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Guided internet-delivered cognitive behavior therapy for post-traumatic stress disorder: A randomized controlled trial

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ABSTRACT

The aim of this randomized controlled trial was to investigate the effects of guided internet-based cognitive behavior therapy (ICBT) for posttraumatic stress disorder (PTSD). Sixty-two participants with chronic PTSD, as assessed by the Clinician-administered PTSD Scale, were recruited via nationwide advertising and randomized to either treatment ($n = 31$) or delayed treatment attention control ($n = 31$). The ICBT treatment consisted of 8 weekly text-based modules containing psychoeducation, breathing retraining, imaginal and in vivo exposure, cognitive restructuring, and relapse prevention. Therapist support and feedback on homework assignment were given weekly via an online contact handling system. Assessments were made at baseline, post-treatment, and at 1-year follow-up. Main outcome measures were the Impact of Events Scale — Revised (IES-R) and the Posttraumatic Stress Diagnostic Scale (PDS). Results showed significant reductions of PTSD symptoms (between group effect on the IES-R Cohen's $d = 1.25$, and $d = 1.24$ for the PDS) compared to the control group. There were also effects on depression symptoms, anxiety symptoms, and quality of life. The results at one-year follow-up showed that treatment gains were maintained. In sum, these results suggest that ICBT with therapist support can reduce PTSD symptoms significantly.

1. Introduction

Lifetime prevalence of posttraumatic stress disorder (PTSD) in the general population has been estimated to range from 5.6% to 8.3% (Frans et al., 2005; Kessler et al., 1995), indicating that PTSD is a common problem after experiencing traumatic events. While there are effective treatments for PTSD, like cognitive behavior therapy (CBT; Bisson et al., 2007), a substantial proportion of individuals with PTSD do not seek professional help or do not have access to effective help (Gavrilovic et al., 2005). Internet-based CBT (ICBT) could be a possible way to increase access to psychological treatment (Andersson, 2009; Andrews et al., 2010). Several studies have investigated the efficacy of therapist-guided ICBT for PTSD symptoms (Hirai and Clum, 2005; Knaevelsrud and Maercker, 2007; Lange et al., 2003), as well as for persons diagnosed with PTSD (Klein et al., 2009; Litz et al., 2007; Spence et al., 2011; for a review see Amstadter et al., 2009). There is also a related literature on the broader concept of telehealth interventions (Sloan et al., 2011).

Lange et al. from The Netherlands were probably the first to develop and test a therapist-guided internet-based treatment protocol for PTSD symptoms in controlled studies (Lange et al., 2001, 2003). They named their protocol Interapy, and the program has since then been translated and tested in studies conducted in Germany (Knaevelsrud and Maercker, 2007), and Iraq (Wagner et al., 2012). Knaevelsrud and Maercker (2007) found that Interapy resulted in large effect sizes and sustained treatment effects over three months, and in an uncontrolled study by Wagner et al. (2012) a similar result was found. In addition, Interapy has been found to work in a large effectiveness study (Ruwaard et al., 2012).

Most trials on PTSD have involved some form of therapist guidance. Guidance typically means that a therapist provides support and encouragement and consequently the contact with patients can be regarded as minimal. Unguided automated programs with no therapist contact generally lead to smaller effects and larger dropout rates (Spek et al., 2007),

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but can be useful in prevention (Andersson, in press). Few trials have been conducted on guided ICBT for persons with diagnosed PTSD. Litz et al. (2007) compared two therapist-supported internet-based interventions; ICBT and supportive online counseling (not based on CBT). They focused on military personnel who served during the attack on the Pentagon in 2001 and the following Iraq war, and all participants were diagnosed with PTSD. This proof-of-concept trial showed that dropout rate from ICBT was the same as in face-to-face CBT. Moreover, ICBT was better than supportive counseling and had greater effects than counseling on symptoms of PTSD, depression, and anxiety at 6 months follow-up (Litz et al., 2007). Klein et al. (2009) included patients with a confirmed PTSD diagnosis (American Psychiatric Association, 2000) and conducted an open trial over the course of ten weeks. The results indicated a clinical reduction of PTSD symptoms, and high ratings of therapeutic alliance, but there were no effects on other more general psychological problems (Klein et al., 2009). The most recent controlled study conducted within this field, is that of Spence et al. (2011) who included individuals with an established primary diagnosis of PTSD. This trial showed large pre-to-post-treatment effect sizes for the treatment group on both PTSD symptoms, depression, anxiety and disability. However, the between group effects were small as the waiting list control group showed a moderate improvement. Collectively, these trials indicate that ICBT is a promising treatment method for PTSD that has the potential to increase access to CBT for persons with PTSD. The studies also suggest that ICBT might be a suitable method for different clinical groups, including persons with sub-clinical PTSD as well as those with a confirmed primary diagnosis of PTSD.

The current study focused on individuals with an established diagnosis of PTSD as measured by the Clinician-administered PTSD Scale (CAPS; Blake et al, 1990). The aim of the study was to investigate the effects of guided ICBT on measures of PTSD symptoms, depression, and other anxiety symptoms, as well as quality of life against a control group. Instead of using a pure waiting list group we included weekly minimal support via the internet in the control condition. We expected moderate to large between group effects in favor of the active treatment.

2. Method

2.1. Participants and procedure

We recruited participants from the general population through advertisements in national and local newspapers. It was stated in the advertisements that the treatment would be provided over the internet. A screening webpage was set up, and individuals interested in the trial were asked to register and to complete seven online self-report measures as well as to complete questions regarding demographics and current and past treatments. Self-report measures were administered via the internet which generally has been found to generate acceptable psychometric properties (Buchanan, 2003; Carlbring et al., 2007).

The inclusion criteria were: to be a resident of Sweden; to be at least 18 years of age; to have access to a computer and internet; to able to read and understand the Swedish language; to be on a current stable dose of medication (for at least the last 3 months) or medication-free; to fulfill the DSM-IV diagnostic criteria for a primary diagnosis of chronic PTSD according to the screening questionnaires.

The following exclusion criteria were used: imminent suicide risk as assessed by item 9 on the Beck Depression Inventory (BDI-II; Beck et al., 1996), followed by a telephone interview regarding suicidal ideation; concurrent psychological treatment; presence of alcohol abuse (scoring 19 or higher on Alcohol Use Disorders Identification Test, AUDIT; Saunders et al., 1993), on-going trauma or trauma of more recent origin than 3 months. Individuals who reported symptoms following childhood abuse as their main reason for participating were also excluded. No other restrictions were made concerning type of trauma experienced, as long as the DSM-IV criterion A was fulfilled.

