Internet-based cognitive behaviour therapy for obsessive–compulsive disorder: a randomized controlled trial

E. Andersson[1]*, J. Enander[1,2], P. Andrén[2], E. Hedman[3], B. Ljótsson[4], T. Hursti[2], J. Bergström[1,5], V. Kaldo[1], N. Lindefors[1], G. Andersson[1,6] and C. Rück[1]

[1] *Department of Clinical Neuroscience, Division of Psychiatry, Karolinska Institutet, Stockholm, Sweden*
[2] *Department of Psychology, Uppsala University, Uppsala, Sweden*
[3] *Department of Clinical Neuroscience, Osher Center for Integrative Medicine & Division of Psychology, Karolinska Institutet, Stockholm, Sweden*
[4] *Department of Clinical Neuroscience, Division of Psychology, Karolinska Institutet, Stockholm, Sweden*
[5] *Department of Psychology, Stockholm University, Stockholm, Sweden*
[6] *Department of Behavioural Sciences and Learning, Swedish Institute for Disability Research, Linköping University, Linköping, Sweden*

Background. Cognitive behaviour therapy (CBT) is an effective treatment for obsessive–compulsive disorder (OCD) but access to CBT is limited. Internet-based CBT (ICBT) with therapist support is potentially a more accessible treatment. There are no randomized controlled trials testing ICBT for OCD. The aim of this study was to investigate the efficacy of ICBT for OCD in a randomized controlled trial.

Method. Participants ($n=101$) diagnosed with OCD were randomized to either 10 weeks of ICBT or to an attention control condition, consisting of online supportive therapy. The primary outcome measure was the Yale–Brown Obsessive Compulsive Scale (YBOCS) administered by blinded assessors.

Results. Both treatments lead to significant improvements in OCD symptoms, but ICBT resulted in larger improvements than the control condition on the YBOCS, with a significant between-group effect size (Cohen's *d*) of 1.12 (95% CI 0.69–1.53) at post-treatment. The proportion of participants showing clinically significant improvement was 60% (95% CI 46–72) in the ICBT group compared to 6% (95% CI 1–17) in the control condition. The results were sustained at follow-up.

Conclusions. ICBT is an efficacious treatment for OCD that could substantially increase access to CBT for OCD patients. Replication studies are warranted.

Introduction

Obsessive–compulsive disorder (OCD) is a prevalent and disabling condition (Weissman *et al.* 1994; Kessler *et al.* 2005) that often follows a chronic course if untreated (Skoog & Skoog, 1999; Mataix-Cols *et al.* 2002). Cognitive behaviour therapy (CBT) is considered to be an evidence-based treatment for OCD, with response rates averaging 50–70% (Abramowitz, 2006; Simpson *et al.* 2006). However, despite evidence that CBT leads to reduction in OCD symptoms, few patients actually receive the treatment (Goodwin *et al.* 2002). In a British study conducted in 2000, only 5% of adults with OCD actually received CBT (Torres *et al.* 2007) and similar

numbers have been found in the USA (Blanco *et al.* 2006). One of the possible reasons for this is the lack of CBT therapists within the healthcare system (Shapiro *et al.* 2003; Mataix-Cols & Marks, 2006). Therefore, it is important to develop new treatment delivery formats that can increase accessibility of CBT with sustained efficacy. Internet-based CBT (ICBT) with therapist support is an effective treatment format for several psychiatric conditions (Andersson, 2009), including anxiety disorders such as panic disorder (Bergstrom *et al.* 2010), social anxiety disorder (Hedman *et al.* 2011*b*), and severe health anxiety (Hedman *et al.* 2011*a*) but there are no large-scale trials that have investigated ICBT for OCD. The effect sizes of ICBT are similar to face-to-face CBT for several psychiatric and medical conditions (Bergstrom *et al.* 2010), but ICBT has the advantage of being more accessible and requiring less therapist time (Andersson, 2009).

* Address for correspondence: Mr E. Andersson, M 46, Karolinska University Hospital, Huddinge, SE-141 86 Stockholm, Sweden.
(Email: erik.m.andersson@ki.se)

Historically, other types of self-help-based treatments for OCD have been developed and investigated in research (Mataix-Cols & Marks, 2006; Tolin *et al.* 2007; Moritz *et al.* 2010), among which 'Behaviour Therapy Steps' (BT Steps) has the strongest empirical support (Tumur *et al.* 2007). In BT Steps, the patient follows a self-help book and uses a touchtone telephone system to receive automated guidance, but no therapist contact is provided. One trial showed that BT Steps had superior effects to relaxation training but inferior effects to individual CBT (Greist *et al.* 2002). In another trial (Kenwright *et al.* 2005), patients received therapist support via telephone in addition to the BT Steps programme, and this procedure was associated with higher effects and lower dropouts than non-guided therapy (Tumur *et al.* 2007). In contrast to BT Steps, ICBT is a more flexible, completely internet-based and interactive. The patients are guided by an online therapist who grants gradual access to self-help modules and provides feedback on homework exercises (Andersson *et al.* 2008). In a recent open pilot study ($n=23$) of therapist-guided ICBT for OCD (Andersson *et al.* 2011), large effect sizes were found (Cohen's $d=1.56$), and a majority (61%) of participants had a clinically significant improvement using the clinician-administered Yale–Brown Obsessive Compulsive Scale (YBOCS). Similar effect sizes were found in another open pilot study of ICBT for OCD (Wootton *et al.* 2011). However, to the best of our knowledge, there are no published randomized controlled trials testing ICBT for OCD. Based on these findings, the aim of this study was to investigate the efficacy of ICBT for OCD in a randomized controlled trial. We hypothesized that ICBT would result in statistically significant reductions in OCD symptoms, depression and general functioning, compared to an active control condition.

