Computer-based Psychological Treatments for Depression:

A Systematic Review and Meta-Analysis

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Abstract
The aim of the paper was to systematically review the literature on computer-based psychological treatments for depression and conduct a meta-analysis of the RCT studies, including examining variables which may effect outcomes. Database and hand searches were made using specific search terms and inclusion criteria. The review included a total of 40 studies (45 published papers), and 19 RCTs (23 published papers) were included in a standard meta-analysis. The review describes the different computer-based treatments for depression, their design, communication types employed: synchronous, asynchronous, and face-to-face (F:F); alongside various types and frequency of support delivered. The evidence supports their effectiveness and highlights participant satisfaction. However, pertinent limitations are noted. Across 19 studies the meta-analysis revealed a moderate post-treatment pooled effect size $d = 0.56$ (95% confidence interval [CI] -0.71, -0.41), $Z = 7.48$, $p<.001$). Supported interventions yielded better outcomes, along with greater retention. The results reported statistically significant clinical improvement and recovery post-treatment. The review and meta-analysis support the efficacy and effectiveness of computer-based psychological treatments for depression, in diverse settings and with different populations. Further research is needed, in particular to investigate the influence of therapist factors in supported treatments, the reasons for dropout, and the maintenance of gains post-treatment.

Keywords: psychological treatment; CBT; depression; meta-analysis, systematic review; computer-based; internet-delivered
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Depression is a serious and growing problem worldwide, displaying high rates of lifetime incidence, early age onset, high chronicity, and role impairment (Richards, 2011). The World Health Organization has estimated that during any 12-month period, about 34 million depressed individuals worldwide go untreated (Kohn, Saxena, Levav, & Saraceno, 2004). Barriers to accessing treatment include a shortage of trained professionals, waiting lists, costs and personal barriers such as stigma (Cuijpers, 1997). In recent years attempts to overcome barriers to access have been addressed through tailored, computer-based, treatment programs. These have become increasingly common administration formats for depression treatment, both in research and slowly in clinical settings (Andersson & Cuijpers, 2009).

Many formats of computer-based interventions have been investigated (Newman, Szkodny, Llera, & Przeworski, 2011). Supported treatments generally yield enhanced results compared to no support (Andersson & Cuijpers, 2009), still, further research is required to determine the best type, frequency, and duration of human support for users (Marks, Cavanagh, & Gega, 2007). Secondly, dropout is a continued cause of concern, with only just over half completing all sessions (Waller & Gilbody, 2009). Whether support predicts dropout is of importance, but has yet to be determined.

The current systematic review and meta-analysis sought to evaluate the overall effectiveness of computer-based treatments for depression, as well as examining the impact of support on dropout rates and clinical outcomes. A number of other reviews and meta-analysis exist to date (Andersson & Cuijpers, 2009; Barak, Hen, Boniel-Nissim, & Shapira, 2008; Griffiths & Christensen, 2006; Spek, Cuijpers et al., 2007). This paper aimed to provide a systematic update to this previous work and to use meta-
analysis to examine the impact of support types on outcomes and other variables; including a consideration of clinical effectiveness at follow-up, which has not previously been conducted.

Method

Literature search and selection of studies

The aim of the literature search was to find all references related to computer-based psychological treatments for depression. A search of three databases (EMBASE, PubMed, and PsychINFO including PsychARTICLES) was conducted for studies published in peer-reviewed journals in the last 10 years (March 2001-March 2011). While work has been carried out previous to March 2001 (e.g. Selmi, Klein, Greist, Sorrell, & Erdman, 1990), the authors decided that the years represented a meaningful timeframe in terms of contemporary technologies, advances in multimedia, and broadband developments. Seven search terms were employed (Online self-help treatment for depression, Web-based intervention for depression, Online depression treatments, Computerized (+Computerised) cognitive behaviour therapy for depression, Internet (+ delivered) treatment for depression), culminating in a total of 21 searches.

All results were assessed at either title, abstract, or by reading the full paper to determine whether the study met the established inclusion criteria. Included studies could be deployed using a variety of different computer-based technologies, synchronously and asynchronously, they could be solely self-administered or therapist-led; or a blended delivery using both. Study participants had to be adults (18+ years) with depression (self-report or diagnosis), established using valid and reliable measures, whom may also have had comorbidity, e.g. anxiety or physical health problems. Studies included were published in peer-reviewed journals in English in the last 10 years, which investigated a computer-based treatment for depression, and included reliable and valid
outcome measures for assessing depression. Participants could be from the general population or a clinical group so long as depression was specifically measured. Preliminary research into recent developments in computerized paradigms for depression such as cognitive bias modification (CBM) based interventions were not considered for inclusion (e.g. Blackwell & Holmes, 2010).

Duplicates were rejected and studies were assessed by the first author, any difficulties discussed with the second author, and a final decision reached. Finally, a hand search was made of papers to identify other relevant studies for inclusion. For the systematic review a comprehensive summary of information extracted from the papers was written, that considered the interventions employed, methodological design, communication and support types used in the studies, clinical outcomes, dropout, participant satisfaction and limitations.

Additional criteria for those papers included in the meta-analysis was that they had to be RCTs, which included a control group, and reported details on their outcomes. Reasons for exclusion at title, abstract, and at paper were recorded for the literature search.

**Meta-analysis procedure**

A meta-analysis was conducted on selected RCT studies ($n = 19$; 23 papers), which included all necessary information on outcomes for the interventions and control groups. To ensure a conservative estimate of pooled effect size, intent to treat analyses (ITT) was used instead of completer analyses, where possible. Control conditions which used active placebo groups, such as treatment as usual (TAU), were also included. Effect sizes of self-report measures of depression were estimated via the standardized mean difference (Cohen’s $d$), weighted by sample size, via a random effects model with 95% confidence intervals. Effect sizes of 0.8 can be considered large, 0.5 moderate,
and 0.2 small (Cohen, 1988). If more than one measure of depression was used both were included in the analysis. Similarly, if there were more than one computerized or online condition in the trial, both were included. The proportion of participants achieving a clinically significant reduction in depression and the proportion who recovered from depression were subjected to an Odds Ratio meta-analysis, using a Mantel-Haenszel random effects model, weighted by sample size, with a 95% confidence interval. Results were calculated using the software package Review Manager 5 (Cochrane, 2008).

Results of the Review

Three databases, PubMed \((n = 872)\), EMBASE \((n = 1184)\), and PsychINFO including PsychARTICLES \((n = 263)\), were searched. Identified papers \((n = 2,319)\) were screened against the established inclusion criteria, yielding 44 papers. A further one paper was identified through hand search (Wright et al., 2005). Figure 1 shows the results of the systematic review. In total, 45 papers met the inclusion criteria and are reviewed below. These include 24 RCT studies \((n = 28)\) and 17 open trials \((n = 17)\).

Programs and their Content

Table 1 outlines selected characteristics of the studies included. A total of 18 different interventions for treating depression have been identified in the review. By far the most researched of these is Beating the Blues (BTB; Proudfoot et al., 2004), with 3 RCTs and 10 open trials. Initially developed in computer disc-read only memory (CD-ROM) format, in recent years it has been transferred to the web. Briefly, it comprised eight sessions of cognitive behavioral therapy (CBT). It included a series of filmed case studies of individuals modelling the symptoms of depression and also the application of
the CBT strategies. It included online exercises and homework tasks alongside a printable post-session summary sheet (Cavanagh et al., 2006).

The structure of BTB is similar to the next most researched programs, MoodGYM (2 RCTs and 2 Open Trials; Christensen, Griffiths, & Korten, 2002) and the Sadness Program (2 RCTs and 1 Open Trial; Perini, Titov, & Andrews, 2008). MoodGYM included modules on cognitive behavioral training, a personal workbook and graphic site characters who modelled patterns of dysfunctional thinking. The content was delivered through text, animated diagrams and interactive exercises, and included downloadable relaxation audios, and integrated workbook exercises. The six lessons of the Sadness Program were presented in the form of an illustrated story of a woman with depression who with CBT learned new ways of managing her symptoms.

Overcoming Depression on the Internet (ODIN; Clarke et al., 2002) was employed in 3 RCTs and consisted of modules on cognitive restructuring skills. The latest RCT saw the program overhauled and used with a young adult population (18-24 years), additionally it included behavioral activation and a range of interactive and automated feedback (Clarke et al., 2009).

The Colour your Life program (3 RCTs) was initially developed for use with over 50-years population (Spek, Nyklicek et al., 2007) and later adapted for use with an adult population (18-65; de Graaf et al., 2009; Warmerdam, van Straten, Twisk, Riper, & Cuijpers, 2008). It consisted of sessions on psycho-education, cognitive restructuring, behavior change, and relapse prevention. It included text modules, exercises, videos and illustrations.

Deprexis (Meyer et al., 2009) was a 10 module program that tailored content to the users responses to given options. It was organized about simulated dialogues and included drawings, photographs, and multimedia animations. The modules included
content other than CBT, such as childhood experiences and early schema, dreamwork, and positive psychology.

Other interventions too deviated from the standard CBT content, for example, problem-solving therapy (PST; van Straten, Cuijpers, & Smits, 2008), a structured writing intervention (SWI; Kraaij et al., 2010), a combination of face-to-face (F:F) and cognitive therapy (Wright et al., 2005), or mindfulness activities with standard CBT elements delivered in group format online (Thompson et al., 2010).

