Acceptability of internet-based cognitive behavioural therapy (i-CBT) for post-traumatic stress disorder (PTSD): a systematic review.

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**Disclosure Statement**

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Abstract

Background: Internet-delivered Cognitive Behavioural Therapy (i-CBT) offers potential as an alternative, accessible, clinically and cost-effective treatment for post-traumatic stress disorder (PTSD), but little is known about its acceptability.

Objective: To review the available evidence to understand acceptability of i-CBT for PTSD.

Method: We undertook a mixed methods systematic review according to Cochrane Collaboration Guidelines, of randomised controlled trials (RCTs) of i-CBT for adults with PTSD. We examined included studies for measures of acceptability, and possible proxy indicators of acceptability, including dropout rates, which were meta-analysed as risk ratios (RRs).

Results: Ten studies with 720 participants were included. We found i-CBT to be acceptable according to specific acceptability measures, and suggestions for acceptability according to some proxy measures of i-CBT programme usage. There was, however, evidence of greater dropout from i-CBT than waitlist (RR 1.39, CI 1.03-1.88; 8 studies; participants=585) and no evidence of a difference in dropout between i-CBT and i-non-CBT (RR 2.14, CI 0.97-4.73; participants=132; 2 studies).

Conclusion: i-CBT appears a potentially acceptable intervention for adults with PTSD. We identified clinical and research questions, including the status of proxy indicators, and call for standardised, consistent treatment acceptability measurement.

Keywords: Post-Traumatic Stress Disorder; PTSD; Cognitive Behavioural Therapy; Guided Self Help; Stress Disorders, Post-Traumatic; Treatment adherence and compliance; Patient Dropouts.
Introduction

Trauma-Focused Cognitive Behavioural Therapy (TF-CBT) is widely evidenced as an effective treatment of choice for PTSD [1], recommended in international clinical guidelines [2]. TF-CBT includes therapies for PTSD sufferers that facilitate an individual to challenge his/her thoughts, beliefs and/or behaviour, and typically include psychoeducation, cognitive and exposure work, stress/relaxation management, and homework. Timely delivery of TF-CBT is important, not least in minimising further potential impact of PTSD, including development of other mental/physical health problems, impaired functioning, and maladaptive coping mechanisms [3, 4].

Timely PTSD treatment, including TF-CBT is not always feasible, with long treatment waiting lists resulting from a limited number of therapists qualified in its delivery [5]. Another barrier in accessing traditional PTSD treatments, such as TF-CBT is the commitment required for weekly face-to-face appointments over several months, something which may not be suitable for all patients [6]. Furthermore, TF-CBT for example, is not covered by national health services or health insurances in all countries [7], thereby excluding individuals, in such countries, who cannot afford such treatment.

Internet-delivered CBT (i-CBT), an alternative to therapist-delivered CBT, offers potential as an effective mode of delivery of CBT, promising increased treatment accessibility and cost-effectiveness [8]. I-CBT includes internet-based programmes to treat PTSD sufferers, using CBT or TF-CBT approaches, and may be self-guided or therapist-guided. I-CBT interventions for PTSD generally offer less therapist contact than in traditional face-to-face TF-CBT, and guidance varies across i-CBT interventions, for example a higher level of therapist involvement, feedback and encouragement, week-to-week, is required in the PTSD i-CBT intervention, Interapy [9], compared with the intervention, PTSD Online [10], which does not require weekly feedback from therapists. Effective across a range of mental health problems, including anxiety disorders and depression [11], i-CBT interventions have also been tested for PTSD, and found to be superior to waitlist and treatment-as-usual, in reducing symptoms of depression and PTSD, with greater effect when guided by a therapist [12]. In recognition of the developing evidence base, guided i-CBT with a trauma-focus has featured amongst treatment recommendations in recent treatment guidelines for PTSD [13].

Treatment acceptability may influence adherence [14] and outcome [15], and a growing demand for patient choice in healthcare treatment, including PTSD treatment [16], suggests an increasing need for accurate information about treatment acceptability in addition to treatment efficacy. A facet of healthcare quality, acceptability is reported increasingly across the literature, however, explicit
theories and definitions are lacking, and measurements vary widely. In a review of 43 studies across healthcare interventions, no explicit theory or definition for acceptability was found [18], with over half (k=23), of the studies assessing acceptability by objective measures of uptake/adherence, with dropout rates the most commonly relied on measure, which is reflected in the acceptability literature.

Most systematic reviews of psychological treatment for PTSD have focused on efficacy, with some reporting acceptability alongside, commonly with respect to dropout. For example, a Cochrane review [1], considered dropout rates as a primary outcome, finding most of the 70 included studies reported dropout rates, with high rates across many studies. However, acknowledged by the authors themselves, interpreting acceptability based on dropout rate alone may be a limitation, with few studies providing explanations for dropouts. Furthermore, outcomes are inconsistently measured for individuals who dropout, and whilst this might in cases indicate treatment unacceptability, and non-improvement of symptoms, research has also shown significant improvement in symptomatology for individuals discontinuing from psychological treatment [19].

Few studies exist that have directly assessed acceptability of internet-based treatments for psychological disorders, as a whole, in terms of treatment preferences, expectations, usability, and satisfaction [20]. It is important to understand more about acceptability of i-CBT interventions for PTSD given that it is a relatively new treatment in this population, and given that acceptability is a factor likely to affect implementation [21]. Therefore, in addition to understanding acceptability according to dropout, we also need to consider acceptability with respect to other factors that might be important, including usability, or tolerability, particularly important given it is an intervention with variable degrees of therapist contact, sometimes largely, sometimes solely, self-directed. To illustrate, it may be argued where there is a considerable reduction, or perhaps no engagement with a therapist, tolerability may be problematic, particularly when concerning exposure work in i-CBT with a trauma-focus, which may require an individual to recount distressing trauma memories [22]. Whilst research has shown alliance can be maintained throughout trauma-focused work [23], clinicians frequently report concern about trauma interventions with exposure, for fear of disrupting therapeutic alliance.