Methods

Participants and recruitment

The present study was open to adults in Sweden with a primary diagnosis of OCD, according to DSM-IV-TR criteria (APA, 2000). Participants with co-morbid disorders were included if OCD was the primary psychiatric condition. Concurrent use of psychotropic medication was permitted, if it had been stable for at least 2 months prior to inclusion, and if the participant agreed to maintain a constant dosage throughout the study.

The exclusion criteria were:

(1) Having undergone CBT for OCD during the last 2 years.
(2) Current other psychological treatment.
(3) Current alcohol or drug abuse.

(4) Extreme OCD (YBOCS >31) (Goodman *et al.* 1989).
(5) Minimal OCD symptoms (YBOCS <12) (McLean *et al.* 2001, van Oppen *et al.* 1995).
(6) OCD symptoms primarily associated with hoarding.
(7) History of psychosis or bipolar disorder.
(8) Suicidal ideation.
(9) Axis II diagnosis that could jeopardize treatment participation.
(10) Physical illness that could interfere with ICBT.

Participants were recruited by referral from primary-care physicians, mental health professionals and through self-referral. Information about the study was published on the official web page of the clinic at Karolinska University Hospital and through advertisements in national newspapers. In the first stage of recruitment, participants ($n=212$) consenting to participate completed an online screening consisting of YBOCS (self-rating version; Rosenfeld *et al.* 1992), Obsessive Compulsive Inventory – Revised (OCI-R; Foa *et al.* 2002), Montgomery–Åsberg Depression Rating Scale – Self-report (MADRS-S; Svanborg & Åsberg, 1994), Alcohol Use Disorders Identification Test (AUDIT; Saunders *et al.* 1993), and the Drug Use Disorders Identification Test (DUDIT; Berman *et al.* 2005). After completing the online screening, participants fulfilling the initial criteria ($n=191$) were interviewed by telephone to establish whether inclusion or exclusion criteria were met and to assess baseline OCD severity and general functioning. Information on medical history and medication use were collected during the interviews. OCD diagnostic criteria were verified through the Structured Clinical Interview for Mental Disorders (SCID-I; First *et al.* 1999) via the telephone. Severity level of OCD symptoms was assessed using the clinician-administered YBOCS (Goodman *et al.* 1989) and the Clinical Global Impression Scale (CGI; Guy, 1976). Comorbid psychiatric conditions were assessed with the Mini International Neuropsychiatric Interview (MINI; Sheehan *et al.* 1998). The assessors were either licensed psychologists or clinical psychology students in their final year of the 5-year psychologist programme. All assessors received extensive training in psychiatric diagnostics from a senior psychiatrist. To ensure reliability in the diagnostic procedure, the psychiatrist and a licensed psychologist reviewed all cases before deciding on inclusion. After the telephone interview, participants completed an online assessment at baseline and were then included and randomized ($n=101$) into two groups, ICBT or control condition (Fig. 1).

The study protocol was approved by the regional ethics review board in Stockholm, Sweden. The trial
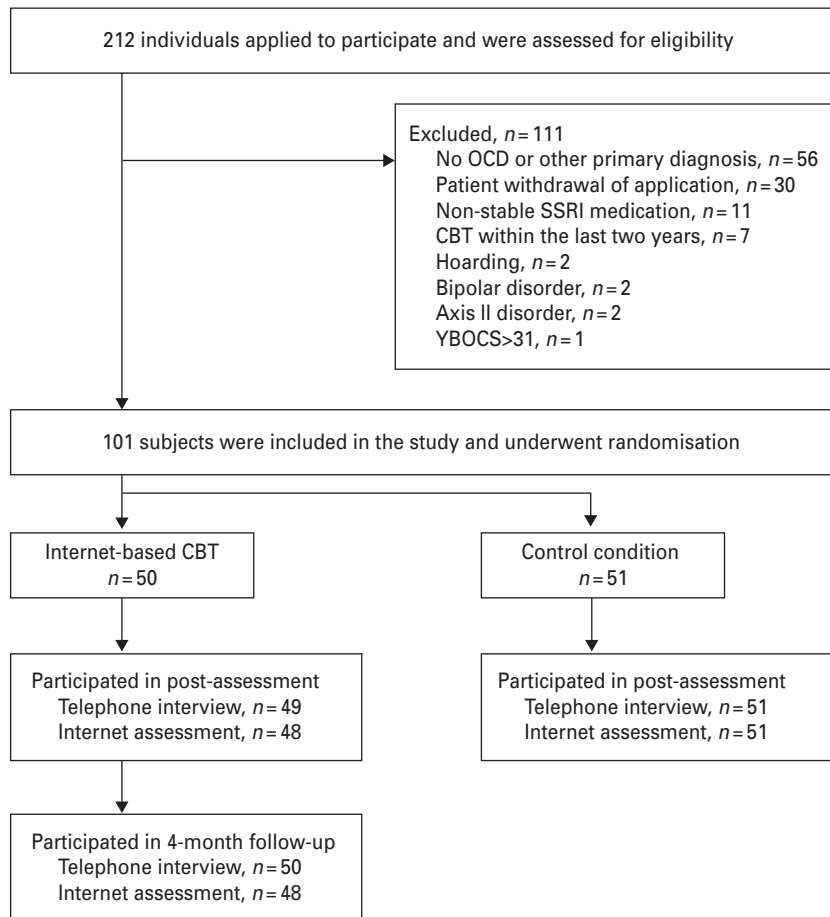
Fig. 1. Participant flow and reasons for dropout throughout the trial. CBT, Cognitive behavioural therapy; OCD, obsessive–compulsive disorder; SSRI, selective serotonin reuptake inhibitor; YBOCS, Yale–Brown Obsessive Compulsive Scale.

was registered at Clinicaltrials.gov, registration ID: NCT01347099.

