DOI: 10.14744/DAJPNS.2025.00276
Dusunen Adam J Psychiatr Neurol Sci
2025;38:67-79

RESEARCH ARTICLE

The efficacy of an internet-based cognitive-behavioral program assisted by a new mobile application for patients with obsessive-compulsive disorder

Sepideh Soltanmohammadlou[1], Abbas Ramezani Farani[2], Seyed Vahid Shariat[2]

[1]University of Social Welfare and Rehabilitation Sciences, School of Behavior Sciences, Department of Clinical Psychology, Tehran, Iran
[2]Iran University of Medical Sciences, Department of Behavioral Science and Mental Health, Tehran, Iran

ABSTRACT

Objective: Cognitive-behavioral therapy (CBT) is one of the most common evidence-based treatments for obsessive-compulsive disorder (OCD). However, barriers such as cost, distance, and time constraints have increased interest in internet-based therapeutic alternatives. This study aimed to evaluate the efficacy and user satisfaction of a therapist-guided internet-based cognitive-behavioral therapy (ICBT) program integrated with a new mobile application, FightOCD, in reducing obsessive-compulsive symptoms, obsessive beliefs, and depressive symptoms among patients with OCD.

Method: A single-case A-B design with follow-up was employed, involving a two-week baseline period followed by 12 therapist-guided ICBT sessions for six patients with OCD. Assessments included the Yale-Brown Obsessive-Compulsive Scale (Y-BOCS), Obsessional Beliefs Questionnaire-44 (OBQ-44), Beck Depression Inventory-II (BDI-II), Client Satisfaction Questionnaire (CSQ-8), Mobile Health Satisfaction Questionnaire (MHSQ), and Therapist Satisfaction Scale (TSS).

Results: Visual analysis of clinical outcomes indicated substantial improvement in all participants. Mixed-model analysis revealed that the intervention significantly reduced obsessive-compulsive symptoms (β=-11.64, $p<0.001$; d=0.64), obsessive beliefs (β=-48.17, $p<0.01$; d=1.35), and depressive symptoms (β=-11.87, $p<0.01$; d=0.70). Both patients and therapists reported moderate to high levels of satisfaction with the ICBT program and the FightOCD mobile application.

Conclusion: Integrating therapist-guided ICBT with the FightOCD mobile application had beneficial effects on obsessive-compulsive symptoms and depression in patients with OCD.

Keywords: Depression, internet intervention, mobile application, obsessive-compulsive disorder, single case

INTRODUCTION

Cognitive-behavioral therapy (CBT), particularly exposure and response prevention (ERP), is widely recognized as one of the most evidence-based psychological treatments (1). While CBT is commonly delivered in person, there is growing interest in internet-based cognitive-behavioral therapy (ICBT) as a means of addressing mental health conditions, depending on the level of therapist involvement and

How to cite this article: Soltanmohammadlou S, Farani AR, Shariat SV. The efficacy of an internet-based cognitive-behavioral program assisted by a new mobile application for patients with obsessive-compulsive disorder. Dusunen Adam J Psychiatr Neurol Sci 2025;38:67-79.

Correspondence: Sepideh Soltanmohammadlou, Department of Clinical Psychology, School of Behavior Sciences, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran
E-mail: se.soltanmohamadlo@uswr.ac.ir
Received: May 26, 2024; **Revised:** January 29, 2025; **Accepted:** March 24, 2025

the method of delivery (2). In synchronous ICBT, video conferencing enables interactive sessions that closely resemble in-person treatment, whereas asynchronous methods involve minimal therapist participation (3).

ICBT refers to the delivery of CBT through various internet-based platforms and tools, which decreases the conventional barriers associated with in-person CBT (4). The primary advantage of ICBT lies in its ability to offer convenient and cost-effective access to evidence-based treatment (5). In particular, it allows for a broad dissemination of therapy, including during times of crisis (4). For instance, during the height of the Coronavirus Disease 2019 (COVID-19), ICBT emerged as a practical solution for maintaining access to care amid quarantine measures and social distancing requirements (6). There is evidence that ICBT can effectively address mental health care challenges in rural and underserved areas, where limited access to treatment and high provider burden are common (7).

Obsessive-compulsive disorder (OCD) is a mental health condition conceptualized through the cognitive-behavioral approach (8). CBT targets cognitive distortions such as catastrophizing, overestimating threats, and excessive responsibility, helping patients interpret neutral stimuli more realistically (9). Additionally, CBT utilizes the ERP method to expose patients to a hierarchy of stimuli over time, helping them habituate to obsessive and compulsive triggers and cope with anxiety without engaging in safety behaviors (10). Similar to traditional CBT, ICBT also emphasizes ERP but delivers it through an online platform to address barriers and enhance accessibility. Regarding the effectiveness of CBT for OCD, there is near consensus in the research literature (11), and evidence indicates that CBT also significantly reduces depressive symptoms in patients with OCD (12).

Several clinical trials have shown that ICBT is as effective as, or even superior to, treatment as usual (TAU) in patients with OCD (13, 14). The efficacy of ICBT for OCD has also been supported by a meta-analysis (15). As ICBT has become more widespread, several mobile applications designed for OCD have demonstrated that training exercises among students significantly reduce the recurrence of OCD-related beliefs and symptoms (16). A study on the self-help application Live Free OCD also showed a considerable reduction in OCD symptoms (17). Nevertheless, therapist support and guidance during self-help treatments for OCD are crucial (18). According to a systematic review, increasing therapist interaction during self-help treatment can lead to greater improvement and lower treatment dropout rates among patients with OCD (19). Furthermore, an evaluation of an integrated treatment model, including brief in-person sessions combined with a mobile application to enhance accessibility and reduce time burden, found that 42% of participants responded to therapy, and 24% experienced minimal symptoms (20).

Several factors suggest that providing synchronous ICBT can address the inherent limitations of traditional in-clinic treatment. First, these interventions offer greater accessibility to mental health services for individuals who may face barriers to attending in-person therapy due to geographical, financial, or time constraints. This expands access to support for a broader range of people. Second, the online format allows for a more flexible and personalized approach to therapy. Clients can engage with therapeutic materials in their own environments and in the comfort of their homes, which may help reduce the stigma and anxiety associated with seeking help in a clinical setting. Finally, online interventions are often more cost-effective than traditional therapies, enabling mental health professionals to serve a larger number of clients and reduce the overall burden of mental health disorders (3). However, the typical interval between sessions, usually one week, may remain a challenge for patients. One of the key motivations behind the development of therapeutic applications is to address these between-session challenges. Recent evidence suggests that mobile applications can support patients by providing information about the treatment process, between-session assignments, and progress tracking (21). They also enable therapists to offer feedback on the challenges patients face with their assignments. Therefore, integrating ICBT with a supplementary mobile application can enhance both in-session and between-session engagement. Additionally, therapists can evaluate how patients implement ERP in their daily lives, making it more convenient to provide appropriate feedback (22). However, knowledge about the effectiveness of internet-based treatments, the benefits of assisted mobile applications, and patient and therapist satisfaction with these tools has not yet reached its peak.