**Aim of the Study**

Acknowledging acceptability as multi-faceted, we decided to adopt Sekhon et al’s definition of acceptability [18] (p.4): “a multi-faceted construct that reflects the extent to which people delivering or receiving a healthcare intervention consider it to be appropriate, based on anticipated or experienced cognitive and emotional responses to the intervention.” Referring to this definition we
aimed to determine if i-CBT is an acceptable psychological treatment for adults with PTSD, through reviewing and synthesising current knowledge.

1. Materials and Methods

We undertook a mixed-method systematic review of randomised controlled trials (RCTs) of i-CBT for adults with PTSD. A protocol was published by PROSPERO, an international prospective register, in November 2017 [24]. With no ‘gold standard’ operationalised acceptability measure, we examined studies using any standardised measure of acceptability, self-reported, or clinician-administered, and commonly reported proxy indicators of acceptability, including treatment non-uptake and dropout, adverse effects, and standardised measures of satisfaction.

Selection Criteria

Included studies were RCTs; randomised cross-over trials; and cluster-randomised trials of i-CBT for PTSD, for optimal confidence interpreting findings, given the rigorous methodology/reporting expected of these designs. For consistency with other reviews of psychological therapies for PTSD [12], studies were eligible if at least 70% of participants were diagnosed with PTSD according to DSM/ICD criteria, and if participants were aged 16 years or older. There was no restriction on the index trauma; severity or duration of symptoms; or length of time since trauma. Included studies allowed co-morbidity if PTSD was the primary diagnosis and a reduction in PTSD symptoms was the primary aim of the intervention. Studies of i-CBT were eligible, including therapies delivered online and through mobile applications, with or without therapist guidance, and if they provided up to a maximum of 5-hours of therapist guidance, delivered face-to-face or remotely. There were no restrictions on number of interactions with a therapist or length of the online programme. Eligible comparator interventions were face-to-face psychological therapy; waitlist/minimal attention/repeated assessment/usual care; and non-CBT internet-delivered psychological therapy. Sample size and publication status were not used to determine inclusion. Studies not published in English were excluded.

Search Strategy

The search strategy used for a review of the efficacy of i-CBT for PTSD [12], was adopted for the current review. Search terms were identified and a systematic search of the Cochrane Common Mental Disorders Group (CCMDG) clinical trials registers databases, was performed for studies published up to 2nd March 2018 (see Appendix A for full search strategy terms). These databases are
updated weekly from searches of OVID MEDLINE (from 1950), Embase (from 1974), and PsycINFO (from 1967), quarterly searches of the Cochrane Central Register of Controlled Trials (CENTRAL), and review-specific searches of additional databases. Reference lists of studies and systematic reviews identified in the search were checked and we searched the World Health Organization’s International Clinical Trials Registry Platform, to identify additional unpublished/ongoing studies. We contacted authors of included studies to identify unpublished/submitted studies and conducted a search of the Published International Literature on Traumatic Stress (PILOTS) database. Abstracts of studies identified in the search and full-text publications of potentially eligible studies were screened independently by two authors and whilst we put in place a procedure to resolve any disagreements with the input of a third reviewer, full inter-rater agreement meant that this was not required.

Data Extraction

A pre-designed data extraction form enabled systematic extraction of information on study methodology, participant characteristics, interventions, outcomes, and data on treatment uptake and dropout. Primary measures of interest were: 1) standardised measure(s) of acceptability, self-reported or clinician-administered, at any time point; 2) non-uptake rate, defined as percentage of individuals offered but not taking treatment; 3) dropout or lost to follow-up rate from baseline and prior to treatment completion, as a percentage; 4) adverse effects, indicated by increased PTSD symptoms from baseline to last available follow-up, measured using a standardised scale, for example the Clinician Administered Scale for PTSD (CAPS-5) [25], or any other adverse effect reported from baseline including increased self-harm and suicide; 5) any standardised measure of satisfaction administered from baseline; and 6) i-CBT programme usage, for example module completion/logons/self-reported usage/homework completion. Measures of acceptability, including proxy indicators were the main outcomes of interest, rather than the primary outcomes of the included studies themselves, which was a reduction in PTSD symptoms in every case.

Data synthesis

Sufficient quantitative data were available across all studies for meta-analyses to be conducted for dropout, as a proxy of acceptability. Data were entered into the Cochrane Collaboration’s Review Manager 5 (RevMan-5) software [26]. Categorical outcomes were analysed as risk ratios (RRs), using 95% confidence intervals. Clinical heterogeneity was assessed by looking at variability in the experimental and control interventions, participants, settings, and outcomes. To further assess heterogeneity, the I² statistic and the chi-squared test of heterogeneity, as well as visual inspection
of the forest plots were used. We intended to pool using a fixed-effect meta-analysis where homogeneity was present, and with random-effects meta-analysis where heterogeneity was present, and we planned to generate funnel plots to assess reporting bias if a meta-analysis included more than 10 studies [27].

Given the likely limited number of included studies with insufficiently similar acceptability measures, we also adopted a narrative synthesis methodology to bring together evidence, an approach described as a form of “trustworthy story-telling”, and “taking a textual approach to the process of synthesis” [28] (p5). This allowed us to organise and describe extracted data which was interpreted and refined by three of the authors, written up in a story-telling narrative.

We assessed included studies for risk of bias using Cochrane criteria [29]. This examines sequence allocation for randomisation; allocation concealment; blinding of assessors; incomplete outcome data; selective outcome reporting; and any other notable threats to validity (for example, premature termination of the study, non-manualised intervention).

Two researchers independently assessed each study and any discrepancies were discussed with a third researcher with the aim of reaching a unanimous decision. Data extraction and synthesis was conducted in line with Cochrane Collaboration Guidelines [29], and Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [30].

2. Results

Figure A presents the study selection flow. At the initial search 983 studies were identified as potentially eligible. Abstracts were considered, and we obtained full text copies for 66 studies deemed as potentially relevant, and Appendix B lists references to excluded studies. Ten RCTs of 720 participants met the Review’s inclusion criteria.

