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Patient adherence to cognitive behavioural therapy for obsessive-compulsive disorder: A systematic review and meta-analysis

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ABSTRACT

Whilst cognitive behavioural therapy (CBT) is the treatment of choice for obsessive-compulsive disorder (OCD), around half of the participants do not experience remission following treatment. As yet, there is no comprehensive systematic review of the extent to which patient non-adherence presents a challenge to the overall benefit of CBT for OCD. The aim of this systematic review and meta-analysis was to identify the magnitude, moderators and reasons for poor patient adherence to CBT for OCD in terms of: (1) treatment refusal, (2) treatment dropout, (3) session attendance/module completion, and (4) between-session CBT task adherence. Sociodemographic and clinical variables, treatment and study design characteristics were examined as moderators of adherence. The systematic search identified 123 studies including 5627 participants taking part in CBT or control conditions. A pooled rate of 15.6% of eligible patients refused CBT and a further 15.9% of treatment starters dropped out from treatment. Group CBT had significantly lower dropout rates than individually-delivered CBT. No other significant moderators were found. Most studies reported moderate to good adherence to between-session CBT tasks, which had a significant medium to large association with post-treatment OCD symptom reduction. Recommendations for enhanced measurement and reporting of patient adherence to CBT for OCD are made along with clinical implications of findings.

1. Introduction

1.1. Background

Obsessive compulsive disorder (OCD) is a mental health condition characterised by persistent intrusive thoughts, images or urges that cause significant anxiety (obsessions), and repetitive, ritualistic behaviours or mental acts aimed at neutralising anxiety or preventing a dreaded event (compulsions) (American Psychiatric Association [APA], 2013). It has a high current and lifetime comorbidity with depression and anxiety and is associated with poor quality of life (Macy et al., 2013).

UK and US practice guidelines recommend exposure and response prevention (ERP), delivered with or without cognitive therapy strategies, as the psychological therapy of choice for OCD (APA, 2007; National Institute of Health and Care Excellence [NICE], 2005). Exposure and response prevention is a behavior therapy during which patients engage in repeated, prolonged exposure to obsessions whilst refraining from compulsions (Kozak & Foa, 1997). Cognitive strategies, rooted in the cognitive therapy (CT) model of OCD, help patients re-evaluate the accuracy of appraisals (i.e. exaggerated beliefs about personal responsibility for preventing harm) that result in the misinterpretation of common intrusive thoughts as significant and therefore anxiety-provoking (Obsessive Compulsive Cognitions Working Group, 1997; Obsessive Compulsive Cognitions Working Group, 2005). In this review, CBT is the umbrella term for ERP, CT and a combination of both.[a]

Öst et al. (2015) conducted a large meta-analysis of the efficacy of CBT for OCD. They report a large post-intervention between-group effect size for CBT compared to waitlist (Hedges' $g = 1.31$, CI [1.08,1.55], $k = 15$) and placebo ($g = 1.33$, 95% CI [.91,1.76], $k = 8$) conditions and a medium effect size compared to antidepressant medication ($g = .55$, 95% CI [.05, 1.04], $k = 4$), using the Yale–Brown Obsessive Compulsive Scale (Y-BOCS) (Goodman et al., 1989) as the outcome measure.

Whilst CBT is the gold standard in the treatment of OCD, not all patients achieve post-treatment OCD symptom remission. A patient is in remission when they no longer meet diagnostic criteria for OCD and have minimal to no symptoms and no functional impairment, lasting for at least one week (Mataix-Cols et al., 2016). Research trials of CBT for OCD typically determine remission based on whether the patient moved from above to below a nominated YBOCS cut-off score from pre- to post-treatment. However, attempts to establish a reliable remission rate

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[a] In the meta-analysis, CBT also denotes the combination of ERP and CT strategies, contrasted with ERP and CT on their own.

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have been marred by the variability in nominated Y-BOCS cut-off scores (Mataix-Cols et al., 2016). For example, Öst et al. (2015) found that just 43 to 52% of patients experienced remission following CT, ERP or CBT. Eighteen of the 20 primary studies contributing to these pooled estimates determined remission based on a Y-BOCS cut-off score. In the absence of normative data for the Y-BOCS, studies used cut-off scores derived from sample-dependent calculations (e.g. pre-treatment sample mean - 2SDs) (Jacobson & Truax, 1991, Jacobson, Roberts, Berns, & McGlinchey, 1999), or from empirical studies (e.g. Fisher & Wells, 2005; Lewin et al., 2011) or followed recommendations from OCD experts (e.g. Pallanti et al., 2002). Consequently, Y-BOCS cut-off scores ranged from 7 to 16 across studies. Some international OCD experts recently suggested that a YBOCS score of ≤ 12 should be used (Maitaix-Cols, 2016). However, other experts have made a distinction between wellness and recovery and have underlined that recovery from illness in OCD, as is the case for other disorders, should be defined as no longer meeting criteria for illness, that is YBOCS ≤ 7, with consistency among interview and psychometric indices (e.g. Pallanti & Quercioli, 2006; Sookman & Steketee, 2010). Therefore, several of the primary studies in Öst et al. (2015) used Y-BOCS scores that were either too lenient or too stringent. Despite these methodological limitations, these figures suggest that a significant proportion of people with OCD do not experience OCD symptom remission following CBT.

CBT for OCD is often seen as a challenging therapy; it is anxiety provoking by design and this is magnified by high levels of distress intolerance associated with OCD (Cougle, Timpano, Fitch, & Hawkins, 2011; Olatunji, Deacon, & Abramowitz, 2009). It is often suggested this may result in poor patient adherence to treatment and account for the moderate remission rates for CBT for OCD (e.g.Whittal, Thordarson, & McLean, 2005). However, little is known about the magnitude and moderators of patient adherence to CBT for OCD and the extent to which nonadherence may be attributable to patients finding the therapy challenging. This is an important evidence gap to address – understanding these factors could lead to therapy modifications to improve adherence and ultimately to improve patient outcomes. This is the focus of the present study.

The World Health Organisation defines adherence as 'the extent to which a person's behaviour… corresponds with agreed recommendations from a health care provider' (Sabate, 2003, p.3). In this study, we consider four adherence factors that could contribute to disappointing outcomes: (1) therapy refusal, i.e. choosing to decline treatment despite professional recommendation; (2) therapy dropout, i.e. the patient prematurely discontinues therapy recommended by their health care provider and is unlikely to have received the full benefit of treatment; (3) poor attendance at therapy sessions despite treatment completion, which can result in people not receiving the therapist recommended 'dose' of the therapy; and (4) poor adherence to therapist recommended between-session ERP/behavioural tasks considered key in achieving symptom improvement.

1.2. Refusal

Research to date has not yet established a reliable estimate of the refusal rate for CBT for OCD. Öst et al. (2015) report an average 15% rate of refusal, pre- and post-randomisation, across 32 RCTs of CBT for OCD. Refusal rates were highly variable across studies (*SD*: 11.6, range: 0–63%). Assessing the magnitude of CBT refusal in the context of RCTs can be problematic as it may reflect refusal unrelated to CBT, e.g. refusal to be randomised. To gain a reliable estimate of the magnitude of CBT refusal, it may be more appropriate to examine patient refusal of CBT for OCD in uncontrolled studies.

1.3. Dropout

Dropout occurs when the patient accepts the offer of CBT and attends at least one session but does not complete the full recommended course of treatment. There are a few meta-analyses of the magnitude of dropout from CBT for OCD, with a modest number of studies. Öst et al. (2015) report a pooled dropout rate for (remote and face-to-face) CBT ranging from 11% (CT, $k = 8$) to 19% (ERP, $k = 28$). Swift and Greenberg (2014) found a CBT (all types) dropout rate of 16.3% across a combination of controlled and uncontrolled studies ($k = 45$), whilst Hans and Hiller (2013) report a dropout rate of 12% for face-to-face CBT for OCD across 20 nonrandomised effectiveness studies.

1.4. Session attendance

US practice guidelines (APA, 2007) recommend a minimum of 13 sessions of CBT whilst UK guidelines (NICE, 2005) propose high intensity CBT (> 10 therapist hours per patient, i.e. individual CBT) for those patients with moderate to severe OCD or those with mild OCD who failed to engage with or benefit from low intensity CBT (< 10 therapist hours per patient, i.e. guided self-help, group CBT). It is therefore important to consider whether among patients completing therapy, session attendance or module completion (for remote therapies) was optimal. However, this aspect of adherence is infrequently considered (Tetley, Jinks, Huband, & Howells, 2011).

1.5. Between-session tasks

Cognitive behavioural therapy places central importance on the regular completion of between-session therapy tasks. A recent meta-analysis found significant large effect sizes for the association of quality (Hedges' $g = .78$, 95% CI [.03, 1.53], $k = 3$, $n = 417$, $I^2 = 91$) and quantity ($g = .79$, 95% CI [.57, 1.02], 1.53], $k = 15$, $n = 1537$, $I^2 = 81$) of homework compliance with post-treatment outcomes for CBT for a range of mental health conditions and physical health issues (Kazantzis et al., 2016). However, results were not specific to key homework tasks of CBT for OCD.

1.6. Reasons for nonadherence

An examination of moderators of adherence to CBT for OCD is key in the identification of risk factors for nonadherence, to drive a targeted approach to keeping patients engaged with therapy (Barrett, Chua, Crits-Christoph, Gibbons, & Thompson, 2008). To date, there are no meta-analyses that consider moderators of refusal, session/module completion and therapy task adherence, but a few studies have tested moderators of dropout from CBT for OCD. Öst et al. (2015) examined CBT type and found that dropout from ERP + antidepressant medication (32%, $k = 7$) was significantly higher than from CT, ERP or CBT (15.5%, $k = 19$), suggesting that the elevated dropout rate might be due to the addition of medication (dropout from antidepressant medication alone was 30%). Ong, Clyde, Bluett, Levin, and Twohig (2016) found that treatment type and format did not moderate dropout from ERP. Therapist experience (coded as: no professional experience, professional experience not specific to CBT, or professional experience with or expertise in CBT) and qualification (coded as: student, non-psychologist professional or therapist, or doctoral level therapist or psychologist) and number of sessions also did not predict dropout. These meta-analyses examined a small number of moderators and some were conducted with a relatively small (sub)group of studies and could have been under-powered to detect moderator effects (Borenstein, Hedges, Higgings, & Rothstein, 2009).

To understand what might help patients to engage with therapy, it is important to consider the reasons participants give for not adhering to therapy. However, few studies have foregrounded this. An observational study found that environmental barriers (e.g. costs, inconvenience) was the main reason for refusing (55%) and dropping out (46%) from CBT for OCD (Mancebo, Eisen, Sibrava, Dyck, & Rasmussen, 2011). Interestingly, 20% of refusal and 12% of dropout was primarily due to feeling too anxious or fearful to participate in CBT. This suggests that (patient perceptions of) the challenging nature of CBT for OCD may contribute to nonadherence. Further studies are needed to establish if this is a consistent finding.

1.7. Objectives for a systematic review and meta-analysis

Developing a better understanding of the magnitude and moderators of adherence to CBT to OCD is crucial if we want to improve patient outcomes. To the best of our knowledge, this is the first systematic review and meta-analysis with a primary focus on patient adherence to CBT for OCD. The aim was to examine the magnitude of refusal and dropout, session attendance, step/module completion and between-session task adherence and to summarise participants' reasons for refusing or dropping out from CBT across studies. In line with models of health service utilisation (Andersen, 2017; Barrett et al., 2008; Owens et al., 2000), a range of sociodemographic, clinical and treatment characteristics were tested as potential moderators of patient adherence to CBT. Study characteristics were also examined as they may influence adherence (e.g. Fernandez, Salem, Swift, & Ramtahal, 2015; Swift et al., 2012). The aim was also to examine the strength of the association of session attendance and therapy task adherence with post-treatment OCD symptom reduction, to further our understanding of the importance of these aspects of adherence to therapy outcomes. Findings will help inform recommendations for improving adherence to CBT for OCD and thereby improving patient outcomes.

2. Method

2.1. Literature search

PsycINFO, PsycArticles, Medline, Web of Science and SCOPUS were searched from their inception until 31st October 2017, using the search terms: *(OCD OR "Obsessive compulsive disorder" OR obsess*) AND (cognitive therapy OR behavio?r* therapy OR exposure* OR CBT)*. OCD terms were searched in the title and CBT terms were searched in the title, abstract or keyword/subject.

Results from electronic searches were checked against systematic reviews of CBT for OCD (Mataix-Cols & Marks, 2006; McKay et al., 2015; Öst et al., 2015; Olatunji, Davis, Powers, & Smits, 2013; Ponniah, Magiati, & Hollon, 2013; Rosa-Alcazar, Sanchez-Meca, Gomez-Conesa, & Marin-Martinez, 2008). International clinical trial registries (ClinicalTrials.gov, ISRCTN, EU clinical trials register) were searched using the terms OCD and obsessive-compulsive disorder. Finally, the references of all eligible articles were hand-searched.

2.2. Selection criteria

Studies were included if: (a) they evaluated CBT for OCD using any design, except single case; (b) they were published in English; (c) they recruited a working age adult sample (majority of participants aged 18+); (d) with participants who met diagnostic criteria for OCD, based on DSM/ICD or equivalent criteria; (e) intervention participants received CBT for OCD in an outpatient setting; and (f) quantitative or qualitative data on (reasons for) CBT treatment refusal, treatment dropout and/or degree or quality of client adherence to therapy sessions and/or therapy tasks was provided.

In this meta-analysis, CBT type is defined as ERP, CT or a combination of (components of) the two (CBT). Face-to-face and remote therapies were included as were therapies delivered in combination with psychotropic medication or (psychological) placebo.

Studies were excluded if they: (a) included participants who met diagnostic criteria for psychosis, autistic spectrum disorder or a learning disability; (b) were single case studies; (c) lacked details of the CBT provided, e.g. no information about duration or content; (d) recruited inpatients, as inpatient treatment refusal may reflect refusal of a hospital stay more generally; and (e) if identical adherence data from the same study were reported in multiple papers only the first published paper was selected for review.

