevent for possible delayed effects of earlier treatments that could influence the results of our study, patients who terminated earlier treatments for OCD within three months before enrollment were excluded from participation in the study. No reward was offered for participating in the study.

Sixteen of the 133 potentially eligible patients were excluded based on the presence of a psychotic disorder (N = 2) or a change in medication in the six weeks before assessment (N = 14). Next, 27 patients refused randomization, leaving 90 patients entering the active treatment phase. Of these 90 patients, 15 (16.7%) dropped out from the active treatment phase, 9 in the ERP condition (19.9%), and 6 in the MCT condition (13.3%). At six month follow-up, the 75 treatment completers were approached. Seven patients appeared unreachable, 2 in the MCT condition and 5 in the ERP condition. For the remaining 68 patient, the Treatment Change Recording Form (TCRF; Tolin, Maltby, Diefenbach, Hannan, & Worhunsky, 2004) was administered. The TCRF is a short questionnaire to assess the initiation, termination, or change of any form of (psycho)therapy, hospital services, support group, self-help program, or medication used by the participant. For the purpose of our study only the initiation or change in medication and the initiation of a psychotherapy as mentioned in the clinical guidelines for OCD were used as exclusion criteria. Based on these two criteria, 18 patients were excluded from the follow-up analyses. In the MCT condition, 3 patients had received additional treatment for OCD and 5 had a change in their medication. In the ERP condition, 5 patients had received additional treatment for OCD and 5 had a change in their medication. Overall, 50 participants completed follow-up assessments (55.6%), 29 participants in the MCT-condition (64.4%) and 21 participants (46.7%) in the ERP-condition.

2.2. Assessment

Participants were assessed by means of self-report measures and a semi-structured clinical interview at entry (pre-treatment), after the last treatment session (post-treatment), and at six-month follow-up The

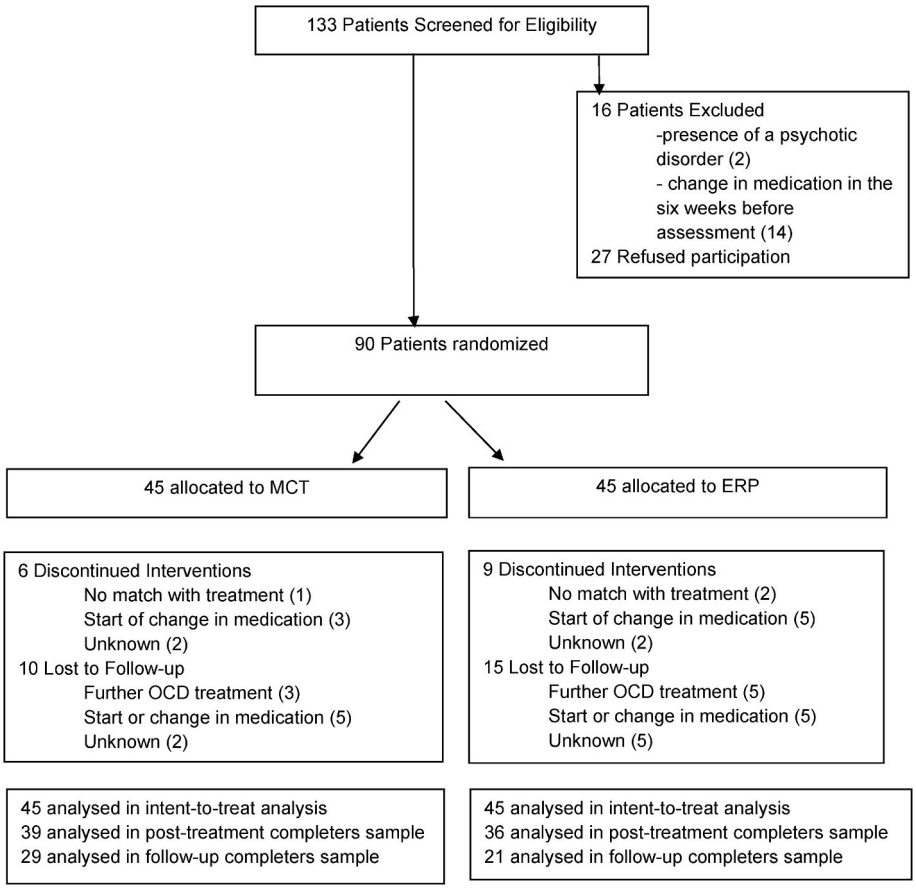

Fig. 2. Flowchart of the study.
Note. ERP = exposure and response prevention; MCT = metacognitive therapy.

semi-structured clinical interviews were administered by 6 independent and extensive trained (at least 2 months of experience in the administration of the interview under supervision) psychology students who were blind to treatment allocation. In case of dropout, measurements and interviews were administered as soon as possible after treatment had ended.

2.2.1. Primary treatment outcome

Yale-Brown-Obsessive-Compulsive-Scale (Y-BOCS). The main outcome of interest for this study is the severity of the OCD symptoms, which was measured with the Y-BOCS (Goodman et al., 1995). The Y-BOCS is a clinician-rated semi-structured interview which is designed to rate the severity of OCD symptoms. It consists of 10 items, of which 5 items measure the severity of obsessions and 5 items measure the severity of compulsions. Each item is rated on a 5-point scale ranging from 0 (*none*) to 4 (*extreme*) leading up to a range from 0 to 40. The Y-BOCS is widely used in treatment outcome research in OCD, and proved to have reasonable psychometric properties (López-Pina et al., 2015; Van Oppen, Emmelkamp, van Balkom, & van Dyck, 1995). In the present trial, Cronbach's α at pretreatment was .76.