Figure A

Characteristics of included studies

Table A presents a summary of included studies. Studies compared i-CBT with a waitlist control group, treatment as usual (TAU) or minimal attention control group (k=8), and with an i-non-CBT psychological intervention (k=2). Studies were conducted in five countries: Australia (k=1) [31]; Iraq (k=1) [32]; Sweden (k=1) [33]; UK (k=1) [34]; and USA (k=6) [35-40]. Three studies recruited in clinical settings via clinician referrals [34-36], these studies also recruited via media, website and promotional material advertising, which was the method used by the remaining seven studies. The
sample size ranged from 34-159 with a mean of 70.1 (SD=40.29). Trauma type varied, with three studies concerning service members with military and terrorist-related trauma [35, 36, 39], and one study concerning civilians with war-related trauma [32], reporting moderate to severe PTSD symptoms, overall. Six studies reported individuals with fairly consistent PTSD severities of mild to moderate level, one study concerning rape trauma [38], the others including a range of traumatic events taking place in the community [31, 33, 34, 37, 40].

The majority of studies excluded individuals receiving treatment elsewhere, with current psychosis, substance dependence, active suicidal ideation, and individuals who had recently changed type/dosage of their mental health medication. Three studies excluded individuals with comorbid depression where depression presented immediately prior to the traumatic event [39], and where symptoms of severe depression presented at assessment [31, 34], and another excluded individuals with gross cognitive impairment [35]. Two studies did not exclude based on comorbidity, nor suicidal ideation [37, 40]. Participants across all studies were aged over 16, the mean ranging from 22-46 years, with a mean across studies of 42.05 (SD=8.72), weighted mean 31.77. Nine studies included female and male participants, the remaining study reporting 100% female participants [38]. The percentage of female participants across studies was 66.33% (SD=32.58), weighted mean of 23.46%.

All participants of included studies met diagnostic criteria for PTSD, according to DSM-5 (k=4) [34, 36, 39, 40], and DSM-IV (k=6) [31-33, 35, 37, 38]. Outcome measures were clinician-administered scales in half of the studies, with self-report measures used in the remaining studies.

Included studies examined the following i-CBT programmes: Delivery of Self Training and Education for Stressful Situations (DESTRESS) (k=2); INTERAPY (k=1); PTSD Coach (k=2); From Survivor to Thriver (k=1); Spring [41] (k=1); Warriors Internet Recovery & Education (WIRED) (k=1); a non-specified internet-based CBT (k=2). PTSD Coach, was the only stand-alone programme, with no guidance, examined by two included studies, and the extent/nature of guidance for the guided programmes examined by the remaining studies was widely variable. Only one study reported face-to-face guidance, comprising an hour-long introductory session and fortnightly 30-minute appointments thereafter, face-to-face or by phone, according to patient preference, with a trauma therapist, amounting to a mean therapist input per participant of 147.53 minutes (SD=57.01) [34]. The remainder of studies reported limited email/telephone check-in contact, for example one study reported “brief check-ins” by Clinical Psychology students, approximately once fortnightly [38]. Of the eight studies of guided i-CBT, six reported guiding clinician qualifications, and three reported their training on the i-CBT programme. Three studies used non-trauma-focused i-CBT programmes:
DESTRESS (primary care version) and PTSD Coach. The i-CBT programmes were trauma-focused in the other studies, and the common components were: psychoeducation; distress management techniques; cognitive restructuring/trauma processing; and relapse prevention. Duration of treatment ranged from four weeks [40], to fourteen weeks [38], averaging 8.3 weeks (SD=2.65), across studies.

Methodological Quality of Studies

Figure B presents risk of bias assessments. Method of sequence allocation was judged to pose “low” risk of bias for seven studies, the remainder rated “unclear” due to insufficient details. Allocation concealment was judged “low” risk for three studies, the remainder rated “unclear”. The outcome assessor was aware of the participant's allocation in two of the studies, with the remaining studies using blinded-raters or self-report questionnaires delivered in a way that could not be influenced by members of the research team. Incomplete outcome data was judged to be “high” risk for four studies, and the remainder were felt to have dealt with dropouts appropriately. Selective reporting was judged “low” risk across studies. We could not rule out potential researcher allegiance, since treatment originators evaluated i-CBT in all but one of the studies. Sample sizes were often small, however, all studies presented objectives.

Insert Figure B

Measures of acceptability

Not one of the studies used a standardised/validated acceptability measure; however, three used measures developed specifically for their studies [31, 35, 40]. Questions addressed whether individuals had learned new tools/skills/techniques to manage symptoms, whether they would recommend the programme to a friend with PTSD, and opinions/experience using the programme. Qualitative data was collected from participants randomised to the experimental treatment arms in three studies, that compared to waitlist, and responses were noted as “extremely enthusiastic” in one of these studies [35], with moderate to high acceptability responses also reported in the other studies [31, 40]. For example in one study, nearly 83% of participants in the i-CBT arm reported they had learned new tools to cope with their symptoms [40]. Similarly, acceptability was found in another study, assessed in the experimental treatment group using the Distress/Endorsement Validation Scale (DEVS) [42], with 76% of individuals reporting they would recommend the treatment to others [32].

Treatment satisfaction
Post-treatment satisfaction was measured in the experimental treatment arms in two studies, and found to be high [31, 38]: one used the Satisfaction with Therapy and Therapist Scale-Revised (STTS-R), measuring satisfaction with one’s therapist and with treatment received [43]; the other used a measure of satisfaction, based on a standardised Credibility/Expectancy questionnaire, measuring satisfaction with the programme, and quality of correspondence with therapist, and treatment modules.

**Therapeutic alliance**

Eight studies examined i-CBT programmes guided by a therapist, the other two being stand-alone programmes [37, 40]. We did not set out to look at therapeutic alliance, given research on therapeutic alliance in i-CBT is growing but limited [6], however it is widely considered an essential ingredient in psychotherapy [44], and was measured post-treatment in the experimental treatment arm in one guided i-CBT study [38], using the Working Alliance Inventory-Short form (WAI-S) [45]. Strong alliance was reported across three areas of measurement: agreement of therapeutic tasks; bond between therapist and client; and mutual endorsement of therapeutic goals.

