


Unguided Internet-based cognitive-behavioral therapy for obsessive-compulsive disorder: A randomized controlled trial

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Abstract

Background: Many individuals with obsessive-compulsive disorder (OCD) do not receive professional treatment due to various idiosyncratic barriers. Internet-based cognitive-behavioral therapy (iCBT) is increasingly used to narrow treatment gaps, but the efficacy of such interventions without guidance of therapists has not been well studied. This study evaluated the efficacy of an unguided iCBT that includes third-wave approaches for the treatment of OCD symptoms.

Methods: A total of 128 individuals with self-reported OCD symptoms were randomly allocated to either an intervention group (unguided iCBT) or to a care-as-usual (CAU) control group following an anonymous baseline assessment via an online survey. Eight weeks after inclusion, a reassessment was carried out online. The Yale-Brown Obsessive-Compulsive Scale served as the primary outcome parameter for detecting symptom changes in the per-protocol sample with at least 60 minutes utilization.

Results: The iCBT group showed a significantly stronger reduction of OCD symptoms with a medium effect size ($\eta^2_p = 0.06$) compared with the control condition. This effect was moderated by the general frequency of Internet usage ($\eta^2_p = 0.08$); the more time per day users spent online, the less they benefited from the intervention. Secondary outcomes revealed (1) a medium effect size on self-esteem ($\eta^2_p = 0.06$); (2) no statistically significant effects on quality of life, depression symptoms, impulsivity, or social insecurity; and (3) good acceptability of the intervention.

Conclusions: The current study provides evidence that unguided iCBT for OCD may be a viable option for individuals who experience treatment barriers. As non-compliance remains a challenge, this topic needs further research.

KEYWORDS

cognitive-behavioral therapy, Internet interventions, obsessive-compulsive disorder, third-wave methods

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1 | INTRODUCTION

Obsessive-compulsive disorder (OCD) is characterized by intrusive thoughts and compulsive behavior (American Psychiatric Association, 2013). OCD has an estimated lifetime prevalence of 2%–3% (Kessler et al., 2012), and it strongly interferes with quality of life as well as social and role functioning in those affected (Coluccia et al., 2016; Hauschildt et al., 2010; Macy et al., 2013). Left untreated, OCD symptoms worsen in response to life stressors and are mostly chronic (Abramowitz et al., 2009). Even though prompt treatment is warranted in OCD, many of those affected do not receive treatment. Treatment gap rates for OCD vary between 40% (Kohn et al., 2004) and 90% (Chong et al., 2012). Many individuals with OCD do not seek professional help due to treatment barriers such as cost of treatment, lack of insurance coverage, and doubts about effectiveness (Marques et al., 2010). Other reasons why individuals with psychological problems do not seek treatment are shame, guilt, and fear of stigmatization (Ociskova et al., 2013). When individuals with OCD do seek professional help, there is often a large delay between disease onset and initiation of treatment (Demet et al., 2010; García-Soriano et al., 2014). Moreover, Wahl et al. (2010) estimate that the disorder remains unrecognized and thus untreated in 72% of the patients in outpatient clinics. Many of those who seek professional help and are diagnosed with OCD do not receive specialized treatment. The gold standard in the treatment of OCD is long-term administration of selective serotonin reuptake inhibitors (SSRI; Del Casale et al., 2019) as well as cognitive-behavioral therapy (CBT) with exposure and response prevention (ERP), which has been proven effective in numerous clinical trials (Olatunji et al., 2013). In an anonymous survey of German psychotherapists treating outpatients ($N = 177$), only 1.7% reported specializing in the treatment of OCD, and 55.7% said they did not provide CBT with ERP, mostly due to their lack of necessary skills or experience with OCD patients (Külz et al., 2010). Consequently, there is a great need for novel approaches targeting the large group of undertreated and untreated individuals with OCD.

To overcome the treatment barriers (Mataix-Cols & Marks, 2006), evidence-based treatment should be provided via low-threshold modalities such as Internet-based approaches. Although psychological Internet interventions, which are often based on the CBT approach (i.e., iCBT), yield medium to large effect sizes in anxiety disorders (Andersson & Hedman, 2013; Andrews et al., 2018; Saddichha et al., 2014) and are cost-effective in primary care settings (Nordgren et al., 2014), the emerging research on online treatment for OCD is still limited and inconclusive compared to the research on Internet interventions for several other psychiatric disorders.

In an uncontrolled feasibility study with 28 participants with OCD (Wootton et al., 2015), the within-subject effects of an unguided 8-week iCBT program showed a large effect on the Yale-Brown Obsessive-Compulsive Scale (Y-BOCS; $d = 1.37$) which was largely still present after 3 months ($d = 1.17$) and 12 months ($d = 1.08$). An uncontrolled study with 42 participants with OCD (Seol et al., 2016) revealed a large within-subject effect ($d = 1.64$) of a

minimally guided (e-mail support on demand) 11-week iCBT program. A randomized controlled trial (RCT) on 101 participants with OCD (Andersson et al., 2012) investigated the effectiveness of a therapist-guided 10-week Internet intervention and yielded large between-subject effects ($d = 1.12$) compared with an active control group (who were taught attention control techniques), which was sustained at the 4-month follow-up. An RCT on 86 participants with OCD (Mahoney et al., 2014) compared a clinically supervised technician-administered iCBT program (6 modules, 10 weeks) to a treatment-as-usual control group and found a large between-group effect size ($d = 0.78$) on OCD symptom reduction, which was sustained at the 3-month follow-up. Further, the study revealed significant group and time effects on maladaptive beliefs and depression symptoms. An RCT on 179 participants with OCD (Kyrios et al., 2018) revealed a significantly greater symptom reduction in a guided iCBT group (12 modules, 10 weeks) compared with an Internet-based progressive relaxation training ($d = 1.12$). One study on iCBT for OCD revealed that online therapist-assisted delivery modes represent a cost-effective alternative to existing face-to-face treatments (Osborne et al., 2019).