In this context, the current study proposes an ICBT program delivered via video conferencing and supported by a mobile application named FightOCD. This app was designed as a facilitating

Table 1: Sociodemographic characteristics and outcome scores

Variable	P1	P2	P3	P4	P5	P6
Age	44	38	34	28	45	32
Gender	Female	Female	Female	Male	Male	Female
Marital status	Married	Married	Single	Single	Married	Single
Education	Bachelor's	Bachelor's	Master's	Associate degree	Bachelor's	Master's
Occupation	Housewife	Housewife	Housewife	Unemployed	Unemployed	Employee
OCD duration	27 years	5 years	14 years	13 years	13 years	14 years
OCD characteristics	Obsession with sin, religion, morality; fear of impurity	–	Obsession with sin, religion, morality	Obsession with sin, religion, morality; fear of impurity	Obsession with sin, religion, morality; fear of impurity	–

Outcome measures	Pre-treatment M (SD)	Post-treatment M (SD)	Follow-up M (SD)
Y-BOCS	27.75 (3.51)	21.50 (5.53)	17.33 (5.75)
OBQ	211.16 (36.23)	186.44 (41.16)	171.83 (43.52)
BDI	32.41 (7.78)	26.75 (8.53)	20.50 (6.09)

P1-P6: Participants; M: Mean; SD: Standard deviation; Y-BOCS: Yale-Brown Obsessive-Compulsive Scale; OBQ: Obsessive Beliefs Questionnaire; BDI: Beck Depression Inventory.

tool to strengthen the therapeutic alliance and assist with homework assignments. A distinctive aspect of this study is its implementation within a Shia community, where predominant clinical presentation among participants was contamination-related OCD with a fear of impurities. Despite this, there is limited evidence regarding the effectiveness of such interventions within this religious group. The aim of this study was to evaluate the satisfaction and efficacy of a therapist-guided ICBT program, supported by the FightOCD mobile application, in reducing obsessive-compulsive and depressive symptoms among individuals with OCD.

The following hypotheses were proposed:

1. Patients with OCD will report reduced levels of obsessive and compulsive symptoms following the therapist-guided internet-based cognitive-behavioral program and use of the FightOCD application.
2. Patients with OCD will report reduced levels of obsessive and compulsive beliefs following the therapist-guided internet-based cognitive-behavioral program and use of the FightOCD application.
3. Patients with OCD will report reduced levels of depressive symptoms following the therapist-guided internet-based cognitive-behavioral program and use of the FightOCD application.
4. Patients with OCD will report high levels of satisfaction with the therapist-guided internet-based cognitive-behavioral program.
5. Patients with OCD will report high levels of satisfaction with the FightOCD application.

METHODS

Participants

As shown in Table 1, we recruited six patients with OCD (66.66% female) from psychiatric centers in Tehran. The participants had an average age of 36.83 years (age range: 28–45 years). Half of the participants were married, while the other half were single.

Additionally, three participants had a bachelor's degree (50.00%), two had a master's degree (33.34%), and one had an associate's degree (16.66%). Regarding employment status, two participants were housewives (33.33%), two were unemployed (33.33%), one was employed full-time (16.66%), and one had a part-time job (16.66%).

Measures

Structured Clinical Interview for DSM-5 Disorders – Clinician Version (SCID-5-CV)

The SCID-5-CV (23) is widely used to diagnose mental disorders based on the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria. It has demonstrated high specificity, good test-retest and inter-rater reliability, and strong clinical validity across various populations worldwide (24). In an Iranian sample, evidence indicates that the sensitivity for all diagnoses exceeds 0.80 (25).

Structured Clinical Interview for DSM-5 Personality Disorders (SCID-5-PD)

The SCID-5-PD (26) was used to diagnose personality disorders based on DSM-5 criteria. It evaluates personality disorder symptoms on a three-point scale: no symptoms, subthreshold, and threshold. While the DSM-5 criteria for personality disorders have not changed, the interview questions have been carefully reviewed and refined. Evidence supports the validity and reliability of the Persian version of the SCID-5-PD (27).

Yale-Brown Obsessive-Compulsive Scale (Y-BOCS)

The Y-BOCS (28) is a semi-structured interview designed to assess the presence and severity of obsessive and compulsive symptoms as rated by a clinician. It consists of 10 items, each rated on a 5-point Likert scale ranging from 0 (none) to 4 (extreme). The scale includes five items that assess distress, time, control of obsessions, resistance, and interference, and five items that assess compulsions. The reliability of the Y-BOCS and its Cronbach's alpha internal consistency coefficient have been reported to range from 0.85 to 0.93 and from 0.69 to 0.91, respectively (28, 29). The psychometric properties of the Persian version of the Y-BOCS demonstrated internal consistency coefficients of 0.97 for the symptom checklist and 0.95 for the severity scale (30).

Obsessive Beliefs Questionnaire (OBQ)

The OBQ (31) is a self-report questionnaire used to assess beliefs in individuals with OCD. It evaluates dimensions such as perfectionism, overestimation of threat, intolerance of uncertainty, responsibility, thought control, and the importance of thoughts. The OBQ uses a 7-point Likert scale ranging from 0 (strongly disagree) to 6 (strongly agree). The internal consistency of this questionnaire has been reported to range from 0.80 to 0.96 in studies involving patients with OCD. Additionally, a high Cronbach's alpha coefficient (α=0.91) has been reported in an Iranian population (32).

Beck Depression Inventory (BDI)

The BDI-II (33) was developed to assess depressive symptoms and consists of 21 items rated on a 4-point Likert scale from 0 (not at all) to 3 (severely). Total scores range from 0 to 63 and are categorized as follows: no depressive symptoms (0–13), mild depression (14–19), moderate depression (20–28), and severe depression (28–63). The BDI's test-retest reliability has been reported to range from 0.73 to 0.96 (34). Additionally, the alpha coefficients for patient and non-patient groups were 0.86 and 0.81, respectively (33). In the Iranian population, the internal consistency of the BDI has been reported as 0.87 (35).

Client Satisfaction Questionnaire (CSQ)

The CSQ (36) is a self-report scale designed to assess participants' satisfaction with a psychotherapy program. It consists of eight items, each rated on a 4-point Likert scale ranging from 1 (excellent) to 4 (poor). Total scores range from 8 to 32, with higher scores indicating greater satisfaction with the treatment. Scores of 8–20 indicate low satisfaction, 21–26 indicate medium satisfaction, and 27–32 indicate high satisfaction. In the original study, the CSQ demonstrated high internal consistency, with Cronbach's alpha ranging from 0.90 to 0.94 (36).