**Non-uptake and dropout**

Five studies reported non-uptake, defined as the number of individuals offered but not taking up treatment [31, 34, 36, 38, 39]. Non-uptake for two studies comparing i-CBT with active treatment comparators, reported 18.60% for i-CBT, and 0% for optimised care [36], and 15.22% for i-CBT, and 14.63% for psycho-education website comparison [38]. Non-uptake in the remaining studies that reported this information did not differentiate between experimental arms, and overall there was insufficient data to conduct meaningful non-uptake meta-analyses.

Dropout ranged from 8.69-62.5% and was higher in the i-CBT intervention across all but two of the studies, both studies of guided, trauma-focused i-CBT interventions compared to waitlist [31, 32]. There was statistically significant evidence for greater dropout from i-CBT compared with waitlist/TAU/minimal attention (k=8; n=585; RR 1.39; CI 1.03-1.88), as shown in figure C. There was no evidence of greater dropout from i-CBT than i-non-CBT (k=2; n=132; RR 2.14; CI 0.97-4.73), as shown in figure D. Interestingly, dropout was higher for i-CBT, compared with waitlist/usual care/minimal attention for two of the three included studies that concerned non-trauma-focused i-CBT programmes [37, 40], as can be seen in Figure C.

Two studies attempted to record dropout reasons with rates. Knaevelsrud et al [32] reported few responses with some individuals noting technical problems, lack of privacy to use the programme undisturbed. Lewis et al [34] reported eight participants dropped out (19.05%), with two individuals...
reporting a lack of time to dedicate to the programme, two finding the programme difficult, one
feeling symptoms had improved, and three individuals did not provide a reason.

*Insert Figure C and Figure D*

**I-CBT programme usage**

Programme usage was reported by most studies, in a range of formats, including information on
module/homework completion, logons, and self-reported usage. Three studies reported the
percentage of individuals completing all programme modules, from 35.38.71% [33, 36, 46]. Two
studies examining PTSD Coach found mean, self-reported weekly usages of 2.65 times per week
(SD=1.03) and 2.27 days per week (SD=1.76), in the treatment groups [37, 40]. Engel el at [36]
reported 65% of participants completed at least 6 of the 18 expected logins, with 35% completing all
logins. Spence et al [31], reported the highest level of engagement, with a mean of 6.74 ‘lessons’
completed (SD=0.54), the total number of lessons being seven, strong homework compliance, with
81% reporting 20 minutes or more daily homework practice, and participants downloaded the
majority (85%) of the additional resources available.

**Adverse effects**

Only two studies reported the presence/absence of adverse effects. One study [38] noted two
individuals in the intervention condition reported a clinically significant increase in depression
symptoms post-treatment, with one of these individuals also reporting a clinically significant
increase in anxiety symptoms. It is, however, difficult to attribute this to i-CBT as, sadly, these
individuals had also both experienced the death of an immediate family member during treatment.
Three additional individuals reported clinically significant increases in anxiety at post-treatment.
With respect to the control condition one individual experienced a clinically significant increase in
depression symptoms between post-treatment and follow-up. No studies reported increased PTSD
symptoms from baseline to last available follow-up.

**Discussion**

Encouragingly, high levels of i-CBT acceptability were reported for treatment group participants
according to measures of acceptability, satisfaction and therapeutic alliance, and usage of the i-CBT
programmes was promising, indicating acceptability.

Contrastingly, lower levels of acceptability were inferred through non-uptake and dropout rates.
Non-uptake was higher in the i-CBT groups in two studies reporting this information in both the i-
CBT and active treatment comparison groups, 18.60% [36], and 15.22% [38], suggesting a
considerable proportion of individuals not engaging with i-CBT interventions for PTSD. Combined dropout across all ten studies was greater for i-CBT, though comparable to dropout reported for face-to-face therapy [47].

The findings are not atypical of some of the uptake and dropout literature for PTSD. A review of barriers to uptake of computerised-CBT [48], reports high acceptability among individuals participating in studies, yet low uptake rates, with explanations suggested, including perceived stigma around research participation. With respect to dropout, high dropout rates were reported in the range of 14-62% in a systematic review of eMental health interventions for PTSD, with 40 included studies [49]. Comparable dropout rates have been shown for i-CBT, face-to-face and other internet-interventions for PTSD [47], though overall, PTSD clinical trial dropout rates are notably variable in the literature, with several possible explanations, including potential research participation burden, completing lengthy questionnaires [50], and level of perseverance in contacting hard to reach participants. Tolerability for PTSD treatment is another potential explanation, perhaps impacted by varying levels of therapeutic alliance [51]. Higher dropout has been demonstrated for TF-CBT compared with CBT non-trauma-focused, and compared to waitlist/usual care [1, 52]. It is possible that elements of the trauma-focused i-CBT interventions in the included studies may have increased distress levels, albeit possibly temporarily, resulting in some dropout. Indeed, a study of the guided i-CBT PTSD Online [47], found high alliance ratings, despite low/moderate levels of programme satisfaction, the authors suggesting “participants may have found some of the program content difficult (e.g. exposure modules); however communication with their therapist was strong and may have mediated these effects” (p.129). However, tolerability is unlikely to be the sole explanation, given the finding of higher dropout for i-CBT, compared with waitlist/usual care/minimal attention, for two of the three included studies concerning non-trauma-focused i-CBT programmes (Miner, Kuhn), as can be seen on Figure C.