Two open trials have researched other CD-ROM based interventions, the first, Blues Begone (Purves, Bennett, & Wellman, 2009) compiled a personalized roadmap to recovery for each user. It included information presented in text, audio, through character dialogues, and activities. It also included religious specific text for users who requested it. The second, Overcoming Depression (Whitfield, Hinshelwood, Pashely, Campsie, & Williams, 2006) offered CBT concepts in six sessions, using text, cartoon illustrations, animations, interactivity, audio and video.

Recovery Road (Robertson, Smith, Castle, & Tannenbaum, 2006) was an integrated e-health system that provided 12 sessions of CBT treatment, progress monitoring reports, psychoeducation, an e-consultation system, and a diary. The system also had a clinician side for the management of client cases.

Lastly, a number of RCTs have employed idiosyncratic CBT-based programs, for example, Ruwaard et al. (2009) CBT treatment included inducing awareness, structuring activities, cognitive restructuring, positive self-verbalisation, social skills, and relapse prevention. Andersson et al. (2005) included modules on behavioral activation, cognitive restructuring, sleep and physical health, and relapse prevention, a version of the program was also employed by Vernmark et al. (2010). Other interventions included similar CBT content, but were aimed at a specific population, for
example, those with partially remitted depression (Holländare et al., 2011). Another described an intervention for comorbid depression with diabetes (van Bastelaar, Pouwer, Cuijpers, Riper, & Snoek, 2011). It included 8 lessons of CBT with text, audio, and videos of depressed diabetes patients modelling how they learned to manage their depression.

The computer-based treatments reviewed were varied in terms of the technologies employed and how content was delivered. The majority of the programs are homogenous in that they used similar CBT content and deployed that content using web-based platforms, high-end multimedia, and interactivity. However, some deployed content different to a CBT framework (Kraaij et al., 2010; Meyer et al., 2009; van Straten et al., 2008; Warmerdam et al., 2008). Some too deployed content solely in text format (Andersson et al., 2005; Wright et al., 2005), or through the use of CD-ROM technology (Purves et al., 2009; Whitfield et al., 2006), or used online synchronous chat-based technology to deliver the intervention (Kessler et al., 2009; Thompson et al., 2010).

Methodological Characteristics

Objectives of the studies.

Some RCT studies reported their objective was to establish the efficacy of a computer-based, clinician-assisted, intervention for depression (Andersson et al., 2005; Perini, Titov, & Andrews, 2009; Ruwaard et al., 2009), others examined the efficacy of unsupported computer-based interventions (Clarke et al., 2002; de Graaf et al., 2009; Meyer et al., 2009; Spek, Cuijpers et al., 2007). Others still in examining efficacy included support which was other than therapeutic (Christensen, Griffiths, & Jorm, 2004; Proudfoot et al., 2004; van Straten et al., 2008). Some studies compared the efficacy of more than one active treatment intervention (Christensen et al., 2004; Spek,
Nyklicek et al., 2007; Warmerdam et al., 2008), or delivered the same intervention in
different modes: clinician versus technician assisted (Titov et al., 2010), individualised
e-mail versus no support (Vernmark et al., 2010). Finally, a number of studies examined
the effectiveness of an intervention with a particular population. Cavanagh et al. (2006)
write how RCTs alone offer a limited guide to the contribution of an intervention in
routine practice. Many open trials complement the RCTs in establishing the
generalizibility of the effectiveness in routine care (Table 1).

Some of the studies included an examination of the lasting effects of the
intervention, and included varying lengths of follow-up assessments from 1 to 4 months
(Thompson et al., 2010; Titov et al., 2010; Warmerdam et al., 2008; Whitfield et al.,
2006), 6 to 8 months (Andersson et al., 2005; Clarke et al., 2002, 2005; Grime, 2004;
Holländare et al., 2011; Kessler et al., 2009; Meyer et al., 2009; Proudfoot et al., 2004;
Vernmark et al., 2010; Wright et al., 2005), or 1 year and beyond (de Graaf et al., 2011;
Mackinnon, Griffiths, & Christensen, 2008; Ruwaard et al., 2009; Spek et al., 2008;
Topolovec-Vranic et al., 2010).

**Recruitment, Sample Types and Sizes.**

Community samples were recruited through a variety of means such as,
advertisements and information on the web, and by email. In a number of studies the
postal system was used to send prospective participants a letter of invite (Clarke et al.,
2009; Clarke et al., 2002, 2005; Christensen et al., 2004; de Graaf et al., 2009; Kraaij et
al., 2010). The majority of open trials and some RCTs recruited participants from
primary or secondary care services. Several studies prescribed for a particular sample
frame, for example, participants over 50 (Spek, Cuijpers et al., 2007), individuals with
HIV (Kraaij et al., 2010), or who had diabetes (van Bastelaar et al., 2011), or who had
epilepsy (Thompson et al., 2010), individuals with a brain injury (Topolovec-Vranic et
al., 2010), or who had partially remitted depressive symptoms (Holländare et al., 2011).

Sample sizes varied considerably, in one trial there were just 48 in the active
condition (Perini et al., 2009). Ruwaard et al. (2009), similarly, had just 36 in the active
condition. Studies that advertised and recruited from community populations achieved
greater success in the numbers included. Spek, Nyklicek et al. (2007) included 301
participants. Likewise van Straten et al. (2008) recruited 213 participants. Meyer et al.
(2009) employed an 80:20 randomization procedure and consequently was able to begin
with 320 participants in the active cCBT intervention and 76 in their TAU control.
Clarke et al. (2002, 2005, 2009) had access to the records of private health care patients
and achieved significant numbers in their trials. Similar to the RCTs reviewed, sample
sizes varied in the open trials, some were large with up to 300 or more participants,
while others had less than 40 participants (Table 1). The largest sample sizes were those
of the Australian studies of MoodGYM. They invited spontaneous users of the website
to participate, this gave them access to a worldwide spread of potential participants
(Christensen et al., 2002; Christensen, Griffiths, Mackinnon, & Brittliffe, 2006).

Eligibility Criteria Employed.

Participants in the various studies were screened and a wide range of eligibility
and exclusion criteria applied. For some studies the eligibility can be considered low,
where a screening instrument was employed but with no established cut-off scores, or
there was a referral because of low mood or depression, but no official diagnosis. For
instance, the criteria for inclusion in one study was the completion of one instance of
the Goldberg Depression Scale (GDS; Goldberg, Bridges, Duncan-Jones, & Grayson,
1988), another if participants had elevated scores on the baseline GDS (Goldberg et al.,
1988) screening measure employed (Christensen et al., 2002; Christensen et al., 2006).
van Straten et al. (2008) screened participants at baseline, but argued that because they recruited from the general population no inclusion or exclusion criteria were used. Whitfield et al. (2006) included participants referred with depression or low mood as a problem. A number of studies used screening instruments but did not report established cut-off scores for inclusion (Fox, Acton, Wilding, & Corcoran, 2004; Hunt, Howells, & Stapelton, 2006; Van den Berg, Shapiro, Bickerstaffe, & Cavanagh, 2004).

Some studies went further and incorporated what could be considered moderate eligibility and exclusion criteria, where a valid assessment instrument was employed for screening with established cut-off scores, alongside other criteria. In Clarke et al. (2002, 2005, 2009) the eligibility criteria was diagnosed depressed patients and thereafter completion of the baseline depression screening measure. Other studies, in addition, included other criteria such as not currently receiving clinical treatment (Christensen et al., 2004; Learmonth & Rai, 2008), not psychotic (Grime, 2004), no suicidal ideation or plans (Learmonth & Rai, 2008; Mitchell & Dunn, 2007; Pittaway et al., 2009), no alcohol or drug dependence, obsessive-compulsive disorder, or other diagnosed mental health condition (Learmonth & Rai, 2008).

Most of the studies did establish what can be considered robust eligibility criteria as would be found in face-to-face depression research. Namely, a valid screening instrument or an official diagnosis, alongside other well defined exclusion criteria (Hollandare et al., 2011; Proudfoot et al., 2004; Thompson et al., 2010; van Bastelaar et al., 2011; Vernmark et al., 2010). For example, in the study by Titov et al. (2010), participants initially completed questionnaires online to determine eligibility. On meeting the inclusion criteria, participants completed, by telephone, the depression section of the Mini International Neuropsychiatric Interview Version 5.0.0 (Lecrubier, Sheehan, Hergueta, & Weiller, 1998) to determine whether they met the Diagnostic and
Statistical Manual for Mental Health Disorders – Fourth Edition (DSM-IV) (American Psychiatric Association [APA], 1994) criteria for depression. Other studies included similar robust criteria (Andersson et al., 2005; de Graaf et al., 2009; Kessler et al., 2009; Ruwaard et al., 2009; Spek, Nyklicek et al., 2007; Wright et al., 2005). Alongside the RCTs a number of open trials also detailed robust eligibility criteria (Cavanagh, Seccombe, & Lidbetter, 2011; Cavanagh et al., 2006; Learmonth & Sadik, 2007; Learmonth, Trosh, Rai, Sewell, & Cavanagh, 2008; Purves et al., 2009; Robertson et al., 2006; Topolovec-Vranic et al., 2010).