Outcome measures

Primary outcome measure

The primary outcome measure was the clinician-administered YBOCS (Goodman *et al.* 1989), which is regarded as the gold standard for assessing the severity of OCD symptoms (Baer & Blais, 2010).

Secondary outcome measures

The secondary outcome measure of OCD symptoms was the OCI-R (Foa *et al.* 2002). In accordance with previous research (Simpson *et al.* 2008), the outcome was assessed by both the OCI-R total score and the subscale with the highest score for an individual participant. Depressive symptoms were assessed with MADRS-S (Svanborg & Åsberg, 1994). Global functioning was measured with the Clinical Global Impression Scale – Severity (CGI-S; Guy, 1976), Clinical

Global Impression Scale – Improvement (CGI-I; Guy, 1976), and the Global Assessment of Functioning Scale (GAF; APA, 2000).

Randomization and assessment points

Participants were randomized (www.random.org) with a 1:1 ratio by an independent person who was not involved in the study. All outcome measures were assessed at baseline, post-treatment and 4 months after treatment completion. A flowchart outlining the trial design is displayed in Fig. 1. The OCI-R (Foa *et al.* 2002) was administered as an online weekly rating in order to monitor treatment progression. The reason for having the OCI-R as weekly rating is that it is a short and easy to use instrument, with high test–retest reliability (α values 0.81–0.89) and has high sensitivity to change (Abramowitz *et al.* 2005). Clinician-administered measures were the YBOCS, GAF, and CGI. Assessors gathered information about adverse events. The assessors were blinded to treatment allocation at the post-treatment interview and

were instructed to guess to which treatment condition the participant had been randomized in order to control for blinding integrity. Adverse events were also assessed via telephone interviews at the 4-month follow-up.

One participant in the ICBT group was lost to the post-treatment telephone interview assessment, and two participants did not complete the internet self-rating questionnaires. At the 4-month follow-up, all participants in the ICBT group were assessed via telephone while two participants did not complete the internet questionnaires. There was no loss of data for the control group at baseline or post-treatment. As the control condition was crossed over to ICBT after the post-treatment assessments were completed, this group was not included in the 4-month follow-up assessment.

Interventions

ICBT

The treatment was based on established CBT methods for treating OCD, including psychoeducation, cognitive restructuring, exposure with response prevention (ERP), and a relapse prevention programme (Abramowitz, 2006, 2009). The treatment consisted of text material (about 100 pages) and worksheets divided into 10 modules (i.e. chapters). The material was also accessible as an mp3 file (about 5 h of total listening) that the participant could download to their computer. All participants read the same texts relating to general psychoeducation and rationale for the treatment, but tailored examples of obsessions and compulsions were given according to participants' subtype of OCD (washing, checking, symmetry, forbidden thoughts). Modules 1–4 consisted of psychoeducation, cognitive restructuring of meta-cognitions, and of establishing an individual ERP hierarchy. Participants were encouraged to spend no more than 1 week on each of the first four modules. All participants had to proceed through modules 1–4 consecutively in order to access the ERP treatment. Modules 5–10 focused on doing daily *in vivo* ERP exercises. These modules were not fixed in a predetermined order but were opened by the therapist depending on the kind of OCD subtype the patient had. Worksheets, self-rating assessments, text material, mp3 files, and therapist e-mail contact were integrated in one single treatment platform that required username and password authentication to be accessed. Detailed information about the treatment content is presented elsewhere (Andersson *et al*. 2011).

The ICBT programme lasted 10 weeks. The therapists had no face-to-face contact with the participants during treatment and their main role was to provide feedback on homework assignments, grant consecutive access to the modules, and to support the participants in doing ERP. The therapists replied to the participants within 24 h on weekdays, and participants were encouraged to contact the therapist if they needed support or clarification. Participants were notified by a short mobile text message (SMS) whenever they received a new message from their therapist in the treatment platform. An SMS was also sent to participants if they had not logged on to the treatment platform for 7 days. If the participant had not logged on within a few days after this SMS, the therapist telephoned the participant to check their status and to remind him/her to log on as soon as possible.

The therapists were all clinical psychology students in their final year of the 5-year psychology programme and had access to on-demand supervision from a licensed psychologist and received scheduled supervision with a psychotherapist on six occasions during the treatment period. Participants interacted with same therapist throughout the whole treatment. Both the psychologist and the psychotherapist had extensive clinical experience in CBT for OCD. To ensure treatment integrity, the psychologist monitored treatment adherence in the treatment platform each day during the entire treatment period.

Control condition

The control condition received online non-directive supportive therapy, which consisted of access to an e-mail function integrated in the treatment platform, through which participants could communicate with a therapist. There were no active treatment components such as self-help texts or worksheets. Each week, the therapist contacted the participant through the treatment platform to enquire how the week had progressed and to encourage the participant to discuss current distressing life events. As with the ICBT group, an SMS was automatically sent whenever the participant had a new message from the therapist. The therapist also telephoned the participant, if he/she had not completed the weekly internet self-ratings. This group used the same therapists as the ICBT group but this contact did not include any CBT interventions.

Non-directive supportive therapy is effective in treating depression (Ward *et al*. 2000) and generalized anxiety disorder (Hunot *et al*. 2007), and, when delivered via the internet, reduces post-traumatic stress disorder symptoms and anxiety (Litz *et al*. 2007). Thus, the rationale for using this control condition was to ensure basic control for attention and possible alleviating effects of sharing one's distress with a professional therapist. As with the ICBT group,

participants in the control condition could expect an answer within 24 h on weekdays, and a licensed psychologist monitored the therapist's communications each day to ensure treatment integrity.