Strengths and Limitations

We found several limitations of the research on i-CBT acceptability. Though we report acceptability of i-CBT for PTSD, according to specific acceptability measures and suggestions for acceptability according to i-CBT programme usage, the lack of standardised measures of acceptability across the literature in general [18], is one limitation. Additionally, only participants in the experimental arms
of the included studies were asked questions regarding acceptability, a limitation likely to affect many studies across the literature. And a study reporting high levels of satisfaction and working alliance did not obtain this information from individuals who did not complete the post-treatment assessment [38]. Acknowledged by the authors themselves, this is a limitation, and again is one which will likely affect many studies across the literature. Due to wide variability in measurement/reporting of i-CBT programme usage across the literature, also evident across the included studies, from self-report questions to direct login information, it was not possible to make direct comparisons between studies to draw a clear conclusion. Similarly, the wide variability in the nature/extent/quality of guidance, and the guiding-clinician’s training in the programmes, so often seen in the literature, and evident in the present review, also make it difficult to meaningfully synthesise information and draw firm conclusions. All programmes were based on cognitive-behavioural approaches, with common components of psychoeducation, distress management techniques, cognitive restructuring/trauma processing, and relapse prevention, though there was still some heterogeneity across i-CBT programmes, so we must be cautious in our interpretation of the findings. However, we considered this clinical heterogeneity alongside the statistical homogeneity of dropout data and were able to pool data using fixed-effect meta-analyses [27].

The contrasting picture of lower levels of acceptability according to dropout rates might be explained by the limited usefulness as dropout an indicator for acceptability [19]. Despite being the most commonly reported indicator of acceptability in the present review, and reflected elsewhere in the literature [18], it is difficult to interpret dropout given the lack of reported reasons. Only four studies in the present review reported reasons or provided reference to their attempted collection [31, 32, 34, 35], and the picture was similar for non-uptake. Arguably an individual might dropout of treatment due to a perceived sense of feeling better, or conversely might engage with a treatment despite perceiving it to be unacceptable. Of course, dropout must indicate treatment unacceptability, and non-improvement of symptoms, in some cases, however research has shown improvement in symptomatology for a considerable proportion (35.85-55.56%) of individual(s) who discontinued psychotherapy for PTSD and depression [19].

For optimal confidence interpreting findings, eligibility was limited to RCTs, given the rigorous methodology/reporting expected of this design, though we accept the inclusion of other designs may have provided additional acceptability information. We followed rigorous Cochrane Collaboration guidelines [29], with two authors independently screening abstracts/relevant papers,
against inclusion criteria, extracting data and rating risk of bias. Risks of bias were identified, limiting our confidence in the quality of the studies.

We included comparison groups of face-to-face and non-CBT internet-delivered psychological therapy; waitlist/minimal attention/repeated assessment/usual care, and we acknowledge the potential limitation of the comparison group heterogeneity. The number of included studies was small, and given that we included only published papers, we must acknowledge the possible influence of publication bias. Also, we excluded studies not published in English, limiting generalisability. Whilst there were enough studies to calculate meta-analysis of dropout [53], it may be argued that the meta-analyses comparisons lack statistical power, given that power was not calculated a priori [54], and we did not consider it appropriate to conduct post-hoc power analysis [55]. There was an insufficient number of studies to investigate reporting bias.

Several studies relied on PTSD diagnosis based on self-report measures, and the predominant methods of recruitment was media/website advertising, potentially limiting generalisability of the findings since not all participants were necessarily treatment-seeking. Nonetheless, our review did not restrict on sample size, index trauma, time since trauma, severity/duration of symptoms, and we decided to include studies with a minimum of 70% of individuals with a PTSD diagnosis, as well as allowing for comorbidity, so there is good reason to believe our findings could be cautiously generalised to clinical populations.

Clinical/Treatment implications

Guided i-CBT has featured amongst treatment recommendations in recent treatment guidelines for PTSD [13], and offers promise as another treatment of choice, addressing the growing demand for patient choice in healthcare treatment, including PTSD treatment [16]. Understanding the clinical utility of i-CBT for individuals with PTSD is of critical importance, and must give weight to acceptability, widely recognised as vital in the roll-out of healthcare interventions [56]. I-CBT for individuals with PTSD offers potential as a cost-effective, timely and accessible treatment choice, especially for individuals who might have difficulty committing to standard treatment of weekly appointments [6], potentially reducing long waiting lists in mental health services.

Treatment uptake, retention and adherence reflect the broader domains of behaviour constituting engagement; therefore, clinicians might consider adopting strategies that might be influential in engaging individuals with PTSD in an i-CBT intervention. These might include motivational/shared decision-making strategies, and enhancing patient/clinician communication, for example facilitating trauma information disclosure, through establishing a strong therapeutic alliance [6, 23, 57, 58].
Clinical practice might also consider the integration of such interventions within stepped-care models [59], appreciating its value as a form of treatment in its own right, whilst also emphasising the ongoing role of individual therapy for more complex presentations [48].

Research Implications

Further research is required in the growing field of i-CBT, which recognises acceptability as a priority outcome in itself, and as an additional factor likely to affect its implementation as a treatment intervention [60]. We need to further understand factors associated with i-CBT treatment acceptability and efficacy, including acceptability’s potential role as a mediator of treatment outcome, in order to facilitate the development of optimised i-CBT for PTSD targeted to individuals who might benefit most [10].

The growing literature points towards advantages of guided, over unguided i-CBT in PTSD [11]. Indeed guided interventions were used in the two included studies in the present review that showed lower attrition in the i-CBT group, compared with waitlist [31, 32]. However, the study with most guidance [34] showed greater dropout in the immediate i-CBT group, and whilst there may be several explanations, therapist input per se does not seem to be the answer and further research is required to understand the relationship between guidance in i-CBT interventions and treatment acceptability.

To develop knowledge in the field of treatment acceptability, and to inform the development of acceptable i-CBT programmes for PTSD, we put forward recommendations. Firstly, the development and routine use of validated, reliable acceptability measures that include measures of treatment satisfaction, therapeutic alliance, intervention usage and adherence. Also, standardised methodology for assessment and reporting of acceptability in mental health and psychological treatment studies. And for further exploration of the reliability of proxy measures of acceptability, particularly dropout. Routine, standardised collection of non-uptake and dropout, including reasons, would be an important step in understanding clinical trial participation generally, as well as in understanding the picture in terms of PTSD treatment acceptability. These recommendations would lead to new studies which may be directly comparable, enabling a clearer understanding of key factors that determine the acceptability of i-CBT.