To assess chronic PTSD as the primary diagnosis, individuals who met initial inclusion criteria were administered the CAPS (Blake et al., 1990) via telephone. Additional questions regarding depressive symptoms were also administered to further rule out suicidal ideation. Interviews were made by five clinically trained psychology students under supervision of experienced licensed psychologists, and lasted between 30 and 90 min. Since this was a new procedure and interviews were not audiotaped for ethical reasons, the CAPS was not regarded as being suitable as a primary outcome measure in the trial and the instrument was only used as a marker of diagnostic status. In addition, different time frames were used for the assessments making it less suitable as a measure of change.

Randomization was conducted by an individual who was not otherwise involved in the research project, using an online true random-number service (www.random.org). The post-treatment interviewers were blind to participant status (i.e. treatment or control). The control group participants were offered the treatment after post-treatment measures had been collected. A 1-year follow-up was conducted, consisting of self-report questionnaires and a telephone interview. This assessment only included participants in the treatment group. Blinding was not possible at the 1-year follow-up due to the lack of a control condition. Questions regarding change in medication and/or engagement in additional treatment were asked both at post-treatment and at 1-year follow-up.

The local ethics committee approved the study protocol, and written informed consent was obtained from all participants. The individuals excluded from the study were sent an e-mail stating the main reason for exclusion along with advice on how to seek health care if needed. Individuals who reported suicidal ideation were contacted by telephone with no delay. An experienced psychiatrist trained in CBT was available for acute situations, but never needed to intervene.

2.2. Measures

2.2.1. Primary outcome measures

Impact of Event Scale Revised (IES-R; Weiss and Marmar, 1997) is a frequently used self-report measure consisting of 22 trauma-related statements, not strictly following DSM-IV criteria. The measure consists of three subscales: avoidance, intrusion, and hyperarousal. A cut-off score of 33 has been used for indicating a PTSD diagnosis. The IES-R has demonstrated high internal consistency (Cronbach's $\alpha = .96$) for the total scale as well as for the subscales (intrusion $\alpha = .94$; avoidance $\alpha = .87$; and hyperarousal $\alpha = .91$) (Creamer et al., 2003). Depending on time since trauma and other factors, test–retest correlation coefficients ranging from $r = .51$ to .89 have been reported for the avoidance subscale, from .57 to .94 for the intrusion subscale, and from .59 to .92 for the hyperarousal subscale (Weiss and Marmar, 1997).

Post-traumatic Stress Diagnostic Scale (PDS; Foa et al., 1997) was used as primary outcome measure and as a screening instrument for PTSD diagnosis. PDS is a self-report measure following the DSM-IV diagnosis criteria for PTSD. It includes a checklist over traumatic events along with questions about diagnosis criteria A and B, followed by a symptom checklist assessing criteria C, D and E. PDS also assesses the onset and duration of symptoms, as well as their impact on valued life areas. The measure has been found to have adequate psychometric properties, with an internal consistency of Cronbach's $\alpha = .92$, and a test–retest reliability of $r = .83$ (Foa et al., 1997).

2.2.2. Secondary outcome measures

Beck Depression Inventory-II (BDI-II; Beck et al., 1996) is a widely used 21 item self-report measure for assessing depression. Studies have reported that the measure has good internal consistency (Cronbach's $\alpha = .93$) and a test–retest reliability of $r = .91$.

Beck Anxiety Inventory (BAI; Beck et al., 1988) is a 21 item self-report measure of anxiety symptoms. Test–retest reliability ($r = .75$), and internal consistency (Cronbach's $\alpha = .92$) are adequate.

Quality of Life Inventory (QOLI; Frisch et al., 1992) is a self-report measure of subjective satisfaction within sixteen areas that are considered important for quality of life. Satisfaction is rated for each area on a six-point scale, ranging from −3 to 3. The importance of each area is rated on a three-point scale from 0 to 2. The product of the two ratings results in a score for each area. The areas rated as unimportant are hence not included in the average score on the QOLI. Test–retest reliability has been documented to be $r = .80–.91$ (Frisch et al., 1992).

2.2.3. Interview measures

Clinician-administered PTSD Scale (CAPS; Blake et al., 1990) was used for the diagnosis of PTSD. CAPS is one of the most frequently used interviews for establishing PTSD (Blake et al., 1990). The interview covers the diagnostic criteria for PTSD according to DSM-IV. For each criterion, intensity and frequency is measured on a scale from 0 to 4. CAPS can either be used to assess symptoms over the last week, the last month, or the worst month. In this trial the last month version was used at pre-treatment assessment, the last week at post-treatment and the last month at 1-year follow-up. Results show internal consistencies of $\alpha = .73–.85$ (Weathers et al., 2001). Students who administered the CAPS received brief training, but interviews were not audiotaped and inter-rater reliability could therefore not be assessed. Hence the CAPS was only used as a marker of diagnostic status.

Clinical Global Impression — Improvement (CGI-I; Guy, 1976) is an instrument for assessing clinical improvement. It consists of three subscales, of which one, CGI — Improvement, was administered at post-treatment and at 1-year follow-up. The instrument requires the clinician to assess how much the patient has improved or worsened relative to a baseline state at the beginning of the intervention. Responses were rated on a 7-point scale ranging from 1 (very much improved) to 7 (very much worse). The CGI-I was assessed after the CAPS interview.

Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993) was used pre-treatment to screen for alcohol abuse. An AUDIT score of 19 or higher has been reported to indicate severe alcohol problems and was chosen as a cutoff for exclusion in this study. The AUDIT was not administered after the treatment period.

2.3. Treatment

A manual for treating PTSD was developed which included validated components commonly used in CBT for PTSD, including psychoeducation, anxiety coping skill training, exposure, and cognitive restructuring (Bisson et al., 2007; Harvey et al., 2003). The treatment consisted of eight text-based modules delivered once a week over a period of 8 weeks. The reading level of the text was approximately eighth grade (ages 12–14). The first module was aimed at giving information about the impact of traumatic events, PTSD, and the principles of ICBT (psychoeducation). The participants were also given the possibility to make a personal commitment for change through a treatment contract. The second module was an introduction to controlled breathing and conditioned relaxation, with skills training in order to facilitate trauma exposure later on (Bisson et al., 2007). The second module also included brief information about insomnia and PTSD (Krakow et al., 2001). Modules three to six were aimed at exposure, where the participants worked with in-vivo exposure (modules 3 and 5), and imaginal exposure (modules 4 and 6) in a graded and structured manner (Foa et al., 1999). Imaginal exposure was carried out through writing and reading trauma narratives. Module seven focused on cognitive restructuring and psychoeducation about common thoughts and beliefs related to trauma and their impact on emotions and behavior, especially avoidance behavior (Ehlers et al., 2005). The eighth and last module was aimed at relapse prevention and maintenance of progress. Information about the next steps of the ongoing trial and some questions about the experience of the treatment program were administered at the end of the last module.