Statistical analyses

Statistical data were analysed with SPSS v. 19 (IBM Inc., USA). Repeated-measures ANOVA was used for continuous data and independent and dependent *t* tests were used *post hoc* on continuous variables. Between-group ordinal and nominal data were analysed with Mann–Whitney and χ^2 tests and within-group ordinal and nominal data were analysed with Wilcoxon's and McNemar's tests. Blinding integrity was tested with Fisher's exact test with the assessor's guess of treatment allocation as a variable, and with CGI-I scores held as covariate. Cases where blinding was broken were excluded from this analysis. To calculate effect sizes, Cohen's *d* formula, based on mean differences and pooled standard deviations (S.D.), was used. Clinically significant improvement was determined by the Jacobson & Truax (1991) criteria, where patients (*a*) made a statistically reliable baseline to post-treatment improvement and (*b*) obtained a post-treatment score 2 S.D. below the mean pre-treatment value. To control for the difference in therapist time and number of sent messages, the ANOVA was repeated using therapist time and number of sent messages as covariates. Baseline differences between completers and non-completers were tested using independent *t* tests. To test within-group changes after receiving ICBT, dependent *t* tests were conducted from post-treatment to follow-up. Power analysis indicated an 84% chance of detecting a between-group effect size of $d = 0.6$ (α level $= 0.05$).

Results

Baseline characteristics

Baseline demographics

There were no significant differences between treatment and control groups at baseline for any demographical variable or outcome measure. Mean CGI-S scores at baseline were 3.60 (S.D. $= 0.70$) for the ICBT group and 3.47 (S.D. $= 0.86$) in the control condition, respectively. Baseline demographics are presented in Table 1.

Primary outcome measure

There was a significant group $\times$ time interaction effect on the YBOCS ($F = 63.87$, df $= 1$, 98, $p < 0.001$), and within-group improvements for both the ICBT

Table 1. *Patient characteristics at baseline*

Variable	ICBT	Control
Gender (*n*)		
Women	33	34
Men	17	17
Age (yr)		
Mean age (S.D.)	33 (12)	35 (14)
Min-max	19–62	18–67
Occupational status (*n*)		
Working full-time	27	28
Student	8	6
Part-time work	11	14
Full-time sick leave	–	1
Unemployed	3	2
Retired	1	–
Earlier psychological treatment (*n*)		
Psychodynamic therapy	6	8
Cognitive therapy	2	1
Cognitive behaviour therapy	13	10
Non-specific counselling	12	14
None	17	18
Education (*n*)		
Primary school	2	–
High school	13	14
University <3 years	11	10
University ⩾3 years	24	27
Psychotropic medication (*n*)		
SSRI	8	10
SNRI	1	1
Benzodiazepines	1	1
Antihistamines	–	1
OCD duration (yr)		
Mean length (S.D.)	18 (12)	18 (13)
Min-max	2–55	1–52
Referral (*n*)		
Self-referral	44	49
GP referral	5	1
Mental health professional referral	1	1

ICBT, Internet-based cognitive behaviour therapy; SSRI, selective serotonin reuptake inhibitors; SNRI, serotonin-norepinephrine reuptake inhibitors; OCD, obsessive–compulsive disorder; GP, general practitioner.

group and control condition ($t = 12.27$–4.34, df $= 48$–50, $p < 0.001$). The within-group effect size was large for the ICBT group ($d = 1.55$) and borderline moderate for the control condition ($d = 0.48$). At post-treatment, there was a between-group mean difference ($t = 5.61$, d.f. $= 98$, $p < 0.001$), with a large between-group effect size ($d = 1.12$) in favour of the ICBT group. The number of participants achieving clinically significant change according to Jacobson & Truax (1991) criteria was 60% (95% CI 46–72) in the ICBT group and 6%

(95% CI 1–17) in the control condition ($p<0.001$). The results were sustained ($t=0.99$, df$=49$, $p=0.33$) with 54% (95% CI 40–67) of the ICBT group achieving clinically significant improvements at follow-up. The main results are presented in Table 2.

Secondary outcome measures

Significant interaction effects were found on the OCI-R total score ($F=40.61$, df$=1$, 97, $p<0.001$), OCI-R subscale with highest score ($F=36.92$, df$=1$, 97, $p<0.001$), MADRS-S ($F=5.19$, df$=1$, 97, $p<0.05$), and GAF ($F=11.69$, df$=1$, 98, $p<0.01$). There were within-group baseline to post-treatment improvements on all secondary outcome measures in the ICBT group ($t=5.65–7.86$, df$=47–48$, $p<0.001$). The control group made a baseline to post-treatment improvement only on the GAF ($t=2.62$, df$=50$, $p<0.05$). Independent t tests revealed between-group post-treatment differences on the OCI-R ($t=3.07$, df$=97$, $p<0.01$), OCI-R subscale with highest score ($t=4.33$, df$=97$, $p<0.001$), and GAF ($t=2.83$, df$=98$, $p<0.01$), with effect sizes ranging between 0.57 and 0.87 (Table 2). The MADRS-S between-group means were not significant at post-treatment ($t=0.92$, df$=97$, $p=0.36$). Weekly mean OCI-R total scores are presented in Fig. 2 with 95% confidence intervals.

At post-treatment, there were between-group effects on both CGI-I and CGI-S ($Z=3.68–6.93$, $p<0.001$). Mean CGI-S scores at post-treatment were 2.61 (s.d.$=0.93$) for the ICBT group and 3.43 (s.d.$=1.01$) in the control condition, respectively, but only the ICBT group had a significant within-group effect on this outcome measure ($Z=5.77$, $p<0.001$). The mean CGI-I scores were 2.27 (s.d.$=0.073$) in the ICBT group and 4.82 (s.d.$=8.77$) in the control condition at post-treatment. The results were sustained for the ICBT group at follow-up (mean$=2.20$, s.d.$=1.11$). The ICBT group made a significant increase on the GAF from post-treatment to follow-up ($t=4.75$, df$=48$, $p<0.001$). There were no significant post-treatment to follow-up change for any other secondary outcome ($t=0.50–1.72$, df$=47$, $p=0.09–0.62$) ($Z=0.79–1.18$, $p=0.94–0.24$). However, the MADRS-S had a non-significant within-group effect size at follow-up ($t=1.62$, df$=47$, $p=0.11$).