Conclusion
Overall, i-CBT appears a potentially acceptable intervention for adults with PTSD. Despite indications of lower levels of acceptability according to dropout rates, higher levels of acceptability were indicated for treatment group participants according to measures of acceptability, and i-CBT programme usage. We identified clinical and research questions, including the status of proxy indicators, and call for standardised, consistent treatment acceptability measurement, to lead to acceptable and effective i-CBT interventions for PTSD.

References


Figure A: Flow diagram for study selection
Figure B: Methodological quality of included studies

Risk of bias judgments for each study (in seven domains: A = random sequence generation; B = allocation concealment; I = blinding of assessors; D = incomplete data; E = selective reporting; F = other bias) are illustrated to the right of the forest plots (green / + = low risk; yellow / ? = unclear risk; red / - = high risk).
**Figure C: Dropout Forest Plots for i-CBT vs waitlist/usual care/minimal attention**

### i-CBT versus wait list

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Events Total</th>
<th>WL Events Total</th>
<th>Weight</th>
<th>Risk Ratio M-H, Fixed, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engel 2015</td>
<td>8</td>
<td>4</td>
<td>37</td>
<td>1.72 [0.58, 5.26]</td>
</tr>
<tr>
<td>Iversen 2014</td>
<td>3</td>
<td>3</td>
<td>31</td>
<td>1.50 [0.27, 8.30]</td>
</tr>
<tr>
<td>Kasperskud 2016</td>
<td>32</td>
<td>79</td>
<td>33</td>
<td>0.99 [0.86, 1.43]</td>
</tr>
<tr>
<td>Kounic 2017</td>
<td>10</td>
<td>16</td>
<td>3</td>
<td>3.13 [1.06, 9.21]</td>
</tr>
<tr>
<td>Khun 2017</td>
<td>11</td>
<td>62</td>
<td>6</td>
<td>1.72 [0.66, 4.34]</td>
</tr>
<tr>
<td>Lewis 2017</td>
<td>6</td>
<td>21</td>
<td>2</td>
<td>3.77 [0.68, 13.26]</td>
</tr>
<tr>
<td>Miner 2016</td>
<td>4</td>
<td>25</td>
<td>1</td>
<td>3.84 [0.46, 31.94]</td>
</tr>
<tr>
<td>Spencer 2011</td>
<td>2</td>
<td>25</td>
<td>2</td>
<td>0.33 [0.13, 5.32]</td>
</tr>
<tr>
<td><strong>Total (95% CI)</strong></td>
<td><strong>300</strong></td>
<td><strong>285</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>1.39 [1.03, 1.88]</strong></td>
</tr>
</tbody>
</table>

Total events 7653

Heterogeneity: Ch² = 8.05, df = 7 (P = 0.33), I² = 13%

Test for overall effect Z = 2.16 (P = 0.03)
### Figure D: Dropout Forest Plots for i-CBT vs i-non-CBT

**i-CBT versus i-non-CBT**

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>I-CBT</th>
<th></th>
<th></th>
<th>I-non-CBT</th>
<th></th>
<th></th>
<th></th>
<th>Risk Ratio</th>
<th>Risk Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Events</td>
<td>Total</td>
<td>Events</td>
<td>Total</td>
<td>Weight</td>
<td></td>
<td></td>
<td>MH, Fixed, 95% CI</td>
<td>MH, Fixed, 95% CI</td>
</tr>
<tr>
<td>Littleton 2016</td>
<td>7</td>
<td>46</td>
<td>3</td>
<td>41</td>
<td>42.0%</td>
<td></td>
<td></td>
<td>2.08 [0.58, 7.62]</td>
<td></td>
</tr>
<tr>
<td>Ulz 2007</td>
<td>10</td>
<td>24</td>
<td>4</td>
<td>21</td>
<td>57.4%</td>
<td></td>
<td></td>
<td>2.19 [0.80, 5.95]</td>
<td></td>
</tr>
<tr>
<td><strong>Total (95% CI)</strong></td>
<td>17</td>
<td>70</td>
<td>7</td>
<td>62</td>
<td>100.0%</td>
<td></td>
<td></td>
<td><strong>2.14 [0.97, 4.73]</strong></td>
<td></td>
</tr>
</tbody>
</table>