The intensity of therapeutic support used in Internet interventions varies greatly (Baumeister et al., 2014), and their effects increase with a higher intensity of guidance (Percy et al., 2016). In previous research, it is difficult to determine the specific contribution of the Internet intervention itself. Because unguided treatment may be advantageous for individuals for whom stigma is a principal treatment barrier, it is important to examine for the first time in a randomized-controlled study design whether an unguided iCBT intervention for OCD can have significant between-group effects.

The aims of the current study were (1) to examine whether 8 weeks of access to an unguided Internet intervention with eight CBT modules for individuals experiencing OCD symptoms would show superior effects on OCD symptom severity compared with a control group with access to care as usual (CAU); (2) to examine whether this iCBT intervention would be more effective on the secondary outcomes quality of life, depression symptoms, impulsivity, self-esteem, and social insecurity; (3) to examine acceptability of the intervention; and (4) to explore moderators of treatment effects on OCD symptoms such as gender, age, education, OCD symptom severity, depression symptom severity, experience with psychotherapy, treatment with pharmacotherapy, frequency of Internet usage, and attitudes towards Internet interventions.

2 | METHODS

2.1 | Study design and procedure

The study was conducted in compliance with the Declaration of Helsinki (World Medical Association, 2013), approved by the local ethics committee of the University of Hamburg (reference number 2017_105), and preregistered in a clinical trials registry (www.drks.de: DRKS00013742). The recruitment and assessments were conducted

anonymously online. Participants were invited via German Internet forums and social media for persons with OCD (e.g., facebook groups). In addition, flyers were distributed by an OCD-specific self-help organization (German Association for OCD) and at in- and outpatient facilities. The study invitation informed about the study design and indicated that all participants would receive free access to the intervention program either immediately or at the end of a waiting period. All participants received written information about the aims and procedures of the study, were informed that they could withdraw from the study at any time, and were told that no financial compensation was offered for their participation. The researchers also made it clear that participation would not require any face-to-face contact with a clinician or investigator and that parallel treatment (i.e., self-help, psychotherapy, or medication) was allowed.

A web-link in the study invitation directed interested persons to the baseline assessment, which was implemented using an online survey software (EFS Survey/Unipark). Online assessments produce valid and efficient results (Alfonsson et al., 2014). On the first page of the survey, the study rationale was explained in more detail, and online informed consent was required before starting the baseline assessment, which collected sociodemographic information, clinical characteristics (e.g., psychiatric diagnoses and treatment history), and psychological measures (e.g., attitudes towards Internet interventions), which are described in detail in Section 2.2.

Inclusion criteria were liberal in order to recruit a clinically representative sample, which is relevant for developing externally valid directions for clinical practice (Hollon & Wampold, 2009). The inclusion criteria were as follows: (a) clinically significant OCD symptoms, operationalized by a Y-BOCS total score >7 , (b) age between 18 and 65, (c) reliable Internet access, (d) sufficient command of the German language, (e) no history of psychotic disorders, (f) no current, acute suicidality, and (g) electronic informed consent. Violating any of the inclusion criteria led to an immediate termination of the online assessment, whereupon the participant was informed of the reason for their exclusion and was again provided with the e-mail address of the study team in case they needed help or further information. For participants with suicidal tendencies, appropriate telephone numbers were automatically displayed. The online survey program used cookies to prevent multiple logins from the same computer.

Participants who met the inclusion criteria were required to enter their e-mail address and were randomized after baseline assessment to one of two conditions: (1) CAU or (2) CAU plus iCBT. Randomization was conducted using an allocation schedule based on a computerized random numbers generator. Participants were informed of the outcome of the randomization via e-mail. Those in the iCBT condition received an access code that allowed them to log on to the intervention and use it at no charge for an 8-week period.

2.2 | Measures

As the primary outcome parameter, we used the *Yale-Brown Obsessive Compulsive Scale* (Y-BOCS; Goodman et al., 1989) total score to

measure OCD symptom severity in the structural dimensions of obsessive thinking and compulsive behavior. This 10-item scale has a total score ranging from 0 to 40 (with a higher score indicating greater symptom severity) and a high degree of internal consistency (Goodman et al., 1989) which has also been confirmed (Cronbach's $\alpha = .80$) for the German version (Jacobsen et al., 2003). The clinician-administered and self-report versions of the Y-BOCS are moderately correlated (Frederici et al., 2010); patients seem to rate symptom severity lower than clinicians (Hauschildt et al., 2019).

We used the *Obsessive-Compulsive Inventory-Revised* (OCI-R; Foa et al., 2002) to assess the manifestation of OCD symptoms in the qualitative dimensions of controlling, washing, ordering, hoarding, mental neutralizing, and obsessive thoughts at baseline and as the secondary outcome parameter in exploratory analyses on changes in the respective subscales. This 18-item scale has a total score ranging from 0 to 72 (with a higher score indicating greater symptom severity). The OCI-R has shown good psychometric properties for the total scale and subscales (Abramowitz & Deacon, 2006; Huppert et al., 2007) and is sensitive to change (Abramowitz et al., 2005).

We used the *Obsessive Beliefs Questionnaire-44* (OBQ-44; Obsessive Compulsive Cognitions Working Group, 1997, 2001), a 44-item scale containing three subscales representing the key belief domains in OCD (inflated responsibility/overestimation of threat, importance of thoughts/controlling thoughts, intolerance of uncertainty/perfectionism), to measure OCD-related cognitive biases within an exploratory analysis as a secondary outcome. The total scale ranges from 44 to 308 (with a higher score indicating stronger cognitive biases) and shows good internal consistency and test-retest reliability (Obsessive Compulsive Cognitions Working Group, 2001) as well as convergent and discriminant validity (Obsessive Compulsive Cognitions Working Group, 2005).