Treatment adherence and attrition

There were between-group differences regarding therapist time and number of messages sent from the therapist ($t=9.90–11.60$, df$=99$, $p<0.001$). The total mean therapist time for the ICBT group was 129 min (s.d.$=67.26$) and the total number of messages sent from the therapist was 35 (s.d.$=13.95$) per participant.

The total mean therapist time for the control condition was 17 min (s.d.$=15.16$) and the average total number of messages sent from the therapist was 16 (s.d.$=2.94$). The average number of completed modules in the ICBT group was 7.28 (s.d.$=2.56$), and the therapists made 17 telephone calls to the ICBT group reminding them to report ERP progression on the treatment platform. For the control condition, the therapists made 41 telephone calls reminding them to do the weekly internet-administered self-ratings. To control for the difference in therapist time and number of sent messages the interaction analysis was repeated on the primary outcome (YBOCS) using these possible confounders as covariates. The results remained significant ($F=5.73$, df$=1$, 96, $p<0.05$). Six participants in the ICBT group were considered as non-completers, as they did not begin ERP. Independent t tests showed no significant baseline differences between non-completers and completers ($t=-0.31$ to 1.55, df$=50$, $p=0.13–0.76$).

Blinding integrity

Blinding was broken for five participants in the ICBT group and for one participant in the control condition during the post-treatment interview assessments. There was no association between assessor's guess and randomization allocation when Fisher's exact test was performed, with the CGI-I scores held as covariates ($p=0.84–0.11$).

Adverse events

At post-treatment, two participants in the ICBT group reported adverse events that could be associated with the treatment. One participant immediately stopped the treatment due to increased OCD symptoms and left the study. Another participant reported increased sleep disturbances due to a heightened anxiety level when beginning ERP, but these symptoms diminished after 5 weeks of ERP. At follow-up, one participant reported increased depressive symptoms a few weeks after the treatment ended: these symptoms were still prominent and impairing 4 months after receiving ICBT.

Discussion

This is, to our knowledge, the first randomized controlled trial to investigate the efficacy of ICBT for OCD. The results show that ICBT is superior to the control condition in improving OCD symptoms, depressive symptoms, and general functioning. The between-group effect sizes were large at post-treatment, significantly favoured ICBT despite a significant pre- to post-treatment improvement in the control group.

Table 2. *Continuous treatment outcome measures*

Measure	Baseline n	Baseline Mean	Baseline S.D.	Post-treatment n	Post-treatment Mean	Post-treatment S.D.	4-months follow-up n	4-months follow-up Mean	4-months follow-up S.D.	Effect size at post-treatment Within group (95% CI)	Effect size at post-treatment Between group (95% CI)	Effect size at follow-up Within group (95% CI)	p value Group x time interaction
YBOCS													
ICBT	50	21.42	4.59	49	12.94	6.26	50	12.56	7.34	1.55 (1.09 to 1.98)	1.12 (0.69 to 1.53)	1.45 (1.00 to 1.88)	<0.001
CC	51	20.80	4.04	51	18.88	4.18				0.47 (0.07 to 0.86)			
OCI-R[a]													
ICBT	50	24.36	13.25	48	12.50	10.15	48	13.69	10.61	1.00 (0.57 to 1.41)	0.62 (0.21 to 1.02)	0.89 (0.47 to 1.29)	<0.001
CC	51	19.86	9.48	51	19.22	11.52				0.06 (−0.33 to 0.45)			
OCI-R[b]													
ICBT	50	9.10	3.14	48	5.23	3.18	48	5.04	2.95	1.23 (0.78 to 1.65)	0.87 (0.45 to 1.28)	1.33 (0.89 to 1.75)	<0.001
CC	51	8.37	2.51	51	7.94	3.05				0.15 (−0.24 to 0.55)			
MADRS-S													
ICBT	50	12.82	8.10	48	8.90	6.67	48	10.71	7.34	0.53 (0.12 to 0.93)	0.19 (−0.21 to 0.58)	0.27 (−0.13 to 0.67)	<0.05
CC	51	10.98	6.83	51	10.16	6.94				0.12 (−0.24 to 0.54)			
GAF													
ICBT	50	58.98	8.05	49	65.78	8.65	48	71.33	12.18	0.81 (0.40 to 1.22)	0.57 (0.16 to 0.96)	1.20 (0.76 to 1.61)	<0.01
CC	51	59.76	6.99	51	60.18	10.94				0.05 (−0.34 to 0.43)			

CI, Confidence interval; YBOCS, Yale–Brown Obsessive–Compulsive Scale; ICBT, internet-based cognitive behaviour therapy; CC, control condition; OCI-R, Obsessive Compulsive Inventory – Revised; MADRS-S, Montgomery– Åsberg Depression Rating Scale – Self rating; GAF, Global Assessment of Functioning.

