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Is cognitive behavioural therapy effective in reducing suicidal ideation and behaviour when delivered face-to-face or via e-health? A systematic review and meta-analysis

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ABSTRACT

Cognitive Behavioural Therapy (CBT) is a widely used psychotherapeutic intervention for suicide prevention despite its efficacy for suicide prevention in adults remaining ambiguous. Reluctance or inability to access face-to-face help suggests that e-health delivery may be a valuable resource for suicidal people. The aim of this study was to systematically review and conduct meta-analysis on research assessing the efficacy of CBT delivered via face-to-face and e-health for suicidal ideation and behaviour. A comprehensive literature search of MEDLINE, PsycINFO, Scopus, PubMed and The Cochrane Central Register of Controlled Trials was conducted. From 764 identified articles, 26 met the inclusion criteria for investigating CBT for suicidal ideation and behaviours in adult populations. Data were extracted on study characteristics and meta-analysis was performed where possible. There was a statistically significant, small to medium effect for face-to-face delivered CBT in reducing suicidal ideation and behaviour although there was significant heterogeneity between the included studies. CBT delivered via e-health was not found to be efficacious for reducing suicidal ideation and behaviour in adults though the number of studies reviewed was small.

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Cognitive behavioural therapy (CBT); suicidal ideation; suicidal behaviour; e-health; meta-analysis

Introduction

Wenzel and Beck (2008) proposed a cognitive model of suicidal behaviour, which highlights the role of hopelessness and attentional fixation in suicide risk (with the conclusion that suicide is the only option to the current problems), alongside predisposing vulnerabilities such as psychiatric illness, and triggers such as a relationship break-up or job loss. It also considers dispositional vulnerability factors, such as impulsivity and problem-solving deficits, which are associated with activating negative core beliefs during a suicidal crisis making it difficult for the individual to identify more adaptive behaviours. When these factors combined reach a critical threshold, a suicide attempt becomes increasingly likely. The maladaptive cognitions that often lead to a suicidal crisis are: hopelessness (It will never get better), helplessness (I can't fix this), un-lovability (I'm worthless), perceived inability

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to tolerate distress (I can't stand this anymore) and perceived burdensomeness (Everyone would be better off if I were dead) (Rudd, 2004). Wenzel and Beck (2008) described cognitive therapy for suicidal patients as an

> active, targeted psychosocial intervention that aims to provide patients skills to (a) modify suicide schemas, (b) interrupt cognitive processes associated with suicidal crises, and (c) modify dispositional vulnerability factors that played a central role in the recent suicidal crisis that brought them into treatment. (p. 196)

Berk, Henriques, Warman, Brown, and Beck (2004) noted that treatment also involves increasing support networks (increased contact with friends and family, as well as professional support services).

Suicidal behaviour can be defined as a self-inflicted, potentially injurious behaviour with intent to die as a result of the behaviour, which may or may not result in death (Wenzel, Brown, & Beck, 2009). For the purposes of this review, the term suicidal ideation refers to suicide intent/planning and suicidal behaviour refers to suicide attempts. Non-suicidal self-injury is not a focus for this review as by definition this does not involve intent to die.

The need for interventions can be seen from data from the World Health Organisation (WHO) estimating that there are over 800,000 suicides a year worldwide and indicating that suicide rates have increased by 60% worldwide in the last 45 years (World Health Organisation, 2016). For every suicide, there are numerous suicide attempts (at least 20 per suicide, De Leo, Cerin, Spathonis, & Burgis, 2005).

CBT delivered via e-health

Over the last 10 years, e-health interventions have been shown to have a use in the treatment of various psychological disorders (Andersson, Carlbring, & Cuijpers, 2009; Andersson & Cuijpers, 2009; Barak, Hen, Boniel-Nissim, & Shapira, 2008; Griffiths & Christensen, 2007; Kessler et al., 2009). E-health services are arguably more accessible in comparison to face-to-face services where there are major barriers of cost, transport/distance and stigma. This may be important for people experiencing suicidal ideation as findings suggest that the majority of those people do not seek professional help (Bruffaerts et al., 2011; Michelmore & Hindley, 2012). It has been suggested that people who access online therapies have comparable outcomes to those who access services face-to-face (Andrews & Titov, 2010).

Research has shown promising results for Cognitive Behavioural Therapy (CBT) delivered via the Internet for depression and anxiety (Christensen, Griffiths, & Jorm, 2004; Griffiths, Farrer, & Christensen, 2010). Richards and Richardson (2012) conducted a review of computer-based psychological treatments for depression with the majority being CBT-based programmes. They found support for therapist contact in addition to computer-based treatment (effect size $d = 0.36$ for unsupported computer-based treatment, $d = 0.58$ for administrative-support, and $d = 0.78$ for therapist support). Positive effects were still present in the unsupported studies in comparison to controls suggesting computer-based treatments for depression without therapist support still have the potential to increase low-cost access to treatment when therapist resources are limited.

Rationale and objectives

The evidence base for the efficacy of CBT with suicidal patients is limited. Tarrier, Taylor, and Gooding (2008) conducted a systematic review with meta-analyses and found that CBT was not effective for suicidal ideation in adolescents, but was effective compared to treatment as usual (TAU) or minimal treatment for suicidal ideation in adults. They included Dialectical Behaviour Therapy (DBT) with CBT for adults (SMD = −0.775, 95% CI: −1.051 to −0.498), and then carried out a subgroup analysis on CBT alone for adults (SMD = −0.562, 95% CI: −0.82 to −0.302) and both showed a significant treatment effect. Labelle, Pouliot, and Janelle (2015) conducted a systematic review and meta-analysis of CBT for suicidal and self-harm behaviours in adolescents and found a significant treatment effect in reducing suicidal ideation and self-harm but not for suicide attempts. They included DBT studies in addition to CBT studies, but did not separate them in the meta-analysis. This somewhat limits the applicability of the findings as it cannot be concluded CBT alone was effective for reducing suicidal ideation and suicidal behaviour. The Tarrier et al. (2008) review demonstrated that CBT and DBT are more effective combined than CBT alone. DBT arguably formed out of CBT and was initially aimed at borderline personality disorder (BPD) and the self-harm and suicidal behaviours often associated with it. It differs from CBT in its focus on validating emotional pain, assisting the patient to differentiate between acceptance of pain and approval of it, and supporting the patient to move between the dialectic of acceptance and change (Marra, 2005).