Total events: 17
Heterogeneity: Chi² = 0.00, df = 1 (P = 0.96), I² = 0%
Test for overall effect: Z = 1.88 (P = 0.06)
<table>
<thead>
<tr>
<th>Country</th>
<th>N</th>
<th>Mean age (SD)</th>
<th>Gender</th>
<th>Unemployment and Education</th>
<th>Method of recruitment</th>
<th>Method of diagnosis</th>
<th>Trauma type</th>
<th>Experimental intervention</th>
<th>Therapist time</th>
<th>Control intervention</th>
<th>Relevant outcome measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engel et al., 2015</td>
<td>USA</td>
<td>80</td>
<td>Experimental - 36.2 (7.75)</td>
<td>18.75% women 81.25% men</td>
<td>Unemployment - not reported University Education - 62.8%</td>
<td>Adverts</td>
<td>Clinician rated, The Clinician-Administered PTSD Scale for DSM-5 (CAPS-5)</td>
<td>Military</td>
<td>6 weeks of DELivery of Self-TRaining and Education for Stressful Situations (DE-STRESS), guided online self-management, non-trauma-focused. A Nurse introduced participants to components of this web-based programme (devices on which this could be accessed were not specified), which included psychoeducation, anger, stress management strategies, sleep hygiene, cognitive reframing.</td>
<td>Nurse guidance, monitoring via website, guidance as necessary</td>
<td>Optimised usual care, consisting of usual primary care PTSD augmented with low intensity care management (15 minute telephone check-ins with DESTRESS nurse, including risk assessment), and feedback to the primary care provider.</td>
</tr>
<tr>
<td>Ivarsson et al., 2014</td>
<td>Sweden</td>
<td>62</td>
<td>Immediate treatment – 44.8 (11.2)</td>
<td>82.3% women 17.7% men</td>
<td>Unemployment – 8.1% University Education – 56.5%</td>
<td>Adverts</td>
<td>Clinician rated, The Clinician-Administered PTSD Scale for DSM-5 (CAPS-5)</td>
<td>Various</td>
<td>8 weeks of I-CBT (unnamed), guided, trauma-focused. Consisting of text-based modules, web-based (devices on which this could be accessed were not specified), of psychoeducation, anxiety coping skills, in-vivo and imaginal exposure (writing and reading trauma narratives), and cognitive restructuring.</td>
<td>Clinical psychology students, guidance once a week and occasional reminders via website</td>
<td>Minimal attention - answering weekly questions on wellbeing, stress and sleep</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>N</td>
<td>Group</td>
<td>Sample Description</td>
<td>Outcome</td>
<td>Description</td>
<td></td>
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<tr>
<td>Knaevelsrud et al., 2015</td>
<td>Iraq</td>
<td>15</td>
<td>Experimental</td>
<td>Interapy – 29.11 (8.20) women (79%) Waitlist – 27.15 (6.48) women (69%)</td>
<td>Adverts</td>
<td>Self-reported, Posttraumatic Stress Diagnostic Scale (PDSD) 5 weeks of Interapy, translated into Arabic and culturally adapted, and internet-based (devices on which this could be accessed were not specified). Guided, and trauma-focused. Structured writing activities, with the following treatment phases: self-confrontation with the trauma; cognitive restructuring; and social sharing.</td>
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<tr>
<td>Krupnick et al., 2017</td>
<td>USA</td>
<td>34</td>
<td>Experimental</td>
<td>8.8% women 91.2% men Unemployment – not reported University Education – not reported</td>
<td>Clinician referral</td>
<td>Self-reported, PTSD Checklist Military (PCL-M) 10 weeks of Warriors Internet Recovery and Education (WIRED) Guided, trauma-focused online (devices on which this could be accessed were not specified), writing intervention, adapted from Interapy. Therapist-guided writing, using principles of prolonged exposure and cognitive therapy.</td>
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<tr>
<td>Kuhn et al., 2017</td>
<td>USA</td>
<td>12</td>
<td>Experimental</td>
<td>69.2% women 30.8% men Unemployment – not reported University education – 14.2%</td>
<td>Adverts</td>
<td>Self-reported, PTSD Checklist Civilian (PCL-C) Participants were instructed to download the PTSD Coach Smartphone Application, or were lent an iPad touch. 12 weeks of PTSD Coach, skills-based, non-trauma-focused intervention of four components: Learn; Self Assessment; Manage Symptoms; Find Support.</td>
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<tr>
<td>Study</td>
<td>Country</td>
<td>Sample Size</td>
<td>Age (Range)</td>
<td>Gender Distribution</td>
<td>Unemployment</td>
<td>Referral Method</td>
<td>Clinical Scale</td>
<td>Interventions</td>
<td>Waitlist</td>
<td></td>
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<tr>
<td>Lewis et al., 2017</td>
<td>UK</td>
<td>42</td>
<td></td>
<td>59.5% women/40.5% men</td>
<td>59.5% Unemployment</td>
<td>Clinician referral and advertisements</td>
<td>Clinician-rated, Clinician-Administered PTSD Scale for DSM-5 (CAPS-5)</td>
<td>Various 8 weeks of Spring, therapist-guided, trauma-focused online intervention (devices on which this could be accessed were not specified), 8 steps: Learning about my PTSD; Grounding myself; Managing my anxiety; Reclaiming my life; Coming to terms with my trauma; Changing my thoughts; Overcoming my avoidance; and Keeping myself well.</td>
<td>Trauma therapists, hour long introductory session followed by fortnightly appointments face to face or by phone</td>
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</tr>
<tr>
<td>Littleton et al., 2016</td>
<td>USA</td>
<td>87</td>
<td>22 years (range 18-42) for whole sample</td>
<td>100% women</td>
<td>Unemployment - not reported University Education - all in sample were students</td>
<td>Adverts</td>
<td>Clinician rated, PTSD Symptom Scale-Interview (PSS-SI)</td>
<td>Rape 14 weeks of From Survivor to Thriver, guided, trauma-focused online computer-based programme, designed to be completed sequentially, consisting of three phases: psychoeducation including distress management and healthy coping; challenging unhelpful thoughts; and behavioural experiments addressing specific concerns.</td>
<td>Brief check-ins by clinical psychology students (approximately 5 minutes, approximately once every two weeks</td>
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<tr>
<td>Litz et al., 2007</td>
<td>USA</td>
<td>45</td>
<td></td>
<td>DE-STRESS – 25% women</td>
<td>Unclear Unemployment</td>
<td>Adverts</td>
<td>Clinician rated, PTSD Scale, Clinician-Administered PTSD Scale</td>
<td>Military 8 weeks of DELivery of Self-TRaining and Education for Stressful Situations (DE-STRESS). Guided, non-trauma-focused web-based intervention (devices on which this could be accessed</td>
<td>Non-CBT based internet intervention (monitoring non-trauma related concerns, psychoeducation, stress management.</td>
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<tr>
<td>Study</td>
<td>Country</td>
<td>Sample Size</td>
<td>Gender</td>
<td>Adverts</td>
<td>Outcome Measure</td>
<td>Intervention</td>
<td>Acceptability Measure</td>
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<tr>
<td>Miner et al., 2016</td>
<td>USA</td>
<td>49</td>
<td>81.6% women, 18.4% men</td>
<td>Not reported</td>
<td>Self-reported, PTSD Checklist Civilian (PCL-C)</td>
<td>4 weeks of PTSD Coach, mobile phone Application, skills-based, non-trauma-focused intervention of four components: Learn; Self Assessment; Manage Symptoms; Find Support.</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spence et al., 2011</td>
<td>Australia</td>
<td>42</td>
<td>81% women, 19% men</td>
<td>Unemployment – 40%; University Education – unclear</td>
<td>Clinician rated, Mini-International Neuropsychiatric Interview (MINI)</td>
<td>8 weeks of I-CBT (unnamed), guided, trauma-focused, and comprising online (devices on which the programme could be accessed were not specified) lessons and homework, concerning: assertiveness skills;</td>
<td>Clinical psychologist via telephone, email and forum</td>
<td></td>
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</tbody>
</table>