2.4. Therapists and treatment contact

The modules consisted mostly of text and images with a basic layout. All the modules were accompanied by written homework assignments that were sent electronically to a therapist on a weekly basis. A new module was only made available to the participant if the previous one had been completed. Access to the modules was given through a secure website. Each participant was randomly assigned to one of five therapists. All therapists were students in their later semester of a five year clinical psychology program and all had received clinical supervision in CBT. Three therapists were in their third year of training, and two therapists were in their last semester. Supervision during the trial was provided on a weekly basis by an experienced clinical psychologist specialized in PTSD. This was done to secure treatment fidelity.

The main task for the therapists was to guide the participants through the self-help program and to give support, encouragement on the progress made, and individual feedback on completed assignments (see Paxling et al., 2013 for more details regarding therapist behaviors in guided ICBT). Another task was to answer questions. The therapists gave reports on treatment progress to the supervisor and also provided the supervisor with treatment e-mails upon request. Feedback from the therapist to the participant was provided once every week, and in addition occasional reminders were sent via email. The communication took place via an encrypted web service set up especially for the treatment project. On average the time spent on communicating with the participants was 28 min/week and client ($SD = 19.8$), with a variation between 11 and 52 min. Each week the participants gave reports on their progress, with the possibility to include questions to the therapist. Feedback was always provided within 24 h. No contact was made between the therapists and participants except for e-mails and the initial diagnostic interview. The participants in the treatment condition who did not finish all the modules within the 8 week time frame were given the opportunity to continue working with the material on their own without regular therapist support after post-treatment data had been collected.

2.5. Control condition

In order to establish a non-passive condition for the participants in the control group we presented them with general questions on well being, stress, and sleep on a weekly basis. The rationale was to stay in touch and provide support during the waiting period. The control group received their first round of questions at the same time as the first module was sent to the treatment group. Voluntary participation was emphasized and they were not required to answer the questions even if many did so. Moreover, they were told that their responses (or lack of responses) would not affect the later treatment. The control group participants were informed that they would be reminded of the questions every weekend and that the contact would be made through the encrypted system. In addition, they were instructed to contact the research group if suicidal ideation would arise. The weekly questions were neutral in relation to the trauma experienced in order to minimize spontaneous trauma writing and/or worsening of PTSD symptoms. Two questions were in the form of ratings, with one dealing with general well being on a Likert-type scale, and the second experienced stress on a 10-point scale. Some participants took the opportunity to ask about other things related to their condition and wellbeing. The clinician who managed the control group correspondence screened the answers for suicidal ideation and also answered general questions about the trial. Overall, however, the contact with the control group was kept to a minimum and only aimed to provide general support.

2.6. Statistical analysis

Linear mixed-effects model, which was fitted with full information maximum likelihood estimation, was used to evaluate treatment effects

on continuous outcomes (Verbeke and Molenberghs, 2000). This multilevel regression-based statistics was endorsed as the primary analytic approach since it is a preferred method for addressing problems with nested data structures that are inherent in repeated-measures data (i.e., observations nested with individuals), and because it adequately deals with missing data under less restrictive missing data assumptions (i.e., missing at random; Gueorguieva and Krystal, 2004; Salim et al., 2008). In this combined two-level model, repeated measures of the outcome at level 1 are nested within individuals at level 2. At level 2, person specific growth parameters (i.e., random effects) vary as function of treatment condition.

We first analyzed the immediate effects of the controlled part of the trial (pre- to post-treatment) using a model with fixed effects of time, treatment, and time by treatment interaction. Degrees of freedom for fixed effects were obtained by the Satterthwaite approximation and were rounded to the nearest integer. Treatment was included as binary coded variable (1 = treatment, 0 = control condition) in the model, and the average difference in change between conditions was estimated with the interaction effect. We next analyzed maintenance of treatment effects through follow-up (pre-treatment to 1-year follow-up) for the participants who were randomized to the treatment condition. Random effects (associated with intercept and slope) were retained in the model when significant (i.e., significance determined by the likelihood ratio test). Separate analyses were conducted for each outcome. Standard difference in average trajectories (*d*) was calculated by the formula provided in Feingold (2009; equation 7) for growth models and was defined as the mean difference in growth factor divided by the population baseline standard deviation (here the pooled *SD*). We calculated 95% confidence intervals for traditional Cohen's *d*, as the sampling variance for growth modeling effect sizes has not yet been derived (Feingold, 2009). All analyses, both the pre- to post-treatment and the pre-treatment to 1-year follow-up analysis, made use of all available data from all randomized participants, following the principle of intention-to-treat. Prior to conducting primary analyses, the missing data assumption was tested by exploring associations between baseline characteristics and the presence of missing data.

Responder status was determined with the Reliable Change Index (RCI; Jacobson and Truax, 1991) for the primary outcome IES-R total. The RCI was calculated using the formula for RCI provided by Jacobson and Truax (1991, formulas provided on p. 14), test–retest reliability for the IES-R and the sample baseline standard deviation. Categorical rates of response (i.e. reliable change), improvement (very much improved or much improved on the CGI-I), and remission (not fulfilling criteria for PTSD according to CAPS) were examined with logistic regression fitted with maximum likelihood. Following the intention-to-treat principle, the regression model used data from all randomized participants. For descriptive purpose, observed means, standard deviations and sample proportions are provided throughout.

3. Results

3.1. Enrollment and baseline characteristics

A total of 186 individuals registered on the website (see Fig. 1). Of these, 145 completed the self-report measures and thus applied for participation in the trial. A total of 62 of the applicants fulfilled all inclusion criteria and were randomized to either treatment ($n = 31$) or control condition ($n = 31$). Table 1 presents demographic characteristics of the study sample. The typical participant in the trial was a middle-aged employed woman who had completed a college or university education. Many participants (41%, $n = 26$) had experienced more than one traumatic event. When asked to state the trauma that was the main reason for seeking treatment, the types of trauma reported varied greatly. Most common were sexual, physical, and/or psychological abuse by partner ($n = 14$). Other traumas included life-threatening disease ($n = 8$), severe offense by significant other (perceived as threatening to integrity) ($n = 6$), life-threatening accident ($n = 5$), non-sexual assault by stranger ($n = 5$), murder of close relative ($n = 4$), non-sexual assault by family member ($n = 3$), death of close relative ($n = 3$), severe maltreatment in health care ($n = 3$), multiple stressors ($n = 3$), life-threatening disease of close relative ($n = 2$), military combat ($n = 2$), torture ($n = 1$), rape by stranger ($n = 1$), rape by family member ($n = 1$), and the tsunami disaster ($n = 1$). A majority of the participants had been in prior psychological treatment (59.7%, $n = 37$), although not necessarily for PTSD. The groups did not differ significantly with regard to the demographic, diagnostic, or trauma characteristics at baseline.