2.2.2. Secondary outcomes

Padua-Inventory Revised (Padua-IR). The severity of common obsessions and compulsions was measured with the Padua-IR (Burns, Keortge, Formea, & Sternberger, 1996), a self-report questionnaire consisting of 41 items. Each item is rated on a 5-point Likert scale from 0 (*not at all*) to 4 (*very much*) which makes up a range from 0 to 164. Previous research has found that the PADUA-IR has adequate psychometric properties (Van Oppen, 1992). In the present trial, Cronbach's α at pretreatment was .93.

Symptom Checklist (SCL-90). General psychopathology and common psychological complaints were measured with the SCL-90 (Derogatis, 1983). The SCL-90 consists of 90 items, all scored on a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*very much)* (range 90–450). The SCL-90 has shown sound psychometric properties (Ettema & Arrindell, 2003). In the present trial, Cronbach's α at pretreatment was .97.

Beck Depression Inventory (BDI-II). To assess comorbid depressive symptoms the revised version of the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996) was included. The questionnaire is based on self-report and consists of 21 items scored on a 4-point scale from 0 (*absence of symptoms*) to 3 (*intense symptoms*) (range 0–63). The BDI-II is a reliable and well-validated measure of depressive symptoms (Wang & Gorenstein, 2013). In the present trial, Cronbach's α at pretreatment was .92.

World Health Organization Quality of Life Questionnaire (WHOQoL--BREF). Finally, the WHOQoL-BREF was used, a 26 item self-report measurement developed for the assessment of well-being. Responses to questions are on a 1–5 Likert scale from 1 (*disagree*) to 5 (*completely agree*) (range 26–130). Analyses revealed the WHOQoL-BREF as a valid assessment of quality of life (Skevington, Lotfy, & O'Connell, 2004). In the present trial, Cronbach's α at pretreatment was .92.

2.2.3. Measures of treatment process

Thought Fusion Instrument (TFI). Changes in metacognitive beliefs about the significance and consequences of intrusive thoughts and feelings were measured with the TFI (Wells, Gwilliam, & Cartwright-Hatton, 2001), a 14-item self-report scale. Each item is rated on a 0 to 100 scale (range 0–1400). Melchior, Franken, Vuijk, Peerbooms, and Heiden van der (2021) found adequate psychometric properties. In the present trial, Cronbach's α at pretreatment was .89.

Beliefs About Rituals Inventory (BARI). Changes in metacognitive beliefs about the necessity of performing rituals in response to obsessions were assessed with the BARI (McNicol & Wells, 2012). This self-report questionnaire contains 12 items which can be rated on a 5-point Likert scale from 0 (*do not agree*) to 4 (*agree very much*), giving it a range from 0 to 48. Unfortunately, the Dutch version was not available at the beginning of this study, so the BARI was not administered in the first 11 patients that were included in this study. In the study of Melchior et al. (2021, pp. 1–12), the BARI appeared as a valid assessment with adequate reliability and validity coefficients. In the present trial, Cronbach's $\alpha = 0.87$.

Obsessional Beliefs Questionnaire (OBQ). Finally, we included the OBQ (Obsessive Compulsive Cognitions Working Group [OCCWG], 2005). The OBQ is a 44-item instrument, specifically designed to measure dysfunctional beliefs assumed to contribute to the escalation of normal intrusive thoughts into clinical obsessions. Responses to questions are on a −3 to 3 Likert scale where −3 represents '*disagree very much*' and 3 represents '*agree very much*' (range -132 – 132). The instrument has shown good validity, internal consistency and reliability. In the present trial, Cronbach's α at pretreatment was .96.

2.3. Treatments, therapists and treatment integrity

An overview of both treatments is provided in Table 1. Both treatments consisted of up to 15 weekly sessions of 45 min duration. Treatment could be terminated earlier, in case patient and therapist agreed that treatment goals were reached, and the relapse prevention phase of treatment was completed. To be classified as treatment completer in the statistical analyses, treatment should have encompassed at least 8 sessions.