Mobile Health Satisfaction Questionnaire (MHSQ)

The MHSQ (37) is a 12-item questionnaire developed to assess user satisfaction with mobile health applications. Although initially scored on a 5-point Likert scale, the developers recommend using a 3-point Likert scale ranging from 1 (strongly disagree) to 3 (strongly agree). The questionnaire includes two sections: evaluation of the application and user experience with the health app. It has demonstrated good test-retest reliability and an intraclass correlation coefficient of approximately 0.82 (37).

Therapist Satisfaction Scale (TSS)

In the current study, a 14-item scale was developed to assess two main subscales: therapist satisfaction with online video teletherapy (nine items) and therapist satisfaction with the mobile application (five items). Items were rated on a 3-point Likert scale ranging from 1 (disagree) to 3 (agree). Higher scores on this scale indicate greater therapist satisfaction with the treatment. The TSS requires further development and validation in future studies.

Design

This study was a single-case pilot trial. We used a single-case, semi-experimental design to assess changes in the dependent variables for each participant. The dependent variables were measured multiple times: at baseline, pre-treatment, and post-treatment (38). Single-case pilot trials are appropriate when the nature of the intervention requires preliminary testing before broader application (39). Therefore, the current study employed an AB design with follow-up. The OBQ, Y-BOCS, and BDI were assessed twice during baseline (Phase A).

During the intervention phase, outcome variables were measured repeatedly (Phase B), and a final assessment was conducted during the follow-up phase.

Procedure

Participants were recruited through an announcement at a psychiatric center, and their eligibility was initially assessed via a brief telephone interview. During these calls, applicants received basic information about the study and were screened for OCD symptoms as well as their willingness to participate in online therapy sessions. A total of 28 individuals were screened during the initial telephone interviews. Of these, six participants were selected for inclusion in the study. The remaining 22 were excluded because they did not meet the study criteria (primarily lacking access to an Android smartphone or being unwilling to participate in online sessions). Applicants who met these two basic criteria were invited for an in-person diagnostic assessment using the Structured Clinical Interview for DSM-5 – Clinician Version (23) and the Structured Clinical Interview For DSM-5 – Personality Disorders (26). Inclusion criteria were as follows: (1) a principal diagnosis of contamination-related OCD based on DSM-5 criteria (as assessed by the SCID-5), with at least moderate severity (Y-BOCS score ≥16) (28); (2) no engagement in OCD-focused psychotherapy during the past three months; (3) not currently taking psychotropic medication, or if taking, maintaining a stable dose for at least three months prior to and throughout the treatment period; (4) daily access to the internet and an Android smartphone; (5) willingness to participate in online therapy sessions; (6) a minimum educational level of ninth grade, and age between 20 and 50 years. Exclusion criteria were as follows: (1) comorbid psychotic symptoms or a diagnosis of substance use disorder; (2) history of bipolar disorder or psychosis; (3) severe personality disorders, including paranoid, borderline, narcissistic, or antisocial personality disorder; (4) serious suicidal ideation including severe thoughts of suicide, having a plan to commit suicide, or a suicide attempt within the past two months; and (5) any medical or psychiatric condition requiring immediate attention (e.g., acute or chronic medical conditions necessitating urgent or prolonged treatment or hospitalization at the time of the study). Eligible participants completed an informed consent form and were provided with instructions on how to use the online video conferencing platform. During the same session, the FightOCD application was installed on their smartphones, and they were guided on how to use it and complete the questionnaires via their phones. Participants received 12 weekly cognitive-behavioral therapy sessions through online video conferencing and used the FightOCD application between sessions. Assessments were conducted at baseline, after each treatment module, and at a two-month follow-up. None of the participants dropped out during the treatment period.

Treatment Program

This study delivered a 12-week ICBT program via video conferencing. The sessions were based on a CBT protocol for OCD (40). Each participant attended 12 weekly sessions, each lasting 45 minutes, except for the ERP sessions, which lasted 90 minutes. The treatment protocol included motivational interviewing, psychoeducation, cognitive restructuring, ERP, and relapse prevention. ERP sessions comprised the longest part of the treatment period, spanning eight sessions. During these sessions, the therapist guided participants on how to rate their anxiety levels before and after exposure to specific stimuli related to their real-life triggers, such as kitchen utensils, toilets, household furniture, and appliances like TV remote controls, sockets, power outlets, wardrobe clothes, door handles, and carpets. The therapist also provided feedback on how to experience emotions and obsessive thoughts during exposure. Participants were given the flexibility to conduct exposure sessions in various settings, including their homes or workplaces, depending on the nature of their obsessive triggers. Each participant followed a personalized exposure hierarchy, using real-life stimuli tailored to their individual situations. Assignments were also customized to address each participant's specific needs, with a strong emphasis on ERP practice.

Therapist's Background and Involvement

The therapist in this study was a Ph.D. candidate in clinical psychology, trained in delivering ICBT for OCD under supervision. She also had prior experience providing psychological services to both inpatient and outpatient populations. Her experience with ICBT was primarily developed during the COVID-19 pandemic, when she was responsible for maintaining patients' online treatment. Throughout the study, she was supervised by her professor, a clinical psychologist and OCD expert (the second author).

In this study, the therapist fulfilled the same role as in traditional in-person sessions. In addition to teaching participants the principles and techniques of ICBT and its practical application, she actively guided all stages of treatment, including psychoeducation, cognitive

restructuring, ERP, and relapse prevention, via video conferencing. She monitored participants' progress and challenges using a digital interface and supported their treatment by providing daily feedback.

Mobile Application: FightOCD

This study utilized an Android application called FightOCD, which was developed based on CBT principles for OCD. The application was designed to help address challenges that patients often face between therapy sessions, such as loss of motivation, forgetting session content, lack of access to treatment materials, and limited therapist contact for feedback. The main objectives of the application were as follows: a) to increase adherence to homework assignments between therapy sessions by providing daily reminders with alarms; b) to enhance patient motivation by displaying goal progress and weekly progress graphs, and by sending daily incentives and motivational messages; c) to sustain motivation by providing daily feedback on homework results and enabling therapist responses; d) to improve therapist involvement in the treatment process; e) to facilitate remote therapy delivery; and f) to support remote administration of questionnaires and follow-up assessments. The user interface of FightOCD was designed for installation on participants' smartphones, while therapists accessed clients' recorded tasks and activities through a panel. The application is divided into multiple sections to help patients manage their symptoms and stay aligned with treatment goals. The first section outlines treatment goals, collaboratively set by the therapist and patient. This helps patients understand what they are working toward and provides a clear roadmap for achieving their objectives.