3.2. Missing data and treatment compliance

The number of participants who provided data at each assessment point is detailed in Fig. 1. The total response rate on self-report measures was 87% ($n = 54$) at post-treatment. In addition, one participant had one of the self-report measures missing at post-treatment assessment. The proportions of missing data did not significantly differ between conditions at post-treatment (see Fig. 1). Among those treated, 71% (22/31) completed the 1-year follow-up. No significant differences regarding baseline characteristics or self-report scores at pre-treatment assessment were found between participants lost to follow-up (i.e., one or more time points), and those who had a complete set of data at all time points. The only exception was that participants lost to follow-up were on average younger ($M = 42.0$ years, $SD = 11.2$) than those with complete set of data ($M = 49.1$ years, $SD = 11.2$), $t(60) = 2.5$, $p = .02$. Given these results and the small amount of missing data, we relied on full information maximum likelihood estimation, which provides unbiased estimates under standard data missing assumptions of ignorable missing (i.e., missing at random; e.g., Salim et al., 2008).

Participants in the treatment condition completed on average of 5.1 modules ($SD = 3.2$, range = 0 to 8) over the 8 weeks of treatment. Twelve participants (39%) completed all modules, and six participants (19%) did not complete a single module (in terms of sending in homework assignments). No significant differences on outcome measures or demographic characteristics at pre-treatment assessment were found between participants who completed a minimal dose of treatment (i.e., ≥4 modules) and those who did not (all $ps > .1$). There was however an association between number of modules completed and treatment outcome on the IES-R total score when controlling for pre-treatment scores ($\beta = -.36$, $p = .013$).

3.3. Controlled treatment effects on continuous outcomes at post-assessment

Table 2 presents means by condition over time. Linear mixed-effect models revealed significant variation in intercepts for all outcome measures. A significant heterogeneity in linear rate of change was also detected for the outcome measure PDS, and random effects for both intercept and slope were thus retained in this model. We detected no significant differences between treatment and control at pre-treatment (random intercept regressed on condition in the model) on any of the outcome measures. The fixed-effect interaction term in the model that tests for differential average rates of change between pre- and post-treatment as a function of condition was statistically significant for the primary outcome IES-R total, −17.9, 95% CI [−25.2, −10.6], $t(58) = 4.9$, $p < .001$, Cohen's $d = 1.25$, 95% CI [0.65, 1.80], favoring treatment over control. A significant time by treatment interaction was also detected on each of the IES-R subscales intrusions, avoidance, and arousal (all $ps < .01$), with associated between group effect sizes [95% CI] of $d = 1.11$ [0.52, 1.66], $d = 0.84$ [0.27, 1.39], and, $d = 1.08$ [0.49, 1.63], respectively. Similarly, there was a significant treatment effect (i.e., treatment by time interaction) for the PTSD symptoms measured by PDS, −9.6, 95% CI [−13.8, −5.3], $t(54) = 4.5$, $p < .001$, Cohen's $d = 1.24$, 95% CI [0.64, 1.81].

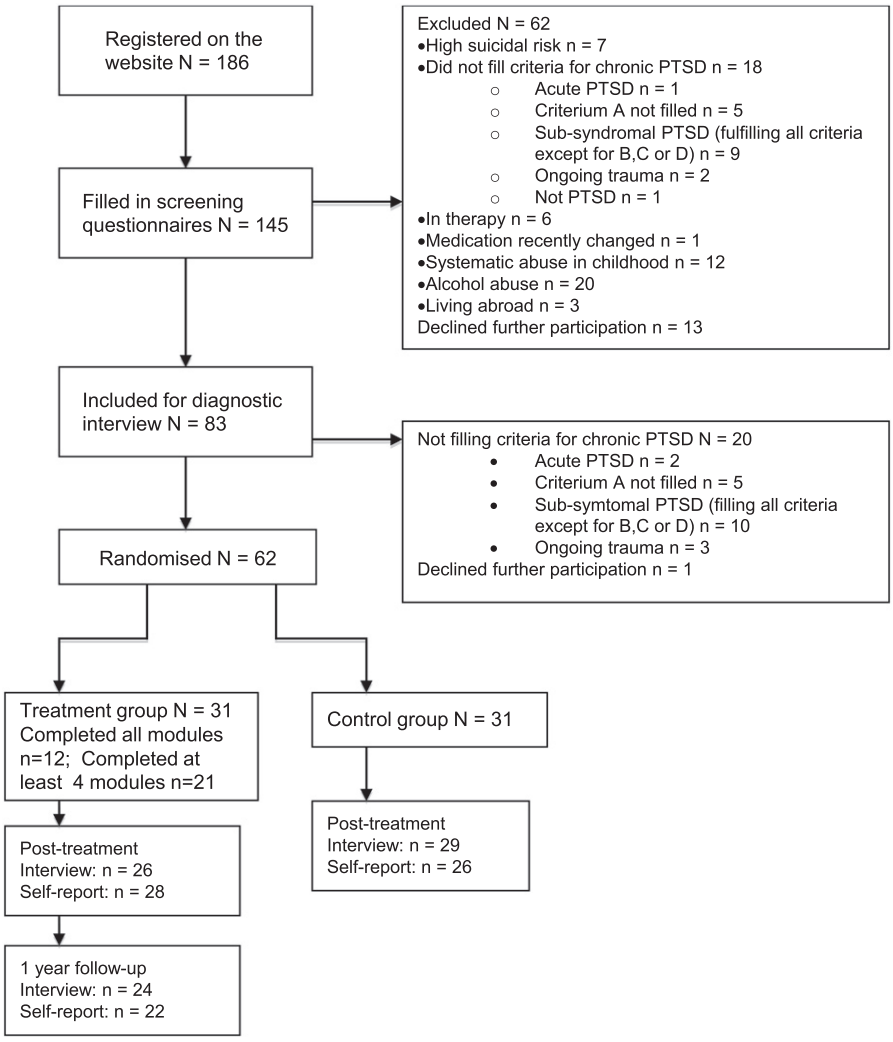

Fig. 1. Flowchart of study participants, point of random assignment, and dropouts at each stage.

In addition, there were significant time by treatment interaction effects on the secondary outcomes of BDI-II, −6.1, 95% CI [−10.7, −1.6], $t(58) = 2.7$, $p = .009$, Cohen's $d = 0.55$, 95% CI [0.00, 1.09], BAI, −6.2, 95% CI [−10.3, −2.1], $t(55) = 3.0$, $p = .004$, Cohen's $d = 0.60$, 95% CI [0.04, 1.13], and QOLI, 0.89, 95% CI [0.26, 1.51], $t(55) = 2.9$, $p = .006$, Cohen's $d = 0.53$, 95% CI [−0.02, 1.06]. The results favored treatment over control in all cases (see Table 2).