The *World Health Organization Quality of Life* questionnaire (WHOQOL-BREF; Skevington et al., 2004) is an abbreviated 26-item version of the WHOQOL-100 that was developed by the WHOQOL Group to measure the quality of life in persons with and without physical or psychological illnesses. The measure, which we used as a secondary outcome, covers four domains: "physical," "psychological," "social," and "environmental quality of life." The total score ranges from 26 to 130, with a higher score indicating a higher quality of life.

We used the *Patient Health Questionnaire-9* (PHQ-9; Kroenke et al., 2001) to measure comorbid depression as a secondary outcome. The PHQ-9 is a prominent self-report scale for the assessment of depression symptoms. It has nine items with a 4-point Likert scale and a total score ranging from 0 to 27. Categorical levels consist of minimal (0–4), mild (5–9), moderate (10–14), and severe (15–27) depression symptoms. The questionnaire shows excellent internal consistencies (Cronbach's $\alpha = .86$ –.89) and good criterion validity (Kroenke et al., 2001).

We used the *Impulsive Behavior Scale-8* (I-8; Kovaleva et al., 2012) to capture impulsivity on the domains "urgency," "intention," "endurance," and "risk taking" as a secondary outcome. This economic measure consists of eight items with a five-point Likert

scale, resulting in a total scale range from 8 to 40 (with a higher score indicating stronger impulsivity). The internal consistency of the instrument lies between $\alpha = .65$ and $.92$, while content validity, factorial validity, and construct validity are acknowledged (Kovaleva et al., 2012).

We used the *Rosenberg Self-Esteem Scale* (RSES; Rosenberg, 1965) to measure self-esteem as a secondary outcome. This scale is a widely used, reliable, and valid measure for self-esteem assessment in social science research (Robins et al., 2001). The ten items result in a total score ranging from 10 to 40, with a higher score indicating a higher self-esteem.

We used the *Insecurity Questionnaire-24* (IQ-24; Albani et al., 2006) to assess social insecurity and social skills based on the domains “fear of criticism,” “fear of contact,” “inability to say no,” and “ability to demand” as a secondary outcome. The total score ranges from 0 to 124 (with a higher score indicating higher social insecurity). The instrument has been demonstrated to have good psychometric properties (Albani et al., 2005).

We used the *Attitudes towards Psychological Online Interventions Questionnaire* (APOI; Schröder et al., 2015) to assess attitudes towards Internet interventions as a possible moderator variable for the effects of the intervention. The instrument captures four dimensions (“skepticism and risk perception,” “confidence in effectiveness,” “technologization threat,” and “anonymity benefits”) on a 5-point Likert scale, with a higher total score representing a more positive attitude. The questionnaire shows an acceptable to good internal consistency of $\alpha = .77$ (Schröder et al., 2015).

We used the *Client Satisfaction Questionnaire-8* (CSQ-8; Attkisson & Zwick, 1982) to assess subjective appraisal of the intervention. This measure consists of eight items, and its 4-point Likert scale has a total score ranging from 8 to 32 (with a higher score indicating higher satisfaction). In several studies, the internal consistency ranged from $\alpha = .83$ to $.93$, and convergent validity has shown to be moderate (Attkisson & Greenfield, 2004). The measure, which usually captures the subjective appraisal of inpatient treatments, was adapted for use in evaluation trials on Internet interventions, as it has been done in previous studies (Moritz et al., 2012; Schröder et al., 2017).

2.3 | Treatment conditions

The Internet intervention used in the current study was developed by the *Clinical Neuropsychology Unit* of the *Department of Psychiatry and Psychotherapy* in the *University Medical Centre Hamburg-Eppendorf, Germany*. The content of this program focuses on established cognitive-behavioral methods for the treatment of OCD, which are summarized in Table 1.

The eight-module intervention consists of text, video, and audio elements, photos, and illustrations which are presented sequentially and are each completed in an average of 45 minutes, depending on the user's reading pace. Interactive exercises help the user learn and

apply helpful thoughts and behaviors. The intervention allows users to save (and print) worksheets to enhance access between the sessions. The content presented in the eight modules focuses on the OCD-specific dysfunctional belief domains defined by the *Obsessive-Compulsive Cognitions Working Group* (OCCWG, 1997, 2003, 2005). The program guides users through exercises based on traditional CBT techniques (i.e., cognitive restructuring and behavior experiments) as well as “third-wave” approaches (e.g., mindfulness and metacognitive strategies). Additionally, it focuses on transdiagnostic traits that are often associated with OCD, primarily rumination, worrying, low self-esteem, and deficient social skills.