Overall, FightOCD represents a promising tool for enhancing adherence and motivation in CBT for OCD. Its user-friendly interface and comprehensive features offer continuous support between therapy sessions and allow therapists to monitor progress remotely. The second section focuses on education and provides patients with written content and videos that offer both general and personalized information related to their treatment. The third section is dedicated to the ERP hierarchy, which is collaboratively developed by the therapist and the patient. It guides patients on gradually exposing themselves to anxiety-provoking situations and helps them identify and manage their responses. After each step, patients are asked to indicate their Subjective Units of Distress Scale (SUDS) level using a sliding bar. The fourth section includes summaries of previous sessions and a plan for the upcoming session. This helps patients track their progress over time and gives them a clear roadmap for the next stage of therapy. The fifth section provides regular reminders to help patients stay engaged by prompting them to complete their assignments consistently. The messaging feature is another important component of the app and includes two categories: encouraging messages and motivational messages. Participants received encouraging messages with therapist feedback when they successfully completed an assignment. In contrast, motivational messages were sent when participants failed to complete an assignment. Finally, progress charts displayed weekly and overall goal progress, providing patients with visual feedback on their treatment journey over time.

To evaluate the initial validity and usability of the application, and to identify potential issues and obstacles before starting the main study, ICBT using the app was first tested with a volunteer diagnosed with OCD (41). The present study then proceeded to assess its effectiveness and patient satisfaction with both the treatment and the mobile application.

Ethical Considerations

The ethical aspects of the study, including informed consent and confidentiality, were clearly explained to all participants. Participation was voluntary, and participants were free to withdraw from the study at any time. Written informed consent was obtained from all participants. The entire study was conducted under the supervision of the Ethics Committee of Iran University of Medical Sciences and received formal approval (IRB approval date: 16.05.2019, No: IR.IUMS.REC.1398.226).

Data Analysis

Data were analyzed using both visual and statistical methods. Visual inspection is the most common approach for single-subject designs; however, as recommended by Campbell and Herzinger (42), statistical analyses were also employed to strengthen confidence in the visual findings, quantify the results, and enhance objectivity. Microsoft Excel was used for graphing the visual data, and SPSS version 22 was used for statistical analysis. Visual inspection followed the guidelines outlined by Barker et al. (43) In the graphs, the Y-axis represents the average scores for the Y-BOCS, OBQ, and BDI, while the X-axis represents the study phases. The visual data include two baseline assessments, 12 assessments during the intervention phase, and one follow-up assessment at two months.

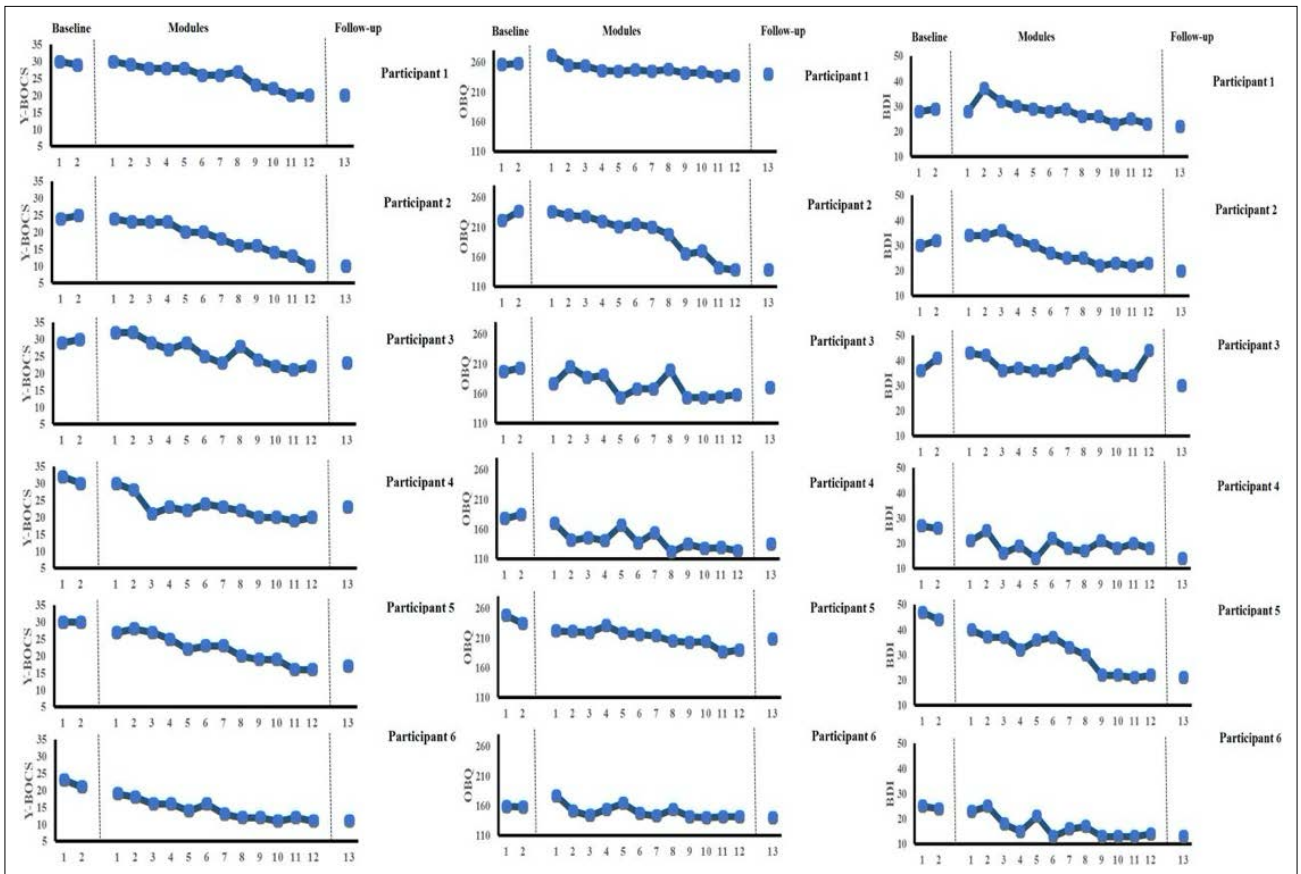

Figure 1. Participants' changes from baseline to follow-up.

Visual Inspection Analysis

Visual inspection of graphs includes assessments of trend (the direction of change over the course of the study), level (the range of assessment scores), and stability (the degree of data variability). Using these indicators, visual analysis evaluated the treatment effects under two conditions: within-condition and between-condition. Within-condition analysis refers to examining the data pattern within a single phase of the study, whereas between-condition analysis involves comparing adjacent phases of the study. In the current study, within-condition analysis included the median, mean, range of change, stability band, and absolute change (i.e., the difference between the first and last data points of each phase). Between-condition analysis included the median, mean, absolute change (i.e., the difference between baseline data and the initial treatment data), change in trend, and data overlap.