2.3. Data extraction & coding

The following information was extracted and coded for each study: authors; year of publication; design; treatment type (ERP, CT or CBT with or without medication and/or (psychological) placebo); treatment format (i.e. (therapist assisted or self-help) remote therapies versus face-to-face (individual, family, couple or group) therapies); protocol treatment duration in weeks, number and hours of sessions; weekly frequency of treatment sessions; therapist experience; sample characteristics (age, % female, % married or co-habiting, % working full-time or part-time, mean years of education, pre-treatment scores on measures of OCD, anxiety and depression, % of sample with prior (adequate) CBT, % on medication at the start of therapy, % comorbidity); refusal data (number of eligible participants, number of eligible participants refusing participation, reasons for refusal); dropout data (number of participants starting and dropping out from treatment, stage of dropout, reasons for dropout); session and task adherence data (percentage or average number of sessions attended, percentage or average number of (hours of) between-session CBT tasks completed, (source, type and timing of) measures of therapy task adherence, the association between task adherence and therapy outcome, predictors of adherence). In addition, this review coded the **clinical representativeness** of the study sample. Based on guidelines set out in Hans and Hiller (2013), the following criteria were applied: routine referrals (vs some active recruitment, e.g. through advertising); allowance of medication; and common exclusion criteria for routine outpatient treatment (vs additional exclusion criteria). A score of 1 meant the criterion for clinical representativeness was met (see Appendix A for the scale).

2.4. Categorisation of variables

The following sets out how the different adherence variables examined in this review were categorised.

2.4.1. CBT refusal

Any patient who was eligible to commence CBT but declined participation for any reason counted as a refusal. Assessing refusal in RCTs is challenging because pre-randomisation refusal could reflect refusal of conditions other than CBT (e.g. medication, wait-list) or of randomisation, whereas post-randomisation refusal of CBT underestimates the refusal rate as it excludes patients who refused pre-randomisation based on the possibility of receiving CBT. Therefore, only refusal data from uncontrolled studies was used to calculate the CBT treatment refusal rate as it was clear which treatment patients refused.

2.4.2. CBT dropout

A patient was counted as a treatment dropout if they attended at least 1 treatment session but discontinued treatment before the final planned session. Patients who completed treatment but did not attend a post-treatment assessment were not counted as CBT dropouts. For studies comparing more than one treatment, separate dropout rates were recorded for each treatment. The reasons for CBT treatment dropout were not taken into consideration, to ensure equivalence between studies that did and did not report this information. Reasons for dropout were analysed separately (below).

2.4.3. CBT session attendance or step/module completion

The mean number and percentage of attended sessions, as a proportion of the total number of planned sessions, were recorded. For remote therapies, the number and percentage of completed modules or steps were recorded.

2.4.4. CBT task adherence

The mean degree of adherence to between-session CBT tasks, e.g. mean number or percentage of tasks completed or the mean score on a CBT task adherence questionnaire, was extracted. Where available, ratings of the quality of task adherence were also recorded.

2.5. Statistical analyses

All data analyses were conducted using Comprehensive Meta-Analysis, 2014 Version 3 (Borenstein et al., 2009).

2.5.1. Mean adherence

Where possible, the following inverse variance weighted effect sizes were calculated and pooled using random effects models, as the true effect size was expected to vary between studies (Borenstein et al., 2009): (a) meta-proportions of refusal and dropout using logit-transformed proportions (Borenstein et al., 2009; Lipsey & Wilson, 2001). Dropout rates were calculated at the treatment level. To ease interpretation, logit-transformed proportions and 95% confidence-intervals were back-transformed into proportions; (b) mean number and percentage of completed CBT sessions or modules, calculated at treatment level; (c) mean number, percentage and/or mean score for between-session CBT task adherence, calculated at treatment level; (d) risk ratio of early (session 1–5) versus late (sessions 6 and after) dropout, calculated at treatment level. The sensitivity of the pooled effect sizes to the impact of individual studies was examined by removing one study at a time and obtaining the re-calculated mean rate, number or percentage (Borenstein et al., 2009).

2.5.2. Moderator/subgroup analysis

The following 10 categorical study and therapy characteristics were tested as potential moderators of adherence: study design (controlled versus uncontrolled); type of CBT (ERP, CT, CBT with/without medication or pill/psychological placebo); therapy format (i.e. face-to-face versus remote therapies; individual versus group, couple or family therapies; therapist-assisted versus self-help remote therapies); intensity (face-to-face and remote therapies involving 10 hours or less of sessions or modules are considered 'low intensity' whereas those of more than 10 sessions or modules are considered high intensity (from the patient perspective); face-to-face session frequency (more than twice weekly; twice weekly; once weekly or less); face-to-face therapy duration (in weeks); therapist experience for therapist delivered treatment (pre-attainment, post-attainment, mixed); recruitment (routine vs active (e.g. using advertising)); patients (routine vs non-routine exclusion criteria); medication (allowed, not allowed).

Subgroup effect sizes were calculated if there were at least 4 studies per subgroup (Fu et al., 2011). A mixed-effect model was used to compare differences between subgroup effect sizes as effect sizes of studies within each subgroup were expected to vary (Borenstein et al., 2009). Differences between subgroup effect sizes were tested with the *Q*-statistic, which is analogous to using *ANOVA* or *t*-tests for testing group differences in primary studies (Borenstein et al., 2009), i.e. it determines if differences in effect size between subgroups are statistically significant.

Moderator analyses of the following 11 continuous socio-demographic and clinical variables were carried out where possible, using a mixed-effects model of meta-regression (Method of Moments) (Borenstein et al., 2009; Kelley & Kelley, 2012): mean age, gender (% female), ethnicity (% Caucasian), marital status (% married or cohabitating), employment status (% working full- or part-time), mean years of education, pre-treatment mean OCD symptom severity (Y-BOCS), % patients with comorbid axis I or II disorders, pre-treatment depression and/or anxiety symptom severity, % patients with prior CBT, and % patients on concurrent medication. Only covariates for which at least 10 studies (k) provided data were included (Borenstein et al., 2009).

2.5.3. Association of CBT task adherence with post-treatment OCD symptom reduction

The association between task adherence and post-treatment OCD symptom reduction was tested by meta-analysing Fisher's *z*-transformed correlations of mean between-session CBT task adherence with post-treatment OCD symptom reduction. Where correlations were not reported, the available statistics were converted into correlations using standard formulae (Borenstein et al., 2009). Where possible, correlations based on post-treatment OCD symptom severity adjusted for pre-treatment OCD symptom severity were selected; otherwise correlations with change scores or post-treatment scores were used. The type of correlation and outcome measure needed to be equivalent across studies to pool effect sizes (Aloe & Thompson, 2013).

2.5.4. Homogeneity analysis

The *Q*-statistic (Hedges & Olkin, 1985) was calculated to test for statistically significant heterogeneity of results. As the *Q*-statistic is affected by the number of studies, I^2 was also calculated to assess the degree of heterogeneity using the following guidelines: 25% (small), 50% (moderate), 75% (large) heterogeneity (Higgins, Thompson, Deeks, & Altman, 2003).

2.5.5. Publication bias

Risk of publication bias was analysed using Egger's regression intercept (Egger, Davey Smith, Schneider, & Minder, 1997) and Duval and Tweedie (2000) trim-and-fill methods (Borenstein et al., 2009).

2.6. Reasons for dropout or refusal

Reasons for refusal or dropout were recorded as stated by study authors, along with the number of participants that the reason applied to. The frequencies for identical reasons (that differed minimally in their wording), were totalled across studies and grouped into different low-level categories, using conventional content analysis (Hsieh & Shannon, 2005) (see result for further details).

3. Results

3.1. Study flow and characteristics

The database and hand searches identified 7725 references. After the removal of 3527 duplicates, 4198 references remained. After excluding 3812 references based on their title, abstract or source, 386 full-text articles were read to assess their eligibility. This resulted in the inclusion of 123 studies (see Fig. 1). Six studies that conducted further analyses with adherence data drawn from outcome studies already included in the meta-analysis were not included in the study characteristics below. The 117 remaining studies included 59 controlled and 58 uncontrolled studies, published between 1984 and 2017. A total of 5627 participants took part in CBT or control conditions. Averaging the unweighted sample means, the mean age was 34.9 (range: 25.71–47.93) and 58% of participants were female (range: 17–100%). Pre-treatment total Y-BOCS scores ranged from 14.35 to 30.38 with a mean of 24.49 (severe symptoms). Mean pre-treatment depression symptom severity (measured with the Beck Depression Inventory (BDI) (Beck, Steer, & Garbin, 1988) was 17.58 (mild depression) (range: 10.40–28.50). Mean duration of OCD symptoms was 14.10 years (range: 4.6–26.40) and 53% of participants were on medication (range: 13–100%). The studies delivered 161 CBT treatments in total, including ERP (68), CBT (55), CT (16), ERP + medication (12), ERP + Placebo pill (6), CBT + medication (2), CT + medication (1), and ERP + Psychological Placebo (1). Treatments were delivered face-to-face ($k = 125$) and remotely ($k = 36$). See Appendix B for study references, Table C1, Appendix C for details of primary studies included under each adherence variable and Tables C2 and C3 in Appendix C for study characteristics.

3.2. Mean adherence

Twenty-six uncontrolled studies contributed to the **refusal rate**. CBT treatments included CBT (13), ERP (12) and ERP + Medication (1). The pooled mean **dropout rate** was calculated with data from 111 studies (controlled studies: 55, uncontrolled studies: 56) that included 153 treatments: ERP (62), CBT (53), CT (16), ERP + Meds (12), ERP + Pill

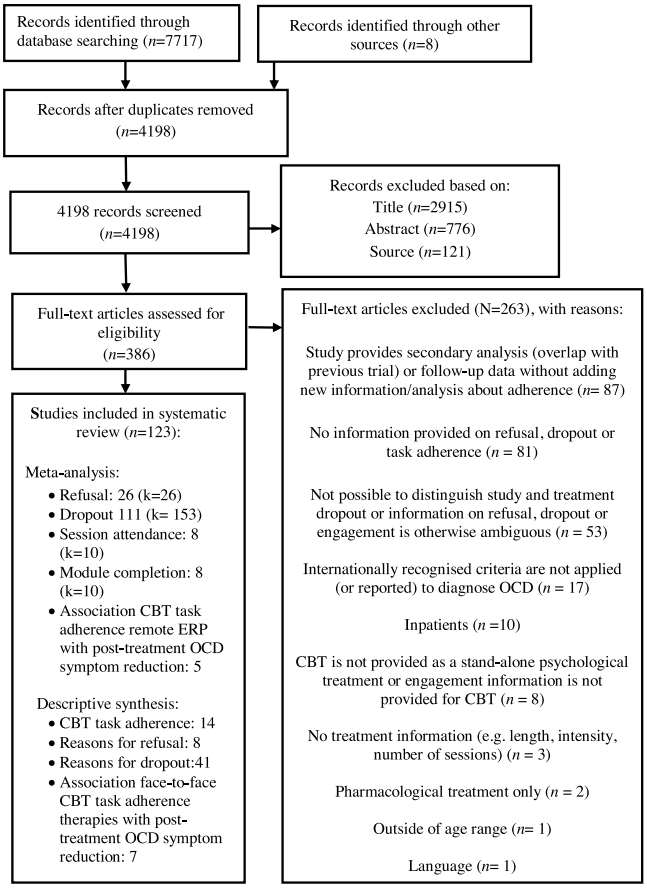

Fig. 1. Study flow.

Placebo (6), CBT + Meds (2), CT + Meds (1), ERP + Psych Pla (1). The **mean number of sessions** attended by patients completing face-to-face CBT could be extracted from only eight studies, whilst the **mean percentage sessions attended** was calculated with data from seven studies. Treatments included ERP (7), CBT (2) and CT (1) using group (2) and individual (8) formats. Eight studies reported the **average number of steps or modules** completed in remote therapies. Eight out of 10 treatments involved CBT (i.e. ERP and cognitive strategies combined). All were internet-based apart from one bibliotherapy treatment. Seven of the 10 treatments involved (a degree of) therapist assistance.

The pooled CBT refusal rate was 15.6% (95% CI [11.9, 20], $k = 26$, $I^2 = 52.36$, $Q = 52.47$, $p < .001$) and pooled dropout rate was 15.9% (95% CI [14.2, 17.8], $k = 153$, $I^2 = 50.8$, $Q = 308.95$, $p < .001$). Participants who completed face-to-face therapy attended a mean of 12.8 sessions (95% CI [12.03, 13.56], $k = 10$, $I^2 = 95.79$, $Q = 213.64$, $p < .001$) or 87.32% of all scheduled sessions (95% CI [82.63, 92.09], $k = 9$, $I^2 = 95.4$, $Q = 174.03$, $p < .001$). Participants accessing remote therapies completed a mean of 5.69 steps/modules (95% CI [4.28, 7.1], $k = 10$, $I^2 = 98.76$, $Q = 724.35$, $p < .001$) or 75.7% of all scheduled steps/modules (95% CI [60.61, 91.12], $k = 10$, $I^2 = 97.73$, $Q = 397.13$, $p < .001$). Due to the use of varied measures of between-session CBT task adherence and a mix of ITT and completer samples, it was not possible to meta-analyse mean CBT task adherence scores (see descriptive summary below).

There was moderate heterogeneity of study refusal and dropout rates. Sensitivity analyses showed that the pooled rate of refusal (range: 14.7–16.5%) and dropout (range: 15.6–16.1%) was stable when removing one study per pass. The study estimates for session attendance and module completion were highly heterogeneous, which suggests session attendance and step/module completion were influenced by moderator effects. The mean number (range: 12.7–13.6) and percentage of sessions attended (range: 86.7%–89.1%.) was stable across studies. For remote therapies, the mean number (range: 4.6–6.9) and percentage (range: 66.4%–92.4%) of completed steps/modules was less stable.