[a] Total score.
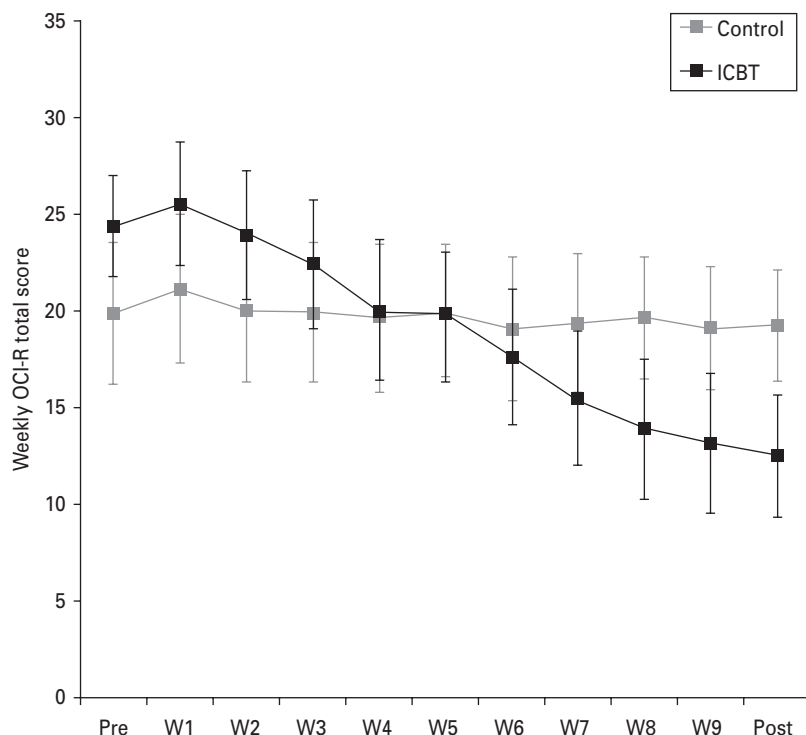[b] Subscale with the highest score.

Fig. 2. Weekly Obsessive Compulsive Inventory – Revised (OCI-R) total score ratings with 95% confidence intervals. ICBT, Internet-based cognitive behaviour therapy; W, week.

The results were maintained at follow-up, indicating sustained efficacy and a lasting potential of ICBT for OCD. The effect sizes and proportion of treatment responders were in the same range as reported for face-to-face CBT in previous studies (Gava *et al.* 2007; Hofmann & Smits, 2008).

The therapists in this trial spent an average of 129 min per participant over the 10-week period, which is substantially lower than in traditional face-to-face treatment (with a corresponding figure in the range of 540–900 min). Despite reduced therapist time, the participants could expect feedback within 24 h on weekdays from their therapist and some participants had contact with the therapist 3–4 days per week. Thus, one possible advantage of ICBT is the combination of overall limited therapist time and the flexibility of increasing therapist input during some parts of the treatment (i.e. ERP intensive periods): intensive contact face-to-face CBT has also been tested for OCD with promising results (Storch *et al.* 2008). Another advantage of ICBT is the highly controlled context of treatment delivery. This minimizes the risk of therapist drift and helps both the therapist and the patient to focus on maximizing the ERP intensity.

The major strengths of this study were the use of adequate power, randomization, and blinded assessors. However, the study also has limitations. First, the participants in the control condition were aware they would receive ICBT later and had less therapist contact than the ICBT group (129 min in the ICBT group *v.* 17 min in the control condition). Furthermore, more telephone calls were made to control group subjects reminding them about the weekly online assessments (41 calls in the control condition *v.* 17 calls in the ICBT group) and this suggests that the control subjects were not as engaged in the programme as the ICBT group. Thus, the differences in effects between the two groups might be due to non-specific factors. However, the results remained significant when repeating the analysis when holding therapist time and number of sent messages as covariates. Thus, the difference between the groups on these variables is unlikely to have affected the outcome to a substantial degree. Second, as the participants were crossed over to ICBT after 10 weeks, there could be no between group-comparisons at follow-up. Third, patients were largely self-selected and the study population might not have been representative of the typical OCD patient within psychiatric care. However, GP-referred patients may have better treatment outcome than self-referred patients or those referred by a mental health professional (Mataix-Cols *et al.* 2006). Thus, even though the participants in this study were mainly a self-referred population, evidence does not suggest that they should be more responsive to treatment compared to GP-referred patients. Fourth, we excluded severe OCD (YBOCS

>31) and this could affect the generalizability of the results. The reason for this exclusion criteria was because it has been suggested that face-to-face CBT should be the treatment of choice for severe cases of OCD (Mataix-Cols & Marks, 2006). However, the empirical evidence regarding this issue is limited and one recommendation for future studies is therefore to have a wider symptom range, including more severe OCD cases. As there was only one case of exclusion due to extreme symptoms in this trial, this criterion should not have affected the outcome substantially.

The results from this trial are promising as ICBT achieved large effect sizes and a large amount of treatment responders, yet the time to treat a patient was about one fourth of regular face-to-face CBT. Consequently, this treatment format could considerably increase the accessibility of evidence-based psychological treatment for OCD. This could be especially important for patients who would not otherwise seek help because of feelings of shame. This trial also opens new venues for future development. As previously mentioned, an advantage with ICBT is the combination of overall limited therapist time and also the flexibility of increasing therapist input during demanding parts of the treatment. A common problem for CBT therapists is that the patients do not do their homework properly. One possible future application is ICBT as an adjunct to face-to-face CBT, i.e. weekly face-to-face sessions in combination with online reports on treatment progression with the therapist reminding and encouraging the patient to do ERP between-session exercises. This could perhaps increase compliance to homework and at the same time increase the sense of responsibility for the treatment by the patient. Another problem in CBT is that some individuals with OCD relapse after receiving treatment. One option to counteract relapse and/or enhance further progression is to add internet-based booster programmes after receiving either face-to-face CBT or ICBT. Consequently, ICBT seems to offer various combinations and opportunities for strengthening treatment adherence and acceptability in patients suffering from OCD.

To summarize, ICBT reduces OCD symptoms, depressive symptoms and increases general functioning compared to an active control group. This treatment may also increase treatment accessibility thereby attracting patient groups who would not otherwise seek or receive help. This study warrants replications and future evaluations should test ICBT against face-to-face CBT.