Statistical Analysis

Although visual inspection was used to analyze each participant's data individually, regression analysis using a mixed model approach was also employed to examine the overall effects of the intervention and the passage of time from baseline to follow-up. Four parameters were defined: b0–b3. The baseline intercept (b0) and the baseline treatment difference in the intercept (b1) indicate the dependent variable scores when time_in_phase is equal to zero. b1 represents the difference in scores between the start of the baseline phase and the start of the intervention. Furthermore, b2 represents the baseline trend, and b3 reflects the change in the dependent variables from baseline to follow-up. To ensure that the observed changes were not due to measurement error, we also evaluated the Percentage of Non-Overlapping Data (PND) and Overlapping Data (POD), Mean Baseline Reduction (MBLR), and Cohen's d.

RESULTS

Visual Inspection

We visually inspected all baseline, intervention, post-treatment, and follow-up assessments of the outcome measures. The baseline levels of half the participants (P2, P3, and P5) were either stable or showed deterioration, while the other half (P1, P4, and P6) demonstrated improvements in the baseline levels. As shown in Figure 1, all participants

Table 2: Coefficients from linear mixed effects regression analysis

Variable	β	SE	P	95% Confidence Interval		d
				Lower bound	Upper bound	
Y-BOCS						1.349
Intercept (b_0)	27.500	1.822	<0.001	23.878	31.122	
Phase (b_1)	-11.639	2.057	<0.001	-15.729	-7.550	
Time_in_phase (b_2)	0.500	2.577	0.847	-4.622	5.622	
Time_in_phase*phase (b_3)	0.386	2.580	0.881	-4.743	5.516	
OBQ						0.638
Intercept (b_0)	212.500	15.995	<0.001	180.704	244.296	
Phase (b_1)	-48.174	18.059	0.009	-84.073	-12.275	
Time_in_phase (b_2)	-2.667	22.620	0.906	-47.633	42.300	
Time_in_phase*phase (b_3)	6.166	22.620	0.786	-38.863	51.194	
BDI-II						0.693
Intercept (b_0)	32.667	3.214	<0.001	26.277	39.056	
Phase (b_1)	-11.870	3.629	0.002	-19.084	-4.656	
Time_in_phase (b_2)	-0.500	4.546	0.913	-9.536	8.536	
Time_in_phase*phase (b_3)	1.412	4.552	0.757	-7.637	10.461	

Y-BOCS: Yale-Brown Obsessive-Compulsive Scale; OBQ: Obsessive Beliefs Questionnaire; BDI-II: Beck Depression Inventory; b1: Difference between baseline and follow-up; b2: Baseline trend; b3: Trend difference between baseline and follow-up; SE: Standard error.

exhibited improvements in their scores during the intervention phase (Fig. 1).

Comparisons Across Study Phases

The current study used mixed model analysis to examine changes in Y-BOCS, OBQ, and BDI-II scores from baseline to follow-up. As shown in Table 2, there was a significant reduction in scores for all three variables at follow-up (Y-BOCS: b1=-11.64, p<0.01; OBQ: b1=-48.17, p<0.01; BDI-II: b1=-11.88, p<0.01). Conversely, no significant changes in trend were observed for any of the dependent variables during the baseline phase (p>0.05). Despite the significant decreases observed at follow-up, no significant trends in score changes were found from baseline to the intervention phase for Y-BOCS, OBQ, or BDI-II (p>0.05). Additionally, the study employed Cohen's d to examine the effect sizes for the three outcome measures: Y-BOCS, BDI-II, and OBQ. The results indicated that the largest effect size was observed for Y-BOCS (d=1.29, large), followed by BDI-II (d=0.693, medium), and OBQ (d=0.638, medium).

Reliable Change

We analyzed the results using the Leeds Reliable Change indicator, which revealed that participants experienced one of three outcomes: no change, reliable change, and clinically significant change (Fig. 2). For the Y-BOCS, all participants showed significant improvement and met the criteria for reliable change. However, only one participant (P6) achieved a clinically significant change. In terms of the OBQ, three participants (P1, P5, and P6) showed no change, while the remaining three (P2, P3, and P4) demonstrated significant improvement, meeting the criteria for

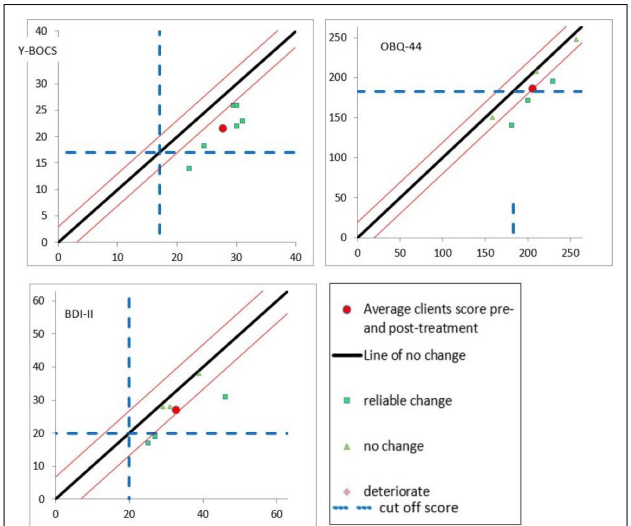

Figure 2. The Leeds Reliable Change Index for Yale-Brown Obsessive-Compulsive Scale (Y-BOCS), the Obsessive Beliefs Questionnaire (OBQ), and the Beck Depression Inventory-II (BDI-II).

reliable change. Among these, two participants (P3 and P4) reached clinically significant change. Regarding the BDI-II, three participants (P1, P2, and P3) showed no change, while the other three (P4, P5, and P6) showed significant improvement and met the criteria for reliable change. Among these, two participants (P4 and P6) achieved clinically significant change.

Satisfaction with Treatment

The results indicated that patients experienced high satisfaction with ICBT, as evidenced by a mean score of 20.17 (standard deviation, SD=0.98) on the CSQ. Additionally, patients reported moderate satisfaction with the mobile application, as measured by the MHSQ, with a mean score of 26 (SD=2.53). The MHSQ subscales assessing participants' experience with the application and their evaluation of it yielded moderate mean scores of 8.67 (SD=1.63) and 17.33 (SD=1.86), respectively. Furthermore, the therapist's satisfaction with both online video teletherapy and the mobile application was assessed using the TSS, which produced a total score of 38. Specifically, the therapist rated online video conferencing and the mobile application as entirely satisfactory, with individual scores of 25 and 13, respectively.