3.3. Mean between-session CBT task adherence

Table 1 provides an overview of the 14 studies ($k = 20$) that reported mean between-session CBT task adherence. Treatments included therapist-delivered (face-to-face) ERP (9), CBT (1) ERP + meds (2), ERP + Placebo (2; pill = 1, psychological = 1) and CT (2), and remotely delivered ERP (3; self-help (1), therapist-assisted (2)) and CBT (1, self-help). Thirteen out of 14 studies rated adherence to between-session ERP tasks and one study rated adherence to CT appraisal change exercises such as behavioural experiments and surveys (Whittal, Woody, McLean, Rachman, & Robichaud, 2010). Two studies also rated the extent to which participants read ERP self-help materials (Tolin et al., 2007; Tolin, Diefenbach, & Gilliam, 2011). Rowa et al. (2007) and Tolin et al. (2011) reported a combined score for within- and between-session task adherence. Five studies rated task adherence at or after the final therapy session (Abramowitz, Franklin, Zoellner, & DiBernardo, 2002; Fals-Stewart & Lucente, 1993; Seol, Kwon, Kim, Kim, & Shin, 2016; Tolin, Maltby, Diefenbach, Hannan, & Worhunsky, 2004, 2007). The remaining nine studies rated task adherence at each session.

Three therapist-rated measures were used in more than one study: Patient Exposure Adherence Scale (PEAS) (Simpson, Maher et al., 2010); Homework Compliance Scale (HCS) (Leung & Heimberg, 1996; Primakoff, Epstein, & Covi, 1986), and Clinician Rated Effort Scale (CRES) (Tolin et al., 2004). The PEAS calculates a total score based on an aggregate of participant scores on a 7-point Likert scale for: (a) quantity of exposure, (b) quality of exposure, and (c) degree of ritual prevention. Scores are aggregated across these items for each session, then averaged across all sessions. The PEAS has good content validity and excellent inter-rater reliability (*ICC* ≥.97) (Simpson, Maher et al., 2010). The HCS rates the extent to which participants attempted to complete their assigned ERP tasks on a 6-point Likert scale. It has no reported evidence for its psychometric properties. The CRES is a 5-point Likert scale rating the degree of effort participants put into assigned ERP tasks and, for bibliotherapy, the proportion of assigned reading completed (Tolin et al., 2007). Tolin et al. (2004) demonstrated good inter-rater reliability for the CRES ($r = .82$) but other psychometric properties are unknown. Tolin et al. (2011) elaborated on the CRES with the **Homework Compliance Rating Form (HCRF)**, using 6-point Likert scales to score: (a) the amount of effort participants put into ERP, (b) the time spent on exposure, and (c) the amount of assigned reading completed (bibliotherapy). Both patients and therapist scored the HCRF. See Table D1 in Appendix D for an overview of anchor points for these scales.

Other measures of adherence included: a therapist-rated 7-point Likert scale of compliance (0 *(poor)* to 6 *(outstanding)*) with homework exposure instruction and self-monitoring of rituals (refraining from rituals/accuracy of recording rituals) (Abramowitz et al., 2002), the number of ERP assignments completed (Vogel, Stiles, & Gotestam, 2004) or uncompleted (Fals-Stewart & Lucente, 1993), participant and/or therapist rated % ERP homework tasks completed (or effort made) (0–100%) (Cottraux et al., 2001; Rowa et al., 2007), and patient-rated extent of participation in remote CBT (0–100%) (Seol et al., 2016).

For **therapist-delivered treatments** (13 studies including 17 treatments (face-to-face = 16, videoconference = 1), the results from five studies suggest good/above average mean adherence to between-session ERP tasks, based on study authors' interpretation of mean adherence ratings as 'good' (75–90% good quality task completion with some to minimal compulsions) or 'high' (77–82.5% task completion) (Cottraux et al., 2001; Goetter, Herbert, Forman, Yuen, & Thomas, 2014; Rowa et al., 2007; Simpson, Zuckoff et al., 2010; 2013). Three further studies report moderate/average mean adherence, as mean ratings showed patients were 'moderately compliant' and put in 'between some to much' and 'between some to average' effort, respectively (Abramowitz et al., 2002; Tolin et al., 2007, Tolin et al., 2011). One study reported poor/below average mean adherence as authors

Table 1
Descriptive summary of studies measuring mean CBT task adherence.

Adherence Measure	Study	Treatment	*M (SD)*	Study authors' description*
PEAS (Simpson, Maher et al., 2010) 7-point Likert scales: **Item a)** quantity of attempted exposure compared to quantity assigned (1 = 0%, 7 = 100%) **Item b**) quality of exposures attempted (1 = refused, 7 = excellent) **Item c)** degree of ritual prevention (1 = refused, 7 = > 90%) See Table D1, Appendix D for further details	Simpson (2010)	Twice-weekly ERP (N = 15)	**5.08 (.88) total** 5.37 (.93) quantity (a) 5.04 (.97) quality (b) 4.83 (1.21) ritual prevention (c)	**Good** 75-90% Good Some to minimal compulsions /safety aids (between 50-75% response prevention)
	Simpson et al. (2013)/ Wheaton, Galfalvy et al. (2016)	Twice-weekly ERP augmentation therapy (N = 37)	**5.33 (.89) total** 5.33 (1.14) quantity (a) 5.34 (.82) quality (b) 5.30 (.97) ritual prevention (c)	**Good** 75-90% Good Minimal compulsions/safety aids (between 75-90% response prevention)
	Goetter (2013)	Once-weekly remote ERP (video conference)	**5.19 (1.13) total**	Good
HCS (Primakoff et al., 1986) 6-point Likert scale (1 = did not attempt the assigned homework, 6 = attempted more than was requested)	Whittal et al. (2005)	Once-weekly CT (N = 30) Once-weekly ERP (N = 29)	4.58 (.42) 4.59 (.43)	[4= The patient did a portion of the assigned homework, 5= the patient did the homework]
HCS (Primakoff et al., 1986) 6-point Likert scale (0 = did not attempt the assigned homework, 5 = attempted more than was requested)	Whittal et al. (2010)	Once-weekly CT (N = 37)	3.50 (.95)	'…did most of their assigned tasks each week' (p.298) [3= The patient did a portion of the assigned homework, 4= the patient did the homework]
CRES (Tolin et al., 2004) 5-point Likert scale (0 = made no effort to do ERP; 4 = put their best effort into ERP) For remote ERP: therapist considered amount of book read, frequency and duration of exposure exercises and degree of effort to abstain from compulsive behaviours.	Tolin et al. (2004) Tolin et al. (2007)	Once-weekly ERP (N = 15) Once-weekly ERP (N = 17) Self-administered ERP (bibliotherapy) (N = 17)	1.61 (1.20) 2.76 (1.15) 1.50 (1.15)	Minimal to some effort Between some and much effort minimal to some effort
HCRF (Tolin et al., 2011). 6-point Likert Scales: (a) amount of **effort** put in (0 = no effort, 5 = best effort), (b) **time** spent on daily self-exposure (0 = none, 5 = more than 2 hours), and (c) **reading**: amount of the book read (0 = none, 5 = all)	Tolin et al. (2011)	Self-administered ERP (bibliotherapy, N = 18) Once-weekly ERP (N = 22)	2.54 (.71) Effort (T) 2.99 (1.01) effort (P) 3.48 (1.34) reading (P) 2.08 (1.11) time spent (P) 2.56 (.87) effort (T) 2.88 (.95) time spent (P) 3.41 (.77) amount of effort (P)	'Some' to 'average' effort 'Average' amount of effort 'Half' to 'most 'read 30-60 mins. daily self-exposure 'Some' to 'average' effort 60-90 mins daily self-exposure 'Average' to 'a lot'
7-point Likert Scale (0 = poor, 6 = outstanding) rating compliance with: (a) patient understanding of treatment rationale (not reported here), (b) compliance with in-session exposure instruction (not reported here), (c) compliance with homework exposure instruction, and (d) compliance with self-monitoring of rituals	Abramowitz et al. (2002)	Twice-weekly to intensive ERP (N = 28)	3.56 (1.93) Homework exposure (c) (3.30 (1.73) Self-monitoring of rituals (d)	Moderately compliant
Non-compliance = number of homework assignments (ERP) that were not completed. Based on patient logs. Completion = daily practice at least once a day and no compulsions for at least 1 hour after exposure	Fals-Stewart and Lucente (1993)	Twice-weekly ERP for 12 weeks (24 session total) (N = 121)	2.9 (2.1)	Compliant. On average, participants did not complete almost 3 assigned homework tasks.
Number of home exposure exercises completed.(Minimum of 2 tasks assigned after each session (sessions 3-11). Minimum assigned total = 18)	Vogel et al. (2004)	Once-weekly CBT (ERP + CT) (N = 15) Once-weekly ERP + Psych Placebo (relaxation) (N = 10)	17.3 (10) 20.6 (7.2)	At least 18 assignments were set and on average 17 tasks were completed At least 18 assignments were set and on average 20 tasks were completed
Percentage of completed homework tasks	Cottraux (1990)	Once-weekly ERP + meds (N = 16) Once-weekly ERP + Pla (N = 15)	70% 78%	Good compliance
0-100% scale (0 = 'I did not try at all or I did not complete any of the exercises', 100 = ' I gave the exercise a 100% effort and I completed exercise as discussed') **applied to both within- and between-session ERP**	Rowa et al. (2007)	Twice-weekly ERP in clinic (N = 8-9) Twice-weekly ERP at home (N = 9-11)	77% (average of client and therapist rating) 82.5% (average of therapist and client rating)	High
Extent of participation on 0-100% scale	Seol et al. (2016)	Remote CBT (minimal therapist contact) (N = 27)	67.9% (17.16)	'participated relatively hard' (participant-rated)

Note. PEAS = Patient Exposure Adherence Scale, HCS = Homework Compliance Scale, CRES = Clinician Rated Effort Scale, HCRF = Homework Compliance Rating Form, T = Therapist, P = participant, *primary study authors.

describe patients as putting in 'minimal to some' effort (Tolin et al., 2004). The latter study attributed the relatively poor adherence to their treatment refractory sample of participants with severe OCD, high rates of comorbidity and relatively poor insight. The results from four further studies were not entirely clear. Fals-Stewart and Lucente (1993) did not stipulate the number of assigned homework tasks so it was not possible to calculate the proportion of completed assigned tasks. However, the authors report that participants, who on average missed 3 assigned homework tasks, were compliant. Vogel et al. (2004) also do not report the exact number of assigned tasks but results suggest that mean adherence was at least adequate as on average participants engaged in a total of 17–20 weekly ERP tasks over a 9-week period. Results from studies involving the HCS were also more ambiguous (Whittal et al., 2005, 2010) as the mean CBT task adherence score represented participants doing 'a portion' of the assigned homework tasks (scale-point 4), without specifying the size of the portion or the quality of exposure (Primakoff et al., 1986). Whittal et al. (2010) did specify that participants did 'most of their assigned tasks each week' (p. 298), which suggests a good degree of adherence. For **self-administered ERP**, mean adherence to CBT tasks was reported by three studies and ranged from below average for self-help ERP (Tolin et al., 2007) to moderate adherence for ERP with at least some therapist assistance (Seol et al., 2016; Tolin et al., 2011).

3.4. Stage of dropout

Twenty-four studies reported the stage of dropout, coded as early (after sessions 1–5) or late (after session 6). Across studies, 690 participants started CBT treatment and 130 dropped out. Treatments included ERP (12), CBT (11), CT (3) and ERP + meds (2). The pooled risk ratio (*RR*) was **2.45** (95% CI [1.38, 4.35], $k = 28$, $z = 3.044$, $p = .002$; $I^2 = 31.39$, Q (27) = 39.35, $p = .06$) towards early dropout (see Appendix E for the forest plot).

3.5. Moderators of adherence

There were no significant categorical **moderators of refusal**; treatment and study design characteristics did not predict refusal (see Table F1 in Appendix F). As studies did not include patients refusing participation in their reported sociodemographic and clinical sample characteristics, it was not possible to conduct a meta-regression with these variables.

There was just one significant moderator effect for dropout (see Table F2 in Appendix F). The dropout rate for group therapy (12.9%, 95% CI [10.0, 16.6], $k = 23$, $I^2 = 18.36$, $Q = 28.17$, $p = .17$) was significantly lower ($Q = 4.28$, $p = .039$) than for individual face-to-face therapy (17.3%, 95% CI [15.4, 19.4, k = 99, $I^2 = 38.36$, $Q = 158.99$, $p < .001$). Meta-regression showed that none of the pre-determined socio-demographic (age, gender, ethnicity, educational attainment, employment and marital status) or clinical variables (OCD, depression and anxiety symptom severity, OCD duration, rates of Axis 1 comorbidity, major depression, medication and prior CBT) of treatment starters were significant moderators of dropout (see Table F3 in Appendix F).

There were too few cases (in each subgroup) to conduct moderator analyses of mean number and % session attendance and/or module completion (Borenstein et al., 2009). As mean CBT task adherence could not be meta-analysed it was also not possible to test moderator effects.

3.6. Reasons for non-adherence

Reasons for refusal were reported by just eight of the 26 uncontrolled studies for which refusal rates were established. Reasons for refusal were given for a total of 29 participants. Treatment conditions included ERP (3), CBT (4), ERP + medication (1). Therapies were delivered individually (2), in a group (3), couple (1) and remotely with therapist assistance (2).

Table 2
Summary of reasons given for refusal (aggregated across studies).

Categories (N, %)	Reason	*N (%)*
Treatment type and format (23, 79.3)	Did not want group treatment/ preferred to wait for ind. therapy	12 (41.4)
	Rejected ERP	6 (20.7)
	Wanted face-to-face sessions	2 (6.9)
	Preferred group treatment	2 (6.9)
	Rejected computerized treatment programme	1 (3.4)
Comorbidity (3, 10.3)	Wanted/needed treatment for comorbid conditions	2 (6.9)
	Too anxious to participate (due to other anxiety problems)	1 (3.4)
Practical barriers (3, 10.3)	Too far/long to travel to clinic	1 (3.4)
	Moved out of area	1 (3.4)
	Sought treatment elsewhere	1 (3.4)
Total		**29**

Note. N = number of patients to which reason applied, % = percentage of patients (out of 29) to which reason applied.

Forty-one (controlled: 24, uncontrolled: 17) of the 111 primary studies contributing to the pooled dropout rate provided reasons for 211 dropouts. A total of 50 treatments included CBT (21), followed by ERP (13), ERP + medication (6), CT (5), CBT + medication (2), ERP + Placebo (2) and CT + medication (1). Studies involved therapist-delivered individual (27), group (12), family (1), couple (1) and a combination of group and individual (1) therapy. Remote, internet-based therapist-assisted (7) and self-help (1) therapies were also included.