3.4. Treatment response and remission at post-treatment

At post-treatment, 81.5% ($n = 22$) of the treated participants no longer met the criteria for PTSD according to the CAPS. In the control group the corresponding figure was 38.9% ($n = 14$). The logistic regression analysis that used all randomized participants ($N = 62$) showed that this difference was statistically significant, est = −1.55, $SE = 0.62$, $p = .01$, odds ratio = 0.12, 95% CI [0.06, 0.71]. Using the Reliable Change Index as an indicator of treatment response status on the primary outcome IES-R total, showed that 78.6% ($n = 22$) in the treatment group and 25.9% ($n = 7$) in the control group improved according to this criterion. Again, this difference was found to be statistically significant, est = 2.35, $SE = 0.64$, $p < .001$, odds ratio = 10.48, 95% CI [3.01, 36.45]. Similarly, a larger proportion of participants were categorized as improved (score of very much improved, much improved on the CGI) in the treatment 63% ($n = 17$) compared to the control group 13.8% ($n = 4$), est = 2.36, $SE = 0.67$, $p < .001$, odds ratio = 10.63, 95% CI [2.86, 39.5]. Only one participant in the control condition showed a reliable deterioration on the IES-R (i.e., Reliable Change Index; $z \geq 1.96$) over the treatment phase. On the other hand, on the CGI-I two participants in the treatment group showed a deterioration (score of very slight worse, much worse and very much worse) on the CGI. In the control group eight participants showed deterioration according to the CGI-I.

3.5. Uncontrolled treatment effects after 1 year

Multilevel regression analyses revealed significant decreases in IES-R, PDS, BDI-II, and BAI scores, and significant increase in QOLI scores from pre- to 1-year follow-up for participants who had been randomly assigned to treatment (all $ps < .01$). Associated within group effect sizes (Cohen's d) were 1.58, 95% CI [0.88, 2.23], 2.03, 95% CI [1.27, 2.72], 1.05, 95% CI [0.40, 1.74], 1.00, 95% CI [0.36, 1.61], and 0.68, 95% CI [0.06, 1.28], respectively. The observed sample proportion of participants no longer meeting criteria for PTSD, rates of responder status (i.e., reliable change), and of improvement (score of very much improved, much improved on the CGI) at 1-year follow-up were 61.3% ($n = 19$), 48.4% ($n = 15$), and 48.4% ($n = 15$), respectively. None of the participants had made a reliable deterioration on the IES-R at the 1-year follow-up (i.e., Reliable Change Index; $z \geq 1.96$). Taken together, these results suggested that treatment gains were maintained through follow-up.

A total of 6 participants reported that they had sought additional help for PTSD during the follow-up period. When analyses were repeated without the data from these participants results were largely

consistent with those reported earlier, i.e., all time coefficients were highly significant for all outcomes.

4. Discussion

The aim of this study was to investigate the effects of guided ICBT for individuals diagnosed with PTSD. The results showed that the treatment program was effective in reducing PTSD symptoms, with large within and between-group effects, and results were largely maintained one year later. In terms of response rates the treatment group was superior to the control group, with larger proportions of participants in the treatment group showing no PTSD diagnosis, reliable change, and clinical global improvement. Moreover, the treatment also resulted in improvements on the secondary outcomes measuring depression (BDI), general anxiety (BAI), and quality of life (QOLI), suggesting that the treatment can be beneficial for other comorbid aspects of PTSD, but probably not as effective as face-to-face treatment (Bisson and Andrew, 2009). In contrast to some earlier studies on ICBT for PTSD (Andersson, 2010), we included participants with clinical levels of PTSD and all were diagnosed with the CAPS.

The primary outcome measure IES-R showed a large between group effect ($d = 1.25$) at post-treatment, and at follow-up one year later IES-R scores remained at a low level. We also found effects on the subscales of the IES-R (intrusion, avoidance, and arousal), which were all in the larger range ($d = 1.11$, 0.84, and 1.08, respectively), indicating no major differential effects on the subscales. These effects were also mirrored in the outcomes for the interview measures and the PDS. It is however interesting to note that a proportion of the control group participants improved, with some no longer fulfilling the PTSD diagnosis (45%), showing reliable change (23%), and being rated as improved on the CGI-I (13%). This raises a question regarding the sample as this is a high rate of improvement for a control group condition. Here it is important to note that the control group was not a pure waiting list group as participants in this condition received weekly contact and could communicate with the research staff by sending in responses to questions each week during the waiting period. Even if the control condition was not aimed to serve as a "placebo", some control group participants benefitted from the non-specific support. In other studies we have used moderated online discussion groups as control condition (e.g., Andersson et al., 2012), but decided not to include an online discussion forum in this trial due to the sensitivity of the topic and ethical concerns of sharing trauma narratives. We also included a 1-year follow-up in this report, and the results are in line with several previous trials on ICBT for anxiety disorders showing that long-term effects can be achieved (e.g., Carlbring et al., 2009; Paxling et al., 2011). Most studies on ICBT for PTSD symptoms have not included follow-ups longer than three months after treatment, the main exception being the *Interapy* program (Ruwaard et al., 2012).

In comparison with previous trials on ICBT for PTSD the present trial appears to have at least as good effects as the previous programs. It is important to note that programs differ in terms of content and amount of therapist contact. For example, the treatment tested in the present trial relied much on text, whereas the program by Spence et al. (2011) used an illustrated story. Most similar in terms of contact time is the trial by Spence et al. (2011), who found a smaller between group effect ($d = 0.47$) on their main outcome measure (The posttraumatic stress disorder checklist — civilian version; PCL-C, Weathers et al., 1994) than the ones found in the current investigation. The Interapy program is the one with the most research support and the effects seen in the trials are usually large (e.g., Lange et al., 2003). However, the Interapy program involves substantially more therapist interaction than the program tested in this trial. It is also yet unclear if Interapy is more or less effective than other guided ICBT programs, since no direct comparisons have been made. Another related question is how well the effects reported in our trial compares to face-to-face CBT for PTSD. Again, there are no direct comparative trials. In other areas such as panic disorder and social anxiety disorder there is however new evidence to suggest that guided ICBT can be as effective as face-to-face CBT (Andersson et al., in press; Cuijpers et al., 2010). Even if our trial, and the findings by other research groups, suggests that guided ICBT is a promising treatment for PTSD, controlled trials are needed, for example comparing ICBT with therapist-led treatment, and in addition investigating patient and clinician preferences.