2.4 | Data analysis

We calculated, using G*Power (Faul et al., 2007), that the sample size should be at least 128, aiming for a test power of 0.80 and an α level of 0.05 (two-tailed) with a small-to-medium effect size ($f = 0.22$) and a dropout rate of 20%. All further analyses were performed in SPSS version 26 (IBM®, 2018). To evaluate the efficacy of the intervention, a one-way analysis of covariance (ANCOVA) was conducted using the factors group (iCBT vs. CAU) as independent variable, the Y-BOCS baseline score as covariate, and the Y-BOCS post score as dependent variable. Symptom severity at baseline as covariate is useful for adjusting biases of regression to the mean (Barnett et al., 2005; Rausch et al., 2003). Per protocol (PP) analyses are reported as primary analyses. PP analyses included all participants of the iCBT condition who utilized the intervention for at least 60 min (which was automatically tracked within the Internet intervention) compared to all participants of the CAU condition. This cut-off for adherence is based on a study by Meyer et al. (2015). The PP analyses were complemented by intention-to-treat analyses (ITT) in which the complete cases sample (CC; participants with available baseline data) is included; study dropouts at post assessments were imputed using multiple imputation (MI). Group assignment, sociodemographic variables (see Table 2), and psychopathological variables at baseline (see Table 3) were entered into the model as predictors for imputation, and 100 imputations were run. All imputed values were normally distributed. For MI results, combined p values of regression analyses are reported. The effect sizes of PP/CC analyses are reported using partial eta squared, following the parameters of Kinnear and Gray (2009) for small ($\eta^2_p = 0.01$), medium ($\eta^2_p = 0.06$), and large ($\eta^2_p = 0.14$) effect sizes. The effect sizes of ITT analyses are reported using Cohen's d , following the parameters of Cohen (1988) for small ($d = 0.2$), medium ($d = 0.5$), and large ($d = 0.8$) effect sizes; Cohen's d values in the ITT analyses were calculated based on the unadjusted mean differences and pooled standard deviations across groups. Exploratory analyses using ANCOVA in the PP sample were conducted to explore whether possible effects would be particularly pronounced in specific OCD dimensions (OCI-R and OBQ-44) and to explore possible moderating effects of the following variables: age (interval scale), gender (female/male), education (basic, medium, or

TABLE 1 Contents of the Internet-based cognitive-behavior therapy (iCBT) intervention for individuals with obsessive-compulsive disorders (OCD)

Module	Content
(0) Introduction	The short introductory module (10 min on average) explains the features of the intervention and how to achieve optimal learning. For example, users are encouraged to practice and apply the techniques consistently in their daily life to increase their sense of self-efficacy and to enable symptom reduction.
(1) Psychoeducation	The psychoeducation module informs users about core features of OCD, such as obsessions, compulsions, and avoidance. They learn how to differentiate obsessive from “normal” and delusional thoughts and are informed about pathogenesis (e.g., the vulnerability-stress model), conditions for different anxiety curves, and the model of OCD introduced by Salkovskis (1998).
(2) Cognition	The cognition module aims at raising awareness of and modifying the three OCD-specific dysfunctional belief domains “overestimation of threat,” “intolerance of uncertainty,” and “inflated responsibility” (Obsessive-Compulsive Cognitions Working Group, 1997). It further educates users on strategies for dealing with these cognitive biases, such as helpful attributional styles following the (meta)cognitive training for OCD (Hauschildt et al., 2016).
(3) Metacognition	The metacognition module aims at raising awareness of and modifying the two OCD-specific dysfunctional belief domains “overimportance of thoughts” and “importance of controlling thoughts” (Obsessive-Compulsive Cognitions Working Group, 1997). The module demonstrates the dysfunctional nature of rumination, worrying, and thought suppression and introduces mindfulness and problem-solving skills as alternative, more functional coping strategies following the metacognitive therapy of Wells (2011). It includes exercises on magical thinking or thought-action fusion (Rees et al., 2010) and introduces the association-splitting technique (Ching et al., 2019).
(4) Mindfulness	The module on mindfulness-based cognitive therapy (MBCT) emphasizes the positive effects of paying attention to the present moment without judgement rather than attempting to neutralize internal experiences with compulsions or reacting with avoidance (Hale et al., 2013). The module promotes accepting that thoughts are mental events that can be observed without being automatically thought of as threats. Several audio exercises are presented.
(5) Exposition and Reaction Prevention (ERP)	The module on ERP educates users on the background of ERP and ways to perform repeated gradual exposure to the situations (including thoughts) that trigger obsessions and compulsions while discontinuing performing compulsive behavior to relearn helpful behavior through fear habituation, belief disconfirmation, and inhibitory learning (Craske et al., 2014). Working sheets with self-monitoring protocols are provided.
(6) Functions of OCD	The module on functions of OCD, which can be regarded as dysfunctional coping strategies, introduces the psychometric <i>Questionnaire for Functions of OCD</i> (Kulla et al., 2015), which helps users to examine their individual functions in the domains “self-confirmation,” “emotion regulation,” “avoidance of responsibility,” “interpersonal regulation,” and “occupation.” Alternative strategies are provided for the various domains (i.e., social competence skills, problem-solving skills, behavior activation).
(7) Social skills	The module on social skills is based on the group training for social competence developed by Hinsch and Pflingsten (2015). The module addresses the domains “assertiveness,” “managing relationships,” and “gaining sympathy” and invites users to adopt and practice a range of social skills. Additional topics are interactional patterns (e.g., how symptoms might affect relationships with significant others) and the communication model of Schulz von Thun (1981).
(8) Self-esteem	The module on self-esteem highlights the dysfunctional nature of “perfectionism,” which is another OCD-specific dysfunctional belief domain (Obsessive-Compulsive Cognitions Working Group, 1997), in order to reduce self-abjection and depressive thought patterns (e.g., unfair comparisons).

Note: Completion of the introductory module takes ten minutes; completion of each content-related modules takes 45 min on average.

Abbreviations: OCD, obsessive-compulsive disorder; OCCWG, Obsessive-Compulsive Cognitions Working Group.

high level of high school or university degree), OCD symptom severity at baseline (Y-BOCS, interval scale), experience with psychotherapy (yes/no), treatment with pharmacotherapy (yes/no), depression symptom severity at baseline (PHQ-9, interval scale), general Internet usage (max. 5 h daily/min. 5 h daily), and attitudes towards Internet interventions at baseline (APOI, interval scale). OCD symptom severity at baseline was again included as covariate to adjust for regression to the mean.