Except for the last eight patients that entered the study, treatment sessions were conducted face-to-face. Due to the COVID-19 pandemic, those eight patients, who were equally distributed over the MCT (n = 4) and ERP (n = 4) condition, were partly treated by using videoconference. The interventions were delivered by 10 female certified cognitive behavioral therapists (mean age 39 year [range 27–57]), familiar with the provision of ERP for OCD and on average 13 years (range 5–24) of clinical experience. During monthly supervision meetings the second author (CH; expert in the provision of cognitive-behavioral treatment protocols for OCD and trained in MCT for OCD by prof. dr. Adrian Wells and dr. Peter Fisher, experts in the field of MCT) supervised current cases in both treatment conditions to ensure treatment quality and adherence. Also, treatment integrity was evaluated by means of randomly assessing recordings of treatment sessions. In both conditions, treatment sessions 2, 5 and 9 were completely recorded. Session 2 focuses on the treatment rationale and should be clearly different for both conditions. Sessions 5 and 9 were chosen as in both treatments these specific sessions focus on exposure exercises/behavioral experiments, but should be distinguishable from each other by the specific nature of the exercises. Where the exposure exercises in the ERP condition are tailored to adjusting ritual and avoidance behaviours, in the MCT condition the behavioral experiments are used to target metacognitive beliefs about intrusive thoughts (session 5) and the necessity of performing compulsions (session 9). By rating sessions 5 and 9, both domains of metacognitive beliefs are covered. By using an intervention checklist covering the entire session, trained master students evaluated whether therapists used the interventions as described in the respective treatment sessions of both treatment manuals, and whether they did not use interventions outside the scope of the treatment they were offering. A 3-point Likert scale was used as an estimation for treatment adherence (complete adherence), slight deviation (e.g., forgotten to reflect on homework), and large deviation (e.g., interventions were applied that were not described in the manual). Finally, a therapist cross-over design was used to control for therapist effects, meaning that therapists delivered both types of treatment in separate blocks. Two psychologists however delivered only one type of treatment due to the fact they left the organization during our trial and were replaced by other therapists.

Table 1
Overview of MCT and ERP for OCD.

Phase	MCT	Sessions	ERP	Sessions
1	- Provide treatment overview - Psycho-education about the metacognitive model of OCD - Elicit metacognitions through guided questioning - Practicing of detached mindfulness	1–2	- Provide treatment overview - Psycho-education about the behavioral model of OCD - Formulation of a hierarchy of anxiety-provoking situations and avoidance behaviors	1–3
2	- Modifying of metacognitions about intrusive thoughts by verbal methods and behavioral experiments, e.g., exposure and response commission	3–8	- Exposure and response prevention exercises (within-session and between sessions)	4–13
3	- Modifying of metacognitions about the necessity of rituals by verbal methods and behavioral experiments, e.g., ritual modulation experiments	9–12	- Development of a personal relapse prevention plan and treatment summary	14–15
4	- Formulation of a new plan for responding to intrusive thoughts, a therapy blueprint consisting of the case conceptualization, and a list of metacognitive beliefs including an overview of evidence challenging them	13–15		

Note. ERP = exposure and response prevention; MCT = metacognitive therapy.

MCT consists of four phases. In the first phase, the metacognitive model is explained to increase the patients' awareness of the role of metacognitions and to develop an idiosyncratic case conceptualization. Experiments are used to illustrate maladaptive coping strategies. For example, thought suppression experiments like the White Bear-experiment (Wegner, Schneider, Carter, & White, 1987) are used to illustrate that the suppression of thoughts will lead to an increase in the frequency and intensity of the suppressed thought. Also, detached mindfulness is introduced as a way to enable patients to move from treating their thoughts about their obsessions and compulsions as facts to being able to objectively evaluate their obsessions as merely mental events not requiring further processing (Fisher & Wells, 2008). In the second phase, verbal cognitive restructuring (e.g., questioning the evidence) and behavioral experiments are used to target metacognitive beliefs about intrusive thoughts. To illustrate, exposure and response commission is an experiment in which patients are asked to perform their rituals while maintaining the intrusive thought simultaneously, instead of trying to get rid of this thought. The goal is to enable patients to experience obsessive thoughts on a metacognitive level by obtaining distance from them and discovering that they are unimportant events in the mind (Wells, 2009). The third phase focuses on challenging metacognitive beliefs about rituals, also by verbal techniques and specific behavioral experiments. For instance, in ritual modulation experiments patients are asked to perform more and less ritual behavior alternately, in order to assess whether rituals are as functional as they state in their metacognitive beliefs (such as 'if I do not carry out my rituals, I will never find peace of mind again'). In the fourth and final phase, a personal relapse prevention plan is formulated for responding to intrusive experiences, in which 'the old plan' (e.g., worrying in response to obsessive thoughts) is replaced by 'a new plan' (e.g., practicing detached mindfulness) of attentional strategies and coping behaviors in reaction

to intrusive thoughts. This phase is completed by developing a blueprint of the therapy, including the case conceptualization, a summary of the therapy, and a list of personalized metacognitive beliefs and overview of evidence challenging them.

Patients in the exposure with response prevention group were treated according to the current treatment guidelines for OCD (Van Balkom et al., 2013). This means that patients received an ERP treatment based on the clinical model of Meyer (1966) in which repeated confrontation with fear-provoking cues (exposure), combined with the refraining from performing ritual behaviors (response prevention) are central. However, resulting from the inhibitory learning model of extinction (Baker, Mystkowski, Culver, Mortazavi, & Craske, 2010; Deacon et al., 2013) exposure exercises were set-up to violate expectations rather than to reach habituation. This was done by designing exposure exercises to test the specific negative expectations regarding the frequency or intensity of aversive outcomes, and by explicitly evaluating the meaning of the actual outcome for the validity of this expectation. In order to optimize exposure and to prevent relapse, some other refinements were made based on the inhibitory learning model, such as varying the contexts (both internal and external) in which exposure exercises are carried out, variability in fear level during exposure instead of utilizing a fear hierarchy, and removal of safety signs and behavior (such as the presence of another person, medications, or carrying a talisman) (Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014). Our ERP protocol consists of three phases. During the first phase, the cognitive-behavioral model of OCD and the treatment rationale are discussed. Subsequently, anxiety provoking situations are registered. In the second phase, in vivo and imaginary exposure exercises are performed during session time and also as homework assignments between sessions. Prior to exposure exercises, fear expectancies are defined. Subsequently, exposure exercises are used to violate expectancies regarding the frequency or intensity of the aversive outcomes. In the third and final phase, a personal relapse prevention plan is developed.