For each included study, reported reasons for refusal or dropout were recorded together with the number of participants the reason applied to. The frequencies for semantically identical reasons were totalled across studies and grouped into different low-level categories, e.g. 'preferred to wait for individual therapy' and 'did not want group therapy' were grouped together under 'did not want group treatment (preferred individual therapy)'. These low-level categories were grouped together under higher-level categories, e.g. refusal due to 'treatment type and format'.

Table 2 reports the total number and proportion of participants (out of 29) to which each refusal reason and category applied. Results show that within this small group of eight studies, not having one's treatment preferences met was the most common reason for refusal (79%), particularly participants not wanting to take part in group therapy (41%) or rejecting ERP (21%).

Table 3 provides an overview of the reasons for dropout. The most common reason was low motivation or a lack of engagement (28%). For 14% of the participants, feeling too anxious about ERP or a reluctance to engage with (further) ERP was specifically listed as the reason for dropout. The second most common reason for dropout was (adverse) life-events (13%), followed by practical barriers (11%). A (perceived) lack of improvement/benefit, patient dissatisfaction with treatment and/or wish for different treatment, together accounted for 14% of dropout. Just over 4% of dropout was due to symptom improvement.

3.7. Association of CBT task adherence with post-treatment OCD symptom reduction

3.7.1. Face-to-face therapies

Table 4 provides a descriptive summary of seven studies (including one study reporting findings for therapist-delivered and self-help ERP combined (Tolin et al., 2007)) that tested the association between CBT task adherence and post-treatment OCD symptom severity. Studies used a range of task adherence measures and types of correlation, i.e. bivariate, partial and semi-partial, making it inadvisable to pool effect sizes (Aloe & Thompson, 2013). All seven studies report a significant medium to large association of between-session CBT task adherence with post-treatment OCD symptom reduction.

Table 3
Summary of reasons given for dropout (aggregated across studies).

Category (*N*, %)	Reason	*N* (%)
Lack of engagement (60, 28.4)	Did not wish to engage (further) in ERP	25 (11.8)
	Low/lack of motivation*	23 (10.9)
	Noncompliance**	7 (3.3)
	Too anxious about exposure	5 (2.4)
Life events (27,12.8)	Adverse life events (incl. medical illness)	16 (7.6)
	Moved out of area	7 (3.3)
	Pregnancy	4 (1.9)
Practical barriers (24,11.4)	Too little time to participate/work commitments	20(9.5)
	Too far/long to travel to clinic	3 (1.4)
	Technical problems (remote therapies)	1 (.5)
No longer meets eligibility criteria (23,10.9)	Stop/start medication	18 (8.5)
	alcohol misuse, change in diagnosis	5 (2.4)
Deterioration in mental health (21,10)	Deterioration in mental health/suicidality (requiring treatment)	21 (10)
Medication (18, 8.5)	Medication/placebo side-effects	12 (5.7)
	Medication side-effects and/or noncompliance	6 (2.8)
Lack of improvement (16, 7.6)	Lack of improvement	7 (3.3)
	Patient reports treatment ineffective	5 (2.4)
	Limited benefit	4 (1.9)
Dissatisfaction with treatment/wish for different treatment (13, 6.2)	Wants more intensive treatment (than remote therapy)	3 (1.4)
	Wants to pursue psychopharmacological treatment	1 (.5)
	Treatment no longer corresponded to patient goals	2 (.9)
	Not willing to continue group therapy	1 (.5)
	No longer wants treatment	3 (1.4)
	Doesn't feel ready to change	1 (.5)
	Treatment too emotionally burdensome	1 (.5)
	Dissatisfied with treatment	1(.5)
Symptom improvement (9, 4.3)	Treatment no longer required due to symptom improvement	9 (4.3)
Total		211

Note. N = number of patients to which reason applied, % = percentage of patients (out of 211) to which reason applied.
* ERP (+/- medication/placebo).
** ERP + meds (n = 20), CT (n = 2), CBT (n = 1).

Three studies also considered the relationship between CBT task adherence and post-treatment OCD symptom remission (Mataix-Cols et al., 2016). Simpson et al. (2011) showed that participants needed to achieve a mean total PEAS score of at least 5.6, i.e. a minimum of 75–90% good quality adherence to between-session ERP tasks as assigned and with minimal to no compulsions or safety aids, to achieve OCD symptom remission post-treatment. Wheaton, Galfalvy et al. (2016) furthermore showed that when the three sub-scales of the PEAS were considered, i.e. (a) quantity of exposure, (b) quality of exposure, and (c) degree of success with response prevention or percentage resisted urges to ritualise, only item c was independently and positively associated with post-treatment OCD symptom severity and increased odds for achieving post-treatment remission. Abramowitz et al. (2002) also found that patients who achieved remission were significantly more adherent to between-session ERP task assignments and had a better understanding of the treatment rationale than those who did not. However, the authors used a Y-BOCS cut-off score of ≤ 16 to define remission rather than the recommended score of ≤12 (Mataix-Cols et al., 2016). Therefore, as some patients may not in fact have been in remission, these results need to be considered with caution.

3.7.2. Remote therapies

Six studies of remote therapies tested the relationship between the number of completed ERP tasks and post-treatment OCD symptom reduction, measured by the Y-BOCS. All studies involved the BT-STEPS programme, delivered via a web-based format (Diefenbach, Wootton, Bragdon, Moshier, & Tolin, 2015; Kobak, Greist, Jacobi, Levy-Mack, & Greist, 2015) or interactive voice response system (Bachofen et al., 1999; Greist et al., 1998, 2002; Kenwright, Marks, Graham, Franses, & Mataix-Cols, 2005). The BT-STEPS programme consists of nine steps; the first 3–4 involve self-assessment, the remainder self-treatment. Within the latter phase, ERP sessions can be completed as many times as needed.

To meta-analyse the relationship between task adherence and post-treatment OCD symptom reduction, effect types other than correlations were converted into correlations using standard formulae (e.g. Borenstein et al., 2009). Diefenbach et al. (2015) was not included in the meta-analysis as it measured adherence differently, rating the highest step (out of nine) rather than the number of ERP tasks completed.

There was a medium positive association between the number of ERP tasks/remote sessions completed and post-treatment OCD symptom reduction: r = .39 (95% CI [.23, .53], k = 5, z = 4.66, p < .001; I^2 = 39.9, $Q(4)$ = 6.66, p = .16) (see Appendix G for forest plot). The correlation was reasonably stable (range: .34–.43) when removing one study per pass. Heterogeneity of study estimates was small to moderate.

3.8. Publication bias

There was no significant potential publication bias for the CBT refusal rate as Egger's intercept test indicated the funnel plot asymmetry was not significant. For dropout, Egger's intercept test shows significant funnel plot asymmetry (Intercept: -1.88, t = 8.36, p < .001), indicating a potential publication bias towards excluding smaller studies with larger dropout rates. The trim-and-fill method showed that 52 study treatments should be trimmed to achieve an adjusted higher dropout rate of 21.6% (95% CI [20.3, 23]). Too few studies contributed to the mean number and percentage of completed sessions or modules and to the association between remote ERP and post-treatment symptom reduction to consider publication bias (Borenstein et al., 2009; Sterne, Egger, & Moher, 2011).

4. Discussion

This meta-analysis found refusal and dropout rates of 15.6% and 15.9% respectively, suggesting that over 30% of eligible patients who are recommended CBT for OCD fail to initiate or complete treatment. Whilst a pooled refusal rate for CBT for OCD has not previously been reported, the dropout rate is consistent with two earlier meta-analyses of studies evaluating CBT for OCD (Öst et al., 2015; Swift, Greenberg,

Table 4
Descriptive summary of studies of therapist-delivered therapies examining the association of between-session task adherence with post-treatment OCD symptom reduction.

Task adherence measure	Study	TX	Outcome measure	N	Type of Effect	ES value
HCS	Goodwin, Koenen, Hellman, Guardino, and Struening (2002)	Daily/twice weekly ERP combined	Post-treatment Y-BOCS score	28 (ITT)	*pr* (a)	−.61**
	Whittal et al. (2005)	ERP + CT samples combined	Post-treatment Y-BOCSScore	58 (C)	*pr*(a)	−.40**
CRES	Tolin et al. (2004)	ERP	% **reduction** post-treatment Y-BOCS score	15 (C)	*r*	.53*
	Tolin et al. (2007)	Self-administered and therapist-administered ERP combined	% **reduction** post-treatment Y-BOCS score	34 (C)	*r*	.50**
PEAS (TOTAL)	Simpson et al. (2011)	Twice-weekly ERP + ERP-MI combined (no sig. difference in adherence/outcomes)	Post-treatment Y-BOCS score	25 (C)	*sr* (a)	−.70***
	Wheaton, Galfalvy et al. (2016), using Simpson et al. (2013) data	Twice-weekly ERP	Post-treatment Y-BOCS score	37 (C)	*sr* (a)	−.56***
% completed exposure tasks (in **week 1**)	De Araujo et al. (1996)	Weekly (in vivo ± imaginal) ERP	Target obsession **change** score	46 (C)	*r*	**.33**

Note. HCS = Homework Compliance Scale, CRES = Clinician Rated Effort Scale, PEAS = Patient Exposure Adherence Scale, Y-BOCS = Yale-Brown Obsessive-Compulsive Scale, ITT = intention to treat sample, C = completer sample, ES = effect size, a = controlled for baseline Y-BOCS /baseline Y-BOCS entered in step 1, pr = partial correlation, sr = semi-partial correlation.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Whipple, & Kominiak, 2012). The risk of early dropout was 2.5 times greater than for late dropout. As early rather than late dropout appears to be related to poor outcomes (Aderka et al., 2011), it suggests most patients who drop out from CBT for OCD are unlikely to have experienced clinically significant benefit. Indeed, the examination of reasons for dropout showed that dropout was rarely due to clinically significant symptom improvement. This reinforces the need to better understand and address the risk of refusal and (early) dropout from CBT for OCD.

This meta-analysis failed to find any significant moderators of refusal to inform our understanding of potential risk factors of refusal of CBT for OCD. Although refusal rates were not significantly higher for group than individual CBT, the exploration of reasons for refusal carefully suggests that a mismatch between patient preference and the treatment on offer, particularly when the treatment is group CBT, may affect patients' opt-in to therapy. Feelings of unease or shame or comorbid social anxiety may contribute to a reluctance to engage in group therapy, or perhaps participants anticipated insufficient individually tailored treatment within a group setting. As dropout was significantly lower for group than individual therapy, it suggests that the group format may enhance adherence once participants commence therapy, e.g. being with other patients with OCD might help to normalise difficulties and support participants during challenging times in therapy. However, this finding could reflect a selection bias; e.g. group CBT participants may be more motivated or less (socially) anxious than participants in individual CBT. We would therefore urge caution in drawing the conclusion the group CBT is inherently more engaging than individual CBT.

The examination of patient reasons for nonadherence lends some support to the notion that negative perceptions of CBT and a lack of satisfaction or perceived benefit from therapy may contribute to treatment refusal and dropout (Mancebo et al., 2011). Interestingly, a sizeable portion of dropout was due to patients violating research eligibility criteria, e.g. changes in medication. This would typically not require withdrawal from CBT in routine clinical settings.

This review did not find a significant difference in dropout for different types of CBT (i.e. ERP, CBT, CT), which is consistent with other meta-analyses (Ong et al., 2016; Öst et al., 2015; Swift & Greenberg, 2014). Also, whilst one would assume that participants are more likely to stay motivated in therapy with increased therapist support, dropout from remote therapies was not significantly higher than for face-to-face therapies and therapist assistance in remote therapies did not moderate dropout from remote therapies. Therapist experience also did not affect dropout, which mirrors results from a meta-analysis of dropout from ERP (Ong et al., 2016).

Results suggest that, on average, participants who completed face-to-face CBT received a therapeutic 'dose' of therapy, commensurate with US and UK practice guidelines (APA, 2007; NICE, 2005). However, results were highly heterogeneous and a significant number of treatment completers may not have received the recommended minimum 13 sessions; studies did not report the data needed to examine this further. Session/module completion for remote therapies appeared lower than for therapist-delivered therapies but, as most remote therapy studies reported figures for ITT rather than completer samples, a direct comparison was not possible.

This review showed a consistent medium to large significant association between CBT task adherence and post-treatment OCD symptom reduction, in line with previous research into the association of homework with outcomes for CBT for a range of psychological disorders (e.g. Kazantzis et al., 2016). Most studies of CBT task adherence reported that adherence was at least satisfactory. However, as between-session task adherence likely needs to be high to achieve post-treatment OCD symptom remission (e.g. Simpson et al., 2011), this may not necessarily be adequate (Mataix-Cols et al., 2016).

4.1. Strengths and limitations

To the best of our knowledge, this is the first comprehensive systematic review of the magnitude, moderators and reasons for poor

adherence to CBT for OCD. It included a larger number of studies than previous meta-analyses of refusal and dropout (e.g. Ong et al., 2016; Öst et al., 2015; Swift & Greenberg, 2014) and considered both controlled and uncontrolled studies. This review adopted a wider focus on adherence by examining session attendance, module completion and between-session task adherence and reasons for non-adherence. By adopting a broad search strategy, it highlighted findings that were not necessarily foregrounded in study titles or abstracts. The large number of included studies allowed the examination of a range of moderators of refusal and dropout.

Whilst a broad range of moderators were included, potentially important moderators may have been missed and some moderator analyses may have been under-powered. The quality of the included studies was not formally assessed. However, as quality assessment tools typically assess study features pertinent to a potential bias in effect sizes for therapy outcomes, they were not directly relevant to the current review (e.g. Jadad et al., 1996; Öst, 2008; Schulz, Altman, & Moher, 2010).

This review attempted to include studies reflective of real-life settings by including uncontrolled studies and examining the moderating effect of the sample's clinical representativeness. However, other features of effectiveness studies were not coded for (e.g. absence of manualised treatment, additional supervision) (Hans & Hiller, 2013)) and only published papers were included. The current refusal and dropout rates might therefore not adequately reflect attrition in routine clinical settings. For example, Di Bona, Saxon, Barkham, Dent-Brown, and Parry (2014) found that 48% of respondents referred to Improving Access to Psychological Therapy (IAPT) services that routinely treat UK patients with common mental health difficulties including OCD, reported not attending the service. Richards and Borglin (2011) showed that, over a three-year period, 23% of IAPT patients dropped out of treatment. Attrition from CBT for OCD in routine settings may therefore be higher than the current rates suggest.