3 | RESULTS

3.1 | Sample characteristics

Overall, 133 participants completed the online survey, five of whom did not meet the inclusion criteria (see Figure 1 flowchart). A total of 128 qualified as participants and were randomized to either iCBT ($n = 64$) or CAU ($n = 64$) group. Of these, 96

TABLE 2 Descriptive statistics and group comparisons of the participants' (socio-)demographic characteristics at baseline assessment

	Intervention (n = 64)	Control (n = 64)	Total sample (N = 128)	Statistics
Gender (female/male)	48/16	50/14	98/30	$\chi^2(1) = 0.17, p = .676$
Age in years (M, SD)	41.45 (12.15)	38.98 (11.55)	40.30 (13.12)	$t(126) = 1.18, p = .241$
Education				$\chi^2(4) = 3.00, p = .808$
Basic-level high school	2	1	3 (2.3%)	
Medium-level high school	15	15	30 (23.5%)	
Higher-level high school	20	22	42 (32.8%)	
University degree	27	26	53 (41.4%)	
Employment status				$\chi^2(3) = 4.31, p = .37$
Working full-time	30	22	52 (40.6%)	
Working part-time	19	17	36 (28.1%)	
Not working	8	14	22 (17.2%)	
Other (e.g., volunteering)	7	11	18 (14.1%)	
Relationship status				$\chi^2(1) = 0.52, p = .472$
In a relationship	36	40	76 (59.4%)	
No relationship	28	24	52 (40.6%)	
General Internet usage (more/less than 5 h daily)	42/22	40/42	82/46	$\chi^2(1) = 0.14, p = .713$

Abbreviations: M, mean; SD, standard deviation.

participated in the post-assessment, which constitutes a 25% overall study dropout rate: 27% in the intervention group and 23% in the control group. Within the intervention group, 37 participants (58%) logged in to the intervention platform at least once, while 33 (52%) used the intervention at least 60 min, resulting in a PP sample size of $N = 82$. The range of utilization was 0–982 min (approx. 16 h), with a mean of 172 min (approx. 3 h) and a median of 126 min (approx. 2 h). Participants reported lack of time or motivation, forgetting to use the intervention, health issues, and disruptive life events as their main reasons for reduced compliance.

No statistically significant differences were found at baseline between the intervention group and the CAU group in terms of participants' demographic and clinical characteristics (see Tables 2 and 3). The majority of the participants were female (77%) and employed (69%). On average, participants were 40 years old and well educated. Most participants (64%) reported using the Internet more than 5 h on an average day (see Table 2).

With regard to OCD, 25% of the participants reported mild symptoms, 43% reported moderate symptoms, and 32% reported severe to extreme symptoms. The average age of onset was 18 years, and the most frequently reported qualitative OCD dimensions were obsessive thoughts, washing, and controlling. Depression symptom severity was mild to moderate. Approximately half of the participants (48%) were not in treatment at the time of the baseline assessment, and 16% had never received any treatment (see Table 3).

3.2 | Primary and secondary outcomes

The intervention group showed a significantly greater reduction in the Y-BOCS total score—the primary outcome—with a medium effect size in the PP analysis, which was not confirmed by ITT analyses (see Table 4). The effect was larger on reducing compulsive behavior (Y-BOCS subscale compulsions), $F(1,79) = 4.64, p = .034, \eta_p^2 = 0.06$, than on reducing obsessive thoughts (Y-BOCS subscale obsessions), $F(1,79) = 2.02, p = .025, \eta_p^2 = 0.03$.

In the analyses of secondary outcomes, the intervention group showed a significantly greater increase in self-esteem (RSES total scale) with a small to medium effect size in the PP analysis, which was confirmed by ITT analyses (see Table 4). The other transdiagnostic secondary outcomes (WHQOL-BREF, PHQ-9, I-8, and IQ-24) revealed statistically significant effects in neither the PP nor the ITT analyses.

3.3 | Exploratory analyses on OCD dimensions

The mostly small effect sizes in the PP analyses of the OCI-R subscales ($\eta_p^2 < 0.01$ for hoarding up to 0.04 for washing) did not reach statistical significance (all $p \geq .065$). Of the OBQ subscales, only “control of thoughts” showed a statistically significant medium effect in favor of the intervention group, $F(1,79) = 6.46; p = .013; \eta_p^2 = 0.08$, whereas the small effect sizes in the other two dimensions (both $\eta_p^2 = 0.03$) did not reach statistical significance (both $p \geq .112$).

TABLE 3 Descriptive statistics and group comparisons of the participants' clinical characteristics at baseline assessment

	Intervention (n = 64)	Control (n = 64)	Total sample (N = 128)	Statistics
OCD symptom severity (Y-BOCS)	20.20 (6.29)	20.17 (5.73)	20.19 (5.99)	$t(126) = 0.03, p = .977$
Subclinical (0–7)*	–	–	–	
Mild (8–15)	16	16	32 (25.0%)	
Moderate (16–23)	29	26	55 (43.0%)	
Severe (24–31)	17	21	38 (29.9%)	
Extreme (32–40)	2	1	3 (2.3%)	
Age of OCD onset (M, SD)	17.47 (7.81)	19.69 (8.24)	18.58 (8.08)	$t(126) = 1.56, p = .121$
OCD dimensions (OCI-R)				
Obsessive thoughts	6.25 (3.37)	6.84 (3.40)	6.55 (3.38)	$t(126) = 0.99, p = .323$
Washing	5.55 (4.33)	5.09 (4.12)	5.32 (4.22)	$t(126) = 0.60, p = .546$
Controlling	5.25 (3.88)	5.70 (3.89)	5.48 (3.88)	$t(126) = 0.66, p = .511$
Ordering	3.95 (3.58)	4.77 (4.22)	4.36 (3.92)	$t(126) = 1.18, p = .242$
Hoarding	2.77 (2.96)	2.94 (3.21)	2.85 (3.08)	$t(126) = 0.32, p = .754$
Mental neutralizing	2.87 (3.24)	2.59 (2.59)	2.73 (2.93)	$t(126) = 0.54, p = .589$
Depression symptoms (PHQ-9)	10.06 (5.43)	9.72 (4.69)	9.89 (5.07)	$t(126) = 0.38, p = .702$
Treatment status				
No OCD treatment yet	10	10	20 (15.6%)	$\chi^2(1) = 0.00, p = 1.00$
No OCD psychotherapy yet	21	19	40 (31.3%)	$\chi^2(1) = 0.15, p = .703$
Currently in no treatment	26	35	61 (47.7%)	$\chi^2(1) = 2.54, p = .111$
Currently in psychotherapy	22	13	35 (27.3%)	$\chi^2(1) = 3.19, p = .074$
Currently in pharmacotherapy	24	18	42 (32.8%)	$\chi^2(1) = 1.28, p = .259$

*Subclinical Y-BOCS symptoms constituted an exclusion criterion.