2.4. Power and sample size

Because there were no large-scale studies to base our effect size on, we had to provide an estimation of the effect size. We chose to design our study with enough statistical power to enable us to detect a medium between-group effect (Cohen's $d = 0.5$; Cohen, 1992) from baseline to posttreatment. We chose this medium between-group effect because expecting a larger difference between the two treatment groups did seem unrealistic since numerous studies have found statistically significant changes and large improvements in OCD-symptoms after ERP. On the other hand, designing our study to enable us to detect a small between-group effect would require very large sample sizes, while small differences are of less relevance for clinical practice. We used the statistical method presented by Liu and Liang (1997) for sample size calculations for studies with correlated observations. To achieve a power of 0.8 with four measurement points with a correlation of 0.5 between repeated measures (standard value) and to detect a medium effect size (Cohen's $d = 0.5$ between the two treatment conditions over time on the primary outcome measure (severity of OCD symptoms as measured by the Y-BOCS) and an expected drop-out rate of 20%, the minimal sample size necessary in each condition is 45.

2.5. Statistical analyses

Data were analyzed using SPSS for windows 25. First of all, data was screened for outliers using the box plot functionality. It appeared that there were no outliers present. Also, prior to performing the t-tests, data was checked on normality, and it appeared that the data followed a normal distribution. Secondly, adequacy of randomization was assessed by studying pretreatment differences between treatment conditions on baseline clinical and demographic variables using t-tests and Pearson's chi-squared tests. Also pretreatment differences between participants who completed the treatment (with a minimum of 8 sessions) and those who did not were analyzed (intent-to-treat [ITT] sample).

Next, treatment outcome is examined. Because of the dropout and the uneven time intervals between measurements (posttest-six-month follow-up), the use of mixed models is the most appropriate statistical method (Singer & Willett, 2003). Model diagnostics were assessed by exploring residual plots. Fixed effects in our model are time, treatment and their interaction. The Benjamini-Hochberg procedure was applied to the p values of the time $\times$ treatment interactions ($\alpha = 0.05$) of the different outcome measures. The time variable was treated categorically, with the first post-baseline measurement as the reference category. To accommodate the modeling of correlation among repeated measurements, we imposed a first order autoregressive (AR[1]) structure on the residuals. Next, the interaction effect between time and group was explored by analyzing the estimated marginal means at different time points. To gain further insight into the statistical significance of the improvements achieved in the two treatment conditions, we perform a least significant difference test with the estimated marginal means to compare changes between treatment conditions.

Further, to allow for comparison with other studies into the effectiveness of ERP and MCT for OCD, Cohen's d statistic ([mean 1 – mean 2]/pooled SD; Cohen, 1991) was employed to calculate within-group effect sizes (ESs) for changes on outcome measures. We calculated Cohen's d statistics by using the observed means and standard deviations. Based on previous research we expected a large within-treatment effect-size for both treatment conditions (Cohen's $d > 0.8$).

Finally, the clinical significance of treatment effects and amount of drop-out was examined also to gain further insight into the clinical value of the two treatment conditions. The clinical significance of treatment effects is examined using the standardized criteria developed by Fisher and Wells (2005) based on the procedures outlined by Jacobson and Truax (1991). Patients were classified as recovered, if they score within the normal range on the Y-BOCS after treatment (cut-off point = 14), and display statistically reliable improvement on that measure (reliable change index = 10). Patients were classified as asymptomatic (a more stringent criterion for defining recovery) when they achieve a post-treatment score of 7 or less (indicating an almost total absence of OCD symptomatology), in addition to meeting the reliable change index. Further, diagnosis-free status was also used as an index of clinically significant change. The clinical significance of treatment effects was examined for both the completers as well as the ITT sample.

3. Results

3.1. Descriptive and preliminary analysis

Demographic characteristics of the sample prior to the start of treatment are displayed in Table 2. On average, patients experienced OCD symptoms for more than eleven years. Moreover, more than two-third (72.2%) received at least one previous treatment as mentioned in the Dutch clinical guideline (Van Balkom et al., 2013) for their OCD symptoms, of which 31.1% even two or three times. Also, more than two-third (71.1%) met DSM-IV criteria for at least one co-morbid diagnosis, with personality disorder (in most of the casus cluster C personality disorder; 28.9%), depressive disorder (24.4%), panic disorder (13.3%), social phobia (11.1%), generalized anxiety disorder (7.8%) and posttraumatic stress disorder (3.3%) being the most common co-morbid diagnoses.

T-tests and Pearson's chi-squared tests revealed no significant differences between treatment groups on demographic and clinical variables at baseline, except for psychopharmaca use. Specifically, 44.4% of the patients in the MCT condition and 22.2% in the ERP condition were using psychopharmaca, a significant difference (χ^2 [1] = 5.000, p = .025). Since patients were only allowed to enroll the study if they were on a stable dose for at least 6 weeks before entering the treatment program, we do not expect that this difference significantly affect the

Table 2
Sample characteristics at pre-treatment.