Many studies reported a two-step eligibility check; an initial (telephone) screening for eligibility, followed by face-to-face assessment to confirm the OCD diagnosis and severity of symptoms. Often a considerable number of patients met the inclusion criteria at telephone screening but disengaged prior to the confirmation of their eligibility following clinic-based assessment (when the refusal rate was calculated). This suggests that the current refusal rate is probably a conservative estimate. Reasons for refusal and dropout were based on a small subset of studies and may not adequately represent reasons for dropout for all studies included in the aggregation of refusal and dropout rates.

The reported mean dropout rate was affected by a potential publication bias; the trim-and-fill test proposed an upwardly adjusted dropout rate (21.6%). Whilst small studies may have lower dropout rates associated with study design characteristics, the latter did not significantly moderate dropout. Alternatively, smaller studies were perhaps more often excluded due to ambiguous reporting on dropout. However, in that case, a small study absence would be observed at both the low and high end of study dropout. It is therefore possible that smaller studies with higher dropout rates are indeed less likely to be published.

Studies spanned a period of more than 30 years, during which conceptual and technical aspects of ERP and CT have evolved (e.g. Jacoby & Abramowitz, 2016; Sookman, 2016). This means that studies of the same type of intervention (i.e. ERP, CBT, CT) may not have been directly comparable and, together with the fact that there is considerable procedural overlap between these three treatment types (Abramowitz, Taylor, & McKay, 2005), limits the conclusions that can be drawn from testing treatment type as a moderator of patient adherence.

There were several limitations of the primary studies. Fifty percent of excluded full-text articles were discarded as they did not (clearly) report attrition data. Few of the 123 included studies reported on CBT task adherence. This is surprising, given the central importance attributed to participants practising therapy tasks between sessions for the success of CBT. The variability in the (quality of) measurement and reporting of CBT task adherence for face-to-face therapies made it impossible to pool study data.

4.2. Clinical implications

Therapists should elicit and address any concerns and misconceptions patients have about CBT, and ERP in particular, at the earliest opportunity, i.e. during the patient's initial assessment, perhaps with the aid of accounts from patients who have successfully completed therapy (using vignettes, audio or video material). Also, patients should ideally have a choice about their preferred treatment format.

It would benefit patients to know that there is a significant relationship between task adherence and OCD symptom reduction and that remission is more likely when task engagement is high. As is good clinical practice, therapists need to make sustained efforts (early on) to maximise patient engagement with key therapy tasks. It is also important to assess psychological factors such as patients' degree of insight into their OCD symptoms and motivation for treatment (e.g. Bachofen et al., 1999; De Araujo, Ito, & Marks, 1996; Tolin et al., 2004). Simpson, Zuckoff et al. (2010) found that adding motivational interviewing to CBT did not enhance adherence, this was in a context of high patient engagement and therefore motivational interviewing may still have a role to play with patients showing poor motivation. Therapists should achieve a clear agreement with the patient on the tasks of therapy as Wheaton, Huppert, Foa, and Simpson (2016) found that this predicted greater adherence to between-session ERP tasks. As some studies show that task adherence predicted therapy outcomes early on in therapy (De Araujo et al., 1996; Simpson et al., 2011), any difficulties and misconceptions about between-session therapy tasks should be addressed at the earliest opportunity and clinicians should consider offering additional support, e.g. offering between-session phone-calls, increasing session frequency and/or including home visits, at this stage. Within the context of remote therapies, it would be advisable to build in (more) therapist assistance when patients first commence self-exposure as this may enhance task adherence (e.g. Tolin et al., 2007). Wheaton, Galfalvy et al. (2016) show that the degree to which patients engage successfully in response prevention, rather than exposure per se, was predictive of post-treatment symptom reduction. Therefore, clinicians reviewing between-session ERP need to gain a clear understanding of patients' degree and quality of response prevention during between-session ERP.

4.3. Research implications

We recommend that studies of CBT for OCD routinely report refusal and dropout rates and consistently distinguish patient- from clinician/researcher-initiated dropout, to aid research into predictors of patient-initiated dropout. Reasons for refusal and dropout should also be reported, aided by formal therapy adherence measures (e.g. Mancebo, Pinto, Rasmussen, & Eisen, 2008). Qualitative, interview-based studies will enable a more in-depth understanding of reasons for non-adherence than a simple tally of refusal or dropout reasons. Enhanced within-study data on differences in sociodemographic and clinical characteristics between eligible patients, refusers, treatment completers and dropouts would enable pooling within-study data to inform our understanding of whether participant-level sociodemographic and clinical variables can predict non-adherence. More research is needed on whether psychological variables, such as participants' beliefs about their mental health difficulties and mental health services, expectations of and motivation for treatment predict non-adherence (Santana & Fontenelle, 2011; Taylor, Abramowitz, & McKay, 2012; Wierzbicki & Pekarik, 1993). The relationships between the client-therapist relationship and patient adherence is also an area for further research (Simpson et al., 2011; Wheaton, Huppert et al., 2016). An examination of group dynamics and peer relationships, in the context of group CBT, would also aid our understanding of whether and how peer support benefits patient adherence.

The effect of different types of CBT (ERP, CT, CBT) on patient adherence requires further investigation, taking account of the conceptual and technical evolvement of these treatments over time. It would also be helpful to examine whether the way in which ERP tasks are

completed, i.e. in a gradual, hierarchical manner (as informed by emotional processing theory (Foa & Kozak, 1986)) or a random, variable manner (as informed by inhibitory learning theory (Jacoby & Abramowitz, 2016)), affects patient dropout, sessions attendance and task adherence.

The OCD research community should also aim to routinely report on CBT task adherence. It would benefit research in this area if researchers use the same measure of adherence to allow direct comparison between studies. We would recommend the PEAS (Simpson, Maher et al., 2010) as this is a measure of ERP task adherence that has already been used in multiple studies and it separately scores the degree of exposure and of response prevention and also captures the quality of exposure. This measure could be developed further, based on a shared understanding of the key features of well-designed exposure tasks that maximise exposure gains, e.g. informed by recent research on inhibitory learning theory (Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014), and markers of successful adherence (e.g.Wheaton, Galfalvy et al., 2016). Further research is needed to establish a suitable measure of adherence to other CBT tasks, e.g. cognitive restructuring, behavioural experiments, in the context of OCD. More objective measures of adherence, e.g. blind rating of video recordings of within- or between-session ERP, would enhance research in this area. Also, using apps to help patients record home practice might benefit self-report. Whilst CBT task adherence is an important predictor of OCD symptom reduction, without repeatedly measuring both over the course of treatment, it is not possible to firmly establish the direction of this relationship. Consistent application of agreed criteria for symptom remission (e.g. Farris, McLean, Van Meter, Simpson, & Foa, 2013) is also needed to advance our understanding of the role of patient adherence in symptom remission and longer-term recovery (Mataix-Cols et al., 2016). These are important areas of research to inform how best to achieve a high degree and quality of adherence to CBT for OCD for the benefit of patients.

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Declaration of Competing Interest

All authors declare that they have no conflict of interest.

Appendix A

Table A1

Table A1
Coding of Clinical Representativeness of patients (from Hans & Hiller, 2013).

Referrals	1	Patients were referred through usual clinical routes (referred by general practitioner, self-referral).
	0	At least some of the patients under study were actively recruited (from the community or from patient samples).
Patients	1	If patients meet criteria for disorder under study, there are no exclusion criteria besides acute suicidality, acute psychosis, organic brain disease, substance dependence, or disorders potentially interfering with treatment engagement.
	0	Exclusion criteria beyond those above, including comorbidity and medication.
Allowance of medication	1	Medication is allowed. Code 1 if no specific mention in exclusion criteria.
	0	Patients are forced to stop medication or are excluded from the study due to medication. Code 1 if medication is discontinued for therapeutic reasons (e.g., benzodiazepines in the case of exposure therapy).

Appendix B

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Appendix C

Table C1
Overview of studies included under each adherence variable.

Study	Mean refusal rate	Reasons for refusal	Mean Dropout rate	Reasons for dropout	Risk Ratio early vs late dropout	Mean (No/%) session attendance	Mean (No/%) module completion	Mean CBT task adheren-ce	Association CBT task adherence & Y-BOCS symptom reduction
Abramowitz et al. (2013)	√	√	√	√					
Abramowitz, Foa, and Franklin (2003)			√		√				
Abramowitz, Franklin, Zoellner, and DiBernardo (2002)								√	√
Abramowitz and Zoellner (2002)	√		√						
Aderka et al. (2011)						√			
Alonso et al. (2001)	√	√	√						
Anderson and Rees (2007)			√						
Andersson et al. (2012)			√	√	√		√		
Andersson et al. (2011)	√		√		√		√		
Bachofen et al. (1999)	√		√		√				√
Belotto-Silva et al. (2012)			√	√					
Bhar, Kyrios, and Hordern (2015)	√								
Cabedo et al. (2010)	√		√						
Castle et al. (1994)			√						
Challacombe et al. (2017)			√						
Chambless and Steketee (1999)			√						
Collins and Coles (2017)	√		√						
Cordioli et al. (2002)			√	√	√				
Cordioli et al. (2003)			√	√	√				
Cottraux et al. (1990)			√	√				√	
Cottraux et al. (2001)			√						
De Araujo, Ito, and Marks (1996)									√
De Araujo, Ito, Marks, and Deale (1995)			√		√				
De Leeuw, van Megen, Kahn, and Westenberg (2017)			√						
Demal, Zitterl, Lenz, Zapotoczky, and Zitterl-Eglseer (1996)			√	√					
Study	**Mean refusal rate**	**Reasons for refusal**	**Mean Dropout rate**	**Reasons for dropout**	**RR - Early vs late dropout**	**Mean (No/%) session attendance**	**Mean (No/%) module completion**	**Mean CBT task adheren-ce**	**Association CBT task adherence & Y-BOCS symptom reduction**
Diefenbach, Wootton, Bragdon, Moshier, and Tolin (2015)	√	√	√	√			√		
Enright (1991)			√	√					
Espie (1986)	√		√			√ (Mean % only)			
Fals-Stewart and Lucente (1993)	√							√	
Fals-Stewart, Marks, and Schafer (1993)			√						
Fineberg, Hughes, Gale, and Roberts (2005)			√						
Foa et al. (2005)			√	√					
Foa, Steketee, and Grayson (1985)			√						
Franklin, Abramowitz, Kozak, Levitt, and Foa (2000)			√						
Freeston et al. (1997)			√	√					
Freeston, Leger, and Ladouceur (2001)			√						
Fritzler, Hecker, and Losee (1997)			√						
Fullana et al. (2014)	√		√		√				
Goetter, Herbert, Forman, Yuen, and Thomas (2014)			√					√	
Greist et al. (2002)			√		√				√
Greist et al. (1998)			√						√
Hagen et al. (2016)			√						
Haland et al. (2010)	√	√	√	√					

(*continued on next page*)

Table C1 (*continued*)

Study	Mean refusal rate	Reasons for refusal	Mean Dropout rate	Reasons for dropout	Risk Ratio early vs late dropout	Mean (No/%) session attendance	Mean (No/%) module completion	Mean CBT task adheren-ce	Association CBT task adherence & Y-BOCS symptom reduction
Havnen, Hansen, Haug, Prescott, and Kvale (2013)	√		√						
Herbst et al. (2014)			√						
Himle et al. (2006)			√						
Hoogduin and Hoogduin (1984)	√		√						
Houghton, Saxon, Bradburn, Ricketts, and Hardy (2010)	√	√	√			√ (Mean No. only)			
Jones and Menzies (1998)			√						
Jonsson, Hougaard, and Bennedsen (2011)			√	√		√			
Kampman, Keijsers, Hoogduin, and Verbraak (2002)			√		√				
Kearns, Tone, Rush, and Lucey (2010)	√	√	√						
Kellner, Nowack, Wortmann, Yassouridis, and Wiedemann (2016)			√		√				
Study	**Mean refusal rate**	**Reasons for refusal**	**Mean Dropout rate**	**Reasons for dropout**	**RR - Early vs late dropout**	**Mean (No/%) session attendance**	**Mean (No/%) module completion**	**Mean CBT task adheren-ce**	**Association CBT task adherence & Y-BOCS symptom reduction**
Kenwright, Marks, Graham, Franses and Mataix-Cols (2005)			√						√
Kobak, Greist, Jacobi, Levy-Mack, and Greist (2015).									√
Krochmalik, Jones, and Menzies (2001)			√						
Krochmalik, Jones, Menzies, and Kirkby (2004)			√						
Krone, Himle, and Nesse (1991)			√						
Kushner et al. (2007)			√						
Kyrios, Hordern, and Fassnacht (2015)			√						
Lindsay, Crino, and Andrews (1997)			√						
Lovell et al. (2017)							√		
Lovell et al. (2006)			√						
Lovell, Ekers, Fulford, Baguley, and Bradshaw (2004)			√		√				
Lovell, Fullalove, Garvey, and Brooker (2000)	√		√						
Mahoney, Mackenzie, Williams, Smith, and Andrews (2014)							√		
Mancebo, Steketee, Muroff, Rasmussen, and Zlotnick (2017)			√	√	√				
Marsden, Lovell, Blore, Ali and Delgadillo (2017)			√						
McLean et al. (2001)			√	√					
McLean et al. (2015)			√						
Morgieve et al. (2014)			√						
Nakatani et al. (2005)			√	√					
Nedeljkovic, Kyrios, Moulding, and Doron (2011)			√						
O'Connor et al. (2012)			√						
O'Connor et al. (2005)			√						
Polman, Bouman, van Geert, de Jong, and den Boer (2011)			√						
Rosqvist et al. (2001)			√						
Rowa et al. (2007)								√	
Safak et al. (2014)			√	√		√			

(*continued on next page*)

Table C1 (*continued*)