Abbreviations: M, mean; OCD, obsessive-compulsive disorder; PHQ-9, Patient-Health-Questionnaire-9; SD, standard deviation; Y-BOCS: *Yale-Brown Obsessive Compulsive Scale*.

3.4 | Exploratory analyses on moderator variables

The variables gender, age, education, baseline OCD symptom severity, baseline depression symptom severity, experience with psychotherapy, treatment with pharmacotherapy, and attitudes towards Internet interventions did not appear to moderate the effects of the intervention in terms of the Y-BOCS total score (all $p \geq .142$). However, Internet usage appeared to moderate the treatment effect significantly, $F(4,77) = 6.188, p = .015, \eta_p^2 = 0.07$ (PP), insofar as the more time individuals in the intervention group spent on the Internet in general, the less they benefited from the iCBT intervention.

3.5 | Acceptability

Most of the participants who had logged on to the intervention at least once ($n = 37; 58\%$) evaluated the quality of the intervention in the CSQ-8 (with pooled answer options “yes” and “rather yes”; “no” and “rather no”) as good (92%), received the help they wanted (73%), felt their needs were met (73%), would recommend the intervention to a friend (81%), were satisfied with the offered help (76%), felt a sense of self-efficacy (76%), were satisfied overall with the intervention (84%), and would use it again (87%).

4 | DISCUSSION

The current study, an online RCT, investigated the efficacy of an unguided iCBT intervention for the treatment of OCD symptoms compared to a waiting condition with access to CAU. The main findings indicate that, when used for at least 1 h, (1) the intervention reduces OCD symptoms (compulsions more than obsessions); (2) the intervention improves self-esteem but has no effect on quality of life, depression symptoms, impulsivity, and social insecurity; (3) the intervention is well accepted; and (4) the general frequency of Internet use moderates the effect of the intervention on OCD symptom amelioration insofar as it is particularly effective for those who use the Internet less in general.

Overall, we interpret these findings as supporting the promising use of Internet interventions in the treatment of OCD. As all previous RCTs on iCBT for OCD involved some type of guidance, the strength of the current study is its focus on the specific contribution of an Internet intervention itself, which had a medium effect size. However, one limitation is that the treatment compliance in this study was poor; the time participants spent using the intervention was three hours on average, which is approximately the time needed to complete three or four of the eight modules. The observed intervention dropout rate of 42% is comparable to that in a

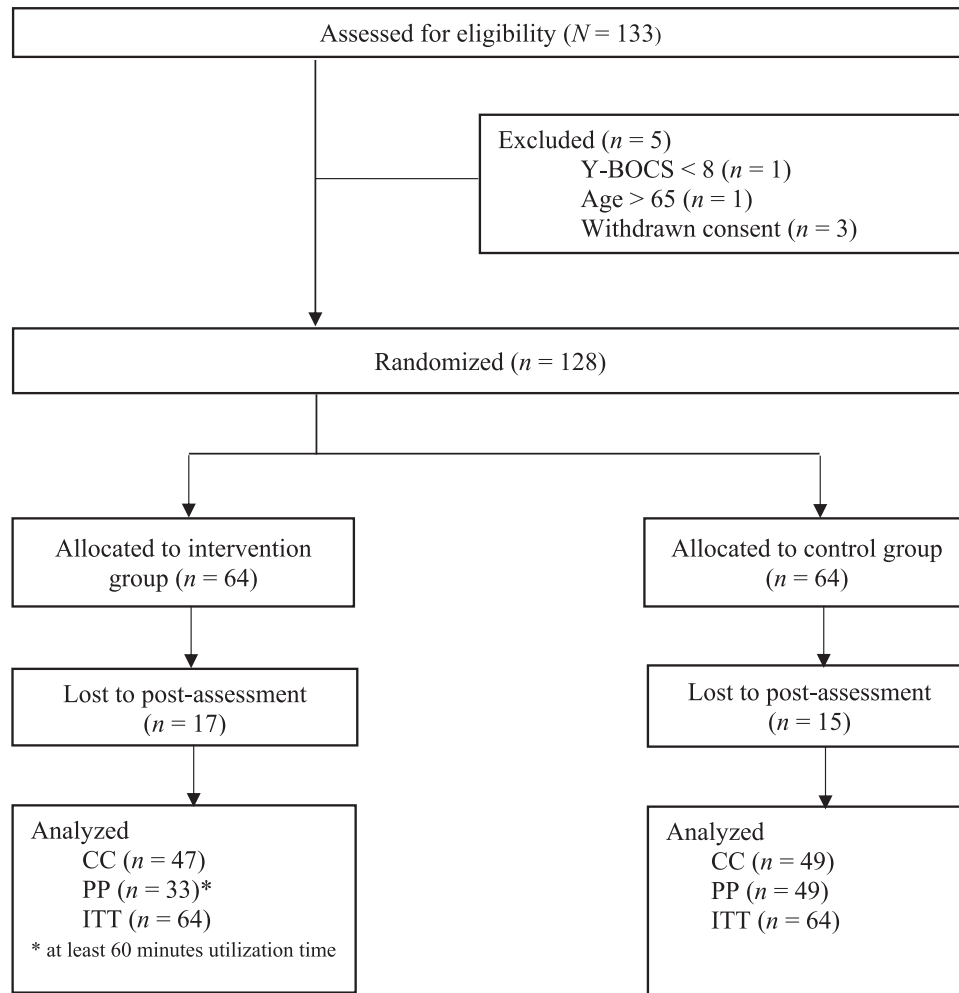


FIGURE 1 This figure shows the participant flow chart across the study (CC, complete cases; PP, per protocol cases; ITT, intention-to-treat cases; Y-BOCS, Yale-Brown Obsessive-Compulsive Scale)