	Total sample (N = 90)		ERP (N = 45)		MCT (N = 45)	
	M	***SD***	***M***	***SD***	***M***	***SD***
Age in years	31.22	9.9	31.6	9.8	30.8	10.2
Duration of OCD in years before start of treatment	11.24	9.8	10.4	8.7	12.11	10.7
	N	**%**	**N**	**%**	**N**	**%**
Gender (female)	55	61.1	26	57.8	29	64.4
Highly educated (Bachelor, Master, PhD)	45	50	21	46.6	24	53.4
Living alone	55	61	27	60	28	62.2
Currently unemployed	13	14.4	4	8.9	9	20
Use of psychopharmaca	30	33.3	10	22.2	20	44.4
≥1 comorbid disorder	64	71.1	35	77.8	29	64.4
1 previous treatment for OCD	37	41.1	16	35.6	21	46.7
2 previous treatments for OCD	19	21.1	8	17.8	11	24.4
≥3 previous treatments for OCD	9	10	3	6.6	6	13.4

Note. ERP = exposure and response prevention; MCT = metacognitive therapy.

treatment results.

Table 3 shows observed means on primary, secondary and process measures for the ITT sample. We found no significant differences between the two treatment conditions on any of the outcome or process measures at baseline (*F*s[1,88] < 3.34, *p*s > .05).

Six patients in the MCT group (13.3%) and 9 (19.9%) in the ERP group did not complete treatment as intended. This difference in attrition rate was non-significant ($\chi^2 = 0.95$, $p = .81$). The 75 patients who completed the active treatment phase did not differ from the 15 drop-outs on any of the baseline outcome measurements. This also appeared true when analyzing differences in baseline characteristics between the 47 study completers (completing all assessment points up to follow-up) and drop-outs from active treatment phase (*p*s > .05). Finally, in both treatment conditions, the majority of patients received the full 15 sessions (79.5% in the MCT condition, 72.2% in the ERP condition). A small subgroup received 12 to 14 sessions (20.5% in the MCT condition, 25% in the ERP condition) and one patient in the ERP condition received 8 sessions (2.8%). There was no significant difference in number of sessions between treatment conditions (MCT: *M* = 13.82, *SD* = 2.32, range 12–15; ERP: M = 12.51, SD = 3.99, range 8–15; t(88) = 1.51, p = .14).

3.2. Treatment integrity

A sample of 66 randomly selected recordings of treatment sessions 2, 5 and 9, equally divided between the two treatment conditions, were analyzed by 6 extensively trained psychology master students with at least 2 months of supervised experience in performing the integrity checks. Distribution of the three treatment sessions was equally divided (session 2: 24 recordings; session 5: 23 recordings; session 9: 19 recordings). Of the analyzed recordings, 85% was scored in the 'complete adherence'-category. In 15% of the cases a slight deviation was perceived. In only 4% of the analyzed recordings, therapeutic interventions were applied that were not described in the treatment manual, but no interventions derived from the other treatment condition were observed.

3.3. Treatment outcome

The results of the multilevel analyses of treatment condition and time effects are shown in Table 4. Time proved to be the most important predictor on all outcome variables. On all outcome variables, the time-effect appeared significant for both groups, both posttreatment and at the time of follow-up, indicating significant improvements on all outcome variables for both groups over time. The time x condition models were all non-significant (YBOCS: $F[2,116] = 0.168$, $p = .91$, Padua: $F[2,117] = 1.228$, $p = .50$, BDI: $F[2,124] = 0.264$, $p = .91$, SCL-90: $F[2,86] = 1.180$, $p = .50$, WOHQoL: $F[2,140] = 1.411$, $p = .50$, TFI: $F[2,135] = 2.801$, $p = .50$, BARI: $F[2,89] = 1.175$, $p = .50$, OBQ: $F[2,127] = 0.092$, $p = .91$), which means that the effect of treatment over time did not differ between treatment condition on any of the outcome or process measures.

Both MCT and ERP were associated with large ESs (Cohen's *d* statistics) on the primary outcome measure (Y-BOCS), at posttreatment (MCT: 1.65; ERP: 2.03) and at follow-up assessment (MCT: 1.78; ERP: 2.29). At posttreatment, ESs on both the secondary outcome measures and process measures appeared moderate to large for both the MCT condition (Padua-IR:0.80, BDI: 0.55, SCL-90: 0.53, WOHQoL: 0.34, TFI = 0.62, BARI: 0.88, OBQ: 0.53) and the ERP condition (Padua-IR: 0.89, BDI: 0.61, SCL-90: 0.83, WOHQoL: 0.55, TFI = 0.44; BARI: 1.07, OBQ: 0.43). For the follow-up assessment, ESs for the MCT condition were all large (Padua-IR: 0.95, BDI: 1.14, SCL-90: 0.85, WOHQoL: 0.96, TFI: 0.94, BARI: 1.29, OBQ: 0.96), for the ERP condition moderate (TFI: 0.52) to large (Padua-IR: 1.04, BDI: 1.08, SCL-90: 1.06, WOHQoL: 0.93, BARI: 1.44, OBQ: 0.97).

3.4. Clinical recovery

An overview of the recovery status of patients is presented in Table 5 (completers sample) and Table 6 (ITT-sample). Pearson's Chi square

Table 3
Observed means, (standard deviations) of all variables at Pre, Post and Follow-up and effect-sizes (cohen's d) of the dependent variables.