DISCUSSION

The present study provides preliminary evidence in support of internet-based interventions for patients with contamination-related OCD, integrating therapist-guided ICBT with a mobile application. The findings showed that participants' obsessive-compulsive symptoms, obsessive beliefs, and depressive symptoms significantly improved following the intervention and were maintained at the two-month follow-up. The effect size for obsessive-compulsive symptoms was large, and medium for both obsessive beliefs and depression. Additionally, all participants demonstrated reliable change across the three outcome variables, except for participants 2, 3, and 4, who showed no change in obsessive beliefs, and participants 1, 5, and 6, who showed no change in depressive symptoms. These results suggest that participants experienced greater behavioral improvements than cognitive ones. Indeed, cognitive change is often time-consuming and particularly challenging, especially for patients with OCD who are preoccupied with themes such as sin, punishment, anxiety, and morality. This tendency, which was evident among participants in the present study, is associated with difficulty in challenging the validity of obsessive beliefs. Furthermore, some researchers suggest that the greater the fusion of thought and action in individuals with OCD, the less they may benefit from treatment (38).

It should be noted that the current study was not specifically designed to target depression; nevertheless, we anticipated that improvements in OCD symptoms would be accompanied by a reduction in depressive symptoms. It appears that as patients recover from OCD, they gain more opportunities to engage in various aspects of life and achieve a higher overall quality of life. The results also demonstrated a high level of patient satisfaction with ICBT and moderate satisfaction with the mobile application. The therapist likewise found both ICBT and the mobile application to be satisfactory.

As mentioned earlier, ERP was conducted via video conferencing in real-life environments, with the therapist guiding patients through direct exposure to real stimuli. Depending on the specific triggers, patients could carry out the exposure process in their own homes, their parents' homes, or in various settings such as bathrooms or different parts of the house. In fact, when patients undergo exposure in natural environments, it becomes easier to generalize treatment effects to other real-world situations. In other words, one reason patients may not achieve optimal treatment outcomes from EPR is the limitation of conducting exposures within a clinical setting (44). Our findings support previous clinical trials that have demonstrated the efficacy of ICBT with ERP for patients with OCD (14). Additionally, they support the notion that delivering ERP via video conferencing can produce outcomes comparable to those achieved through ERP in real-world environments (45).

According to the literature, patients who engage in ERP through video conferencing benefit from a strong therapeutic alliance, a sense of autonomy in achieving therapeutic goals, and overall satisfaction with the treatment process (46). One of the key factors contributing to the success of ERP via video conferencing is the ability to perform exposures in the patient's real-life environment, where symptoms are naturally triggered, while receiving real-time guidance and feedback from the therapist (47). For instance, the therapist can monitor exposure procedures in settings like bathrooms via video conferencing without needing to travel to the patient's home, observe the patient's specific triggers, adjust the exposure hierarchy as needed, and provide immediate feedback on the patient's actual responses.

The effect sizes in this study were large for the Y-BOCS and medium for both the OBQ and the BDI. These results are consistent with findings from previous clinical trials, which reported a large effect size of ICBT on Y-BOCS and a medium effect size on OBQ (48). These findings support research demonstrating the effectiveness of ICBT in reducing obsessive-compulsive symptoms in patients with OCD. However, contrary to our expectations, the results suggest that adding a therapeutic mobile application to ICBT does not significantly enhance its efficacy compared to studies without a supplementary app. This is because some mobile applications, such as the one used in the current study, are designed to enhance the patient experience with the primary treatment rather than function as standalone interventions. As a result, they contribute to greater satisfaction and improved access to care (49).

A high average score on the CSQ and a moderate average on the MHSQ indicate strong patient satisfaction with ICBT, including both the evaluation of and experience with the mobile application. Patients are able to overcome treatment barriers by attending video-conferencing sessions from their homes or any other convenient location. For example, they can access their therapist promptly without investing significant time or financial resources. Additionally, patients concerned about the stigma associated with mental disorders can receive necessary care through ICBT without facing that stigma. Finally, patients are not required to discontinue therapy in exceptional situations, such as relocating to a different geographic area. The benefits of ICBT, combined with the growing shift of everyday activities to digital platforms, make it a convenient and satisfactory therapy option for some patients. As for the treatment application, some clients report high satisfaction, while others are less satisfied or even dissatisfied. Although this study did not assess the direct impact of the FightOCD application on treatment effectiveness, previous research has shown that using mobile applications can positively influence treatment outcomes. This indicates that treatments incorporating detailed therapist feedback on the intervention process and patient progress can lead to improved outcomes (50). Therapist feedback helps patients compare their actual performance with expected outcomes. The identified discrepancies between expected and actual performance encourage both patients and therapists to adjust their behaviors and make changes to the treatment process. Additionally, feedback strengthens the therapist-patient alliance, supports more accurate assessment of treatment goals, enhances patients' understanding of their condition, increases their involvement in decision-making, and boosts their self-efficacy (51). While some patients report high satisfaction, others may feel less satisfied or even dissatisfied.

Patients' satisfaction with mental health applications mainly depends on a user-friendly environment, high processing speed, and time-efficient activities. In contrast, dissatisfaction with the applications often stem from a lack of choice diversity, personalization, customer support, trust, and security. Although the present study achieved average satisfaction among OCD patients, previous evidence shows that some applications supporting ERP interventions in the form of self-help have achieved high user satisfaction (17).

Owing to the limitations of the present study, the results should be interpreted with caution. The research was a pilot study; thus, to generalize the findings, it is important to conduct further, comparable research with a larger sample size. Second, because the application was used for the first time, both the therapist and participants encountered technical problems during the course of therapy. For instance, the application could not access the server or retrieve information from previous sessions. There were also bugs in the estimation of participants' progress, which were fixed by an update from the application development team. In addition, although efforts were made to control for side effects to a significant extent, factors such as the history of previous treatments, different types of medications used by participants, or cultural and religious teachings specific to Iranian culture (or unique to each participant) may have influenced the results. This could limit the generalizability of the findings. Our clinical observations revealed that patient and therapist satisfaction with the application was influenced by the completion of forms and written content, such as summaries of previous sessions, feedback from the therapist to the patient, questions from the patient to the therapist, and the patient's reports on assignment details. Another limitation of the current study was the two-data-point baseline, which resulted from the large number of research tools and limited participant cooperation. It is recommended that future studies include at least a 5–6 point baseline to more accurately assess the stability of the results. Finally, the Android version was the only platform capable of running the application.

CONCLUSION

This study contributes to the growing body of evidence on the use of ICBT integrated with a mobile application for patients with OCD. It is recommended that similar studies with larger sample sizes be conducted to more precisely evaluate this treatment model for patients with OCD. Future research could also compare the effectiveness of this approach with other psychological interventions, such as traditional CBT. In particular, a parallel experiment comparing ICBT with and without the mobile application is suggested to determine the added value of the app. Additionally, future studies should consider increasing the number of therapy sessions and extending the follow-up period to enhance the assessment. To further improve therapist and participant satisfaction, it is also recommended that, where feasible, feedback and reports be provided in the form of audio files within the application.

Ethical Approval: The Iran University of Medical Sciences Ethics Committee granted approval for this study (date: 16.05.2019, number: IR.IUMS.REC.1398.226).