meta-analysis on unguided web-based interventions for depression in which, on average across 10 RCTs, 40% of the intervention group participants dropped out before completing 25% of the treatment modules (Karyotaki et al., 2015). As intervention effects for OCD symptom reduction are only significant in the PP sample but not in the ITT sample and the intervention effects for self-esteem are significant in both the PP and the ITT samples, we speculate that the improvement in self-esteem was more independent of the utilization intensity than the reduction in OCD symptom severity.

It is likely that the effects would have been more pronounced if the participants had spent more time using the intervention. Since the most frequently reported reasons for reduced compliance were lack of time or motivation and forgetting to use the intervention, it can be concluded that, first, guidance is likely necessary in Internet interventions for individuals with OCD for adequate compliance, and, second, future research should focus on examining and implementing additional determinants of compliance. Hilvert-Bruce et al. (2012) suggested that, apart from clinician contacts, reminders, the ability to choose the module sequence, and usage fees increase the adherence to iCBT interventions in individuals with anxiety and depression

disorders. Therefore, we suggest examining whether these factors represent necessary and sufficient conditions for a positive outcome in OCD as well. As previous RCTs on iCBT interventions in OCD individuals involved minimally a 10-week intervention period (Andersson et al., 2012; Kyrios et al., 2018; Mahoney et al., 2014), an extension of the intervention period beyond 8 weeks might also improve compliance and efficacy due to giving the participants more time to use the intervention, to transfer their new knowledge into their daily life, and to practice helpful cognitions and behavior. Further, the observed study dropout rate of 25% is lower than the one described in a meta-analysis on unguided computer-based depression interventions. On average across 40 studies, 38% of the participants dropped out before the post-assessment (Richards & Richardson, 2012). The study dropout rate in the current study is also lower than the one in the only previous (but uncontrolled) study on an unguided iCBT intervention for OCD, in which 36% of the participants dropped out before the post-assessment and intervention dropout rates were not reported (Wootton et al., 2015). To achieve a lower study dropout rate, future RCTs on iCBT would probably profit from the same modifications that were suggested

TABLE 4 Means (standard deviations) and group comparisons of primary and secondary outcome parameters for the complete cases (CC) sample, the per protocol (PP) sample, and intention-to-treat (ITT) sample

	Pre				Post				ANCOVA	
	Intervention CC (n = 64)	Intervention PP (n = 40)	Control CC/PP (n = 64)	Intervention CC (n = 47)	Intervention PP (n = 33)	Control CC/PP (n = 49)	PP	CC	ITT (MI)	
Y-BOCS	20.20 (6.29)	20.63 (6.39)	20.17 (5.73)	17.38 (7.35)	16.85 (7.32)	18.98 (6.17)	F(2,79) = 4.78, $p = .032^*$, $\eta_p^2 = 0.06$, 95% CI [0.18, 3.91]	F(2,93) = 2.35, $p = .128$, $\eta_p^2 = 0.03$, 95% CI [-0.40, 3.09]	$p = .176$, $d = 0.3$	
WHO-QoL	75.69 (13.24)	74.90 (14.29)	76.31 (11.35)	76.87 (13.48)	78.30 (13.66)	76.47 (11.10)	F(2,79) = 0.94, $p = .337$, $\eta_p^2 = 0.01$, 95% CI [-4.01, 1.39]	F(2,93) = 0.17, $p = .685$, $\eta_p^2 = 0.00$, 95% CI [-2.96, 1.95]	$p = .758$, $d = 0.1$	
PHQ-9	10.06 (5.43)	10.23 (5.50)	9.72 (4.69)	9.87 (5.62)	9.36 (5.60)	10.33 (5.84)	F(2,79) = 1.90, $p = .172$, $\eta_p^2 = 0.02$, 95% CI [-0.62, 3.40]	F(2,93) = 1.66, $p = .201$, $\eta_p^2 = 0.02$, 95% CI [-0.63, 2.94]	$p = .445$, $d = 0.2$	
I-8	23.94 (3.36)	23.80 (3.53)	23.58 (3.48)	24.64 (3.17)	24.70 (3.15)	23.80 (3.25)	F(2,79) = 0.78, $p = .379$, $\eta_p^2 = 0.01$, 95% CI [-1.86, 0.72]	F(2,93) = 0.60, $p = .439$, $\eta_p^2 = 0.01$, 95% CI [-1.61, 0.71]	$p = .265$, $d = 0.1$	
RSES	26.48 (7.44)	26.10 (7.68)	27.06 (7.12)	28.32 (7.53)	28.30 (7.95)	26.51 (7.08)	F(2,79) = 4.25, $p = .043^*$, $\eta_p^2 = 0.05$, 95% CI [-3.73, -0.07]	F(2,93) = 5.69, $p = .019$, $\eta_p^2 = 0.06$, 95% CI [-3.53, -0.32]	$p = .017^*$, $d = 0.3$	
IQ-24	63.77 (12.29)	63.83 (12.76)	63.31 (12.83)	62.70 (14.74)	61.76 (13.43)	63.69 (13.69)	F(2,79) = 1.48, $p = .228$, $\eta_p^2 = 0.02$, 95% CI [-1.56, 6.44]	F(2,93) = 0.86, $p = .355$, $\eta_p^2 = 0.01$, 95% CI [-1.91, 5.28]	$p = .483$, $d = 0.1$	

Note: effect sizes: small ($\eta_p^2 = 0.01$), medium ($\eta_p^2 = 0.06$), large ($\eta_p^2 = 0.14$); small ($d = 0.2$), medium ($d = 0.5$), and large ($d = 0.8$). *Statistical significance at the .05 level.