	MCT					ERP				
	M (*SD*)			cohen's *d*		*M* (*SD*)			cohen's *d*	
	Pre	Post	Follow-up	Post	Follow-up	Pre	Post	Follow-up	Post	Follow-up
Primary outcome										
Y-BOCS	24.78 (6.01)	12.95 (8.32)	12.07 (8.25)	1.65	1.78	24.36 (5.21)	11.81 (7.18)	10.38 (6.98)	2.03	2.29
Secondary outcomes										
PADUA-IR	61.64 (27.53)	40.59 (25.29)	35.37 (27.49)	.80	.95	63.24 (27.39)	39.11 (27.11)	39.50 (18.10)	.89	1.04
BDI-II	19.67 (10.31)	13.49 (12.31)	8.89 (8.56)	.55	1.14	21.44 (12.14)	14.00 (12.13)	9.80 (9.49)	.61	1.08
SCL-90	192.09 (50.13)	164.03 (56.61)	148.52 (51.82)	.53	.85	198.50 (55.05)	151.69 (57.44)	145.85 (44.44)	.83	1.06
WOHQoL	87.16 (13.27)	92.31 (16.65)	100.11 (13.62)	.34	.96	86.47 (15.67)	95.75 (17.83)	100.15 (13.72)	.55	.93
Process measures										
TFI	425.91 (287.67)	258.46 (251.48)	194.07 (203.04)	.62	.94	357.56 (254.74)	252.22 (223.51)	230.50 (231.60)	.44	.52
BARI	26.65 (7.68)	19.86 (7.79)	17.59 (6.36)	.88	1.29	27.77 (8.95)	18.79 (7.79)	17.40 (5.45)	1.07	1.44
OBQ	9.67 (47.77)	−16.80 (52.33)	−39.70 (54.93)	.53	.96	1.62 (59.69)	−24.04 (59.54)	−51.20 (49.04)	.43	.97

Note. ERP = exposure and response prevention; MCT = metacognitive therapy; Y-BOCS = Yale-Brown Obsessive Compulsive Scale.
Padua-IR = Padua Inventory Revised; BDI-II = Beck Depression Inventory, 2nd edition; SCL-90 = Symptom Checklist.
WOHQoL = World Health Organization Quality of Life Questionnaire; TFI = Thought Fusion Instrument; BARI = Beliefs About Rituals Inventory.
OBQ = Obsessional Beliefs Questionnaire.

Table 4
Parameter estimates for mixed models regarding baseline – posttreatment–follow-up.

	Estimate	SE	p
Y-BOCS			
Intercept	24.78	0.89	<.01
Condition	−0.422	1.17	.72
Time-posttreatment	−11.67	1.00	<.01
Time-follow-up	−11.40	1.13	<.01
Time x condition posttreatment	−0.94	1.62	.56
Time x condition follow-up	−0.94	1.84	.72
Padua-IR			
Intercept	61.64	4.06	<.01
Condition	1.60	5.73	.78
Time-posttreatment	−21.33	2.19	<.01
Time-follow-up	−19.74	3.58	<.01
Time x condition posttreatment	−2.16	4.24	.61
Time x condition follow-up	6.09	4.97	.22
BDI-II			
Intercept	19.67	1.52	<.01
Condition	1.78	2.35	.45
Time-posttreatment	−5.84	1.36	<.01
Time-follow-up	−7.91	1.31	<.01
Time x condition posttreatment	−1.18	2.24	.60
Time x condition follow-up	0.07	2.65	.98
SCL-90			
Intercept	192.09	7.39	<.01
Condition	6.80	11.02	.54
Time-posttreatment	−28.09	5.72	<.01
Time-follow-up	−31.98	7.34	<.01
Time x condition posttreatment	−17.66	12.11	.15
Time x condition follow-up	−10.42	12.76	.42
WHOQoL			
Intercept	87.16	1.96	<.01
Condition	−0.69	3.03	.82
Time-posttreatment	4.45	1.69	.01
Time-follow-up	8.87	1.81	<.01
Time x condition posttreatment	3.92	2.55	.13
Time x condition follow-up	0.79	2.72	.77
TFI			
Intercept	425.91	42.87	<.01
Condition	−68.35	56.99	.23
Time-posttreatment	−179.57	32.72	<.01
Time-follow-up	−176.35	33.94	<.01
Time x condition posttreatment	87.00	42.79	.05
Time x condition follow-up	107.85	48.53	.03
BARI			
Intercept	26.41	1.17	<.01
Condition	1.34	1.82	.46
Time-posttreatment	−6.96	1.06	<.01
Time-follow-up	−6.96	1.08	<.01
Time x condition posttreatment	−2.76	1.92	.16
Time x condition follow-up	−2.85	1.94	.15
OBQ			
Intercept	11.63	7.16	.11
Condition	−10.15	11.44	.38
Time-posttreatment	−28.15	6.47	<.01
Time-follow-up	−42.27	8.61	<.01
Time x condition posttreatment	3.60	8.90	.69
Time x condition follow-up	4.47	12.54	.72

tests revealed no significant differences on both recovery and asymptomatic rates between treatment conditions (all *ps* > .05). Tables 5 and 6 also show the percentages of patients with a diagnosis-free status at post-treatment and at follow-up assessment. Again, no significant difference between the ERP and MCT groups were found (all *ps* > .05).