**Outcome Measures Used.**

A variety of valid and reliable instruments were employed in the different studies to measure depressive symptoms (Table 1). They closely align with the symptom content outlined in the DSM-IV (APA, 1994) and/or the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10) (World Health Organisation [WHO], 2007).

Three studies in the review used the Clinical Outcomes in Routine Evaluation – Outcome Measure (Evans et al., 2000). It comprises items on symptoms of depression and anxiety, items on functioning including general functioning, social relationships and close relationships, items on trauma, on physical symptoms, and on risk assessment.

**Support Type and Communication Mode in the Studies**

Support in the studies was offered by therapists, trainee therapists, other health professionals, and non-clinical staff such as receptionists or administrators. The authors have categorised support types as either no support (NS), therapist support (TS) or administrative support (AS), see Table 1\(^2\). Studies that provided no support \((n = 12)\) were completely self-administered by the participants. Therapist-supported studies \((n =

\(^2\) Titov et al. (2010) included both TS and AS. Vernmark et al. (2010) included both TS and NS.
10) included a clinician who offered post-session feedback and support or a clinician-delivered intervention.

Administrative-supported studies \((n = 20)\) supported users of the program, but did not claim to be clinical, but rather sought to guide users, and in some cases they also provided some feedback. This category is broad and includes support delivered through synchronous and asynchronous communication, by phone and also F:F. For the most part it is clear that these studies provided support only in logistical or administrative ways and used receptionists, nurses, lay people, research coordinators, administrative staff, or technicians.

Twenty-nine \((n = 29)\) studies deployed support of some type, 11 did not include support for participants in the intervention. Two studies employed synchronous online communication in the delivery of treatment to clients (Kessler et al., 2009; Thompson et al., 2010). Asynchronous online communication was far more common in the studies \((n = 11)\) and many of these used it to offer weekly support or feedback to participants. Telephone contact with participants to direct their use of the intervention was employed by two studies (Christensen et al., 2004; Topolovec-Vranic et al., 2010). Lastly F:F communication was used in 14 studies. Two studies incorporated a mix of support types and communication modes (Titov et al., 2010; Vernmark et al., 2010).

**Outcomes, Support Types and Dropout**

The results from the collection of studies is positive, yet outcomes varied depending on the type of support provided. The analysis of within groups effect sizes and type of support excluded a number of studies \((n = 9)\) as they used only CORE-OM (Cavanagh et al., 2009; Pittaway et al., 2009), or there was insufficient data to calculate effect size (Christensen et al., 2002; Fox et al., 2004; Mitchell, 2009; Mitchell & Dunn,
The analysis included 31 studies reporting a total of 58 post-treatment and 34 follow-up within groups effects based on valid depression outcome measures. The analysis showed that in therapist-supported studies the mean post-treatment effect size was $d = 1.35$ ($n = 18$ effects) and at follow-up $d = 1.29$ ($n = 13$ effects). For administrative-supported studies the mean post-treatment effect size was $d = 0.95$ ($n = 23$ effects) and at follow-up $d = 1.20$ ($n = 10$ effects). For studies that provided no support the mean post-treatment effect was $d = 0.78$ ($n = 17$ effects), and at follow-up $d = 1.13$ ($n = 11$ effects).

The review analysed dropout from the treatment interventions in the studies that provided such data ($n = 36$). A number ($n = 4$) of studies were excluded as they did not provide the information (Clarke et al., 2009; Clarke et al., 2002; Christensen et al., 2002; Thompson et al., 2010). Overall, across 40 studies, 4153/7313 participants dropped out (57%). The data detailing dropout was compared between the different support classifications, namely, no support (NS), administrative-support (AS), and therapist-support (TS). Levels of dropout were 2911/3943 (74%) for NS, 1098/2851 for AS (38.4%), and 144/519 (28%) for TS. The odds ratios (OR) of dropping out between the different types of support comparatively was as follows:

- No support vs Administrative support: $OR = 2.45$, $z = 15.65$, $p < .001$
- No support vs Therapist support: $OR = 7.35$, $z = 19.08$, $p < .001$
- Administrative support vs Therapist support: $OR = 3.0$, $z = 10.21$, $p < .001$

Studies with NS had considerably higher levels of dropout compared to studies with AS and TS. There was little difference between AS and TS, though levels of dropout were slightly higher in AS. The presence of human support, administrative or
therapeutic, can have the impact of reducing dropout rates by up to 30-40%. In consideration of any confounding by trial type the review further analysed dropout between open trials and RCTs. The results showed that dropout was similar: In the open trials 730/1926 (37.9%) dropped out compared to 3487/5467 (63.8%) in the RCTs, producing an OR = 2.89, $z = 19.35$, $p<.001$.

**Satisfaction**

Satisfaction reports provide knowledge about how clients have experienced computer-based interventions (Proudfoot et al., 2004; Wright et al., 2005). For instance, Meyer et al. (2009) reported that 80% of users were generally satisfied with the online program (Deprexis). Similarly, 82% felt the program benefitted them, and that the program met or exceeded their expectations (78%). The majority (74%) felt the program equalled or was better than a ‘real’ therapist and 95% would recommend the program to others. No one reported any adverse affects from using the program (Meyer et al., 2009).

Learmonth and Rai (2008) reported that participants using the Beating the Blues program found it useful, relevant, and easy to use. Similarly, Cavanagh et al. (2011) reported that the majority (93%) were satisfied with the treatment they received. Perini et al. (2009), reported acceptable levels of satisfaction on behalf of participants with their experience of the Sadness Program and that it was considered helpful. Additionally, the majority (71%) reported that the quality of the communication with the therapist support as excellent or good. Whitfield et al. (2006), reported high overall satisfaction ratings from participants using the Overcoming Depression program. The majority found it useful, easy to use, preferred it over a workbook, and reported that it improved their mood.
Topolovec-Vranic et al. (2010) reported that some patients found the MoodGYM program demanding and perhaps more geared for a younger age group. Although the population may have found it more difficult giving they carried traumatic brain injury.

**Limitations**

Often it is the case that the studies were analysing data from heterogeneous samples and this limits generalization. Eligibility criteria, for instance, can often cause heterogeneity. For example, highly educated groups (Spek, Nyklicek et al., 2007), or only for those with mild to moderate depressive symptoms (Ruwaard et al., 2009), or those who were more computer literate. Such limitations are duly noted and open trials in naturalistic settings certainly complement RCTs.

Some studies included in this review had small sample sizes, consequently it is difficult to make any statement about the significance of the results beyond the sample included. The Australian studies note a particular limitation in that their sampling frame, because it was self-defined, therefore lacked clarity about the specific characteristics of the sample (Christensen et al., 2002; Christensen et al., 2006).

Another concern regards the perennial problem of missing data. Researchers were often left using ITT analysis, using, for example, Last Observation Carried Forward (LOCF) or other procedure to account for missing data, however, this may have underestimated the true extent of change for the sample. Follow-up data is often collected, analysed, and reported, but uncontrolled for. Therefore participants may have accessed other treatments during follow-up and consequently impacted the results.

Another limitation is that many studies relied on self-report data to the exclusion of an official diagnosis. It is the case that independent ratings by clinicians would
certainly strengthen the self-report and minimise any potential errors in appropriately excluding or including participants (Andersson & Cuijpers, 2009).

The issue of online data collection and whether it adversely affected the validity as compared with the traditional paper-and-pencil administrations is a potential limitation (de Graaf et al., 2009). However, research to date comparing different administrations of standard instruments have yielded similar results (Carlbring et al., 2007).

**Results from the Meta-Analysis**

Using the search terms outlined in the method section, and the established eligibility criteria, 19 RCT studies (representing 23 papers) were included into the meta-analysis (Figure 1).

**Characteristics of the Studies Included**

Although the systematic search identified 24 randomized studies (representing 28 papers) the meta-analysis included 19 of these (representing 23 studies). A number were excluded as they did not have a control group (Christensen et al., 2006; Learmonth & Sadik, 2007) or they did not report sufficiently their outcomes (Thompson et al., 2010; van Bastelaar et al., 2011), or in one case treatment included F:F alongside computer-based treatment (Wright et al., 2005). The studies (n = 19; 23 papers) included 1553 participants in active treatment interventions and 1443 in control comparisons. Select characteristics of the studies can be found in Table 1. All used valid and reliable depression screening and outcome instruments and twelve studies included participants with a formal diagnosis of depression. Community samples were represented in twelve studies, and primary and secondary care samples were represented in seven studies. Waiting list control was used in ten studies, TAU used in eight studies,
and another type of control used in one. Six of the studies included more than one computer-based intervention, or different modes of delivery against a control group.

CBT interventions were employed in seventeen studies, Problem Solving Therapy (PST) by two studies, and one employed a Structured Writing Intervention. Two studies examined a stand-alone computer delivered intervention, the remainder used the internet to deliver the intervention. A variety of support types were employed alongside communication modes.