Even if participants were excluded from the trial, with as many as 20 because of ongoing alcohol abuse, 9 because of subsyndromal PTSD, and 12 because of systematic abuse in childhood, we did include

Table 1
Demographic characteristics of the participants at pre-treatment.[a]

		Treatment ($n = 31$)	Control ($n = 31$)	Total ($n = 62$)
Gender	Male	7 (22.6%)	4 (12.9%)	11 (17.7%)
	Female	24 (77.4%)	27 (87.1%)	51 (82.3%)
Age	Mean (*SD*)	44.8 (11.2)	47.2 (12.2)	46 (11.7)
	Min–Max	21–67	22–67	21–67
Marital status	Married/living together	16 (51.6%)	13 (41.9%)	29 (46.8%)
	In a relationship, not living together	2 (6.5%)	5 (16.1%)	7 (11.3%)
	Single	13 (41.9%)	12 (38.7%)	25 (40.3%)
	Widowed	0 (%)	1 (3.2%)	1 (1.6%)
Highest educational level	Nine year compulsory school	3 (9.7%)	2 (6.5%)	5 (8.1%)
	Secondary school (compl.)	5 (16.1%)	3 (9.7%)	8 (12.9%)
	Vocational school (compl.)	6 (19.4%)	3 (9.7%)	9 (14.5%)
	College/university (not compl.)	2 (6.5%)	3 (9.7%)	5 (8.1%)
	College/university (compl.)	15 (48.4%)	20 (64.5%)	35 (56.5%)
Employment status	Employed[b]	14 (45.2%)	21 (67.7%)	35 (56.5%)
	Student	1 (3.2%)	1 (3.2%)	2 (3.2%)
	Unemployed	1 (3.2%)	4 (12.9%)	5 (8.1%)
	Retired	8 (25.8%)	2 (6.4%)	10 (16.1%)
	Registered sick at least 50%	7 (22.6%)	3 (9.6%)	10 (16.1%)
Psychopharmacological medication[c]	None	16 (51.6%)	13 (41.9%)	29 (46.8%)
	Earlier	8 (25.8%)	9 (29%)	17 (27.4%)
	Present	7 (22.6%)	9 (29%)	16 (25.8%)
Psychotherapy	None	14 (45.2%)	11 (35.5%)	25 (40.3%)
	Earlier	17 (54.8%)	20 (64.5%)	37 (59.7%)
	Present	0	0	0

[a] No significant differences existed between groups according to χ^2 and independent *t*-tests.
[b] Full time or part time.
[c] Medication had to be stable for at least 3 months for inclusion.

Table 2
Observed means and standard deviations for all continuous outcome measures at each assessment point.

	Pre		Post		1-year follow-up	
Measure and group	*M*	*SD*	*M*	*SD*	*M*	*SD*
IES-R: Total scale						
Treatment	54.65	13.16	30.96	16.06	25.05	20.68
Control	54.87	15.48	49.19	18.09		
IES-R: Intrusion						
Treatment	21.71	5.53	12.82	6.66	11.09	8.43
Control	19.61	6.41	17.23	7.08		
IES-R: Avoidance						
Treatment	18.58	6.96	10.36	7.19	7.77	7.87
Control	20.90	7.52	18.85	8.37		
IES-R: Arousal						
Treatment	14.35	4.81	7.79	4.58	6.18	5.82
Control	14.35	5.06	13.12	5.85		
PDS						
Treatment	31.90	6.52	17.32	9.86	13.0	10.76
Control	29.84	8.77	25.04	11.14		
BDI-II						
Treatment	26.61	11.42	16.11	10.49	14.82	10.80
Control	26.35	10.88	22.19	10.50		
BAI						
Treatment	23.03	10.27	13.57	8.15	11.95	9.33
Control	22.61	10.51	20.08	10.26		
QOLI						
Treatment	0.14	1.71	1.15	1.60	1.20	1.57
Control	0.59	1.65	0.62	1.93		

IES-R = Impact of Event Scale Revised; PDS = Post-traumatic Stress Diagnostic Scale; BDI-II = Beck Depression Inventory-II; BAI = Beck Anxiety Inventory; QOLI = Quality of Life Inventory. *Note*. Control condition received treatment after post-assessment and data for this condition are therefore not presented at 1-year follow-up.

participants with significant levels of depression and tried to keep exclusion to a minimum. It is of course possible that we had too narrow inclusion criteria. Transdiagnostic or tailored approaches to ICBT provides more flexibility when it comes to treating participants with comorbid conditions and subsyndromal problems (e.g., Carlbring et al., 2010; Titov et al., 2010a), and could be further explored as treatments for PTSD given the high rate of comorbidity and the relatively smaller effects on measures of depression, anxiety and quality of life.

The amount of time used for corresponding with the participants was 28 min/week (*SD* = 19.8), with the time for the 5 different therapists varying between 11 and 52 min. The time spent was substantially higher in comparison with Spence et al. (2011) who had a total mean time of 104 min (*SD* = 97) for the entire treatment. Klein et al. (2009) reported an average total therapist time of 238.7 min (*SD* = 143.2), which is similar to this trial. Litz et al. (2007) used another approach and started their trial with a 2 hour face-to-face session with their participants. There is a longstanding discussion on the need for support in ICBT (Palmqvist et al., 2007), and it could be argued that therapist support is important for certain intensive and challenging parts of the treatment such as exposure to trauma (Klein et al., 2009). It may also be that some clients prefer contact over the internet (in particular if it is perceived as being secure) over in-person contact, and that this may be a way to overcome treatment barriers for some individuals (i.e., stigma, shame that may be heightened via personal contact with therapist). Unfortunately, we did not assess patient preferences in this trial which could have shed light on this issue.

There are several limitations with this trial. The first limitation is the absence of structured psychiatric screening for possible comorbid disorders. For example, we did not establish a diagnosis of major depression, and allowed high scores on the BDI-II. The absence of structured diagnostic interview of possible comorbid conditions was mainly due to time restrictions, especially since the CAPS took a long time to administer. A second limitation is that validity of the CAPS might be affected by its administration via a telephone. In addition, we were not able to assess the reliability of the CAPS and used different time frames in the assessment. A third limitation is the high educational level of the participants (56.5% of all participants had a university degree), which may reduce the external validity. This is however not uncommon in ICBT trials. Comparable figures can be found in Knaevelsrud and Maercker (2007), where 44% of the participants had a university degree. The forums used in this trial to recruit participants were common ones such as radio, newspaper, both locally and nationwide, as well as websites. The information presented was aimed to be easily accessible and no prior knowledge or skills were demanded except for good knowledge of the Swedish language. This relates to a third possible limitation that the participants were recruited from the community and not via a clinic. This of course limits the external validity of the trial. On the other hand, this can be justified by the treatment versus demand gap that has been noted for anxiety disorders (Kohn et al., 2004), namely that many individuals with clinical levels of anxiety do not reach the clinic. It may also be that individual in the community with PTSD differs in other respects from clinic patients and that ICBT may be a way to reach these persons. With this in mind, it becomes crucial how information about the treatment is presented. We believe that advertisements in the national news may be one option, but not the only one. Moreover, one study found that an internet clinic sample had disorders as severe as those attending an outpatient clinic, but with demographic characteristics more consistent with a national sample (Titov et al., 2010b).