The present study focuses on participants over the age of 16 years and on CBT alone rather than in combination with other therapeutic approaches, such as DBT, Acceptance and Commitment Therapy, and Mindfulness Based Cognitive Therapy since these all include additional therapeutic strategies and limit the comparability to standard CBT. The first objective of this review is to evaluate the efficacy of CBT delivered face-to-face for suicidal ideation and/or behaviours in adults. The second objective is to assess whether e-health CBT interventions are comparable to traditional face-to-face interventions in the treatment of suicidal ideation and/or behaviours (for the purpose of this study e-health refers to interventions delivered via Internet, computer and telephone).

Method

This review was conducted in line with the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement (Liberati et al., 2009; Moher, Liberati, Tetzlaff, Altman, and The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) Group, 2009).

Search method for identification of studies

A systematic database search was conducted in April 2016 to identify CBT intervention studies for suicide. The following databases were searched without date limitations: MEDLINE, PsycINFO, Scopus, PubMed and The Cochrane Central Register of Controlled Trials (CENTRAL). Keywords, phrases and medical subject headings (MeSH) terms were used to search the electronic databases for the three main concepts: suicide/suicidal ideation/suicide attempt, CBT and RCT (full search string details are available from the authors). In

addition, the reference lists of relevant studies were reviewed to identity additional potentially relevant studies.

Inclusion and exclusion criteria

Studies were included if they had a CBT treatment group (based on standard CBT as described by Beck, 1967, 2011) and a control group. Suicidal ideation or behaviour had to be included as an outcome measure. Participants had to be older than 16 and, in order to maximise methodological quality, participant allocation had to be randomised. The article needed to be available in English and published in a peer-reviewed journal and not be a thesis or conference proceeding or further analysis of data from an RCT where those data were already included in this review in another article.

Selection of studies

Articles were identified through the initial search strategy (see Figure 1). Duplicate articles were removed and the remaining articles were screened by the first author for relevance via the title and abstract. The remaining articles were screened via the full text by two raters (the first author and another registered psychologist) according to the inclusion criteria. Articles mutually agreed upon were retained. Where discrepancy occurred between the raters, the article was reviewed again in full and discussed until mutual agreement was reached.

Quality assessment

The Clinical Trial Assessment Measure (Tarrier & Wykes, 2004) attempts to determine study quality and therapy quality by combining the common risk of bias measures with an assessment of the treatment. The Clinical Trial Assessment Measure (see Table 1) consists of 15 items grouped into six areas of trial design: sample size and recruitment method; allocation to treatment; assessment of outcome; control groups; data analysis; and description of treatments and adherence/quality of treatment. The authors of the measure reported good blind inter-rater agreement of 0.96, adequate internal consistency (Cronbach's alpha 0.691) and excellent concurrent validity when assessed against three other scales (Brown, 1991; Chalmers et al., 1981; Jadad et al., 1996). The overall quality of each study was assessed using the Clinical Trial Assessment Measure. The maximum possible score was 100. The Clinical Trial Assessment Measure was used to assess variability between the studies in adherence to CBT and therapist competence, in addition to risk of bias. Poor adherence and therapy quality may impact the ability to draw specific conclusions on the role of CBT in suicide interventions. Assessment of treatment quality was determined to mean assessment of therapist competence, such as by the Cognitive Therapy Rating Scale (CTRS) or the Revised Cognitive Therapy Scale (CTS-R).

Data analysis

Studies were grouped according to intervention type (face-to-face or e-health) and by outcome scale (dichotomous or continuous). Continuous and dichotomous outcomes were extracted and analysed separately. Only the outcome measures that explicitly measured