Study	Mean refusal rate	Reasons for refusal	Mean Dropout rate	Reasons for dropout	Risk Ratio early vs late dropout	Mean (No/%) session attendance	Mean (No/%) module completion	Mean CBT task adheren-ce	Association CBT task adherence & Y-BOCS symptom reduction
Sampaio, Lima, Corregiari, and Bernik (1999)	√		√	√					
Saxena et al. (2009)			√		√				
Study	**Mean refusal rate**	**Reasons for refusal**	**Mean Dropout rate**	**Reasons for dropout**	**RR - Early vs late dropout**	**Mean (No/%) session attendance**	**Mean (No/%) module completion**	**Mean CBT task adheren-ce**	**Association CBT task adherence & Y-BOCS symptom reduction**
Seol, Kwon, Kim, Kim, and Shin (2016)			√						
Shinmei et al. (2017)			√	√					
Simpson, et al. (2013)			√					√	√
Simpson et al. (2008)			√	√					
Simpson, Gorfinkle, and Liebowitz (1999)	√	√	√	√	√				
Simpson et al. (2011)									√
Simpson et al. (2010)			√	√	√	√		√	
Sousa, Isolan, Oliveira, Manfro, and Cordioli (2006)			√	√	√				
Storch et al. (2007)			√						
Storch et al. (2008)			√	√					
Taylor et al. (2003)			√						
Tenneij, van Megen, Denys, and Westenberg (2005)			√	√					
Tolin, Diefenbach, and Gilliam (2011)			√	√				√	
Tolin, Diefenbach, Maltby, and Hannan (2005)			√						
Tolin et al. (2007)			√					√	√
Tolin, Maltby, Diefenbach, Hannan, and Worhunsky (2004)			√	√				√	√
Tundo, Salvati, Busto, Di Spigno, and Falcini (2007)			√	√					
Van Balkom et al. (1998)			√	√					
Van Balkom et al. (2012)			√						
Van NoppenSteketee, McCorkle, and Pato (1997)			√	√					
Van Oppen et al. (1995)			√	√					
Van Oppen et al. (2010)			√						
Vandborg, Hartmann, Bennedsen, Pedersen, and Thomsen (2015)			√	√		√			
Visser et al. (2015)			√	√					
Vogel et al. (2012)	√	√	√						
Vogel et al. (2014)			√						
Vogel, Stiles, and Gotestam (2004)			√					√	
Vos, Huibers, and Arntz (2012)			√	√					
Vyskocilova, Prasko, and Sipek (2016)			√	√					
Study	**Mean refusal rate**	**Reasons for refusal**	**Mean Dropout rate**	**Reasons for dropout**	**RR - Early vs late dropout**	**Mean (No/%) session attendance**	**Mean (No/%) module completion**	**Mean CBT task adheren-ce**	**Association CBT task adherence & Y-BOCS symptom reduction**
Warren and Thomas (2001)			√			√ (mean No. only)			
Wheaton et al. (2016)								√	
Wheaton, Huppert, Foa, and Simpson (2016)								√	
Whittal, Woody, McLean, Rachman, and Robichaud (2010)			√					√	
Whittal, Thordarson, and McLean (2005)			√			√		√	√
Wilhelm et al. (2009)			√	√	√				
Wilhelm et al. (2005)			√	√	√				

(*continued on next page*)

Table C1 (*continued*)

Study	Mean refusal rate	Reasons for refusal	Mean Dropout rate	Reasons for dropout	Risk Ratio early vs late dropout	Mean (No/%) session attendance	Mean (No/%) module completion	Mean CBT task adheren-ce	Association CBT task adherence & Y-BOCS symptom reduction
Wilson and Chambless (2005)			√						
Wootton, Dear, Johnston, Terides, and Titov (2013)			√	√			√		
Wootton, Dear, Johnston, Terides, and Titov (2014)	√		√	√			√		
Wootton et al. (2011)	√		√	√			√		
Wroe and Wise (2012)	√	√	√						
Yang et al.(2015)			√						
TOTAL	**26**	**8**	**111**	**41**	**24**	**8**	**8**	**14**	**13**

Table C2
Sociodemographic characteristics of included studies (N = 117)*.

ID	Study	Year	Sample**	*N*	Mean age	Mean % Female	Mean duration	Mean % Comorbid	Mean % Axis 1	Mean % axis II	Mean % medication	Mean % prior CBT	Mean total YBOCS	Mean total BDI
1	Abramovitz	2013	C	16	33.13				50		25	0	25.75	15.06
2	Abramovitz	2003	ITT	40	37.45	43	17.45	45			45	28	25.65	19.30
4	Abramovitz - pilot	2002	ITT	6	29.00	33	11.40		33	0	100		23.30	15.20
6	Alonso	2001	C	60	30.20		11.90						24.70	
7	Anderson	2007	C	54	33.73	70	13.70				62		24.50	18.20
8	Andersson	2012	ITT	101	34.00	66	18.00				22	26	21.11	
9	Andersson	2011	ITT	23	39.00	65	13.00				17	26	20.00	
10	Bachofen	1999	ITT	23	31.00	43	12.00				30	78	25.00	
11	Belotto-Silva	2012	ITT	158	34.04	55				82			25.89	
12	Bhar	2015	ITT	62	36.05	30					39		23.99	18.00
13	Cabedo	2010	ITT	42	33.79		8.96						25.41	
14	Castle	1994	ITT	219	34.00	58	10.00							
15	Challacombe	2017	ITT	17		100							24.85	
16	Chambless - OCD only	1999	ITT	60			15.00							
17	Collins	2017	C	27	32.30	52		52			55		24.08	12.93
18	Cordioli	2002	ITT	32	39.50	69	23.60	72			56		24.00	
19	Cordioli	2003	ITT	47	36.50	51	21.10				45		25.70	
20	Cottraux	1990	C	44	35.90	64	13.37							15.27
21	Cottraux	2001	ITT	62	35.80	75			37				28.55	17.20
23	De Araujo	1995	C	46	33.00	50	12.00						28.10	28.50
24	De Leeuw	2017	ITT	39	35.15		12.85				51	54	21.95	17.50
25	Demal	1996	ITT	70	34.40	41	14.30						23.80	
26	Diefenbach	2015	ITT	26	37.08	65		65			58		24.92	
27	Enright	1991	ITT	27	32.10		6.60				19	0		
ID	**Study**	**Year**	**Sample****	***N***	**Mean age**	**Mean % Female**	**Mean duration**	**Mean % Comorbid**	**Mean % Axis 1**	**Mean % axis II**	**Mean % medication**	**Mean % prior CBT**	**Mean total YBOCS**	**Mean total BDI**
28	Espie	1986	ITT	5	28.80	60	4.60				60	100		
29	Fals-Stewart & Lucente	1993	ITT	137	30.50	58	15.50		63					
30	Fals-Stewart	1993	C	93	30.50	55	12.70						20.73	12.17
31	Fineberg	2005	ITT	41	39.45	76	13.75				34		23.30	
32	Foa	2005	ITT	122	34.80	48	16.40						25.40	
33	Foa	1985	C	19	34.10		12.00					0		17.90
34	Franklin	2000	ITT	110	34.20	47		54		17			26.79	18.44
35	Freeston	1997	ITT	29	35.80	45	9.40				35		23.50	20.65
36	Freeston	2001	ITT	6	30.17	67	12.33						23.17	18.50
37	Fritzler	1997	ITT	12	37.17	33					67		22.90	19.37
38	Fullana	2014	C	74	34.09	62							22.20	
39	Goetter	2014	ITT	15	32.20	87					13			
40	Greist	2002	ITT	218	39.00	42	22.00	24					25.00	
41	Greist	1998	ITT	40	34.90	48						0	23.60	
42	Hagen	2016	C	44	33.25	66							24.41	
43	Haland	2010	C	50	35.90	74	16.10		64			14	23.70	16.80
44	Havnen	2013	ITT	6	38.80	67	21.30				33	29	23.50	15.60
45	Herbst	2013	ITT	34	35.71	65	14.06					0	20.13	13.49
46	Himle	2006	ITT	3	29.00	100	10.33	67			67		30.17	
47	Hoogduin	1984	ITT	25	33.50	60	5.50							
48	Houghton	2010	ITT	37	36.80	49	16.00	86					24.20	
49	Jones	1998	C	21	38.50	91								13.43
50	Jonsson	2011	ITT	93	32.70	66			40	30	81		26.46	22.10
51	Kampman	2002	C	9	28.60	100			44			0	28.10	
52	Kearns	2010	ITT	24	43.00	58	21.60						24.70	21.90
53	Kellner	2016	C	16	33.35	56	15.45	64			64		26.75	21.75
ID	**Study**	**Year**	**Sample****	***N***	**Mean age**	**Mean % Female**	**Mean duration**	**Mean % Comorbid**	**Mean % Axis 1**	**Mean % axis II**	**Mean % medication**	**Mean % prior CBT**	**Mean total YBOCS**	**Mean total BDI**
54	Kenwright	2005	ITT	44	40.00	52	16.00				50	64	26.00	
55	Kobak	2015	ITT	87	38.34	63	5.40	72					22.43	
56	Krochmalik	2001	ITT	5	42.00	80	26.40							10.40
57	Krochmalik	2004	C	18	37.07	81							25.70	
58	Krone	1991	C	36	38.00		19.00	47			45		21.20	15.60
59	Kushner	2007	ITT	32							62		27.65	
60	Kyrios	2015	C	59	36.00	61							23.19	19.35
61	Lindsay	1997	ITT	9	31.60	44	9.00						28.70	21.33
62	Lovell	2017	ITT	473	32.70	60							25.13	
63	Lovell	2006	ITT	72	31.90	59	15.10				51	35	25.70	17.95
64	Lovell	2004	ITT	7	29.14	71	6.79						25.57	15.00
65	Lovell	2000	ITT	4	35.00	75							26.25	22.50
66	Mahoney	2014	ITT	67	39.07	60					34			

(*continued on next page*)

Table C2 (*continued*)

ID	Study	Year	Sample**	*N*	Mean age	Mean % Female	Mean duration	Mean % Comorbid	Mean % Axis 1	Mean % axis II	Mean % medication	Mean % prior CBT	Mean total YBOCS	Mean total BDI
67	Mancebo	2017	ITT	8	45.00	88			88	88		0	30.38	
68	Marsden	2017	ITT	55	32.04	62							25.82	
69	Mclean	2001	C	63	35.00	48			51		48		21.85	17.40
70	Mclean	2015	ITT	32	31.41	50					100		25.84	
71	Morgieve	2014	ITT	35	32.43	51	17.17				49		22.46	
72	Nakatani	2005	C	28	33.80	68	12.80			82			29.60	
73	Nedeljkovic	2011	C	26	38.11	53							26.38	22.27
74	O'Connor	2012	C	37	47.93	68					57		25.24	17.02
75	O'Connor	2005	C	26	40.00	42							20.75	16.70
76	Polman	2011	ITT	7	25.71	100	6.19				43		22.14	
77	Rosqvist	2001	ITT	11	40.00	45		27					22.45	
78	Rowa	2007	C	28	33.83	75					82		26.00	
79	Safak	2014	ITT	37	32.13	76	8.89	57			54			
ID	**Study**	**Year**	**Sample****	***N***	**Mean age**	**Mean % Female**	**Mean duration**	**Mean % Comorbid**	**Mean % Axis 1**	**Mean % axis II**	**Mean % medication**	**Mean % prior CBT**	**Mean total YBOCS**	**Mean total BDI**
80	Sampaio	2016	ITT	30	39.50	57	24.60							
81	Saxena	2009	C	10	40.60	40			0				25.20	
82	Seol	2016	C	27	29.22	30	9.47				41		23.70	14.89
83	Shinmei	2017	ITT	37	35.70	54	13.30						26.92	22
84	Simpson	2013	ITT	100	33.90	48	16.10		48		87	7	26.40	
85	Simpson	2008	ITT	108	39.20	43	22.00		44		100	12	25.80	
86	Simpson	1999	ITT	6	35.00	17		100				0	23.80	
88	Simpson	2010	ITT	30	39.90	47	18.50		50			13	28.10	
89	Sousa	2006	ITT	56	38.50	77	23.50					0	25.60C	22.10C
90	Storch	2007	C	24	29.00	50							30.35	16.05
91	Storch	2008	C	62	31.80	47							26.75	16.05
92	Taylor	2003	ITT	33	38.00	76	23.00						19.00C	
93	Tenneij	2005	ITT	96	36.70	65	15.50					36	14.35	
94	Tolin	2011	ITT	34	33.64	58		68			47	0	24.91	
95	Tolin	2005	ITT	11	40.50	55		46					23.91	13.27
96	Tolin	2007	ITT	41	38.18	37				34	56	0	23.33	21.31
97	Tolin	2004	ITT	20	39.35	50			75	30			25.20	19.28
98	Tundo	2007	ITT	36	31.00	37	13.40		58		89		28.20	
99	Van Balkom (-Van Oppen)	1998	C	32	36.90	59	13.95				88		25.80	17.33
100	Van Balkom	2012	ITT	48	36.80	59	19.10	60					23.00	
101	Van Noppen	1997	C	36	33.00	67							23.90	
102	Van Oppen	1995	C	57	34.70	53	12.90						24.75	16.45
103	Van Oppen	2010	ITT	118	35.00	60	17.00						26.00	
104	Vandborg	2015	C	39	30.26		7.75				59		25.64	
105	Visser	2015	ITT	90	34.80	66					39		26.05	16.70
ID	**Study**	**Year**	**Sample****	***N***	**Mean age**	**Mean % Female**	**Mean duration**	**Mean % comorbidity**	**Mean % Axis 1**	**Mean % axis II**	**Mean % medication**	**Mean % prior CBT**	**Mean total YBOCS**	**Mean total BDI**
106	Vogel	2012	ITT	6	31.50	17						17	24.70	
107	Vogel	2014	ITT	30	33.10	60							23.90	11.23
108	Vogel	2004	ITT	27	35.35	70			30				24.30	15.90
109	Vos	2012	ITT	78	30.64	62	6.35				21			
110	Vyskocilova	2016	ITT	57	31.74	58	16.23		56	54	100		24.30	18.43
111	Warren	2001	C	19	30.10	37	5.28	32			68		23.00	
114	Whittal	2010	ITT	73	31.50	47			75		52	0	18.18C ***	17.26C
115	Whittal	2005	C	59	34.91	63	13.23		55				22.58	17.68
116	Wilhelm	2009	ITT	29	33.40	52		41			48	0	25.60	
117	Wilhelm	2005	ITT	15	33.50	33						33	23.30	12.40
118	Wilson	2005	ITT	6	33.16	50							21.50	21.00
119	Wootton	2013	ITT	52	38.00	75					81		22.13	
120	Wootton	2014	ITT	44	34.26	78					31		21.30	
121	Wootton	2011	ITT	22	35.18	59					27		20.90	
122	Wroe	2012	ITT	17	35.64	24	14.40						24.53	17.59
123	Yang	2015	ITT	22	30.95	55	8.22					0	24.43	
Information provided by (*N*) studies:					114	107	66	19	19	9	52	31	102	53
Mean					34.86	58	14.10	57	51	46	53	18	24.49	17.58
Total				5627										

Note. *Six studies that use CBT task adherence data from outcome studies already included in the meta-analysis are not listed here, ** Indicates whether socio-demographic data is based on intention-to-treat /treatment starter (ITT) or completer (C) samples, Y-BOCS = Yale-Brown Obsessive Compulsive Scale, BDI = Beck's Depression Inventory.