The Cochrane’s method for assessing the risk of bias (Higgins & Green, 2009) was used and data entered and analysed by Review Manager. This showed that the randomized controlled trials included in the meta-analysis were of high quality (See Figure 2), though the risk of missing data was relatively high. Studies were conducted in the U.S., Sweden, Australia, The Netherlands, U.K., and Germany. Overall improvement in depression throughout the studies was estimated via the standardized mean difference (Cohen’s $d$), using a random effects model. Subgroups analyses were performed on select study characteristics to compare effect sizes and whether they influenced outcome.

**Improvements in Depression Compared with Control Groups: Overall Effects**

As previously stated, for studies which had more than one measure, or more than one computer-based intervention group, both sets of data were included. There was statistically significant heterogeneity for the included studies across this variable ($\chi^2 = 167.37$, $p<.001$, $I^2 = 81\%$). Across $19^3$ studies (33 post-treatment effects) and a total of $n$
= 1443 in the control groups and \( n = 1553 \) in the computer-based intervention groups, there was a pooled effect size of \( d = 0.56 (-0.71, -0.41) \) for self-reported depression post-treatment, which was statistically significant: \( Z = 7.48, p<.001 \). Across the 14\(^4\) studies (22 follow-up effects) which reported scores on these measures at follow-up compared to a control, the average effect size was \( d = 0.20 (-0.31, -0.09) \), which was statistically significant: \( Z = 3.50, p<.01 \). All results were in favour of the computer-based treatments for depression. Post-treatment effect sizes and 95% CIs of the individual contrast groups are plotted in Figure 3.

Inspection of the forest plot demonstrated wide variation in the effect sizes. The funnel plot also suggested variation and possible publication bias.

The proportion of participants in the computer-based interventions and the control conditions who achieved clinically significant improvements in levels of depression was included in an odds ratio meta-analysis. This was reported for seven studies\(^5\) and produced a pooled odds ratio of 3.68 (2.12, 6.40), which was statistically significant: \( Z = 4.61, p<.001 \). The proportion of participants who recovered from depression (reported in eight studies\(^6\)), produced a pooled odds ratio of 4.14 (2.01, 8.53) which was statistically significant: \( Z = 3.86, p<.001 \). The proportion who had recovered at follow up was only reported by one study so could not be subjected to analysis.

\(^4\) Andersson et al., 2005; Christensen et al., 2004 & Mackinnon et al., 2008; Clarke et al., 2005; Clarke et al., 2002; Clarke et al., 2009; de Graff et al., 2009, 2011; Grime, 2004; Holländare et al., 2011; Kessler et al., 2009; Meyer et al., 2009; Proudfoot et al., 2003, 2004; Spek, 2007, 2008; Vernmark et al., 2010; Warmerdam et al., 2008.

\(^5\) de Graff et al., 2009, 2011; Meyer et al., 2009; Spek, 2007, 2008; Titov et al., 2010; Van Straten et al., 2008; Vernmark et al., 2010; Warmerdam et al., 2008.

\(^6\) Clarke et al., 2002; Clarke et al., 2005; Kessler et al., 2009; Meyer et al., 2009; Perini et al., 2009; Ruwaard et al., 2009; Titov et al., 2010; Van Straten et al., 2008.
Subgroup Analysis

Subgroup analyses were performed on study characteristics to compare effect sizes and whether they influenced outcomes. There was insufficient data to examine such effects for follow-up or odds ratios, so the effects on self-report measures of depression post-treatment were examined. Table 2 displays the results of these analyses.

All subgroups still had significantly reduced self-reported depression post-treatment, but pooled effect sizes differed. Studies which used therapist support and administrative support had a similar pooled effect size ($d = 0.78$ and $d = 0.58$), but the effect size for no support was lower ($d = 0.36$). Chi-square analysis of differences between subgroups for support was not significant for no support vs administrative support, $\chi^2 = 1.19$, $p > .05$, nor for administrative support vs therapist support, $\chi^2 = 1.37$, $p > .05$, but was significant for no support vs therapist support, $\chi^2 = 7.86$, $p < .05$.

Surprisingly, the pooled effect size for studies which used less than eight sessions was considerably higher than studies which used eight or more sessions ($d = 0.75$ vs. $d = 0.29$) and this was shown to be significant, $\chi^2 = 7.48$, $p < .01$.

Pooled effect sizes were similar between studies conducted in community settings and primary or secondary care settings ($d = 0.52$ vs. $d = 0.46$), with no significant difference, $\chi^2 = 0.08$, $p > .05$. The pooled effect size reached was almost twice as large for the general clinical treatment studies compared to studies performed on specific populations ($d = 0.60$ vs. $d = 0.33$) and was significant, $\chi^2 = 5.09$, $p < .05$. Studies that provided support asynchronously yielded greater effects than did studies that provided support synchronously ($d = 0.70$ vs. $d = 0.28$), but not significantly so, $\chi^2 = 1.64$, $p > .05$. Lastly, subgroup analysis revealed that studies which used a waiting list control yielded greater effects than those which used a treatment as usual control group.
(d = 0.68 vs. d = 0.39) however, comparisons demonstrated no significant difference, \( \chi = 3.13, p > 0.05 \).

**Discussion**

The aim of the paper was to systematically review the literature on computer-based psychological treatments for depression and conduct a meta-analysis on the available RCTs. Across 40 studies (45 published papers), eighteen different interventions were identified and described. While the majority were CBT-based programs, alternative content was described for some interventions. The majority were delivered online and four delivered through standalone CD-ROM, although one of these, Beating the Blues, has in recent years been transferred online. One intervention was delivered in group format, the others individual format. A range of support types were included in the studies and their delivery was asynchronous, synchronous and also F:F. Participants were recruited from primary and secondary care and also from the community. Some studies recruited from specific populations.

Given the effect sizes reported in the review for different interventions there is little doubt as to the usefulness of support of some type. The meta-analysis revealed an overall effect size of \( d = 0.56 \). The estimate is useful, but the data showed an effect size of \( d = 0.78 \) for therapist-supported studies and \( d = 0.58 \) for administrative-supported studies. These contrast an effect size of \( d = 0.36 \) for studies that included no support. Although analysis of subgroups showed that support was only significantly different between studies with no support vs therapist support. However, while effects are superior in supported interventions, they are still present in studies of unsupported interventions. Given the worldwide growth of depression and the unmet need for
treatment, unsupported programs have the potential to increase access, at minimal cost, especially where human resources are limited.

The findings are similar to those of other recent meta-analysis regarding the differences in supported and non-supported studies (Andersson & Cuijpers, 2009; Spek, Cuijpers et al., 2007). Andersson and Cuijpers (2009) reported an overall effect size of $d = 0.41$, but when considered by support type, supported studies yielded an effect size of $d = 0.61$ compared to $d = 0.25$ for unsupported studies. The current meta-analysis extends the evidence, especially in terms of the number and variety of studies included ($n = 19$) compared to Andersson et al. (2009) ($n = 12$) and Spek, Cuijpers et al. (2007) ($n = 13$). Further, the results showed a statistically significant effect size ($d = 0.20$) at follow-up in favour of computer-based interventions compared to a control.

The meta-analysis complements what the review reported regarding the attainment of greater post-treatment and follow-up effects with supported treatments compared to no support. Open studies have confirmed this difference too (Cavanagh et al., 2011; Christensen et al., 2006; Hunt et al., 2006; Purves et al., 2009; Robertson et al., 2006). However, it is important to note the considerable difference in effect size between post-treatment and follow-up, which suggests that the benefits of computerized interventions maybe relatively short-term. The studies included varying lengths of follow-up; further research regarding the maintenance of benefits in computer-based treatments is welcome. Perhaps interventions with booster sessions may be of use to maintain improvements (Hollon et al., 2005).

The effects of support versus no support are not new (Andersson & Cuijpers, 2009; Spek, Cuijpers et al., 2007), however, the analysis showed clearly that support of some administrative type, not delivered by a mental health professional and not having the aim of being therapeutic, works equally well as therapist-supported studies. The
type and frequency of delivery of such support is broad, thus providing some information to answer Marks et al. (2007) question as to finding the optimal support type and frequency of delivery for computer-based interventions. However, it also highlights the need to explore and establish an empirical base regarding to the role of therapist factors in computer-based interventions.

In many of the open trials context dictates the type and frequency of support. Large demands on services necessitate a model of brief support, it is clear and it does what it porports to do. In other cases support was manualized in its delivery, and at times adherence measures were employed to map the adequate delivery of such support (e.g. Kessler et al., 2009). Perhaps users, when they know what to expect by way of support, can often accept it for what it is and progress. Evidence for such, for instance, comes from studies where dropout across different modes of delivering the same treatment are similar, irrespective of the type of support offered (e.g. Titov et al., 2010).

In terms of support provided in the studies other potential confounding variables are any contact at all, through snail mail, automated emails, reminder emails, phone calls, or in person interviews. Future studies would do well to make more detail available on any supports and their possible influence. Some studies, for instance, delivered support using health professionals (Ormrod, Kennedy, Scott, & Cavanagh, 2010), a health psychologist (van Bastelaar et al., 2011), or with master students in clinical psychology (van Straten et al., 2008; Warmerdam et al., 2008). While claiming the support was not clinical (van Straten et al., 2008; Warmerdam et al., 2008), one has to speculate about any uncontrolled for therapeutic benefits of having such support.