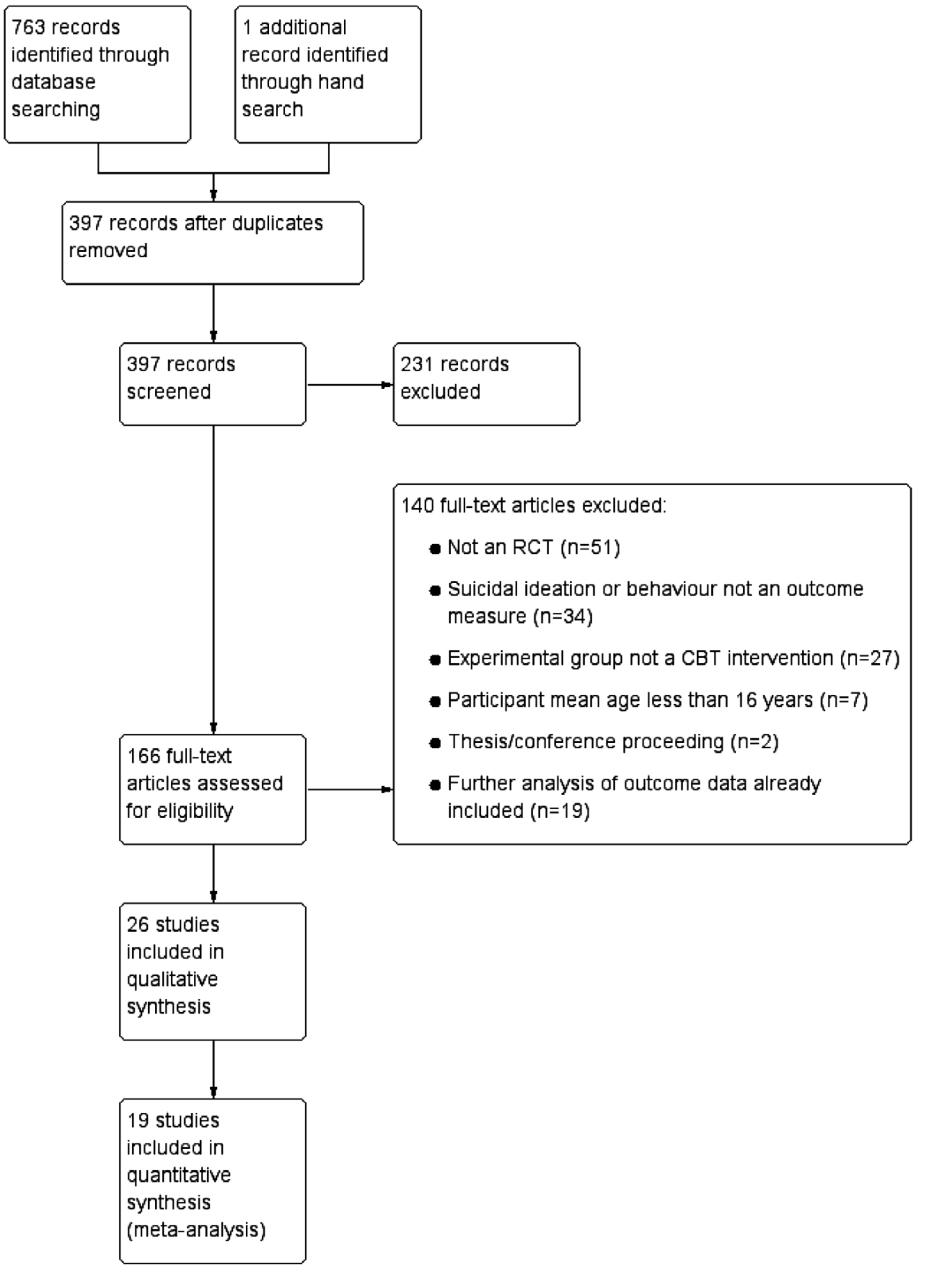

Figure 1. Flow diagram of article identification and selection.

suicidal ideation or suicidal behaviour were extracted. Where a study used more than one suicidal ideation and suicidal behaviour measure, the measure that most closely matched those used in the other included studies was used in order to reduce heterogeneity across the included studies. Where a study reported both a continuous outcome and dichotomous outcome measure both were extracted and included in the relevant meta-analysis (see more detail below). In studies where summary data were not available, study authors were

Table 1. The clinical trials assessment measure.

Clinical trials assessment measure
Sample—two questions: maximum score = 10
1. Is the sample a convenience sample, e.g. clinic attenders, referred patients (score 2) or a geographic cohort—all patients eligible in a particular area or a geographic cohort (score 5), or highly selective sample, e.g. volunteers (score 0)?
2. Is the sample size greater than 27 participants in each treatment group (score 5) or based on described and adequate power calculations (score 5)?
Allocation—three questions: maximum score = 16
3. Is there true random allocation or minimisation allocation to treatment groups (if yes score 10)?
4. Is the process of randomisation described (score 3)?
5. Is the process of randomisation carried out independently from the trial research team (score 3)?
Assessment (for the main outcome)—five questions: maximum score = 32
6. Are the assessments carried out by independent assessors and not therapists (score 10)?
7. Are standardised assessments used to measure symptoms in a standard way (score 6), or idiosyncratic assessments of symptoms (score 3)?
8. Are assessments carried out blind (masked) to treatment group allocation (score 10)?
9. Are the methods of rater blinding adequately described (score 3)?
10. Is rater blinding verified (score 3)?
Control groups—one question: maximum score = 16
11. Is TAU a control group (score 6) and/or a control group that controls for non-specific effects or other established or credible treatment (score 10)?
Analysis—two questions: maximum score = 15
12. Is the analysis is appropriate to the design and the type of outcome measure (score 5)?
13. Does the analysis include all those participants as randomised (sometimes referred to as an intention to treat analysis) (score 6) and an adequate investigation and handling of drop outs from assessment if the attrition rate exceeds 15% (score 4)?
Active treatment—three questions: maximum score = 11
14. Was the treatment adequately described (score 3) and was a treatment protocol or manual used (score 3)?
15. Was adherence to the treatment protocol or treatment quality assessed (score 5)?
Total score: maximum score = 100

Source: Adapted from Tarrier and Wykes (2004).

contacted and asked to provide the missing data. If the missing data were not obtained, the study was analysed narratively.

For continuous outcomes, mean and standard deviation post-test suicidal ideation scores were extracted for the intervention and control groups in each study. The Cochrane Collaboration RevMan version 5.3 (downloaded from http://tech.cochrane.org/revman) was used for the meta-analyses. For continuous outcome measures, RevMan calculates effect sizes using Hedges' *g* (Hedges & Olkin, 1985) which is a corrected measure of Cohen's *d* (Cohen, 1988) allowing for different sample sizes for the control and intervention groups. Effect sizes were interpreted using Cohen's guidelines (small ≤ 0.20; medium > 2.0 and ≤ 0.50; and large ≥ 0.8). Means and standard deviations were not reported in several studies so were not included in the meta-analysis.