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Declaration of Interest

None.

References

Abramowitz J, Tolin D, Diefenbach G (2005). Measuring change in OCD: sensitivity of the Obsessive Compulsive Inventory – Revised. *Journal of Psychopathology and Behavioral Assessment* **27**, 317–324.

Abramowitz JS (2006). The psychological treatment of obsessive-compulsive disorder. *Canadian Journal of Psychiatry* **51**, 407–416.

Abramowitz JS (2009). *Getting over OCD: a 10-step Workbook for Taking Back Your Life*. Guilford Press: New York.

Andersson E, Ljotsson B, Hedman E, Kaldo V, Paxling B, Andersson G, Lindefors N, Rück C (2011). Internet-based cognitive behavior therapy for obsessive compulsive disorder: a pilot study. *BioMed Central Psychiatry* **11**, 125.

Andersson G (2009). Using the Internet to provide cognitive behaviour therapy. *Behavior Research and Therapy* **47**, 175–180.

Andersson G, Bergstrom J, Buhrman M, Carlbring P, Hollandare F, Kaldo V, Nilsson-Ihrfelt E, Paxling B, Strom L, Waara J (2008). Development of a new approach to guided self-help via the internet: the Swedish Experience. *Journal of Technology in Human Services* **26**, 161–181.

APA (2000). *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV-TR*). American Psychiatric Association: Washington, DC.

Baer L, Blais MA (2010). *Handbook of Clinical Rating Scales and Assessment in Psychiatry and Mental Health*. Humana Press: New York.

Bergstrom J, Andersson G, Ljotsson B, Rück C, Andreewitch S, Karlsson A, Carlbring P, Andersson E, Lindefors N (2010). Internet- versus group-administered cognitive behaviour therapy for panic disorder in a psychiatric setting: a randomised trial. *BioMed Central Psychiatry* **10**, 54.

Berman AH, Bergman H, Palmstierna T, Schlyter F (2005). Evaluation of the Drug Use Disorders Identification Test (DUDIT) in criminal justice and detoxification settings and in a Swedish population sample. *European Addiction Research* **11**, 22–31.

Blanco C, Olfson M, Stein DJ, Simpson HB, Gameroff MJ, Narrow WH (2006). Treatment of obsessive-compulsive disorder by U.S. psychiatrists. *Journal of Clinical Psychiatry* **67**, 946–951.

First MB, Gibbon M, Spitzer RL, Williams JBW, Benjamin LS (1999). *Structured Clinical Interview for*

DSM-IV Axis I Disorders (*SCID-I*) (Swedish Version). Pilgrim Press.: Danderyd.

Foa EB, Huppert JD, Leiberg S, Langner R, Kichic R, Hajcak G, Salkovskis PM (2002). The Obsessive-Compulsive Inventory: development and validation of a short version. *Psychological Assessment* **14**, 485–496.

Gava I, Barbui C, Aguglia E, Carlino D, Churchill R, De Vanna M, McGuire HF (2007). Psychological treatments versus treatment as usual for obsessive compulsive disorder (OCD). *Cochrane Database of Systematic Reviews*. Issue No. 18. Art. No. CD005333.

Goodman WK, Price LH, Rasmussen SA, Mazure C, Fleischmann RL, Hill CL, Heninger GR, Charney DS (1989). The Yale-Brown Obsessive Compulsive Scale. I. Development, use, and reliability. *Archives of General Psychiatry* **46**, 1006–1011.

Goodwin R, Koenen KC, Hellman F, Guardino M, Struening E (2002). Helpseeking and access to mental health treatment for obsessive-compulsive disorder. *Acta Psychiatrica Scandinavica* **106**, 143–149.

Greist JH, Marks IM, Baer L, Kobak KA, Wenzel KW, Hirsch MJ, Mantle JM, Clary CM (2002). Behavior therapy for obsessive-compulsive disorder guided by a computer or by a clinician compared with relaxation as a control. *Journal of Clinical Psychiatry* **63**, 138–145.

Guy W (ed.) (1976). *Clinical Global Impressions*. US Department of Health and Human Services: Rockville, MD.

Hedman E, Andersson G, Andersson E, Ljotsson B, Rück C, Asmundson GJ, Lindefors N (2011*a*). Internet-based cognitive-behavioural therapy for severe health anxiety: randomised controlled trial. *British Journal of Psychiatry* **198**, 230–236.

Hedman E, Andersson G, Ljotsson B, Andersson E, Rück C, Mortberg E, Lindefors N (2011*b*). Internet-based cognitive behavior therapy vs. cognitive behavioral group therapy for social anxiety disorder: a randomized controlled non-inferiority trial. *PLoS One* **6**, e18001.

Hofmann SG, Smits JA (2008). Cognitive-behavioral therapy for adult anxiety disorders: a meta-analysis of randomized placebo-controlled trials. *Journal of Clinical Psychiatry* **69**, 621–632.

Hunot V, Churchill R, Silva de Lima M, Teixeira V (2007). Psychological therapies for generalised anxiety disorder. *Cochrane Database of Systematic Reviews*. Issue No. 24. Art. No. CD001848.

Jacobson NS, Truax P (1991). Clinical significance: a statistical approach to defining meaningful change in psychotherapy research. *Journal of Consulting and Clinical Psychology* **59**, 12–19.

Kenwright M, Marks I, Graham C, Franses A, Mataix-Cols D (2005). Brief scheduled phone support from a clinician to enhance computer-aided self-help for obsessive-compulsive disorder: randomized controlled trial. *Journal of Clinical Psychology* **61**, 1499–1508.

Kessler RC, Chiu WT, Demler O, Merikangas KR, Walters EE (2005). Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry* **62**, 617–627.