In spite of these caveats, and other possible limitations such as not having access to the internet in some countries (albeit not Sweden), we believe this study adds to the growing literature on the effects of guided ICBT for PTSD. It remains to be established if guided ICBT can be as effective as face-to-face CBT, and the long term effects beyond one year is not known. Perhaps most important would be to develop treatment approaches to handle comorbid problems such as alcohol abuse and suicidal intent as these problems tend to lead to exclusion from trials. It is also important to study the effects of guided ICBT in representative clinical samples with patients who seek treatment for PTSD. Overall, however, guided ICBT has the potential to become an evidence-based treatment alternative for persons with PTSD.

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References

American Psychiatric Association, 2000. Diagnostic and Statistical Manual of Mental Disorders, 4th ed. American Psychiatric Press, Washington, DC (text revision ed.).
Amstadter, A.B., Broman-Fulks, J., Zinzow, H., Ruggiero, K.J., Cercone, J., 2009. Internet-based interventions for traumatic stress-related mental health problems: a review and suggestion for future research. Clin. Psychol. Rev. 29, 410–420.
Andersson, G., 2009. Using the internet to provide cognitive behaviour therapy. Behav. Res. Ther. 47, 175–180.
Andersson, G., 2010. Guided internet-delivered cognitive behavior therapy for posttraumatic stress disorder and other comorbid anxiety disorders. In: Brunet, A., Ashbaugh, A.R., Herbert, C.F. (Eds.), Internet Use in the Aftermath of Trauma. IOS Press, Amsterdam, pp. 243–254.
Andersson, G., 2014. The Internet and CBT: A Clinical Guide. CRC Press, Boca Raton (in press).
Andersson, G., Carlbring, P., Furmark, T., on behalf of the SOFIE Research Group, 2012. Therapist experience and knowledge acquisition in internet-delivered CBT for social anxiety disorder: a randomized controlled trial. PLoS One 7, e37411.
Andersson, G., Cuijpers, P., Carlbring, P., Riper, H., Hedman, E., 2014. Internet-based vs. face-to-face cognitive behaviour therapy for psychiatric and somatic disorders: a systematic review and meta-analysis. World Psychiatry (in press).
Andrews, G., Cuijpers, P., Craske, M.G., McEvoy, P., Titov, N., 2010. Computer therapy for the anxiety and depressive disorders is effective, acceptable and practical health care: a meta-analysis. PLoS One 5, e13196.
Beck, A.T., Epstein, N., Brown, G., Steer, R.A., 1988. An inventory for measuring clinical anxiety: psychometric properties. J. Consult. Clin. Psychol. 56, 893–897.