For studies that measured suicidal behaviour as a dichotomous outcome, the total number of events was extracted for the intervention and control groups in each study. The Mantel–Haenszel (Mantel & Haenszel, 1959) method was selected in RevMan for the meta-analysis of the dichotomous outcome measures. This method was selected as it has been shown to have better statistical properties when there are few events (Higgins & Green, 2011) and takes different participant group sizes into account. A random-effects model was used with a 95% confidence interval.

Statistical heterogeneity in the meta-analyses was analysed in RevMan using the Chi^2 test and I^2 statistic (Higgins, Thompson, Deeks, & Altman, 2003). Detection of heterogeneity

has low power when a small number of studies are included so in this case $p \leq 0.10$ was used. Statistical heterogeneity was considered to be significant if I^2 was $\geq 50\%$ with a p value ≤ 0.10, and moderate if only one of the two criteria was met.

Studies that used e-health interventions were described narratively without meta-analysis due to the perceived heterogeneity and small number of studies ($n = 5$) identified for inclusion.

Results

Systematic search results

A total of 763 studies were identified by applying the search strategy to the electronic databases MEDLINE ($n = 189$), PsycINFO ($n = 117$), Scopus ($n = 217$), PubMed ($n = 152$) and CENTRAL ($n = 88$). One further study was identified by hand search. Once duplicates were removed, 397 articles were retained. Following the title and abstract screen for irrelevant articles, a further 231 were excluded. This left 166 for full text screening after which a further 140 articles were excluded. Initial discrepancy between the two raters resulted in seven articles being reviewed further and discussed until consensus was reached. Six of the articles were retained. This resulted in 26 articles being retained for inclusion in the review.

Description of studies

Tables 2 and 3 present the characteristics of the 26 included studies. Studies were categorised based on the method of intervention delivery with 22 studies investigating CBT delivered via face-to-face, and five studies investigating CBT delivered via e-health (the Handley 2013 study was included in both meta-analyses as it included both face-to-face and e-health groups in comparison to control).

The face-to-face studies had an average of 43 participants in the intervention group (range 5–104). The e-health studies had an average of 62 participants in the intervention group (range 25–116). The average age of participants in the face-to-face studies was 35 years (range 16–58) and the proportion of females ranged from 13 to 100%. The average age of participants in the e-health studies was 38 years and the proportion of females ranged from 46 to 82%.

There was heterogeneity in the diagnostic groups with studies targeting participants who have: attempted suicide or have suicidal thoughts ($n = 8$) and have comorbid substance misuse ($n = 1$); schizophrenia/psychosis ($n = 4$); depression with comorbid substance misuse problems ($n = 1$) and without ($n = 3$); self-harming behaviour ($n = 2$); bereaved by suicide ($n = 2$); epilepsy ($n = 1$); BPD ($n = 2$); psychological distress ($n = 1$), and medical interns without any symptom eligibility criteria ($n = 1$).

Intervention duration, adherence and therapist competence

Tables 4 and 5 present the adherence to protocol/manual and therapist competence data for the face-to-face and e-health studies, respectively. All 22 face-to-face studies reported the number of CBT sessions planned in the methodology (average 11.97 sessions, range 3–30); however, only 13 of the face-to-face studies reported the number of sessions actually

Table 2. Summary of face-to-face study characteristics.

Study & country	*N*	Setting and participants	Intervention & control	Quality rating (CTAM)	Outcome measure
Bateman et al. (2007) UK	90	Inpatients with schizophrenia Mean age 39 years, 41% female	CBT vs. Befriending	61	CPRS-item 7
Brown et al. (2005) USA	120	Suicide attempters presenting to emergency Mean age 35 years, 61% female	CBT vs. Enhanced TAU	58	Occurrence of suicide attempt
Davidson et al. (2006) UK	106	Patients with borderline personality disorder Mean age 32 years, 84% female	CBT vs. TAU	77	Acts of deliberate self-harm inventory
de Groot et al. (2007) Netherlands	122	Families bereaved by suicide Mean age 43 years, 33% female	CBT in family group vs. TAU	62	Suicidal ideation measured by Paykel, Myers, Lindenthal, and Tanner (1974)
Fournier et al. (2013) USA	240	Outpatients with depression Mean age 40 years, 59% female	CBT vs. Placebo	47	17 item HRSD suicide items
Gandy et al. (2014) Australia	42	People with epilepsy Mean age 40 years, 63% female	CBT vs. Wait-list	59	NDDI-E—suicide item
Handley et al. (2013) Australia	127	Outpatients with comorbid depression and substance abuse Mean age 43 years, 46% female	CBT vs. Supportive counselling (participant directed content)	59	BDI-item 9
Husain et al. (2014) Pakistan	216	Self-harm patients Mean age 23 years, 69% female	CBT vs. TAU	80	BSS
Morley et al. (2014) Australia	74	Suicidal outpatients with substance use disorders Mean age 36 years, 37% female	CBT vs. TAU	74	BSS
Patsiokas and Clum (1985) USA	10	Patients who have attempted suicide Age and gender not available	CBT vs. Non directive control	42	BSS
Peters et al. (2010) UK	74	Outpatients with psychosis Mean age 37 years, 38% female	CBT for psychosis vs. Wait-list	53	BSS—converted into dichotomous measure
Raj, Kumaraiah, and Bhide (2001) India	40	Patients who have attempted suicide 16–50 years old, 58% female	CBT vs. TAU	30	BSS
Rudd et al. (2015) USA	152	Suicidal army soldiers Mean age 27 years, 13% female	CBT vs. TAU	84	Suicide attempt BSS
Samaraweera et al. (2007) Sri Lanka	9	Suicidal individuals from randomly approached households Mean age 37 years, 60% female	CBT vs. TAU	43	BSS
Slee, Garnefski, van der Leeden, Arensman, and Spinhoven (2008) Netherlands	82	Self-harming outpatients Mean age 25 years, 94% female	CBT vs. TAU	62	Suicide cognition scale