Litz BT, Engel CC, Bryant RA, Papa A (2007). A randomized, controlled proof-of-concept trial of an Internet-based, therapist-assisted self-management treatment for posttraumatic stress disorder. *American Journal of Psychiatry* **164**, 1676–1683.

Mataix-Cols D, Cameron R, Gega L, Kenwright M, Marks IM (2006). Effect of referral source on outcome with cognitive-behavior therapy self-help. *Comprehensive Psychiatry* **47**, 241–245.

Mataix-Cols D, Marks IM (2006). Self-help with minimal therapist contact for obsessive-compulsive disorder: a review. *European Psychiatry* **21**, 75–80.

Mataix-Cols D, Rauch SL, Baer L, Eisen JL, Shera DM, Goodman WK, Rasmussen SA, Jenike MA (2002). Symptom stability in adult obsessive-compulsive disorder: data from a naturalistic two-year follow-up study. *American Journal of Psychiatry* **159**, 263–268.

McLean PD, Whittal ML, Thordarson DS, Taylor S, Sochting I, Koch WJ, Paterson R, Anderson KW (2001). Cognitive versus behavior therapy in the group treatment of obsessive-compulsive disorder. *Journal of Consulting and Clinical Psychology* **69**, 205–214.

Moritz S, Jelinek L, Hauschildt M, Naber D (2010). How to treat the untreated: effectiveness of a self-help metacognitive training program (myMCT) for obsessive-compulsive disorder. *Dialogues in Clinical Neuroscience* **12**, 209–220.

Rosenfeld R, Dar R, Anderson D, Kobak K, Greist JH (1992). A computer-administered version of the Yale-Brown Obsessive-Compulsive Scale. *Psychological Assessment* **4**, 329–332.

Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption. *Addiction* **88**, 791–804.

Shapiro DA, Cavanagh K, Lomas H (2003). Geographic inequity in the availability of cognitive behavioural therapy in England and Wales. *Behavioural and Cognitive Psychotherapy* **31**, 185–192.

Sheehan DV, Lecrubier Y, Sheehan KH, Amorim P, Janavs J, Weiller E, Hergueta T, Baker R, Dunbar GC (1998). The Mini-International Neuropsychiatric Interview (M.I.N.I.): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *Journal of Clinical Psychiatry* **59** (Suppl. 20), 22–33.

Simpson HB, Foa EB, Liebowitz MR, Ledley DR, Huppert JD, Cahill S, Vermes D, Schmidt AB, Hembree E, Franklin M, Campeas R, Hahn CG, Petkova E (2008). A randomized, controlled trial of cognitive-behavioral therapy for augmenting pharmacotherapy in obsessive-compulsive disorder. *American Journal of Psychiatry* **165**, 621–630.

Simpson HB, Huppert JD, Petkova E, Foa EB, Liebowitz MR (2006). Response versus remission in obsessive-compulsive disorder. *Journal of Clinical Psychiatry* **67**, 269–276.

Skoog G, Skoog I (1999). A 40-year follow-up of patients with obsessive-compulsive disorder. *Archives of General Psychiatry* **56**, 121–127.

Storch EA, Merlo LJ, Lehmkuhl H, Geffken GR, Jacob M, Ricketts E, Murphy TK, Goodman WK (2008). Cognitive-behavioral therapy for obsessive-compulsive disorder: a non-randomized comparison of intensive and weekly approaches. *Journal of Anxiety Disorders* **22**, 1146–1158.

Svanborg P, Åsberg M (1994). A new self-rating scale for depression and anxiety states based on the Comprehensive Psychopathological Rating Scale. *Acta Psychiatrica Scandinavica* **89**, 21–28.

Tolin DF, Hannan S, Maltby N, Diefenbach GJ, Worhunsky P, Brady RE (2007). A randomized controlled trial of self-directed versus therapist-directed cognitive-behavioral therapy for obsessive-compulsive disorder patients with prior medication trials. *Behavior Therapy* **38**, 179–191.

Torres AR, Prince MJ, Bebbington PE, Bhugra DK, Brugha TS, Farrell M, Jenkins R, Lewis G, Meltzer H, Singleton N (2007). Treatment seeking by individuals with obsessive-compulsive disorder from the british psychiatric morbidity survey of 2000. *Psychiatric Services* **58**, 977–982.

Tumur I, Kaltenthaler E, Ferriter M, Beverley C, Parry G (2007). Computerised cognitive behaviour therapy for obsessive-compulsive disorder: a systematic review. *Psychotherapy and Psychosomatics* **76**, 196–202.

van Oppen P, de Haan E, van Balkom AJ, Spinhoven P, Hoogduin K, van Dyck R (1995). Cognitive therapy and exposure in vivo in the treatment of obsessive compulsive disorder. *Behavior Research and Therapy* **33**, 379–390.

Ward E, King M, Lloyd M, Bower P, Sibbald B, Farrelly S, Gabbay M, Tarrier N, Addington-Hall J (2000). Randomised controlled trial of non-directive counselling, cognitive-behaviour therapy, and usual general practitioner care for patients with depression. I: clinical effectiveness. *British Medical Journal* **321**, 1383–1388.

Weissman MM, Bland RC, Canino GJ, Greenwald S, Hwu HG, Lee CK, Newman SC, Oakley-Browne MA, Rubio-Stipec M, Wickramaratne PJ (1994). The cross national epidemiology of obsessive compulsive disorder. The Cross National Collaborative Group. *Journal of Clinical Psychiatry* **55** (Suppl.), 5–10.

Wootton BM, Titov N, Dear BF, Spence J, Andrews G, Johnston L, Solley K (2011). An Internet administered treatment program for obsessive-compulsive disorder: a feasibility study. *Journal of Anxiety Disorders* **25**, 1102–1107.