4. Discussion

In the present study, an RCT was carried out to assess the effectiveness of MCT in comparison to ERP in an outpatient clinical sample of patients with OCD. Exclusion criteria were kept to a minimum in order to enhance the clinical representativeness of the sample. Results of the current RCT show that ERP and MCT are both effective treatment methods for OCD. Both treatments produced significant pre-treatment to post-treatment decreases in obsessive-compulsive symptoms, comorbid psychological symptoms (e.g., depressive symptoms) and dysfunctional (metacognitive) beliefs as indexed by the process measures. Further, quality of life increased between pre- and post-treatment. We found large within-group effect sizes on the measurements for obsessive-compulsive symptoms and moderate to large within-group effect sizes for secondary and process measures. High percentages of clinically significant change were found in both treatment conditions. Drop-out rates (20% in the ERP condition and 13% in the MCT condition) were in line with previous meta-analytic findings with regard to drop-out in cognitive behavioral therapy for OCD (Leeuwerik et al., 2019). Treatment gains were maintained at six-month

follow-up. No significant differences were found between the two treatments on any outcome or process measure, nor in terms of clinically significant change or drop-out rate. As such, we did not find support for our main hypothesis that MCT is more effective than ERP in the treatment of OCD.

One explanation for not finding significant differences might be that underlying mechanisms of change are partly shared between the two treatment conditions. This hypothesis is supported by the fact that we found statistically significant decreases in dysfunctional (metacognitive) beliefs as indexed by the process measures in both treatment conditions without significant between-group differences. It is possible that the implementation of the inhibitory learning model of extinction in our ERP condition has reduced the differences between MCT and ERP, as both treatments focus on expectation violation by utilizing mainly behavioral experiments (e.g., exposure exercises). Although theoretically different expectations are targeted (metacognitive beliefs about obsessions/rituals and obsessive thoughts respectively), it cannot be ruled out that the exposure exercises address the same expectations in both conditions, or even target both kind of expectations at the same time. For instance, it might well be that a patient who is asked in MCT to stand by an open window and repeat his obsessive thought 'I will jump out of the window' in order to challenge his metacognitive belief that 'thinking of jumping means that I will jump' also learns that his obsessive thoughts on jumping out of windows are incorrect. In a similar way it is possible that patients who are asked to refrain from washing their hands after visiting the toilet in order to challenge their obsessive thoughts on becoming ill, also (unintentionally) learn that their thoughts on becoming ill does not have any meaning or power and/or that their compulsive washing is in fact not necessary. It can be argued that specific behavioral experiments as formulated in MCT (e.g. exposure and response commission) should be added to the current, more classical behavioral experiments, in ERP treatments. This will broaden

Table 5
The rate of clinical recovery at post-treatment and six-month follow-up for completers of the study.

		Recovered (%)	Asymptomatic (%)	Diagnosis-free
Post-treatment	ERP (N = 36)	22 (61.1%)	12 (33.3%)	19 (52.7%)
	MCT (N = 39)	28 (71.8%)	10 (25.6%)	24 (62.0%)
	Significance test	$\chi^2 = 0.96$, $p = .33$	$\chi^2 = 0.53$, $p = .47$	$\chi^2 = 0.59$, $p = .44$
Follow-up	ERP (N = 21)	14 (66.7%)	7 (33.3%)	12 (57.1%)
	MCT (N = 29)	21 (72.4%)	9 (31.0%)	20 (69.0%)
	Significance test	$\chi^2 = 0.19$, $p = .66$	$\chi^2 = 0.03$, $p = .86$	$\chi^2 = 0.74$, $p = .39$

Note. ERP = Exposure and Response Prevention; MCT = Metacognitive Therapy.

Table 6
The rate of clinical recovery at post-treatment and six-month follow-up for patients who entered treatment (intent-to-treat sample).

		Recovered (%)	Asymptomatic (%)	Diagnosis-free
Post-treatment	ERP (N = 45)	22 (48.9%)	12 (26.7%)	19 (42.2%)
	MCT (N = 45)	28 (62.2%)	10 (22.2%)	24 (53.3%)
	Significance test	$\chi^2 = 1.62$, $p = .20$	$\chi^2 = 0.24$, $p = .62$	$\chi^2 = 0.80$, $p = .37$
Follow-up	ERP (N = 45)	14 (31.1%)	7 (15.6%)	12 (26.7%)
	MCT (N = 45)	21 (46.7%)	9 (20.0%)	20 (44.4%)
	Significance test	$\chi^2 = 2.29$, $p = .13$	$\chi^2 = 0.30$, $p = .58$	$\chi^2 = 0.54$, $p = .47$

Note. ERP = Exposure and Response Prevention; MCT = Metacognitive Therapy.

the range of possible experiments to violate OCD relevant expectations, both metacognitive beliefs and the obsessions themselves. To obtain more clarity on hypotheses about underlying working mechanisms during treatment process and to what extend these processes are responsible for the treatment effect, future research should include mediation analyses.