Stewart, Quinn, Plever, and Emmerson (2009) Australia	20	Patients who have attempted suicide Aged 20–58 years, 52% female	CBT vs. TAU	30	BSS
Tarrier et al. (2006) UK	146	Inpatients with psychosis Mean age 29 years, 31% female	CBT for psychosis vs. TAU	72	Non-accidental self-injury scale of the HoNOS
Tarrier et al. (2014) UK	36	Suicidal community MH patients with psychosis Mean age 35, 37% female	Cognitive behavioural prevention of suicide in psychosis protocol (CBSPp) vs. TAU	64	BSS
Wei et al. (2013) China	159	Patients who have attempted suicide Mean age 31, 74% female	CBT vs. TAU	60	BSS
Weinberg, Gunderson, Hennen, and Cutter Jr. (2006) USA	30	BPD patients with repetitive deliberate self-harm Mean age 30 years, 100% female	Manual assisted cognitive therapy vs. TAU	38	Suicide behaviours questionnaire
Weitz et al. (2014) USA	73	Psychiatric outpatients with current major depressive episode Mean age 35 years, 70% female	Manualised CBT vs. Placebo with clinical management	74	17 item HRSD-suicide items BDI-item 9
Wittouck et al. (2014) Netherlands	83	People bereaved by suicide Mean age 49 years, 76% female	CBT vs. TAU	40	BDI-item 9

Notes: UK = United Kingdom, USA = United States of America, N = Number of participants, CBT = Cognitive behavioural therapy, TAU = Treatment as usual.
Measures: CPRS = Comprehensive psychopathological rating scale, HRSD = Hamilton rating scale for depression, NDDIE = The neurological depressive disorders inventory epilepsy, BDI = Beck depression inventory, BSS = Beck scale for suicide ideation, HoNOS = Health of the nation outcome scales, CTAM = Clinical trial assessment measure.

Table 3. Summary of e-health study characteristics.

Study & country	*N*	Setting and participants	Intervention & control	Technology used	Quality rating (CTAM)	Outcome measure
Christensen et al. (2013) Australia	116	Callers to a helpline service with moderate to high psychological distress Mean age 41 years, 82% female	1. Web-based CBT 6 sessions over 6 weeks 2. Web-based CBT as above plus weekly 10 min telephone call from a counsellor to address any issues with the use of intervention over 6 weeks TAU—free to use the helpline service as needed	Internet & telephone	67	GHQ-4 items
Guille et al. (2015) USA	199	Medical interns Mean age 25 years, 49% female	30 min weekly web-based CBT sessions over 4 weeks (MoodGYM) 1 email per week for 4 weeks with general information about depression and suicide with referral links	Email with links to website	75	PHQ-Item 9
Handley et al. (2013) Australia	126	Outpatients with comorbid depression and substance abuse problems Mean age 43 years, 46% female	9 × 1 h of CBT delivered by CD-Rom with brief check in from therapist at end 9 × 1 h sessions of CBT face-to-face	CD-ROM	59	BDI—Item 9
van Spijker et al. (2014) Netherlands	236	People with mild to moderate suicidal thoughts Mean age 41 years, 66% female	CBT unguided self-help (6 modules/approx. 30 min per day and up to 6 automated motivating emails) Access to a website providing general information on suicide and referral links	Internet & email	75	BSS
Wagner et al. (2014) Switzerland	62	People with depression Mean age 38 years, 64% female	8 CBT sessions online with therapist responding to texts and two written assignments each week with individual written feedback provided within one day 8 CBT sessions face to face	Internet and text	70	BSS

Notes: USA = United States of America, N = Number of participants, CBT = Cognitive behavioural therapy, TAU = Treatment as usual.
Measures: GHQ = General health questionnaire, PHQ = Patient health questionnaire, BDI = Beck depression inventory, BSS = Beck scale for suicide ideation, CTAM = Clinical trial assessment measure.

Table 4. Adherence to protocol and quality of CBT within the face-to-face studies.

Study	Treatment protocol or manual used	Adherence to protocol or manual assessed	Therapist competence assessed	Planned number of sessions/duration	Actual number of sessions/duration
Bateman et al. (2007)	Yes	Yes Reported session attendance data	Yes Independent assessor using CTRS (score 45.8)	Average 19 × 1 h sessions over 9 months	Average 19 sessions (range 2–33) & average total session time of 11 h 30 min
Brown et al. (2005)	Yes	Yes Reported session attendance data	No	Average 9 × 1 h sessions	8.92 sessions (range 0–24) with 50% ($n = 30$) receiving 10 or more sessions
Davidson et al. (2006)	Yes	Yes Reported session attendance data	Yes Two non-independent assessors using CTRS. Scores ranged from 37.9–67.7 across five therapists (one therapist rated below the accepted competency level)	30 × 1 h sessions over 1 year	16 sessions (range 0–35) with 51% receiving 15 or more sessions
de Groot et al. (2007)	Yes	No	No	4 × 2 h family group sessions over 3 months	Not reported
Fournier et al. (2013)	Yes	No	No	20 × 50 min sessions over 16 weeks	Not reported
Gandy et al. (2014)	Yes	Yes Checklist for therapists to complete but results not reported	No	8 sessions over 9 weeks	Not reported
Handley et al. (2013)	Yes	Yes	No	9 × 1 h sessions of CBT face-to-face	51% completion rate reported for face-to-face intervention
Husain et al. (2014)	Yes	Yes	Yes CTS-R but did not report results	6 × 50 min sessions over 3 months	50% completed all 6 sessions
Morley et al. (2014)	Yes	Yes Clinical checklist used each session	Yes 20% of sessions audiotaped and reviewed by two independent raters but results not reported	8 × 60–75 min sessions plus follow up group session	Median number of sessions was 5 (range 1–8) with 64% drop out rate but remaining 44% received at least 4 sessions
Patsiokas and Clum (1985)	Yes	Yes Adherence rated independently by listening to 10 min audiotaped segment of each session	Yes Therapist competence was rated by participants	10 × 1 h sessions conducted over 3 weeks	Not reported
Peters et al. (2010)	Yes	Yes	Yes Independent assessor using CTS-psy score 40.7 (range 21–53) out of a maximum score of 60. 77% of sessions scoring above 30	Average 16 × 1 h sessions over 6 months	Average 16 sessions (range 8–28)