The paper included seven studies in an odds ratio analysis of clinically significant improvement at post-treatment, demonstrating a pooled odds ratio of 3.68, which was statitically significant. Similarly, a statistically significant odds ratio of 4.14
was established for an analysis of recovery post-treatment across eight studies in the meta-analysis. While definitions for clinical change and recovery were different across the studies, the results suggest that as well as reductions in self-reported symptoms, computer-based interventions can also produce clinically significant improvements and recovery in depression. This gives further support to the efficacy of these interventions.

Success in treatment can be understood as adherence to treatment, completing a sufficient dose of treatment, and producing successful outcomes. Dropout from treatment is a continued cause of concern, especially with interventions that offer no support (Eysenbach, 2005). Despite an overall attrition rate of 57% across the forty studies included in the review, a compelling picture is built as to the efficacy and effectiveness of computer-based treatments for depression. The current review confirms a high dropout rate (74%) for unsupported treatments. Dropout is similar in therapist supported (28%) and administrative supported (38%) studies and can be considered at the lower end of dropout when compared to dropout in F:F treatments for depression, where dropout is anywhere between 30-60% (Piper et al., 1999; Reis & Brown, 1999).

The meta-analysis odds ratio of dropping out between the different categories of support types comparatively confirms the significance of support. Supported studies can have the benefit of increasing retention up to 30-40% compared to studies that offer no support. While not negating the potential for unsupported treatments, it can be concluded that support is important in computer-based treatments for depression. This supports the wisdom that a blended approach is preferable, the more successful programs usually incorporate some therapist/ human support, whether that is online, or by phone, or in person (Christensen et al., 2006). It is the case, generally, that RCTs provide more structure, information and support to participants, yet despite what one
might expect to find dropout was not different between the RCT studies compared to
the open trials.

A conservative approach was adopted to calculate dropout in the current review,
recording dropout over time that was based on completers. This however does not
provide a completely accurate reflection of the success of any intervention. It ignores
the substantial proportion of participants who receive less (and often much less) than the
entire dose and still demonstrate significant improvements (Mitchell & Dunn, 2007;
Warmerdam et al., 2008). Warmerdam et al. (2008) highlighted that many participants
showed rapid improvement within the first five weeks of treatment. Similarly, Meyer et
al. (2009) observed how participants showed lasting effects even after receiving only a
small number of sessions.

Dropout from computer-based psychological treatments for depression is
something to be investigated further. Including a follow-up questionnaire for dropout
pre-treatment and during treatment asking about the reasons may yield significant
information. Some studies have collected such data (Andersson et al., 2005; Proudfoot
et al., 2003), suggesting difficulties using the computer, negative features of the
program, perceived as too demanding, and poor clinical progress, or other extraneous
reasons independent of the intervention were cited. Warmerdam et al. (2008) reported
on reasons for dropout that included receiving alternative treatment, feeling better, lack
of time, and problems understanding the computer program.

Both van Straten et al. (2008) and Warmerdam et al. (2008) have highlighted the
potential for shorter treatment interventions. The meta-analysis results supports the
effectiveness of treatments that were less than 8-sessions, the pooled effect size for
studies that had less than eight sessions was considerably higher than studies with eight
sessions. However, it is important to note that these studies and interventions may have
differed on other unmeasured key variables such as the type and content of the interventions and how the interventions were deployed: it is not certain that the differences in effect size are due to the number of sessions alone. The results highlight the potential for future research.

The meta-analysis demonstrated no significant differences between the pooled effect sizes of studies conducted in the community or in primary and secondary settings. Underscoring the potential for computerized interventions to be used in a wide variety of settings, with different client groups, and symptom severity.

It is only recently that research has attempted to use computer-based interventions for treating depression in specific population groups. One early study by Spek, Nyklicek et al. (2007, 2008) investigated the efficacy of an online intervention for treating subthreshold depression in over 50’s. The subgroup analysis demonstrated a post-treatment effect size of $d = 0.34$ for studies with specific populations which contrasts a pooled effect size of $d = 0.60$ for all other RCT studies and comparisons showed the difference to be significant. The results support the overall effectiveness of computer-based interventions for depression, however the potential for specific populations, while encouraging, is unclear at present and future research is needed.

The delivery of support using different modes of computer mediated communication (CMC) potentially influences outcome (Barak et al., 2008). Asynchronous CMC may be superior to synchronous CMC; perhaps because of the benefits associated with asynchronous communication such as disinhibition and more time to reflect and compose ones responses (Suler, 2004). Although caution is advised as the subgroups comparison showed that any differences were not significant. Also the number of studies included in the synchronous category was small ($n = 2$) and the differences between the communication types employed (synchronous chat vs phone
contact) alongside other unmeasured key variables, such as those mentioned in relation
to different treatment lengths above, cannot be overlooked; there is potential for future
research.

The use of a waiting list control group showed some potential for better
outcomes compared to TAU control group, however any differences were not
significant.

The meta-analysis has a number of limitations. Overall there was considerable
heterogeneity across the studies, and thus the results should be interpreted with
cautions. In addition, as previously mentioned, some of sub-analyses had only a few
studies included. It is also unclear to what extent the studies differ on other variables.
For example, supported studies may have had different intervention components than
those without support. Thus it is not clear that any differences between these studies
occurred solely on the basis of support levels.

RCT studies are largely heterogeneous regarding samples and treatments. It is
therefore important to be tenative about the extent to which the results can generalize to
all those with depression. Also research in naturalistic settings does not require nor seek
to achieve the same levels of eligibility and exclusion as do many RCTs.

The interventions themselves may be problematic, perhaps there is a lack of
functionality, multimedia, interactivity, that might engage any user and support
adherence. Proudfoot et al. (2005) reported negative features of the program as a cause
of dropout. Meyer et al. (2009) noted that with their program it would be interesting to
investigate what added components might enhance the program and increase
engagement and adherence.

Conclusion
The review and meta-analysis support the efficacy and effectiveness of computer-based psychological treatments for depression, in community, primary, and secondary care, and with diverse populations. As well as reductions in self-reported symptoms, computer-based interventions can also produce clinically significant improvements and recovery in depression. Supported interventions yield better outcomes, along with greater retention. Further research is needed, in particular to investigate the influence of therapist factors in supported treatments, the reasons for dropout, the maintenance of gains post-treatment, the potential for shorter treatments, and treatments with diverse population groups.
References