Abbreviations: ANCOVA, analyses of covariance; I-8, Impulsivity-8; IQ-24, Insecurity Questionnaire-24; MI, multiple imputation; PHQ-9, Patient-Health-Questionnaire-9; RSES, Rosenberg Self-Esteem Scale; WHOQoL, WHO Quality of Life-BREF; Y-BOCS, Yale-Brown-Obsessive-Compulsive-5-scale.

above in order to lower intervention dropouts. Taken together, compliance with the study protocol is comparable to similar study protocols, but there is a need for improvement in general.

The finding that the 8-week iCBT intervention was more effective at reducing compulsive behavior (medium effect size) than obsessive behavior (small to medium effect size) may be explained by the assumption that resistance to compulsive behavior might arise before the expectation violation regarding the course of the anxiety curve enables persons to resist obsessive thoughts. Further, exploratory analyses indicated that the iCBT intervention increased participants' ability to control thoughts (medium effect size), which may be regarded as a prerequisite to resisting obsessive thoughts. It is also important to note that two of the Y-BOCS items measure OCD-related phenomenological aspects that are exactly the opposite of the way of relating to stressful thoughts as proposed in two of the iCBT modules (metacognition and mindfulness), namely, the effort to resist and the ability to control obsessive thoughts (items 4 and 5). Hence, higher scores on these two items (i.e., less resistance and control) in the intervention group might have dampened the effects. Preliminary evidence for this possibility is provided by Cludius et al. (2020). The precise mechanisms of change in OCD treatment may depend on the order in which the content is presented and would therefore be a fruitful area of research in the context of Internet interventions. The observed effects of the iCBT intervention in improving self-esteem (small to medium effect size) may indicate that this topic fits well to individuals with OCD. Beyond that, it could also be that simply utilizing an Internet intervention leads to enhanced self-efficacy and a feeling of pride, which are major elements of self-esteem. This could be examined in future studies on the effect mechanisms of Internet interventions in general. The absence of statistically significant effects of the intervention on quality of life, depression symptoms, impulsivity, and social insecurity may reflect that these dimensions should be focussed in an optimization of the intervention's module contents. Future research should further examine whether there are statistical associations with these variables (e.g., as mediators of iCBT effects on OCD symptom severity) when the intervention period is extended and/or during follow-up assessments.

Another strength of the study is that it elucidates treatment moderators in Internet interventions, for which evidence is currently still low. The findings suggest that the iCBT intervention was particularly effective for less Internet-savvy study participants with OCD. A plausible explanation for this result is that those participants who spend more time on the Internet in general were more easily distracted by other online activities, whereas those who usually spend less time on the Internet in general concentrate more on the iCBT intervention. Since the moderator analyses were exploratory, it remains to be tested whether this effect can be replicated in future studies. If replicated, it would have important implications for the implementation of Internet interventions (i.e., recommendations for efficient utilization). Another speculative interpretation of the moderator effect of Internet usage is that people with OCD who use the Internet intensively do so as avoidance behavior, which maintains

the disorder. The test power for the moderation analyses was diminished, which may explain the lack of statistical significance for the moderators; the moderation analyses should be replicated in future studies.

The acceptability of the current iCBT intervention was higher compared to the acceptability of iCBT interventions for other conditions, such as panic disorders and phobias (Schröder et al., 2017) as well as depression (Moritz et al., 2012), where the same subjective appraisal measure was used. This may reflect general differences in the appraisals of iCBT across individuals with mental disorders or differences in the fit of the specific interventions to the needs and problems of the studied groups. A third explanation could be that some of the dissatisfied users were intervention and/or study dropouts, suggesting the need to optimize the intervention for better user compliance.

Currently, it is unknown whether the reported effects will be confirmed with a more active control condition or whether the effects will be sustained over longer time periods. Follow-up trials with additional longitudinal measurement time points as well as active control conditions need to be conducted. One factor that might limit the generalizability of the study results may be the finding that the current sample was well educated and showed relatively high employment rates. Whether these characteristics are typical for individuals with OCD who are interested in unguided Internet interventions should be tested in future studies. A further limitation of the current study is the usage of self-report measures only, which could have compromised the validity of the diagnoses obtained in this trial. Therefore, conducting diagnostic interviews should be considered in replication studies. However, this constraint may also be considered appropriate insofar as external validity constitutes a key priority; diagnostic interviews conducted on the telephone or face-to-face might discourage individuals with strong feelings of shame and fear of stigmatization from participating, and this might be the same group that avoids the traditional health care system. It is, however, essential that follow-up trials adopt conditions to increase compliance to the studied iCBT intervention in order to meet the limitation that, despite high acceptability, the intervention dropout rate was high, mostly due to lack of time or motivation. This could be accomplished by optimizing the intervention (e.g., via reminders or by allowing participants to choose the module sequence), by adding guidance (e.g., via e-mail), or by examining the intervention within a blended treatment (Erbe et al., 2017) setting.

5 | CONCLUSIONS

The unguided iCBT intervention proved to be helpful in the treatment of individuals with OCD who used it regularly. If the results are replicated, offering this intervention in mental health care settings could be a promising strategy for overcoming the existing treatment gap. However, further research needs to be conducted on how Internet interventions for OCD can achieve the greatest benefit, who they are most helpful for, and in which settings they work best.

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CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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