(*Continued*)

Table 4. (*Continued*).

Study	Treatment protocol or manual used	Adherence to protocol or manual assessed	Therapist competence assessed	Planned number of sessions/duration	Actual number of sessions/ duration
Raj et al. (2001)	No	No	No	10 sessions over 2–3 months plus follow-up letters and 1–5 booster sessions if required	Not reported
Rudd et al. (2015)	Yes	Yes	Yes Using CTRS but score not reported. Did report overall 90% fidelity ratings	12 × 60–90 min sessions over 24 weeks	Average 11.75 sessions with 11.1% ($n = 8$) dropping out before attending any sessions
Samaraweera et al. (2007)	Yes	No	No	3–6 × 45 min sessions over 6 weeks	Not reported
Slee et al. (2008)	Yes	No	No	12 sessions over 5.5 months	Not reported
Stewart et al. (2009)	Yes	No	No	CBT manualised to occur over approx. 7 sessions	Average 8.73 sessions (range 7–10)
Tarrier et al. (2006)	Yes	Yes	Yes Two independent masked assessors using CTS-psy. Assessed as "good" with mean sub-scale score of 20.7 for specificity of CBT techniques	15–20 h within 5 weeks plus boosters	Average 16.1 sessions and average total therapy time 8.6 h
Tarrier et al. (2014)	Yes	No	No	Up to 24 sessions over 12 weeks	Not reported
Wei et al. (2013)	Yes	Yes	No	10 sessions within 3 months	Average 4.4 sessions (range 0–10) with 6.1% ($n = 5$) of participants receiving CBT. 82.9% ($n = 68$) refused to receive CBT and 11% ($n = 9$) were not contactable
Weinberg et al. (2006)	Yes	No	No	6 sessions of manual assisted cognitive therapy	6 sessions attended by all participants
Weitz et al. (2014)	Yes	Yes	Yes Assessed using collaborative Study Psychotherapy Rating Scale (Hollon et al., 1988). Sessions audiotaped and therapeutic approach reliably differentiated 95% of the time	16–20 50 min sessions over 16 weeks	Average 13 sessions, with average 16.2 sessions for completers and 6.2 sessions for early terminators
Wittouck et al. (2014)	No	No	No	4 × 2 h home visits	Not reported

Table 5. Adherence to protocol and quality of CBT within the e-health studies.

Study	Treatment protocol or manual used	Adherence to protocol or manual assessed	Therapist competence assessed	Planned number of sessions/duration	Actual number of sessions/ duration
Christensen et al. (2013)	Yes	Yes	N/A	1 Web-based CBT group—6 modules over 6 weeks	1. Average 1.5 modules completed, average 2.2 visits to website for average 7.4 min
			Therapy not provided by a therapist	2 Web-based CBT with call back—as above plus weekly 10-min telephone call from a counsellor	2. Average 2 modules completed, average 1 visit to website for average 3.8 min
Guille et al. (2015)	Yes	Yes	N/A Therapy not provided by a therapist	30 min weekly web-based CBT sessions over 4 weeks (MoodGYM)	51% completed all 4 modules
Handley et al. (2013)	Yes	Yes	N/A Therapy not provided by a therapist in the e-health intervention group	9 × 1 h of CBT delivered by CD-Rom	51% completion rate for all sessions (same as face-to-face)
van Spijker et al. (2014)	Yes	Yes	N/A Therapy not provided by a therapist	6 modules/approx. 30 min per day and up to 6 automated motivating emails	22.4% did not start intervention, 21.6% completed 1–2 modules, 56.0% completed at least 3 modules
Wagner et al. (2014)	Yes	No	No Therapist responded to texts and provided written feedback on assignments but competence was not assessed	8 CBT sessions online with therapist responding to texts and two written assignments each week with individual written feedback provided within one day	Only reported attrition rate of 22% ($n = 7$)

attended in the results (average 11.35 sessions, range 1–35—the number of sessions attended exceeded the number planned in the report by Davidson et al., 2006). Nine of the face-to-face studies assessed therapist competence (see Table 4) using a variety of methods.

Wei et al. (2013), in a study of Chinese adults who attempted suicide, reported that only 6.1% (n = 5) of participants in the CBT intervention group received CBT with a mean number of 4.4 sessions attended (range 0–10). They reported 82.9% (n = 68) of participants refused to receive CBT and a further 11% (n = 9) were not contactable. The authors suggest that mental health awareness is insufficient in China and many participants did not understand what CBT was about, furthermore, they suggested great fear of being stigmatised as having a mental disorder if they were to participate in CBT.

The five e-health studies planned an average of 6.6 sessions/modules (range 4–9) over 4–10 weeks in the methodology. The amount of time required to complete the e-health interventions ranged from the lowest requirement of 30 min per week (Guille et al., 2015) to the highest being 30 min per day (van Spijker, van Straten, & Kerkhof, 2014). One study included two written assignments alongside a module each week taking approximately 90 min (Wagner, Horn, & Maercker, 2014). (see Table 5).