Table 1

Studies included in the review and meta-analysis

<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Sample</th>
<th>Design</th>
<th>Intervention</th>
<th>Support</th>
<th>Measures</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Andersson et al. (2005)</td>
<td>Adults, met criteria for MDD + score 15-30 MADRS -S</td>
<td>117 community sample</td>
<td>RCT: CCBT + DB, n = 57 DB only, n = 60</td>
<td>5 Modules of CBT - ID netCBT</td>
<td>TS by email - feedback after each module</td>
<td>BDI MADRS</td>
<td>Sweden</td>
</tr>
<tr>
<td>Cavanagh et al. (2011)</td>
<td>Adults referred to CCBT service</td>
<td>295 primary care sample</td>
<td>Open Trial</td>
<td>8 Modules CBT – ID BTB</td>
<td></td>
<td>PHQ-9</td>
<td>U.K.</td>
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<tr>
<td>Christensen et al. (2002)</td>
<td>Adults who completed at least 1 instance of GDS</td>
<td>1574 community sample</td>
<td>Open Trial</td>
<td>5 Modules of CBT - ID MoodGYM</td>
<td></td>
<td>GDS</td>
<td>Australia</td>
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<tr>
<td>*Christensen et al. (2004) &amp; MacKinnon et al. (2008)</td>
<td>Adults, self-reported depression on K-10 &gt;22</td>
<td>525 community sample</td>
<td>RCT: BluePages, n = 166 CCBT, n = 182 Control, n = 178</td>
<td>5 Modules of CBT - ID MoodGYM</td>
<td>AS - Weekly phone call to direct use of website by lay interviewers</td>
<td>CES-D</td>
<td>Australia</td>
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<tr>
<td>Study Source</td>
<td>Participant Characteristics</td>
<td>Sample Size</td>
<td>Study Design</td>
<td>Intervention Details</td>
<td>Comparator</td>
<td>Effect Size Measures</td>
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<tr>
<td>Christensen et al. (2006)</td>
<td>Adults, self-reported elevated scores on GDS</td>
<td>2231 community sample</td>
<td>RCT: Participants randomized to six versions of CCBT</td>
<td>CBT - ID MoodGYM</td>
<td>NS</td>
<td>GDS Australia</td>
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<tr>
<td>*Clarke et al. (2002)</td>
<td>Adults depressed + non depressed from primary care</td>
<td>299 primary care sample</td>
<td>RCT: CCBT, n = 144 TAU, n = 155</td>
<td>7 Modules CBT - ID ODIN</td>
<td>NS</td>
<td>CES-D U.S.</td>
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<tr>
<td>*Clarke et al. (2005)</td>
<td>Adults depressed + non depressed from primary care</td>
<td>255 primary care sample</td>
<td>RCT: CCBT+P CR, n = 75 CCBT+T EL, n = 80 TAU, n = 100</td>
<td>8 Modules CBT - ID ODIN</td>
<td>NS</td>
<td>CES-D U.S.</td>
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<tr>
<td>*Clarke et al. (2009)</td>
<td>Young Adults (18-24) depressed and non-depressed from primary care</td>
<td>160 primary care sample</td>
<td>RCT: CCBT+P CR, n = 83 TAU, n = 77</td>
<td>4 Modules of CBT – ID ODIN</td>
<td>NS</td>
<td>PHQ-9 U.S.</td>
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<tr>
<td>*de Graff et al. (2009) &amp; de Graff et al. (2011)</td>
<td>Adults, BDI ≥16 + CIDI-auto to confirm diagnosis</td>
<td>303 community sample</td>
<td>RCT: CCBT, n = 100 CCBT+TAU, n = 100 TAU, n = 103</td>
<td>8 Modules CBT - ID Colour Your Life</td>
<td>NS</td>
<td>BDI Netherlands</td>
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<tr>
<td>Fox et al. (2004)</td>
<td>Adults referred by GP</td>
<td>56 primary care sample</td>
<td>Open Trial</td>
<td>8 Modules CBT - SA BTB</td>
<td>NS</td>
<td>BDI U.K.</td>
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<tr>
<td>*Grime</td>
<td>Adults</td>
<td>48 work</td>
<td>RCT:</td>
<td>8 Modules AS - clinical helper F:F, clinical and technical issues</td>
<td>NS</td>
<td>HADS U.K.</td>
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<td>Study</td>
<td>Sample Description</td>
<td>Randomization</td>
<td>Treatment</td>
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<tr>
<td>Hunt et al. (2006)</td>
<td>Adults referred by GP, 164 from primary care sample</td>
<td>Open Trial</td>
<td>8 Modules CBT - SA BTB</td>
<td>AS - assistant psychologist F:F, 5 mins per session</td>
<td>U.K.</td>
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<tr>
<td>Holländar et al. (2011)</td>
<td>Adults, partial remitted depression, 84 community sample</td>
<td>RCT: CCBT, n = 42</td>
<td>10 weeks CBT + Therapist email</td>
<td>TS - weekly email from a personal therapist</td>
<td>Sweden</td>
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<tr>
<td>Kraaij et al. (2010)</td>
<td>Adults with HIV, depressive symptoms, 73 sample from patient organization</td>
<td>RCT: CBS, N=24 SWI, N=25 WL, N=24</td>
<td>2 Hours weekly over 4 weeks</td>
<td>NS</td>
<td>Netherlands</td>
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<td>Study</td>
<td>Target Population</td>
<td>Sample Size</td>
<td>Intervention Description</td>
<td>Comparator</td>
<td>Outcomes</td>
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<tr>
<td>Learmont et al. (2008)</td>
<td>Adults referred to CBT therapist and assessment made, including likely to benefit from cCBT</td>
<td>555</td>
<td>Open Trial</td>
<td>AS - F:F adminstrator on hand, not clinical</td>
<td>BDI U.K.</td>
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<tr>
<td>Learmont and Rai et al. (2008)</td>
<td>Adults referred to CBT therapist and assessment made, including likely to benefit from cCBT</td>
<td>104</td>
<td>Open Trial</td>
<td>AS - F:F adminstrator on hand, not clinical</td>
<td>BDI U.K.</td>
<td></td>
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</tr>
<tr>
<td>*Meyer et al. (2009)</td>
<td>Adults, included participants who completed at least 50% of BDI</td>
<td>396</td>
<td>RCT: CCBT+T AU, n = 320 TAU, n = 76</td>
<td>NS</td>
<td>BDI German y</td>
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<tr>
<td>Ormrod et al. (2010)</td>
<td>Adult referred to mental health care service</td>
<td>23</td>
<td>Open Trial</td>
<td>AS - F:F commtunity psych nurse or occupational therapist monitored sheets at end of sessions</td>
<td>BDI U.K.</td>
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<tr>
<td>Study</td>
<td>Participants</td>
<td>Sample Size</td>
<td>Intervention Details</td>
<td>Outcomes</td>
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<td>Perini et al. (2008)</td>
<td>Adults, PHQ-9 score 5-23, + met criteria for MDD, assessed by MINI</td>
<td>13 community sample</td>
<td>Open Trial</td>
<td>6 Modules CBT + DB-ID Sadness Program</td>
<td>TS - Therapist email after each completed lesson</td>
<td>PHQ-9 Australia DASS a</td>
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<tr>
<td>Perini et al. (2009)</td>
<td>Adults, PHQ-9 score 5-23, + met criteria for MDD, assessed by MINI</td>
<td>45 community sample</td>
<td>RCT: CCBT, n = 29 WL, n = 19</td>
<td>6 Modules CBT + DB-ID Sadness Program</td>
<td>TS - Therapist email feedback after each completed lesson</td>
<td>BDI Australia PHQ-9 a</td>
<td></td>
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<tr>
<td>Pittaway et al. (2009)</td>
<td>Adults referred from GP + CORE-OM (exclude don on risk items)</td>
<td>50 secondar y care sample</td>
<td>Open Trial</td>
<td>8 Modules CBT – ID BTB</td>
<td>AS - F:F Research coordinator, not clinical</td>
<td>CORE-OM U.K.</td>
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<tr>
<td>Purves et al. (2009)</td>
<td>Adults referred by GP or secondary care profession al</td>
<td>100 primary/secondar y care sample</td>
<td>Open Trial</td>
<td>30 episodes of CBT – SA BluesBego ne</td>
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<tr>
<td>Robertso n et al. (2006)</td>
<td>Adults referred from public and private clinics</td>
<td>104</td>
<td>Open Trial</td>
<td>12 Modules CBT Recovery Road</td>
<td>TS DSS Australia</td>
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<td>Sample Size</td>
<td>Feedback</td>
<td>Comparator</td>
<td>Conditions</td>
<td>Intervention</td>
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<td>301 sample</td>
<td>after each session</td>
<td>RCT: CCBT, n = 102, GCBT, n = 99</td>
<td>WL, n = 100</td>
<td>8 Modules CBT - ID Colour your Life</td>
<td>Netherlands</td>
<td></td>
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<tr>
<td>53 sample from hospital-based epilepsy clinic</td>
<td></td>
<td>RCT: Internet intervention, n = 12 Phone intervention, n = 13</td>
<td>WL, n = 27</td>
<td>8 Modules CBT - ID, delivered in groups</td>
<td>U.S.</td>
<td></td>
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<tr>
<td>141 sample</td>
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<td>RCT: CCBT-T, n = 47, CCBT-C, n = 49</td>
<td>WL, n = 45</td>
<td>6 Modules of CBT - ID Sadness Program</td>
<td>Australia</td>
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<td>21 outpatient sample</td>
<td></td>
<td>Open Trial</td>
<td></td>
<td>6 Modules CBT – ID MoodGY M</td>
<td>Canada</td>
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<tr>
<td>Study</td>
<td>Population Description</td>
<td>N</td>
<td>Design</td>
<td>Interventions</td>
<td>CES-D</td>
<td>Country</td>
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<tr>
<td>van Bastelaar et al. (2011)</td>
<td>Adults with diabetes, CES-D score ≥16</td>
<td>255</td>
<td>RCT: CCBT, n = 125, WL, n = 130</td>
<td>8 Modules CBT – ID, AS - Feedback email on homework from health psychologist</td>
<td></td>
<td>Netherlands</td>
<td></td>
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<tr>
<td>*van Straten et al. (2008)</td>
<td>Adults, no inclusion or exclusion used</td>
<td>213</td>
<td>RCT: PST, n = 107, WL, n = 106</td>
<td>5 Modules of PST - ID, AS – Email feedback end of each session, master level psychology students feedback on exercises, not therapeutically</td>
<td></td>
<td>Netherlands</td>
<td></td>
</tr>
<tr>
<td>*Vernmarch et al. (2010)</td>
<td>Adults, score 14-32 on MADRS-S, + F:F SCID-I-CV interview</td>
<td>88</td>
<td>RCT: Email, n = 30, Self-help, n = 29</td>
<td>7 Modules CBT - ID, TS - Individualized CBT email therapy weekly, master psychologyst students</td>
<td></td>
<td>Netherlands</td>
<td></td>
</tr>
<tr>
<td>*Warmer</td>
<td>Adults, 263</td>
<td>RCT: 8 modules</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Netherlands</td>
</tr>
<tr>
<td>Authors</td>
<td>Age</td>
<td>Recruitment Method</td>
<td>Treatment Details</td>
<td>Outcome Measures</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>------------------</td>
<td>-----</td>
<td>--------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dam et al. (2008)</td>
<td>Adults</td>
<td>Community sample</td>
<td>CCBT, n = 88, CPST, n = 88, WL, n = 87</td>
<td>Email feedback end of each session, master level psychology students, not therapeutic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whitfield et al. (2006)</td>
<td>Adults</td>
<td>Secondary care referral</td>
<td>Open Trial 20 modules, CBT-SA 6 Modules Overcoming Depression</td>
<td>AS - F:F BDI support nurse available to answer queries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wright et al. (2005)</td>
<td>Adults</td>
<td>Community sample</td>
<td>RCT: F:F CT, n = 15, CBT-ID, n = 9 CT</td>
<td>TS - 25 minutes F:F +25 min CCT HDRS U.S. BDI</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note.** RCT: Randomized controlled trial; CCBT: Computerized Cognitive Behavior Therapy; CCBT+PCR: Postcard reminders; CCBT+TEL: Telephone reminders; CCBT(PC): Physical comorbidity; GCBT: Group Cognitive Behavior Therapy; ECBT: Email Cognitive Behavior Therapy; CPST: Computerized Problem Solving Therapy; PST-ID: Internet Delivered; CT: Cognitive Therapy; CCT: Computerized Cognitive Therapy; F:F: Face to Face; DB: discussion boards; CCBT-ID: Internet Delivered; CCBT-SA: Standalone; TS: Therapist support; AS: Administrative support; NS: No support; GP: General practitioner; MDD: Major Depressive Disorder; WL: Waiting List; TAU: Treatment as Usual; MADRS-S: Montgomery-Åsberg depression rating scale- self-rated; BDI: Beck Depression Inventory; GDS: Goldberg Depression Scale; CORE-OM: Clinical Outcomes in Routine Evaluation - Outcome Measure; CES-D: Centre for Epidemiological Studies-Depression Scale; PHQ-9: Patient Health Questionnaire; SCL-90-R: Symptom Checklist-90-Revised; MDI: Major Depression Inventory; EDS: Edinburgh Depression Scale; K-10: Kessler-10; ICD-10: International Classification for Diseases-10; MINI: Mini International Neuropsychiatric Interview Version 5.0.0; SCID-I-CV: Structured Clinical Interview for DSM-IV – Axis I disorders, clinical version; CIDI-auto: Composite International Diagnostic Interview; CIS-R: Clinical Interview Schedule – Revised. *denotes RCTs included in the meta-analysis.
Table 2
Sub-group analyses on self-report measures post-treatment