Beck, A.T., Steer, R.A., Brown, G.K., 1996. Manual for the Beck Depression Inventory-II. Psychological Corporation, San Antonio, TX.
Bisson, J., Andrew, M., 2009. Psychological treatment of post-traumatic stress disorder (PTSD). Cochrane Database Syst. Rev. CD003388.
Bisson, J.I., Ehlers, A., Matthews, R., Pilling, S., Richards, D., Turner, S., 2007. Psychological treatments for chronic post-traumatic stress disorder: systematic review and meta-analysis. Br. J. Psychiatry 190, 97–104.
Blake, D.D., Weather, F.W., Nagy, L.M., Kaloupek, D.G., Gusman, F.D., Charney, D.S., et al., 1990. The development of a Clinician-administered PTSD Scale. J. Trauma. Stress. 8, 75–90.
Buchanan, T., 2003. Internet-based questionnaire assessment: appropriate use in clinical contexts. Cogn. Behav. Ther. 32, 100–109.
Carlbring, P., Brunt, S., Bohman, S., Austin, D., Richards, J.C., Öst, L.-G., Andersson, G., 2007. Internet vs. paper and pencil administration of questionnaires commonly used in panic/agoraphobia research. Comput. Hum. Behav. 23, 1421–1434.
Carlbring, P., Bergman Nordgren, L., Furmark, T., Andersson, G., 2009. Long term outcome of internet delivered cognitive–behavioural therapy for social anxiety disorder: a 30-month follow-up. Behav. Res. Ther. 47, 848–850.
Carlbring, P., Maurin, L., Törngren, C., Linna, E., Eriksson, T., Sparthan, E., Strååt, M., Marquez von Hage, C., Bergman-Nordgren, L., Andersson, G., 2010. Individually tailored internet-based treatment for anxiety disorders: a randomized controlled trial. Behav Res Ther 49, 18–24.
Creamer, M., Bell, R., Failla, S., 2003. Psychometric properties of the Impact of Event Scale — Revised. Behav. Res. Ther. 41, 1489–1496.
Cuijpers, P., Donker, T., van Straten, A., Andersson, G., 2010. Is guided self-help as effective as face-to-face psychotherapy for depression and anxiety disorders? A meta-analysis of comparative outcome studies. Psychol. Med. 40, 1943–1957.
Ehlers, A., Clark, D.M., Hackmann, A., McManus, F., Fennell, M., 2005. Cognitive therapy for post-traumatic stress disorder: development and evaluation. Behav. Res. Ther. 43, 413–431.
Feingold, A., 2009. Effect sizes for growth-modeling analysis for controlled clinical trials in the same metric as for classical analysis. Psychol. Methods 14, 43–53. http://dx.doi.org/10.1037/a0014699.
Foa, E.B., Cashman, L., Jaycox, L., Perry, K., 1997. The validation of a self-report measure of posttraumatic stress disorder: the Posttraumatic Diagnostic Scale. Psychol. Assess. 9, 445–451.
Foa, E.B., Dancu, C.V., Hembree, E.A., Jaycox, L.H., Meadows, E.A., Street, G.P., 1999. A comparison of exposure therapy, stress inoculation training, and their combination for reducing posttraumatic stress disorder in female assault victims. J. Consult. Clin. Psychol. 67, 194–200.
Frans, Ö., Rimmö, P.A., Åberg, L., Fredrikson, M., 2005. Trauma exposure and posttraumatic stress disorder in the general population. Acta Psychiatr. Scand. 111, 291–299.
Frisch, M.B., Cornell, J., Villanueva, M., Retzlaff, P.J., 1992. Clinical validation of the Quality of Life Inventory. A measure of life satisfaction for use in treatment planning and outcome assessment. Psychol. Assess. 4, 92–101.
Gavrilovic, J.J., Schützwohl, M., Fazel, M., Priebe, S., 2005. Who seeks treatment after a traumatic event and who does not? A review of findings on mental health service utilization. J. Trauma. Stress. 18, 595–605.
Gueorguieva, R., Krystal, J.H., 2004. Move over ANOVA: progress in analyzing repeated-measures data and its reflection in papers published in the Archives of General Psychiatry. Arch. Gen. Psychiatry 61, 310–317.
Guy, W., 1976. Clinical Global Impressions. ECDEU Manual, US Department of Health and Human Services. NIMH, Rockville, pp. 217–222.
Harvey, A.G., Bryant, R.A., Tarrier, N., 2003. Cognitive behaviour therapy for posttraumatic stress disorder. Clin. Psychol. Rev. 23, 501–522.
Hirai, M., Clum, G.A., 2005. An internet-based self-change program for traumatic event related fear, distress, and maladaptive coping. J. Trauma. Stress. 18, 631–636.
Jacobson, N.S., Truax, P., 1991. Clinical significance: a statistical approach to defining meaningful change in psychotherapy research. J. Consult. Clin. Psychol. 59, 12–19. http://dx.doi.org/10.1037/0022-006X.59.1.12.
Kessler, R.C., Sonnega, A., Bromet, E., Nelson, C.B., 1995. Posttraumatic stress disorder in the national comorbidity survey. Arch. Gen. Psychiatry 52, 1048–1060.
Klein, B., Mitchell, J., Gilson, K., Shandley, K., Austin, D., Kiropoulos, L., Abbott, J., Cannard, G., 2009. A therapist-assisted internet-based CBT 56 intervention for posttraumatic stress disorder: preliminary results. Cogn. Behav. Ther. 38, 121–131.
Knaevelsrud, C., Maercker, A., 2007. Internet-based treatment for PTSD reduces distress and facilitates the development of a strong therapeutic alliance: a randomized controlled clinical trial. BMC Psychiatry 7, 13.
Kohn, R., Saxena, S., Levav, I., Saraceno, B., 2004. The treatment gap in mental health care. Bull. World Health Organ. 82, 858–866.
Krakow, B., Johnston, L., Melendrez, D., Hollifield, M., Warner, T.D., Chavez-Kennedy, D., Herlan, M.J., 2001. An Open-label Trial of Evidence-based Cognitive Behavior Therapy for Nightmares and Insomnia in Crime Victims with PTSD.
Lange, A., van de Ven, J.-P., Schrieken, B., Emmelkamp, P.M., 2001. Interapy: treatment of posttraumatic stress through the internet: a controlled trial. J. Behav. Ther. Exp. Psychiatry 32, 73–90.
Lange, A., Rietdijk, D., Hudcovicova, M., van de Ven, J.-P., Schrieken, B., Emmelkamp, P.M., 2003. Interapy: a controlled randomized trial of the standardized treatment of post-traumatic stress through the internet. J. Consult. Clin. Psychol. 71, 901–909.
Litz, B.T., Engel, C.C., Bryant, R.A., Papa, A., 2007. A randomized, controlled proof-of-concept trial of an internet-based, therapist-assisted self-management treatment for posttraumatic stress disorder. Am. J. Psychiatr. 164, 1676–1683.
Palmqvist, B., Carlbring, P., Andersson, G., 2007. Internet-delivered treatments with or without therapist input: does the therapist factor have implications for efficacy and cost? Expert Rev. Pharmacoeconomics Outcomes Res. 7, 291–297.
Paxling, B., Almlöv, J., Dahlin, M., Carlbring, P., Breitholtz, E., Eriksson, T., Andersson, G., 2011. Guided internet-delivered cognitive behavior therapy for generalized anxiety disorder: a randomized controlled trial. Cogn. Behav. Ther. 40, 159–173.
Paxling, B., Lundgren, S., Norman, A., Almlöv, J., Carlbring, P., Cuijpers, P., Andersson, G., 2013. Therapist behaviours in internet-delivered cognitive behaviour therapy: analyses of e-mail correspondence in the treatment of generalized anxiety disorder. Behav. Cogn. Psychother. 41, 280–289.
Ruwaard, J., Lange, A., Schrieken, B., Dolan, C.V., Emmelkamp, P., 2012. The effectiveness of online cognitive behavioral treatment in routine clinical practice. PLoS One 7 (7), e40089.
Salim, A., Mackinnon, A., Christensen, H., Griffiths, K., 2008. Comparison of data analysis strategies for intent-to-treat analysis in pre–post-test designs with substantial dropouts. Psychiatry Res. 160, 335–345.
Saunders, J.B., Aasland, O.G., Babor, T.F., De la Fuente, J.R., Grant, M., 1993. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption-III. Addiction 88, 791–804.
Sloan, D.M., Gallagher, M.W., Feinstein, B.A., Lee, D.J., Pruneau, G.M., 2011. Efficacy of telehealth treatments for posttraumatic stress-related symptoms: a meta-analysis. 40, 111–125.
Spek, V., Cuijpers, P., Nyklicek, I., Riper, H., Keyzer, J., Pop, V., 2007. Internet-based cognitive behaviour therapy for symptoms of depression and anxiety: a meta-analysis. Psychol. Med. 37, 319–328.
Spence, J., Titov, N., Dear, B.F., Johnston, L., Solley, K., Lorian, C., Wootton, B., Zou, J., Schwencke, G., 2011. Randomized controlled trial of internet delivered cognitive behavioural therapy for posttraumatic stress disorder. Depression Anxiety 28, 541–550.
Titov, N., Andrews, G., Johnston, L., Robinson, E., Spence, J., 2010a. Transdiagnostic internet treatment for anxiety disorders: a randomized controlled trial. Behav. Res. Ther. 48, 890–899.
Titov, N., Andrews, G., Kemp, A., Robinson, E., 2010b. Characteristics of adults with anxiety or depression treated at an internet clinic: comparison with a national survey and an outpatient clinic. PLoS One 5, e10885.
Verbeke, G., Molenberghs, G., 2000. Linear Mixed Models for Longitudinal Data. Springer-Verlag, New York, NY.
Wagner, B., Schulz, W., Knaevelsrud, C., 2012. Efficacy of an internet-based intervention for posttraumatic stress disorder in Iraq: a pilot study. Psychiatry Res. 195, 85–88.
Weathers, F.W., Litz, B.T., Huska, J.A., Keane, T.M., 1994. PCL-C for DSM-IV. National Center for PTSD, Behavioral Science Division, Boston.
Weathers, F.W., Keane, T.M., Davidson, J.R., 2001. Clinician-administered PTSD Scale: a review of the first ten years of research. Depression Anxiety 13, 132–156.
Weiss, D.S., Marmar, C.R., 1997. The Impact of Event Scale — Revised. In: Wilson, J.P., Keane, T.M. (Eds.), Assessing Psychological Trauma and PTSD. Guilford Press, New York, pp. 399–411.