**Control – 19% women for DSM-5 (CAPS-5) were not specified), promoting stress and negative affect management strategies applied to trauma triggers.**

Therapist contact as required, focused on non-trauma related concerns.
Table 1: Summary of included studies

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<th></th>
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<th>Measure of satisfaction based on the standardised Credibility/Expectancy questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>anger management; panic; sleep; diet and exercise; exposure and behavioural activity session.</td>
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</table>
Appendix A – Supplementary Material

Specialised Register of the Cochrane Common Mental Disorders Group (CCMDCTR)

The Cochrane Common Mental Disorders Group maintains a specialised register of randomised controlled trials, the CCMDCTR. This register contains over 40,000 reference records (reports of RCTs) for anxiety disorders, depression, bipolar disorder, eating disorders, self-harm, and other mental disorders within the scope of this Group. The CCMDCTR is a partially studies-based register with more than 50% of reference records tagged to about 12,500 individually population, intervention, comparison, outcome (PICO)-coded study records. Reports of trials for inclusion in the register are collated from (weekly) generic searches of OVID MEDLINE (from 1950), Embase (from 1974), and PsycINFO (from 1967), quarterly searches of the Cochrane Central Register of Controlled Trials (CENTRAL), and review-specific searches of additional databases. Reports of trials are also sourced from international trial registries, drug companies, the handsearching of key journals, conference proceedings, and other (non-Cochrane) systematic reviews and meta-analyses. Details of CCMD's core search strategies (used to identify RCTs) can be found on the Group’s website, with an example of the core Medline search displayed.

Electronic searches

The Cochrane Common Mental Disorders Group’s Information Specialist ran searches on their specialised register using the following search terms (to 2 March 2018).

1. The CCMDCTR-Studies Register:
   Condition = (PTSD or *trauma* or “acute stress” or “stress reaction”) AND Intervention = (computer* or internet or web* or online or self-help or self-manage* or self-change)

2. The CCMDCTR-References Register was searched using a more sensitive set of terms to identify additional untagged or uncoded reports of RCTs:
   #1. (PTSD or *trauma* or “combat disorder*” or “stress reaction” or “acute stress” or “stress disorder” or “war neurosis”):ab,ti,kw,emt,mh,mc
   #2. (self near3 (care or change or guide* or help or intervention or manag* or support* or train*)):ab,ti,kw,emt,mh,mc
   #3. (android or app or apps or audio* or blog or iCBT or cCBT or i-CBT or c-CBT or CD-ROM or “cell phone” or cellphone or chat or computer* or cyber* or distance* or DVD or eHealth or e-health or “electronic health*” or e-Portal or ePortal or eTherap* or e-therap* or forum* or gaming or “information technolog*” or “instant messag*” or internet* or interapy or ipad or i-pad or iphone or i-phone or ipod or i-pod or web* or WWW or “smart phone” or smartphone or “mobile phone” or e-mail* or email* or mHealth or m-health or mobile or multimedia or online* or on-line or “personal digital assistant” or PDA or SMS or “social medi*” or Facebook or software or telecomm* or telehealth* or teledem* or telemonitor* or teleport* or telepsych* or teletherap* or “text messag*” or texting or tape or taped or video* or YouTube or podcast or virtual* or remote):ab,ti,kw,emt,mh,mc
   #4. [48 and (#2 or #3)]
   [Key to CRS field tags: ab:abstract; ti:title; kw:CRG keywords; ky:other keywords; emt:EMTREE headings; mh:MeSH headings; mc:MeSH checkwords]

3. The Information Specialist also ran a complementary search on PILOTS (Published International Literature on Traumatic Stress, US Department of Veterans Affairs), using relevant subject headings and search syntax appropriate to this resource (1990 to 2 March 2018)

4. We searched international trial registries via the WHO International Clinical Trials Registry Platform (ICTRP) and ClinicalTrials.gov to identify unpublished or ongoing studies (to 2 March 2018).
We did not restrict any of the searches by date, language, or publication status.

**Searching other resources**

**Grey literature**

We searched sources of grey literature including dissertations and theses, clinical guidelines, and reports from regulatory agencies (when appropriate).

- ProQuest Dissertations and Theses Database.
- Worldwide Regulatory Agencies ([www.globepharm.org/links/resource_agencies.html](http://www.globepharm.org/links/resource_agencies.html)).
- Open Grey ([www.opengrey.eu/](http://www.opengrey.eu/)).

**Reference lists**

We scrutinised the reference lists of all included studies and relevant systematic reviews to identify additional missed studies. We also conducted a cited reference search on the Web of Science.

**Correspondence**

We identified from included studies, authors working in the field of i-CBT and the study team agreed on subject matter experts and trialists that were then contacted for information on unpublished or ongoing studies, and to request additional trial data. Additionally, since the studies were included on the International Society for Traumatic Stress Studies (ISTSS), website for comment by the ISTSS membership, additional studies could be brought to our attention in this way, also.
References to studies excluded from this review


NCT01552278. Enhancing cognitive function and reintegration in Iraq and Afghanistan veterans with PTSD using computer-based cognitive training. clinicaltrials.gov/show/NCT01552278 Date first received: 15 March 2010.

NCT01678196. Helping families help veterans with PTSD and alcohol abuse: an RCT of VA-CRAFT. clinicaltrials.gov/ct2/show/NCT01678196 Date first received: 3 September 2012.

NCT01710943. Web-based CBT for recent veterans experiencing problems with trauma symptoms or alcohol/drug use. ClinicalTrials.gov/show/NCT01710943 Date first received: 19 October 2012.

NCT01760213. Brief Internet based treatment for PTSD. ClinicalTrials.gov/show/NCT01760213 Date first received: 4 January 2013.

NCT01891734. Enhancing delivery of problem solving therapy using SmartPhone technology. Available from clinicaltrials.gov/show/NCT01891734 Date first received: 25 June 2013.


NCT00640445. Military to civil: RCT of an intervention to promote postdeployment reintegration. clinicaltrials.gov/show/NCT00640445 Date first received: 18 March 2008.