A second hypothesis regarding the non-significance of the findings is arguably that there is insufficient power to detect group differences. Our study was designed with a power to detect medium effect sizes. We chose for this medium between-group effect because expecting a larger difference between the two treatment groups did not seem realistic since numerous studies have found statistically significant changes with large effect sizes in OCD-symptoms after ERP. On the other hand, designing our study to enable us to detect a small between-group effect would require very large sample sizes, while small differences are arguably of less relevance for clinical practice. We only can conclude that there are no large or even medium size differences between the two treatments. And if there are any, they will be small. For example, with regard to the effect sizes, the differences in Y-BOCS score reductions (1.65 for MCT vs 2.03 for ERP posttreatment, and 1.78 vs 2.29 at follow-up) are worth mentioning and in favor for ERP. The other way around, on a descriptive level, MCT produced more recovered patients than ERP directly after treatment (71.8% for MCT vs. 61.1% for ERP) whereas ERP produced more asymptomatic patients (25.6% for MCT vs. 33.3% for ERP). It might be that if the sample size had been larger, such differences would be significant.

High percentages of clinical significant change were found for both treatment conditions at post-treatment and at follow-up. Recovery rates appear at least comparable with findings from previous studies (Fisher & Wells; 2005; Van der Heiden et al., 2016). There were no significant differences between treatment conditions and clinical recovery rates. Since both treatment conditions produced equally high percentages of clinically significant change, future research should use predictor analysis including baseline variables (e.g., various subgroups of OCD) to enhance our knowledge on which method works better for whom. Such knowledge would be useful for clinical practice to assign patients to the treatment method they are most likely to benefit from.

Although not the focus of this study, it is of interest that we found good treatment results for both MCT and ERP in relatively few treatment sessions. Both treatments consisted of up to 15 weekly sessions of only 45 min duration, whereas ERP typically consists of 15–20 session of 90 min duration (Foa & Kozak, 1996). As recovery rates in both conditions were at least comparable with findings from previous studies (Fisher & Wells; 2005; Van der Heiden et al., 2016), and were maintained at six-month follow-up, it is suggested that treatment gains may be established with less face-to-face time with a therapist than is typically assumed. Another interesting finding is that the recovery rates in both conditions of our study seem to outperform those found in the study of Glombiewski et al. (2021 [MCT: 28.6% in the Glombiewski et al. study vs 71.8% in our study; ERP: 50% in the Glombiewski et al. study vs 61.1% in our study];). One explanation might be that ERP based on extinction learning is more effective than ERP based on the habituation model. However, this does not explain the differences in recovery rates between the MCT conditions. The results justify further investigations into the effectiveness of MCT and ERP based on extinction learning and possible advantages of both approaches, such as being less time consuming and therefore more economic alternatives.

The findings of this study should be interpreted in the context of several limitations. First of all, the same supervisor (expert in the field of cognitive behavioral treatments for OCD) supervised the therapists in both treatment conditions, which might enhance the risk of deviations from treatment protocols. To prevent these deviations, treatment integrity was also evaluated by means of randomly assessing recordings of treatment sessions. However, integrity can be improved in future studies by using multiple supervisors. Second, the implementation of the therapist cross-over design was limited by the fact that two therapists left the organization during our trial and were replaced by other therapists. Thirdly, our treatment integrity check could be improved on several points. Only sessions 2, 5 and 9 were recorded and therapists were aware of that, which might have affected their attention to protocol adherence for only those sessions. Also, treatment integrity can be further improved by using multiple raters. Next, it must be mentioned that the last eight patients in our study were treated by video-conference as a consequence of the COVID-19 pandemic. These eight patients were however equally distributed over the MCT and ERP condition. It is not clear whether this had an effect on treatment outcome, and if so, in which direction. Finally, although our study was not designed to detect small differences between the two treatment conditions, it is possible that subtle differences between the two treatment conditions might have been significant in a larger sample size. This would especially be true for the follow-up analysis since the greatest loss of participants took place in the follow-up period. However, given our (and Glombiewski et al., 2021) results, a non-inferiority design might be more suitable in future investigations to explore if MCT is equally effective as the well-established ERP.

The present study has also several strengths. The RCT provides unique data of a relatively unselected sample of patients with OCD collected within an outpatient mental health center. Analyses of relevant sample characteristics (e.g. comorbidity rates, duration of OCD in years before start of treatment) seem to indicate that our group was a representative sample of patients with OCD (American Psychiatric Association, 2013), and therefore study results can be generalized to clinical practice. Also, we included a six-month follow-up to examine whether the treatment effects were maintained. Furthermore, the interventions were applied by therapists who are experienced in the provision of ERP and received training in the provision of MCT. Also, we used a semi-structured interview as well as a self-report measurement to evaluate treatment outcome. Lastly, integrity checks were performed to ensure treatment quality.

In summary, both MCT and ERP provide positive treatment outcomes and these effects are retained at six-month follow-up. As such, MCT seems a promising and possibly equally effective treatment to the well-established ERP treatment for OCD. More specific, our results suggest that there are no large, or even medium, differences in effect size between these two treatments. This suggestion should be explored in more detail in future studies whereby non-inferiority studies are recommended. Also, future research should include predictor and mediation analysis to enhance our knowledge on which method or elements works best for whom and why.

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CRediT authorship contribution statement

Kim Melchior: Conceptualization, Validation, Formal analysis, Investigation, Writing – original draft, Project administration. **Colin van der Heiden:** Conceptualization, Investigation, Resources, Writing – original draft, Writing – review & editing, Supervision. **Mathijs Deen:** Methodology, Formal analysis. **Birgit Mayer:** Writing – original draft, Writing – review & editing. **Ingmar H.A. Franken:** Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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