Risk of bias

The average Clinical Trial Assessment Measure score for the face-to-face studies was 57.6 (range 30–84) and for the e-health studies the average was 69.2 (range 59–75). The average sample size for the face-to-face studies was 93 (range 9–240) and 148 (range 62–236) for the e-health studies. All included studies reported random allocation, although only 17 of the studies described the process of randomisation, and nine reported that the randomisation was carried out independently from the trial research team.

All studies used some form of standardised assessment to measure symptoms or number of suicidal events. Ten of the 22 face-to-face studies used independent assessors and 10 used blinding to mask treatment group allocation. Only four studies adequately described the method of rater blinding, and only three verified the rater blinding. The e-health studies all used online self-report outcome measures, which could not be blind to treatment group, resulting in the e-health studies being disadvantaged in terms of the overall Clinical Trial

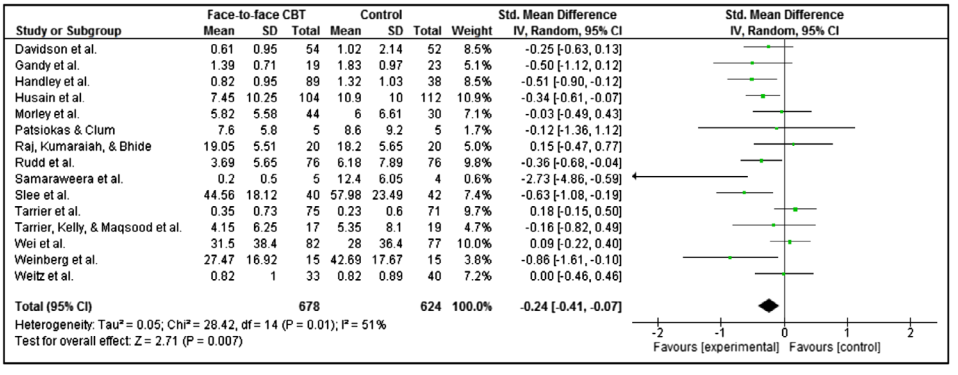

Figure 2. Forest plot of face-to-face CBT interventions for suicidal ideation and suicidal behaviour versus control (continuous outcome measures).

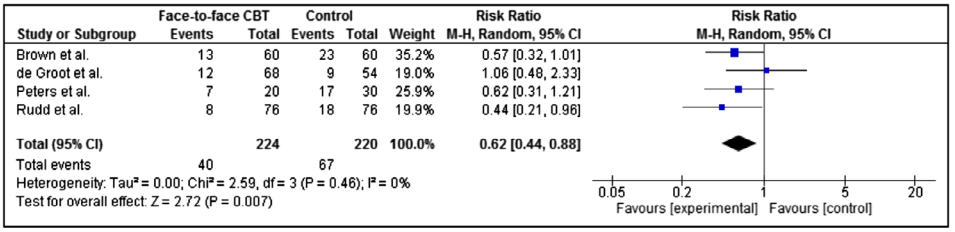

Figure 3. Forest plot of face-to-face CBT interventions for suicidal ideation and suicidal behaviour versus control (dichotomous outcome measures).

Assessment Measure score. To overcome this, all five e-health studies were given the maximum score of 10 on this Clinical Trial Assessment Measure item as to not disadvantage them in comparison to the face-to-face studies. Nine of the face-to-face studies used an intention to treat analysis, as did four of the e-health studies.

Efficacy of face-to-face interventions

The 22 face-to-face studies were assessed for inclusion in the meta-analysis and grouped by continuous or dichotomous outcome measure. There were 15 in the continuous grouping and four in the dichotomous grouping. Rudd et al. (2015) reported both continuous and dichotomous outcome measures and the relevant data-sets were included in each grouping. There was one study (Weitz, Hollon, Kerkhof, & Cuijpers, 2014) which reported two relevant continuous outcome measures (the 17 item Hamilton Rating Scale for Depression and the Beck Depression Inventory). Mean scores were calculated by combining the Hamilton Rating Scale for Depression and Beck Depression Inventory scores to generate a single intervention and control group score that could be included in the meta-analysis.

Three of the face-to-face studies (Bateman, Hansen, Turkington, & Kingdon, 2007; Fournier et al., 2013; Wittouck, Van Autreve, Portzky, & van Heeringen, 2014) did not report mean and SD data. Data requests were emailed to the authors in July 2016 but none were provided and were therefore unable to be included in the meta-analysis.

The weighted mean effect size for face-to-face CBT interventions on suicidal ideation and suicidal behaviour (continuous outcome measures) based on 15 independent samples and 1302 participants was of small size (SMD = −0.24, 95% CI: −0.41 to −0.07) and statistically significant ($z = 2.71$, $p = 0.007$). Heterogeneity was deemed to be statistically significant ($p = 0.01$, $I^2 = 51\%$). Figure 2 shows a forest plot of the effect sizes of these 15 studies.

In an attempt to reduce heterogeneity, the meta-analysis was conducted again with only the studies that had a Clinical Trial Assessment Measure score > 50; however, the heterogeneity remained statistically significant ($p = 0.04$, $I^2 = 48\%$) and there was minimal impact on the overall effect size (SMD = −0.21, 95% CI: −0.39 to −0.04). One study (Samaraweera, Sivayogan, Sumathipala, Bhugra, & Siribaddana, 2007) had a much larger effect size ($z = -2.73$) than all of the other studies. When this study was removed from the meta-analysis, the impact on the overall results was again minimal (SMD = −0.22, 95% CI: −0.38 to −0.06) and the heterogeneity remained statistically significant ($p = 0.04$, $I^2 = 44\%$). The sample size for this study was very small ($N = 9$), so the weighting in the meta-analysis was also small at 0.6%. This explains the minimal impact this study had on the overall results.