Table C3
Overview of design and treatment characteristics of included studies (N = 117)*.

ID	Study	Year	Design	Treatment conditions**	Therapist contact	Session freq.
1	Abramovitz	2013	Uncontrolled	CBT (couple)	> 10 hrs	Mod
2	Abramovitz	2003	Controlled	ERP (High freq.), ERP (Mod freq.)	> 10 hrs	High **vs** mod
4	Abramovitz - pilot	2002	Uncontrolled	CBT	> 10 hrs	Mod to low
6	Alonso	2001	Uncontrolled	ERP	> 10 hrs	Low
7	Anderson	2007	Controlled	CBT (Grp), CBT, WLC	≤ 10 hrs	Low
8	Andersson	2012	Controlled	CBT (remote, therapist-assisted), Psych Pla	≤ 10 hrs	
9	Andersson	2011	Uncontrolled	CBT (remote, therapist-assisted)	≤ 10 hrs	
10	Bachofen	1999	Uncontrolled	ERP (self-help)	≤ 10 hrs	
11	Belotto-Silva	2012	Controlled	CBT (Grp), Med	> 10 hrs	Low
12	Bhar	2015	Uncontrolled	CBT	> 10 hrs	Low
13	Cabedo	2010	Controlled	CBT, CBT (Grp)	> 10 hrs	Low
14	Castle	1994	Uncontrolled	ERP		
15	Challacombe	2017	Uncontrolled	CBT	> 10 hrs	Mod
16	Chambless - OCD only	1999	Uncontrolled	ERP	> 10 hrs	Mod to low
17	Collins	2017	Uncontrolled	ERP	> 10 hrs	
18	Cordioli	2002	Uncontrolled	CBT (Grp)	> 10 hrs	Low
19	Cordioli	2003	Controlled	CBT (Grp), WLC	> 10 hrs	Low
20	Cottraux	1990	Controlled	ERP + Med, ERP + Pla, Anti-ERP + Med	> 10 hrs	Low
21	Cottraux	2001	Controlled	CT, ERP	> 10 hrs	Mod (ERP), Mod to low (CT)
23	De Araujo	1995	Controlled	ERP (In vivo), ERP (In vivo + imaginal)	> 10 hrs	Low
24	De Leeuw	2017	Controlled	ERP + Pla, ERP + Med (DCS)	≤ 10 hrs	Low
25	Demal	1996	Uncontrolled	CBT + Med	> 10 hrs	Low
26	Diefenbach	2015	Uncontrolled	ERP (remote - therapist assisted)	≤ 10 hrs	
27	Enright	1991	Uncontrolled	CBT (Grp)	> 10 hrs	Low
28	Espie	1986	Uncontrolled	CBT (Grp)	> 10 hrs	Low
29	Fals-Stewart & Lucente	1993	Uncontrolled	ERP	> 10 hrs	Mod
ID	**Study**	**Year**	**Design**	**Treatment conditions***	**Therapist contact**	**Session freq.**
30	Fals-stewart	1993	Controlled	ERP, ERP (Grp)	> 10 hrs	Low (grp), Mod (Ind)
31	Fineberg	2005	Controlled	CBT (Grp), Psych Pla	> 10 hrs	Low
32	Foa	2005	Controlled	ERP, ERP + Med, Med, Pla	> 10 hrs	High
33	Foa	1985	Controlled	ERP in vivo, ERP imaginal	> 10 hrs	High
34	Franklin	2000	Uncontrolled	ERP	> 10 hrs	High
35	Freeston	1997	Controlled	CBT, WLC	> 10 hrs	Mod
36	Freeston	2001	Uncontrolled	CT	> 10 hrs	Low
37	Fritzler	1997	Controlled	ERP, WLC	≤ 10 hrs	Low
38	Fullana	2014	Uncontrolled	ERP	> 10 hrs	Low
39	Goetter	2014	Uncontrolled	ERP (remote, assisted (video-conference))	> 10 hrs	
40	Greist	2002	Controlled	ERP, ERP (self-help), Psych Pla	≤ 10 hrs (remote), > 10 hrs (face-to-face)	Low (ERP)
41	Greist	1998	Uncontrolled	ERP (self-help)	≤ 10 hrs	
42	Hagen	2016	Uncontrolled	ERP		
43	Haland	2010	Uncontrolled	ERP (Grp)	> 10 hrs	Low
44	Havnen	2013	Uncontrolled	ERP (Grp)	> 10 hrs	High
45	Herbst	2013	Controlled	CBT (remote, therapist-assisted), WLC	≤ 10 hrs	
46	Himle	2006	Uncontrolled	CBT (remote, therapist-assisted (videoconference))	> 10 hrs	
47	Hoogduin	1984	Uncontrolled	ERP		
48	Houghton	2010	Uncontrolled	CBT		
49	Jones	1998	Controlled	CT (Grp), WLC	≤ 10 hrs	Low
50	Jonsson	2011	Controlled	CBT, CBT (Grp)	> 10 hrs	Low
51	Kampman	2002	Uncontrolled	CBT	≤ 10 hrs	Low
52	Kearns	2010	Uncontrolled	CBT (Grp)	> 10 hrs	Low
53	Kellner	2016	Controlled	ERP + Med, ERP + Pla		
54	Kenwright	2005	Controlled	ERP (remote, assistance requested), ERP (remote, assistance scheduled)	≤ 10 hrs	
55	Kobak	2015	Controlled	ERP self-help, ERP (remote, lay coaching) ERP (remote, therapist coaching)	≤ 10 hrs	
ID	**Study**	**Year**	**Design**	**Treatment conditions***	**Therapist contact**	**Session freq.**
56	Krochmalik	2001	Uncontrolled	CT	≤ 10 hrs	Low
57	Krochmalik	2004	Controlled	ERP, CT (DIRT)	> 10 hrs	
58	Krone	1991	Uncontrolled	ERP (Grp)	> 10 hrs	Low
59	Kushner	2007	Controlled	ERP + Med (DCS), ERP + Pla	≤ 10 hrs	Mod
60	Kyrios	2015	Uncontrolled	CBT	> 10 hrs	Low
61	Lindsay	1997	Controlled	ERP	> 10 hrs	High
62	Lovell	2017	Controlled	(remote, therapist-assisted)	≤ 10 hrs	
63	Lovell	2006	Controlled	ERP, ERP (remote, assisted (phone))	≤ 10 hrs	
64	Lovell	2004	Uncontrolled	CBT	≤ 10 hrs	Low
65	Lovell	2000	Uncontrolled	ERP (remote, therapist assisted)	≤ 10 hrs	
66	Mahoney	2014	Controlled	ICBT (remote self-help), TAU	≤ 10 hrs	
67	Mancebo	2017	Uncontrolled	ERP (Grp)	> 10 hrs	Low
68	Marsden	2017	Controlled	ERP	> 10 hrs	
69	McLean	2001	Controlled	CT (Grp), ERP (Grp)	> 10 hrs	Low
70	McLean	2015	Uncontrolled	ERP	> 10 hrs	Mod
71	Morgieve	2014	Controlled	CBT, CBT + CAPT (computer-assisted psycho-pedagogic tool)	> 10 hrs	Low

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Table C3 (*continued*)

ID	Study	Year	Design	Treatment conditions**	Therapist contact	Session freq.
72	Nakatani	2005	Controlled	ERP + Pla, Psych Pla + Med, Psych Pla + Pill Pla	≤10 hrs	Low
73	Nedeljkovic	2011	Uncontrolled	CBT	> 10 hrs	Low
74	O'Connor	2012	Controlled	CBT (overt), CBT (overt + covert)	> 10 hrs	Mod
75	O'Connor	2005	Controlled	CBT (Grp), CBT (Ind)	> 10 hrs	Low
76	Polman	2011	Uncontrolled	CBT	> 10 hrs	Low
77	Rosqvist	2001	Uncontrolled	ERP	> 10 hrs	Mod
78	Rowa	2007	Controlled	ERP (office), ERP (home)	> 10 hrs	Mod
79	Safak	2014	Uncontrolled	CBT (Grp)	> 10 hrs	Low
80	Sampaio	2016	Uncontrolled	ERP	> 10 hrs	Mod
81	Saxena	2009	Uncontrolled	CBT	> 10 hrs	High
82	Seol	2016	Uncontrolled	CBT (self-help)	≤10 hrs	
83	Shinmei	2017	Uncontrolled	ERP	> 10 hrs	Low
ID	**Study**	**Year**	**Design**	**Treatment conditions***	**Therapist contact**	**Session freq.**
84	Simpson	2013	Controlled	ERP + Med, Med, Pla	> 10 hrs	Mod
85	Simpson	2008	Controlled	ERP + Med, Psych Pla + Med	> 10 hrs	Mod
86	Simpson	1999	Uncontrolled	ERP + Med	> 10 hrs	Mod
88	Simpson	2010	Controlled	ERP, ERP + MI	> 10 hrs	Mod
89	Sousa	2006	Controlled	CBT (Grp), Med	> 10 hrs	Low
90	Storch	2007	Controlled	ERP + Med (DCS), ERP + Pla	> 10 hrs	Low
91	Storch	2008	Controlled	CBT (high), CBT (low)	> 10 hrs	High vs Low
92	Taylor	2003	Controlled	CBT (remote, therapist-assisted)	≤10 hrs	
93	Tenneij	2005	Controlled	ERP + Med (3 months), ERP + Med (9 months)	> 10 hrs	
94	Tolin	2011	Controlled	ERP, ERP (stepped: ERP (remote-therapist assisted), ERP)	≤10 hrs (remote) > 10 hrs (ERP)	Mod (face-to-face)
95	Tolin	2005	Uncontrolled	ERP (stepped: ERP (self-help), ERP (remote, therapist-assisted), ERP)	≤10 hrs (remote) > 10 hrs (ERP)	Mod (face-to-face)
96	Tolin	2007	Controlled	ERP, ERP (stepped: ERP (self-help), ERP)	≤10 hrs (remote) > 10 hrs (ERP)	Mod (ERP)
97	Tolin	2004	Uncontrolled	ERP	> 10 hrs	High to low
98	Tundo	2007	Uncontrolled	CBT		Low
99	Van Balkom (- Van Oppen data)	1998	Controlled	CT + Med, ERP + Med	≤10 hrs	Mod
100	Van balkom	2012	Controlled	CT, Med	≤10 hrs	Low
101	Van Noppen	1997	Controlled	ERP (family), ERP (Grp)	> 10 hrs	Low
102	Van Oppen	1995	Controlled	CT, ERP	> 10 hrs	Low
103	Van Oppen	2010	Controlled	ERP (self-controlled/student therapist), ERP (self-controlled/qualified therapist), ERP (therapist-controlled/student), ERP (therapist-controlled/qualified therapist)	> 10 hrs	Low
104	Vandborg	2015	Uncontrolled	CBT	> 10 hrs	Low
105	Visser	2015	Controlled	CBT, IBA	> 10 hrs	Low
106	Vogel	2012	Uncontrolled	ERP (remote, assisted (video-conference))	> 10 hrs	
ID	**Study**	**Year**	**Design**	**Treatment conditions***	**Therapist contact**	**Session freq.**
107	Vogel	2014	Controlled	ERP (remote, assisted (video-conference)), ERP (self-help), WLC	> 10 hrs	
108	Vogel	2004	Controlled	CBT (CT + ERP), ERP + Psych Pla	> 10 hrs	Mod
109	Vos	2012	Controlled	CT (danger), CT (responsibility)	> 10 hrs	Low
110	Vyskocilova	2016	Uncontrolled	CBT + Med (Grp + Ind)	> 10 hrs	High
111	Warren	2001	Uncontrolled	CBT		Low
114	Whittal	2010	Controlled	CT, Psych Pla	> 10 hrs	Low
115	Whittal	2005	Controlled	CT, ERP	> 10 hrs	Low
116	Wilhelm	2009	Controlled	CT, WLC	> 10 hrs	Low
117	Wilhelm	2005	Uncontrolled	CT	> 10 hrs	Low
118	Wilson	2005	Uncontrolled	CT	> 10 hrs	Low
119	Wootton	2013	Controlled	CBT (remote, assisted), CBT (remote, assisted), WLC	≤10 hrs	
120	Wootton	2014	Uncontrolled	CBT (self-help)	≤10 hrs	
121	Wootton	2011	Uncontrolled	CBT (remote, therapist-assisted)	≤10 hrs	
122	Wroe	2012	Uncontrolled	CBT (Grp)	> 10 hrs	Low
123	Yang	2015	Uncontrolled	CBT	> 10 hrs	Low

Note. *Six studies that use data previously reported in other studies included in the meta-analysis for the purpose of examining CBT task adherence are not listed here, **Individual face-to-face treatment unless otherwise specified, WLC = wait-list control, Grp = Group, Med = medication, Pla = pill placebo, Psych Pla = Psychological placebo, Self-help = remote, unassisted treatment. Remote, assisted = remote therapy with therapist assistance, High = > 2*wkly, Mod = 2*wkly, Low = ≤1*wkly.