Informed Consent: Written informed consent was obtained from each participant prior to enrollment in the study.

Conflict of Interest: The authors declare that they have no conflict of interest.

Financial Disclosure: This study was funded by the Iran University of Medical Sciences (grant number: 98.2.83.14933).

Use of AI for Writing Assistance: Not declared.

Contribution Categories		Author Initials
Category 1	Concept/Design	S.S., A.R.F.
	Data acquisition	S.S.
	Data analysis/Interpretation	S.S.
Category 2	Drafting manuscript	S.S., A.R.F.
	Critical revision of manuscript	S.V.S.
Category 3	Final approval and accountability	S.S., A.R.F., S.V.S.
Other	Technical or material support	A.R.F., S.V.S.
	Supervision	S.V.S.
	Securing funding (if applicable)	A.R.F., S.V.S.

Peer-review: Externally peer-reviewed.

REFERENCES

1. Ost LG, Enebrink P, Finnes A, Ghaderi A, Havnen A, Kvale G, et al. Cognitive behavior therapy for obsessive-compulsive disorder in routine clinical care: A systematic review and meta-analysis. Behav Res Ther 2022; 159:104170. [CrossRef]
2. Andersson G, Titov N. Advantages and limitations of Internet-based interventions for common mental disorders. World Psychiatry 2014; 13:4-11. [CrossRef]
3. Townsend AN, Hertz AG, D'Souza JM, Wiese AD. Advances in psychotherapy with internet-based cognitive behavioral therapy for anxiety and obsessive-compulsive disorder. Adv Psychiatry Behav Heal 2022; 2:57-70. [CrossRef]
4. Molloy A, Ellis DM, Su L, Anderson PL. Improving acceptability and uptake behavior for internet-based cognitive-behavioral therapy. Front Digit Heal 2021; 3:653686. [CrossRef]
5. Osborne D, Meyer D, Moulding R, Kyrios M, Bailey E, Nedeljkovic M. Cost-effectiveness of internet-based cognitive-behavioural therapy for obsessive-compulsive disorder. Internet Interv 2019; 18:100277. [CrossRef]
6. Aminoff V, Sellén M, Sorliden E, Ludvigsson M, Berg M, Andersson G. Internet-based cognitive behavioral therapy for psychological distress associated with the covid-19 pandemic: A pilot randomized controlled trial. Front Psychol 2021; 12:684540. [CrossRef]
7. Shealy KM, Davidson TM, Jones AM, Lopez CM, de Arellano MA. Delivering an evidence-based mental health treatment to underserved populations using telemedicine: The case of a trauma-affected adolescent in a rural setting. Cogn Behav Pract 2015; 22:331-344. [CrossRef]
8. Gragnani A, Zaccari V, Femia G, Pellegrini V, Tenore K, Fadda S, et al. 'Cognitive-behavioral treatment of obsessive-compulsive disorder: The results of a naturalistic outcomes study. J Clin Med 2022; 11:2762. [CrossRef]
9. Kaczkurkin AN, Foa EB. Cognitive-behavioral therapy for anxiety disorders: An update on the empirical evidence. Dialogues Clin Neurosci 2015; 17:337-346. [CrossRef]
10. Benito KG, Walther M. Therapeutic process during exposure: Habituation model. J Obsessive Compuls Relat Disord 2015; 6:147-157. [CrossRef]
11. Foa EB. Cognitive behavioral therapy of obsessive-compulsive disorder. Dialogues Clin Neurosci 2010; 12:199-207. [CrossRef]
12. Rodrigues EP, Fechine AJB, Oliveira AC, Matos CFF, Passarela C de M, Hemanny C, et al. Randomized trial of the efficacy of trial-based cognitive therapy for obsessive-compulsive disorder: Preliminary findings. Trends Psychiatry Psychother 2023; 45:e20210247. [CrossRef]
13. Lundström L, Flygare O, Andersson E, Enander J, Bottai M, Ivanov VZ, et al. Effect of internet-based vs face-to-face cognitive behavioral therapy for adults with obsessive-compulsive disorder: A randomized clinical trial. JAMA Netw Open 2022; 5:e221967. [CrossRef]
14. Matsumoto K, Hamatani S, Makino T, Takahashi J, Suzuki F, Ida T, et al. Guided internet-based cognitive behavioral therapy for obsessive-compulsive disorder: A multicenter randomized controlled trial in Japan. Internet Interv 2022; 28:100515. [CrossRef]
15. Pozza A, Andersson G, Dèttore D. Therapist-guided internet-based cognitive-behavioural therapy for adult obsessive-compulsive disorder: A meta-analysis. Eur Psychiatry 2016; 33:276-277. [CrossRef]
16. Roncero M, Belloch A, Doron G. A novel approach to challenging OCD related beliefs using a mobile-app: An exploratory study. J Behav Ther Exp Psychiatry 2018; 59:157-160. [CrossRef]

17. Boisseau CL, Schwartzman CM, Lawton J, Mancebo MC. App-guided exposure and response prevention for obsessive compulsive disorder: an open pilot trial. Cogn Behav Ther 2017; 46:447-458. [CrossRef]

18. Kenwright M, Marks I, Graham C, Franses A, Mataix-Cols D. Brief scheduled phone support from a clinician to enhance computer-aided self-help for obsessive-compulsive disorder: Randomized controlled trial. J Clin Psychol 2005; 61:1499-1508. [CrossRef]

19. Pearcy CP, Anderson RA, Egan SJ, Rees CS. A systematic review and meta-analysis of self-help therapeutic interventions for obsessive-compulsive disorder: Is therapeutic contact key to overall improvement? J Behav Ther Exp Psychiatry 2016; 51:74-83. [CrossRef]

20. Gershkovich M, Middleton R, Hezel DM, Grimaldi S, Renna M, Basaraba C, et al. Integrating exposure and response prevention with a mobile app to treat obsessive-compulsive disorder: Feasibility, acceptability, and preliminary effects. Behav Ther 2021; 52:394-405. [CrossRef]

21. Jalal B, Chamberlain SR, Robbins TW, Sahakian BJ. Obsessive-compulsive disorder - contamination fears, features, and treatment: Novel smartphone therapies in light of global mental health and pandemics (COVID-19). CNS Spectr 2022; 27:136-144. [CrossRef]

22. Van Ameringen M, Turna J, Khalesi Z, Pullia K, Patterson B. There is an app for that! The current state of mobile applications (apps) for DSM-5 obsessive-compulsive disorder, posttraumatic stress disorder, anxiety and mood disorders. Depress Anxiety 2017; 34:526-539. [CrossRef]

23. First MB, Williams JB, Karg RS, Spitzer RL. Structured Clinical Interview for DSM-5 Disorders, Clinician Version (SCID-5-CV). Arlington, VA: American Psychiatric Association, 2016, 94-99.