<table>
<thead>
<tr>
<th>Variable</th>
<th>Studies included</th>
<th>$d$</th>
<th>95% CI</th>
<th>Z</th>
<th>Significance</th>
<th>Difference between subgroups (Chi Square)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Support Type</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Therapist Support</td>
<td>$n = 7^7$</td>
<td>0.78</td>
<td>0.92, -</td>
<td>10.79</td>
<td>p&lt;.001</td>
<td>NS vs. TS, $\chi = 7.86, p&lt;.05$</td>
</tr>
<tr>
<td>Administrative Support</td>
<td>$n = 5^8$</td>
<td>0.58</td>
<td>(-</td>
<td>0.88, -</td>
<td>3.67</td>
<td>p&lt;.001</td>
</tr>
<tr>
<td>No Support</td>
<td>$n = 9^9$</td>
<td>0.36</td>
<td>(-</td>
<td>0.61, -</td>
<td>2.72</td>
<td>p&lt;.01</td>
</tr>
<tr>
<td><strong>Number of Sessions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 8</td>
<td>$n = 9^{10}$</td>
<td>0.75</td>
<td>(-</td>
<td>1.02, -</td>
<td>5.55</td>
<td>p&lt;.001</td>
</tr>
<tr>
<td>8 or more</td>
<td>$n = 10^{11}$</td>
<td>0.39</td>
<td>(-</td>
<td>0.56, -</td>
<td>4.46</td>
<td>p&lt;.001</td>
</tr>
<tr>
<td><strong>Clinical Setting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community</td>
<td>$n = 12^{12}$</td>
<td>0.60</td>
<td>(-</td>
<td>0.76, -</td>
<td>7.32</td>
<td>p&lt;.001</td>
</tr>
<tr>
<td>Primary/Secondary Care</td>
<td>$n = 7^{13}$</td>
<td>0.46</td>
<td>(-</td>
<td>0.84, -</td>
<td>2.42</td>
<td>p&lt;.05</td>
</tr>
</tbody>
</table>

7 Andersson et al., 2005; Holländare et al., 2011; Kessler et al., 2009; Perini et al., 2009; Ruwaard et al., 2009; Titov et al., 2010; Vernmark, et al., 2010.
8 Christensen et al., 2004 & MacKinnon et al., 2008; Proudfoot et al., 2003, 2004, Titov et al., 2010; Van Straten et al., 2008; Warmerdam et al., 2008.
9 Clarke et al., 2002; Clarke et al., 2005; Clarke et al., 2009; de Graff et al., 2009, 2011; Grime, 2004; Kraaij et al., 2010; Meyer et al., 2009; Spek et al., 2007, 2008; Vernmark et al., 2010.
10 Andersson et al., 2005; Christensen et al., 2004 & MacKinnon et al., 2008; Clarke et al, 2002; Clarke et al., 2009; Kraaij et al., 2010; Perini et al., 2009; Titov et al., 2010; Van Straten et al., 2008; Vernmark et al., 2010.
11 Clarke et al., 2005; de Graaf et al., 2009, 2011; Grime, 2004; Holländare et al., 2011; Kessler et al., 2009; Meyer et al., 2009; Proudfoot et al., 2003, 2004; Ruwaard et al., 2009; Spek et al., 2007, 2008; Warmerdam et al., 2008.
12 Andersson et al., 2005; Christensen et al., 2004 & MacKinnon et al., 2008; de Graaf et al., 2009, 2011; Holländare et al., 2011; Meyer et al., 2009; Perini et al., 2009; Ruwaard et al., 2009; Spek et al., 2007, 2008; Titov et al., 2010; Van Straten et al., 2008; Vernmark et al., 2010; Warmerdam et al., 2008.
13 Clarke et al., 2002; Clarke et al., 2005; Clarke et al., 2009; Kessler et al., 2009; Proudfoot et al., 2003, 2004, Grime, 2004; Kraaij, et al., 2010.
Asynchronous

<table>
<thead>
<tr>
<th>Population</th>
<th>n</th>
<th>Effect Size</th>
<th>95% Confidence Interval</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synchronous</td>
<td>2</td>
<td>0.28</td>
<td>(-0.91, 0.35)</td>
<td>.05</td>
</tr>
<tr>
<td>Specific populations</td>
<td>3</td>
<td>0.34</td>
<td>(-, 0.54)</td>
<td>.05</td>
</tr>
<tr>
<td>General populations</td>
<td>16</td>
<td>0.60</td>
<td>(-, 0.77)</td>
<td>.05</td>
</tr>
</tbody>
</table>

Control Group

<table>
<thead>
<tr>
<th>Treatment as Usual</th>
<th>n</th>
<th>Effect Size</th>
<th>95% Confidence Interval</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asynchronous</td>
<td>8</td>
<td>0.70</td>
<td>(-0.85, -0.55)</td>
<td>.05</td>
</tr>
<tr>
<td>Synchronous</td>
<td>2</td>
<td>0.28</td>
<td>(-0.91, 0.35)</td>
<td>.05</td>
</tr>
<tr>
<td>Specific populations</td>
<td>3</td>
<td>0.34</td>
<td>(-, 0.54)</td>
<td>.05</td>
</tr>
<tr>
<td>General populations</td>
<td>16</td>
<td>0.60</td>
<td>(-, 0.77)</td>
<td>.05</td>
</tr>
</tbody>
</table>

Waiting List

<table>
<thead>
<tr>
<th>n</th>
<th>Effect Size</th>
<th>95% Confidence Interval</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asynchronous</td>
<td>8</td>
<td>0.70</td>
<td>(-0.85, -0.55)</td>
</tr>
<tr>
<td>Synchronous</td>
<td>2</td>
<td>0.28</td>
<td>(-0.91, 0.35)</td>
</tr>
<tr>
<td>Specific populations</td>
<td>3</td>
<td>0.34</td>
<td>(-, 0.54)</td>
</tr>
<tr>
<td>General populations</td>
<td>16</td>
<td>0.60</td>
<td>(-, 0.77)</td>
</tr>
</tbody>
</table>

Note. Mantel-Haenszel random effect model, 95% Confidence Interval; CI – Confidence Interval

---

14 Andresson et al., 2005; Holländare et al., 2011; Perini et al., 2009; Ruwaard et al., 2009; Vernmark et al., 2010; Titov et al., 2010; Van Straten et al., 2008; Warmerdam et al., 2008.
15 Christensen et al., 2004 & Mackinnon et al., 2008; Kessler et al., 2009.
16 Spek et al., 2007; Kraaij et al., 2010; Holländare et al., 2011. Andresson et al., 2005; Christensen et al., 2004 & MacKinnon et al., 2008; Clarke et al., 2002; Clarke et al., 2005; Clarke et al., 2009; de Graaf et al., 2009, 2011; Grime, 2004; Kessler et al., 2009; Meyer et al., 2009; Perini et al., 2009; Proudfoot et al., 2003, 2004; Ruwaard et al., 2009; Titov et al., 2010; Van Straten et al., 2008; Vernmark et al., 2010; Warmerdam et al., 2008.
17 Andresson et al., 2005; Christensen et al., 2004 & MacKinnon et al., 2008; Clarke et al., 2002; Clarke et al., 2005; Clarke et al., 2009; de Graaf et al., 2009, 2011; Grime, 2004; Kessler et al., 2009; Meyer et al., 2009; Perini et al., 2009; Proudfoot et al., 2003, 2004; Ruwaard et al., 2009; Titov et al., 2010; Van Straten et al., 2008; Vernmark et al., 2010; Warmerdam et al., 2008.
18 Clarke et al., 2002; Clarke et al., 2005; Clarke et al., 2009; de Graaf et al., 2009, 2011; Grime, 2004; Kessler et al., 2009; Meyer et al., 2009; Proudfoot et al., 2003, 2004.
19 Kraaij et al., 2010; Perini et al., 2009; Ruwaard et al., 2009; Spek et al., 2007; Titov et al., 2010; Van Straten et al., 2008; Vernmark et al., 2010; Warmerdam et al., 2008.
Figure 1 *Results from the Systematic Review search*