Appendix D

Table D1
Summary of Likert-scale measures of adherence to between-session CBT tasks.

Measure	Anchors							
	0	1	2	3	4	5	6	7
Homework Compliance Scale (HCS) (Primakoff et al., 1986; Leung & Heimberg, 1996)	No homework assigned	The patient did not attempt the AHW*	The patient attempted the AHW but was unable to execute it for reasons such as lack of ability or extenuating circumstances	The patient did homework that was different from AHW, but that would be considered "relevant" to cognitive therapy and the patient's particular target problems	The patient did a portion of the AHW	The patient did the AHW	The patient did more of the AHW than was requested	
Patient exposure adherence scale (PEAS) (Simpson et al., 2010) **Item a)** quantity of exposure: what % of exposures assigned did the patient attempt since last visit? (#attempted/#assigned = % attempted)	–	None (0%)	Minimal (< 10%)	Very few (˜ 25%)	About half (˜50%)	Many (˜75%)	Most (> 90%)	All that were assigned (100%)
PEASItem b) quality of exposure: how well did the patient do the assigned exposures that were attempted?	–	Refused	Attempted exposures with no intent or attempt to refrain from compulsions (e.g. few or minimal exposures conducted with full intent to ritualize after)	Attempted exposures with intention of refraining from compulsions but with obvious reluctance (e.g. spent little time on exposures, did compulsions during the exposures without making real effort to refrain)	Made a good effort to conduct the exposures as assigned by the therapist but gave into compulsions during or after the exposure	Good = completed the exposures as assigned by the therapist (e.g. appropriate exposure, correct amount of time), with minimal compulsions or safety aids during or afterwards)	Very good = exposures performed as assigned by the therapist (e.g. appropriate level exposure, correct amount of time, no compulsions during or afterwards, no safety aids	Excellent = all of the exposures attempted were performed as assigned by the therapist (e.g. appropriate level exposure, correct amount of time, no compulsions during or afterwards, no safety aids), the patient facilitated the process (e.g. made modifications to the assignment that increased the exposure) and the patient looked for opportunities to extent the exposure homework into their lifestyle)
PEASItem c) degree of ritual prevention: what % of urges to ritualise did patient successfully resist since the last visit?	–	None (0%)	Minimal (< 10%)	Sporadically (˜25%)	About half (˜50%)	Many (˜75%)	Most (> 90%)	(Most (> 90%) and re-exposed themselves if they slipped and did rituals ***or*** no urges because symptoms are so minimal ***or*** 100% response prevention
Clinician Rated Effort Scale (CRES) (Tolin et al., 2004) Degree of patient effort. For bibliotherapy, clinician considers amount of the book read, frequency/ duration of ERP, degree of effort to inhibit compulsions	Made no effort to do EX/RP	Minimal effort	Some effort	Much effort	Put their best effort into EX/RP			
Homework Compliance Rating Form (HCRF) (Tolin et al., 2011) **Item 1**. Amount of effort put into ERP assignments	No effort	Minimal effort	Some effort	Average	A lot	Best effort		

(*continued on next page*)

Table D1 (*continued*)

Measure	Anchors							
	0	1	2	3	4	5	6	7
HRCFItem 2. Time spent on exposure each day outside of the treatment session	None	30 minutes	1 hour	1.5 hours	2 hours	More than 2 hours		
HRCFItem 3. Reading – how much of the assigned reading they completed	None	(Not defined)	(Not defined)	Half	Most	All		

Note. *AHW = assigned homework.

Appendix E

Fig. E1

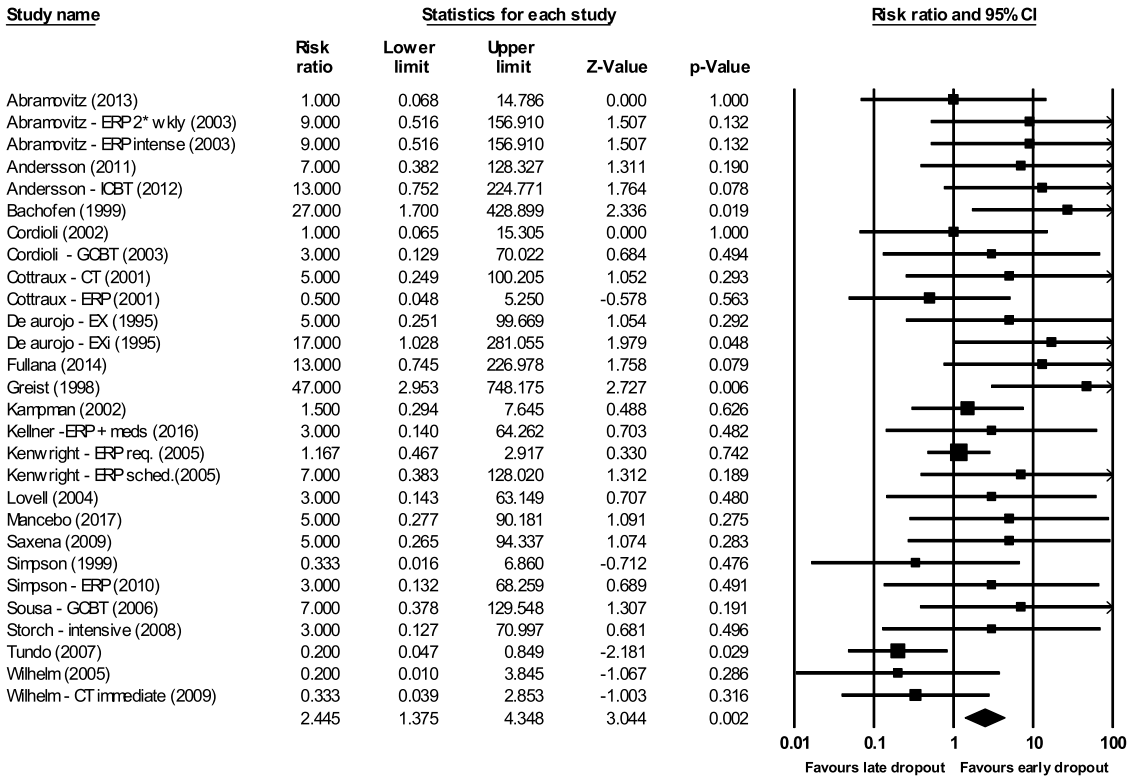

Fig. E1. Forest plot risk ratio early vs late dropout.

Appendix F

Table F1
Results from subgroup analyses of the overall refusal rate.

Moderator (*k*)	Mean % refusal	95% CI	I^2	*Q*	*p*
Therapy type				**.808**	**.37**
ERP (12)	13.6	8.7, 20.5	61.76	28.77	.002
CBT (13)	17.4	12.3, 24.1	46.34	22.37	.034
Format				**1.509**	**.22**
Face-to-face (18)	14.3	10.1, 19.9	60.59	43.14	< .001
Remote (8)	19.3	13.6, 26.6	9.51	7.74	.36
Format *				**.739**	**.39**
Group (7)	17.8	8.5, 33.5	71.97	21.41	.002
Individual (10)	12.5	8.5, 17.9	47.87	17.26	.045
Therapist contact				**.32**	**.57**
> 10 hours (17)	15.5	10.7, 21.9	64.08	44.55	< .001
≤10 hours (7)	17.9	12.7, 24.7	0.00	5.03	.54
Session frequency*				**.077**	**.78**
Twice-weekly (4)	14.8	10.3, 20.8	3.93	3.12	.37
≤ once weekly (9)	13.4	7, 24.1	77.15	35.01	< .001
Recruitment				**1.00**	**.32**
Routine (16)	17.1	11.6, 24.4	63.3	40.87	< .001
Active (8)	13.1	9, 18.6	0	5.10	< .648
Patients				**1.22**	**.27**
Non-routine (14)	12.4	9, 17	23.57	17.01	.2
Routine (10)	16.7	10.9, 24.6	56	20.45	.015

Note. ERP = Exposure and response prevention, CBT = cognitive-behavioural therapy (including ERP), remote = therapy conducted online, by phone or video-conference, * face-to-face therapies only.
(Method of Moments) Meta-regression analysis showed that therapy duration (in weeks) was not a significant predictor of treatment refusal (B = -.0499, *95% CI* [-.1685,.0686], z = -.83, p = .41, k = 15).

Table F2
Results from subgroup analyses of the overall dropout rate.

Moderator (*k*)	Mean % dropout	95% CI	I^2	*Q*	*p*
Treatment format*				**4.28**	**.039**
Individual (99)	17.3	15.4,19.4	38.36	158.99	< .001
Group (23)	12.9	10.0,16.6	18.36	28.17	.17
Session frequency*				**3.32**	**.19**
> twice-weekly (11)	14	8.2, 22.7	59.78	24.86	.006
Twice-weekly (25)	19	14.9, 23.9	34.56	36.68	.047
≤ once weekly (73)	14.8	12.9, 16.9	27.30	99.04	.019
Therapy type				**3.41**	**.49**
ERP (62)	16.6	13.7, 20	60.84	155.77	< .001
CBT (53)	15.2	12.8, 18	30.01	74.35	.028
CT (16)	14.1	10.7, 18.4	0	11.12	.75
ERP + Meds (12)	20.4	14, 28.7	54.17	24.00	.013
ERP + Pill Pla (6)	19.5	10.8, 32.5	26.54	6.81	.24
Treatment format				**.182**	**.67**
Face-to-face (125)	16.1	14.5,18	38.26	200.85	< .001
Remote (28)	14.7	9.5,22	72.51	98.23	< .001
Therapist assistance				**.57**	**.45**
Remote - self-help (8)	19.3	8.3,38.7	83.44	42.28	< .001
Remote - assisted (20)	13.5	8.8,20.4	50.97	38.75	.005
Therapist contact				**.001**	**.94**
> 10 hours (103)	15.6	13.9, 17.6	34.62	156.01	< .001
≤10 hours (42)	15.8	11.6, 21.1	67.48	126.07	. < .001
Study design				**.002**	**.97**
Controlled (94)	16	13.9, 18.3	43.41	164.33	< .001
Uncontrolled (59)	15.9	13, 19.4	59.81	144.31	< .001
Recruitment				**.001**	**.97**
Active (40)	15	12, 18.6	47.30	74.01	.001
Routine (70)	15.1	12.8,17.7	38.18	111.61	.001
Patients				**1.889**	**.169**
Non-routine (122)	15.2	13.4, 17.3	48.21	233.64	< .001
routine (24)	18.7	14.3, 24.1	54.09	50.09	.001
Medication				**.614**	**.43**
Not allowed (28)	14.5	10.8, 19.1	57.20	63.09	< .001
Allowed (119)	16.4	14.5, 18.5	46.78	221.72	< .001
Therapist experience*				**3.27**	**.20**
Pre-degree attainment (7)	19.7	16,24	0.00	3.99	0.68
Post-degree attainment (72)	16.6	14.2,19.2	42.70	123.91	< .001
Mixed (25)	15.1	12.1,18.7	17.38	29.05	0.22

Note. ERP = Exposure and response prevention, CBT = cognitive-behavioural therapy (including ERP), CT = cognitive therapy, ERP + Meds = ERP with medication, ERP + Pill Pla = ERP with pill placebo, remote = therapy conducted online, by phone or videoconference, * face-to-face therapies only.

Table F3
Results from (Method of Moments) meta-regression analyses of treatment-level dropout rates using treatment starter sample data.

Variable (*k*)	Point estimate	95% CI	*z*	*p*
Baseline mean total YBOCS (83)	−.0059	−.0779,.0661	−.16	.87
Baseline mean total BDI (41)	.0011	−.0681,.0659	−.03	.97
Baseline mean total HAMD (21)	.0847	−.0418,.2213	1.31	.19
Mean % Axis 1 co-morbidity (16)	.0079	−.0192,.0350	.57	.57
Mean % comorbid major depression (22)	.0217	−.0015,.0449	1.83	.07
Mean % concurrent medication (51)	−.0025	−.0151,.0064	−.56	.58
Mean % prior CBT (48)	−.0001	-.0121,.0119	−.02	.99
Mean Age (90)	−.0010	−.0547,.0555	−.03	.97
Mean % Female (78)	−.0068	−.0203,.0066	−.99	.32
Mean % work (28)	−.0007	−.0146,.0133	−.09	.93
Mean % married or living together (38)	−.0025	−.0181,.0132	−.31	.76
Mean % Caucasian (18)	−.0009	−.0386,.0368	−.05	.96
Mean Years Education (18)	−.0097	−.0372, .0178	−.69	.49
Mean Duration of OCD (51)	−.0101	−.0594, .0391	−.4	.69
Treatment duration in weeks (106)*	.0048	−.0206, .0302	.37	.71

Note. Pre-YBOCS = Pre-treatment mean total Yale-Brown Obsessive-Compulsive Scale score, BDI = Pre-treatment mean total Becks Depression Inventory, HAMD = Pre-treatment mean total Hamilton rating scale for depression* face-to-face therapies.

Appendix G

Fig. G1

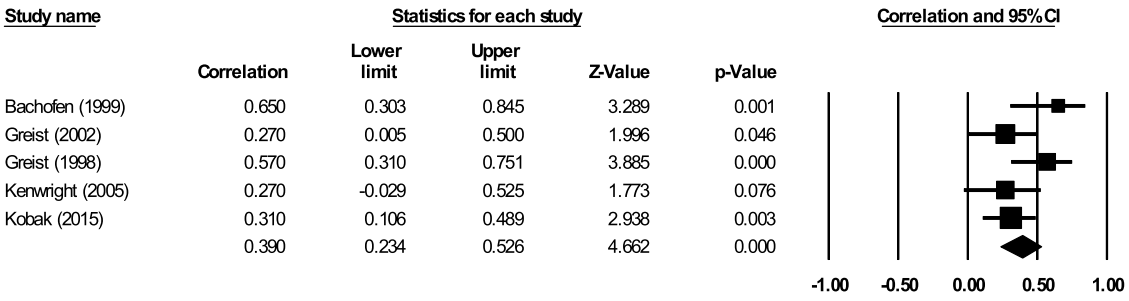

Fig. G1. Forest plot of correlation between ERP task adherence and post-treatment Y-BOCS change scores.

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