24. Osório FL, Loureiro SR, Hallak JEC, Machado-de-Sousa JP, Ushirohira JM, Baes CVW, et al. Clinical validity and intrarater and test-retest reliability of the structured clinical interview for DSM-5 - Clinician Version (SCID-5-CV). Psychiatry Clin Neurosci 2019; 73:754-760. [CrossRef]

25. Shabani A, Masoumian S, Zamirinejad S, Hejri M, Pirmorad T, Yaghmaeezadeh H. Psychometric properties of structured clinical interview for DSM-5 disorders-clinician version (SCID-5-CV). Brain Behav 2021; 11:e01894. [CrossRef]

26. First M, Williams J, Benjamin L, Spitzer R. Structured clinical interview for DSM-5 personality disorders: SCID-5-PD. Arlington, VA: American Psychiatric Association, 2016, 94-99.

27. Gharraee B, Shabani A, Masoumian S, Zamirinejad S, Yaghmaeezadeh H, Khanjani S, et al. Psychometric properties of persian version of structured clinical interview for DSM-5 for personality disorders. East Asian Arch Psychiatry 2022; 32:95-99. [CrossRef]

28. Goodman WK, Price LH, Rasmussen SA, Mazure C, Fleischmann RL, Hill CL, et al. The Yale-Brown Obsessive Compulsive Scale: I. development, use, and reliability. Arch Gen Psychiatry 1989; 46:1006-1011. [CrossRef]

29. Woody SR, Steketee G, Chambless DL. Reliability and validity of the Yale-Brown Obsessive-Compulsive Scale. Behav Res Ther 1995; 33:597-605. [CrossRef]

30. Esfahani SR, Motaghipour Y, Kamkari K, Zahiredin A, Janbozorgi M. Reliability and validity of the Persian version of the Yale-Brown Obsessive-Compulsive Scale (Y-BOCS). Iranian J Psychiatry Clin Psychol 2012; 17:297-303.

31. Frost R, Steketee G, Amir N, Bouvard M, Carmin C, Clark DA, et al. Cognitive assessment of obsessive-compulsive disorder. Behav Res Ther 1997; 35:667-681. [CrossRef]

32. Shams G, Esmaili Y, Karamghadiri N, Ebrahimhkani N, Yousefi Y, McKay D. Psychometric properties of the Persian language version of obsessive beliefs questionnaire (OBQ-44) in Iranian general population. Acta Med Iran 2014; 52:66-75.

33. Jackson-Koku G. Beck Depression Inventory. Occup Med (Lond.) 2016; 66:174-175. [CrossRef]

34. Wang YP, Gorenstein C. Psychometric properties of the beck depression inventory-II: A comprehensive review. Rev Bras Psiquiatr 2013; 35:416-431. [CrossRef]

35. Ghassemzadeh H, Mojtabai R, Karamghadiri N, Ebrahimkhani N. Psychometric properties of a Persian-language version of the beck depression inventory-second edition: BDI-II-Persian. Depress Anxiety 2005; 21:185-192. [CrossRef]

36. Larsen DL, Attkisson CC, Hargreaves WA, Nguyen TD. Assessment of client/patient satisfaction: Development of a general scale. Eval Program Plann 1979; 2:197-207. [CrossRef]

37. Melin J, Bonn SE, Pendrill L, Lagerros YT. A questionnaire for assessing user satisfaction with mobile health apps: Development using rasch measurement theory. JMIR Mhealth Uhealth 2020; 8:e15909. [CrossRef]

38. Thompson-Hollands J, Farchione TJ, Barlow DH. Thought-action fusion across anxiety disorder diagnoses: Specificity and treatment effects. J Nerv Ment Dis 2013; 201:407-413. [CrossRef]

39. Shadish WR. Analysis and meta-analysis of single-case designs: An introduction. J Sch Psychol 2014; 52:109-122. [CrossRef]

40. Leahy RL, Holland SJ, Treatment Plans and Interventions for Depression and Anxiety Disorders. New York: Guilford Press, 2000, 409-410. [CrossRef]

41. Soltanmohammadlou S, Farani AR, Shariat SV, Habibi M. Effectiveness of technology-based interventions for scrupulous obsessions and compulsions: A case report. Iran J Psychiatry Behav Sci 2022; 16:e118186. [CrossRef]

42. Campbell JM, Herzinger C V. Statistics and single subject research methodology. In: Gast DL, editor. Single Subject Research Methodology in Behavioral Sciences. New York: Routledge, 2009, 417-453. [CrossRef]

43. Barker LA, Gout BS, Crowe TC. Hospital malnutrition: Prevalence, identification and impact on patients and the healthcare system. Int J Environ Res Public Health 2011; 8:514-527. [CrossRef]

44. Gillihan SJ, Williams MT, Malcoun E, Yadin E, Foa EB. Common pitfalls in exposure and response prevention (EX/RP) for OCD. J Obsessive Compuls Relat Disord 2012; 1:251-257. [CrossRef]

45. Wootton BM. Remote cognitive-behavior therapy for obsessive-compulsive symptoms: A meta-analysis. Clin Psychol Rev 2016; 43:103-113. [CrossRef]

46. Vogel PA, Solem S, Hagen K, Moen EM, Launes G, Håland ÅT,

et al. A pilot randomized controlled trial of videoconference-assisted treatment for obsessive-compulsive disorder. Behav Res Ther 2014; 63:162-168. [CrossRef]

47. Feusner JD, Farrell NR, Kreyling J, McGrath PB, Rhode A, Faneuff T, et al. Online video teletherapy treatment of obsessive-compulsive disorder using exposure and response prevention: Clinical outcomes from a retrospective longitudinal observational study. J Med Internet Res 2022; 24:e36431. [CrossRef]

48. Schroder J, Werkle N, Cludius B, Jelinek L, Moritz S, Westermann S. Unguided internet-based cognitive-behavioral therapy for obsessive-compulsive disorder: A randomized controlled trial. Depress Anxiety 2020; 37:1208-1220. [CrossRef]

49. Denecke K, Schmid N, Nussli S. Implementation of cognitive behavioral therapy in e-mental health apps: Literature review. J Med Internet Res 2022; 24:e27791. [CrossRef]

50. de Jong K, Conijn JM, Gallagher RAV, Reshetnikova AS, Heij M, Lutz MC. Using progress feedback to improve outcomes and reduce drop-out, treatment duration, and deterioration: A multilevel meta-analysis. Clin Psychol Rev 2021; 85:102002. [CrossRef]

51. Gondek D, Edbrooke-Childs J, Fink E, Deighton J, Wolpert M. Feedback from outcome measures and treatment effectiveness, treatment efficiency, and collaborative practice: A systematic review. Adm Policy Ment Health 2016; 43:325-343. [CrossRef]