- **Total papers produced**
  \[ n = 2379 \]

- **Rejected at title** \( n = 2110 \)
  - Not a computer-based intervention for depression treatment

- **Abstracts screened**
  \[ n = 209 \]

- **Rejected at abstract** \( n = 156 \)
  - Duplicates \( n = 118 \)
  - Not a computer-based intervention for depression treatment \( n = 21 \)
  - Only outlined a study protocol \( n = 14 \)
  - Describes the development of web-based program \( n = 2 \)
  - Feasibility of web-based CBT \( n = 1 \)

- **Full papers screened**
  \[ n = 53 \]

- **Rejected at paper** \( n = 9 \)
  - Not a computer-based intervention for depression treatment \( n = 9 \)

- **Identified by databases**
  \[ n = 44 \]
  - Identified via hand-search
    \[ n = 1 \]

- **Total papers included in the meta-analysis**
  \[ n = 23 \]
Figure 2:

Risk of Bias Graph

<table>
<thead>
<tr>
<th>Bias Category</th>
<th>Low risk of bias</th>
<th>Unclear risk of bias</th>
<th>High risk of bias</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random sequence generation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allocation concealment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blinding of participants and personnel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blinding of outcome assessment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selective reporting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incomplete outcome data (short term)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incomplete outcome data (long term)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

0%  25%  50%  75%  100%
Figure 3:

**Forest plot of self-report measures post-treatment**

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>cCBT Mean</th>
<th>cCBT SD</th>
<th>Control Mean</th>
<th>Control SD</th>
<th>Std. Mean Difference IV, Random, 95% CI</th>
<th>Std. Mean Difference IV, Random, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andersson et al. 2005</td>
<td>12.7</td>
<td>8.3</td>
<td>18</td>
<td>7.6</td>
<td>-0.79 [-1.24, -0.34]</td>
<td>-0.79 [-1.24, -0.34]</td>
</tr>
<tr>
<td>Christianen &amp; Mackinnon 2006</td>
<td>4.2</td>
<td>0.1</td>
<td>3.9</td>
<td>0.1</td>
<td>0.03 [0.18, 0.24]</td>
<td>0.03 [0.18, 0.24]</td>
</tr>
<tr>
<td>Clarke et al. 2002</td>
<td>22.4</td>
<td>11.4</td>
<td>22.4</td>
<td>13.6</td>
<td>0.00 [0.03, 0.02]</td>
<td>0.00 [0.03, 0.02]</td>
</tr>
<tr>
<td>Clarke et al. 2005</td>
<td>21.7</td>
<td>12.4</td>
<td>22.5</td>
<td>13.1</td>
<td>-0.06 [0.06, 0.24]</td>
<td>-0.06 [0.06, 0.24]</td>
</tr>
<tr>
<td>Clarke et al. 2009</td>
<td>24.0</td>
<td>13.1</td>
<td>22.5</td>
<td>13.1</td>
<td>0.18 [0.10, 0.46]</td>
<td>0.18 [0.10, 0.46]</td>
</tr>
<tr>
<td>De Graaf et al. 2008 &amp; 2011</td>
<td>21.7</td>
<td>10.1</td>
<td>22.1</td>
<td>10.2</td>
<td>-0.04 [-0.32, 0.24]</td>
<td>-0.04 [-0.32, 0.24]</td>
</tr>
<tr>
<td>Obrist et al. 2004</td>
<td>20.0</td>
<td>10.4</td>
<td>22.1</td>
<td>10.2</td>
<td>-0.16 [-0.42, 0.14]</td>
<td>-0.16 [-0.42, 0.14]</td>
</tr>
<tr>
<td>Obrist et al. 2004</td>
<td>39.3</td>
<td>3.3</td>
<td>38</td>
<td>3.9</td>
<td>-0.34 [0.07, 0.11]</td>
<td>-0.34 [0.07, 0.11]</td>
</tr>
<tr>
<td>Hoekstra et al. 2011</td>
<td>9.3</td>
<td>1.2</td>
<td>13.4</td>
<td>11.1</td>
<td>-0.34 [-0.91, 0.23]</td>
<td>-0.34 [-0.91, 0.23]</td>
</tr>
<tr>
<td>Kessler et al. 2009</td>
<td>24.0</td>
<td>6.6</td>
<td>24</td>
<td>7.6</td>
<td>-0.84 [-1.05, -0.53]</td>
<td>-0.84 [-1.05, -0.53]</td>
</tr>
<tr>
<td>Kraaij et al. 2010</td>
<td>24.0</td>
<td>4.0</td>
<td>24.1</td>
<td>4.0</td>
<td>-0.01 [-0.38, 0.35]</td>
<td>-0.01 [-0.38, 0.35]</td>
</tr>
<tr>
<td>Meyer et al. 2009</td>
<td>19.5</td>
<td>10.5</td>
<td>20.1</td>
<td>10.1</td>
<td>-1.00 [-1.17, -0.83]</td>
<td>-1.00 [-1.17, -0.83]</td>
</tr>
<tr>
<td>Perrin et al. 2009</td>
<td>5.00</td>
<td>0.9</td>
<td>27</td>
<td>4.1</td>
<td>-0.55 [-1.47, 0.32]</td>
<td>-0.55 [-1.47, 0.32]</td>
</tr>
<tr>
<td>Probst et al. 2003 &amp; 2004</td>
<td>13.6</td>
<td>3.3</td>
<td>13.9</td>
<td>3.4</td>
<td>-0.55 [-1.83, 0.73]</td>
<td>-0.55 [-1.83, 0.73]</td>
</tr>
<tr>
<td>Ruwaard et al. 2009</td>
<td>28.7</td>
<td>8.1</td>
<td>34.4</td>
<td>10.5</td>
<td>-0.65 [-1.44, -0.26]</td>
<td>-0.65 [-1.44, -0.26]</td>
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<tr>
<td>84.0</td>
<td>9.0</td>
<td>80.0</td>
<td>7.0</td>
<td>-0.83 [-1.42, -0.24]</td>
<td>-0.83 [-1.42, -0.24]</td>
<td></td>
</tr>
<tr>
<td>Spek et al. 2007 &amp; 2008</td>
<td>11.57</td>
<td>9.06</td>
<td>102.4</td>
<td>10.42</td>
<td>-0.37 [0.05, 0.01]</td>
<td>-0.37 [0.05, 0.01]</td>
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<tr>
<td>Titov et al. 2010</td>
<td>11.5</td>
<td>9.4</td>
<td>99</td>
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<td>-0.30 [-0.58, -0.02]</td>
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<tr>
<td>Van Straten et al. 2008</td>
<td>22.0</td>
<td>8.5</td>
<td>107</td>
<td>8.8</td>
<td>-0.32 [-0.59, -0.05]</td>
<td>-0.32 [-0.59, -0.05]</td>
</tr>
<tr>
<td>Veerman et al. 2010</td>
<td>20.0</td>
<td>10.8</td>
<td>20.2</td>
<td>10.6</td>
<td>-0.50 [-0.77, -0.23]</td>
<td>-0.50 [-0.77, -0.23]</td>
</tr>
<tr>
<td>11.9</td>
<td>6.3</td>
<td>29.0</td>
<td>7.9</td>
<td>-0.80 [-1.34, -0.26]</td>
<td>-0.80 [-1.34, -0.26]</td>
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<tr>
<td>12.3</td>
<td>7.3</td>
<td>27.7</td>
<td>7.8</td>
<td>-0.70 [-1.24, -0.16]</td>
<td>-0.70 [-1.24, -0.16]</td>
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</tr>
<tr>
<td>7.6</td>
<td>7.0</td>
<td>16.6</td>
<td>7.3</td>
<td>-0.21 [-0.74, 0.31]</td>
<td>-0.21 [-0.74, 0.31]</td>
<td></td>
</tr>
<tr>
<td>10.3</td>
<td>5.2</td>
<td>29.8</td>
<td>7.5</td>
<td>-0.53 [-1.17, -0.30]</td>
<td>-0.53 [-1.17, -0.30]</td>
<td></td>
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<tr>
<td>Wannemuehle et al. 2008</td>
<td>19.4</td>
<td>11.3</td>
<td>88.0</td>
<td>0.8</td>
<td>-0.58 [-0.89, -0.28]</td>
<td>-0.58 [-0.89, -0.28]</td>
</tr>
</tbody>
</table>

Total (95% CI) -0.56 [-0.71, -0.41]

**Note:** more than one number is given for some studies, if they used more than one standardised measure or more than one cCBT condition.
Figure 4:

Funnel Plot
Highlights

Computer-based psychological interventions for depression are effective

A range of different interventions, communication types and support types exist

Improvements in depression are significant post-treatment with many recovering

Improvements are maintained at follow-up, but less pronounced

Supported interventions yield better outcomes and greater retention