The weighted mean effect size for face-to-face CBT interventions on suicidal ideation and suicidal behaviour (dichotomous outcome measures) based on four independent samples and 444 participants was of medium size (Risk Ratio = 0.62, 95% CI 0.44 to 0.88) and statistically significant ($z = 2.72$, $p = 0.007$). The studies were regarded as homogeneous ($p = 0.46$, $I^2 = 0\%$). Figure 3 shows a forest plot of the effect sizes of these four studies.

Efficacy of e-health interventions

Due to the limited number of studies retrieved and the heterogeneity, it was not possible to conduct meta-analysis on the e-health studies. Of the five studies, one did not report means and SDs (Christensen et al., 2013) and, although a data request was sent to the authors in July 2016, data were not provided.

Two studies assessed the efficacy of CBT e-health interventions for suicidal ideation in comparison to CBT delivered face-to-face (Handley et al., 2013; Wagner et al., 2014). Handley et al. (2013) reported no significant improvement in suicidal ideation for either the face-to-face or e-health groups and no significant differences between the two groups. Wagner et al. (2014) found significant improvement in suicidal ideation pre- to post scores for the face-to-face group but not the e-health group, and the between-group difference post treatment was insignificant ($p = 0.63$, $d = 0.02$).

Two studies utilised the provision of general information with referral links delivered online as the comparison group for unguided CBT delivered online (Guille et al., 2015; van Spijker et al., 2014). Both studies reported a significant reduction in suicidal ideation in the treatment condition as compared to the control group ($p = 0.03$, $d = 1.97$; $p = 0.036$, $d = 0.28$). Interestingly, van Spijker et al. (2014) reported a significant improvement over time for both the treatment intervention group and, after the six-week waitlist period, for the control group.

One study compared CBT delivered via e-health to TAU (free to call a helpline as needed) (Christensen et al., 2013). This study included two intervention groups with differing levels of therapist contact (one with no contact and one with weekly 10-min telephone calls to address any issues using the web-based intervention). They found no significant differences between the conditions post intervention or at 6-month follow-up in comparison to TAU. Suicidal ideation significantly reduced in the Internet only condition between pre and post-intervention ($p = 0.050$) and at 6-month follow-up ($p = 0.016$), significantly reduced in the TAU condition at post-intervention ($p = 0.005$) but not at 6-month follow-up ($p = 0.053$), and did not reduce significantly for the Internet plus telephone call back condition at post-intervention ($p = 0.85$) or at 6 month follow-up ($p = 0.15$). This study had poor adherence to the protocol making it likely that there was minimal difference between the intervention and control group due to the low "dosage" of CBT in the intervention group.

Discussion

The hypothesis that CBT delivered face-to-face can reduce suicidal ideation and suicidal behaviour in adults was somewhat supported. There was a statistically significant, small to medium effect for face-to-face delivered CBT for suicidal ideation and suicidal behaviour, although there was significant heterogeneity between the included studies that used continuous outcome measures.

The hypothesis that CBT delivered via e-health is comparable in efficacy to CBT delivered via face-to-face for reducing suicidal ideation and suicidal behaviour in adults was unsupported. Three of the five e-health studies found no evidence to support e-health for suicidal ideation. Of the remaining two studies, the evidence was inconclusive with one showing a large effect in favour of e-health in comparison to a control, and the other showing a small effect in favour of e-health, but also finding that suicidal ideation significantly improved pre- to post test in the control condition. Due to the inability to conduct statistical analysis, it is hard to be conclusive, however, on the basis of these five studies, it appears that CBT delivered via e-health has not yet been shown to be effective in reducing suicidal ideation and suicidal behaviours in adults. There is not enough research to date to determine if targeted e-health interventions are effective for suicidal ideation and suicidal behaviour. It will be important for a future meta-analysis to revisit the efficacy question once the number of e-health intervention studies has grown.

Five of the included studies (Christensen et al., 2013; Morley, Sitharthan, Haber, Tucker, & Sitharthan, 2014; Patsiokas & Clum, 1985; van Spijker et al., 2014; Weitz et al., 2014) all reported a significant improvement over time in the control condition. This suggests that time alone or other non-CBT specific elements (e.g. the therapeutic alliance) may reduce symptoms.

The average number of sessions attended was 11.35 and 11.97 for the face-to-face and e-health groups, respectively. Since Beck (2011) suggested that between 9 and 18 sessions of CBT are required depending on severity of symptoms, it is possible that the overall efficacy of CBT would have been greater for both groups had participants received a larger "dosage" of CBT though the present data showed no trends linking significant results to adherence rates or treatment length. The challenges in measuring therapist competence and adherence to CBT have been discussed previously and, although the CTAM was chosen in an attempt to address this, the level of therapist expertise or the amount of CBT necessary for a therapeutic effect is still unknown. A criticism of the CTAM is that assessment of adherence to treatment protocol and assessment of treatment quality are included within the same item (Question 15) although these are quite distinct components. It is possible to adhere to a protocol but for the treatment to be of poor quality, and with CTAM the same score is allocated if a study measures one or both. A further challenge of CTAM is that interpretation guidelines are not provided for the overall CTAM score, which would be extremely useful for determining if a study is of adequate methodological quality. All of these factors combined likely gave the e-health studies an advantage in their methodological quality and resultant CTAM scores.

Regarding the e-health studies, the actual completion rates were much lower in many cases (four out of five) than described in the protocol. For example, MoodGYM reports that each module takes from 30 to 45 min to complete (although users can opt to skip sections) and the protocol for Christensen et al. (2013) planned six MoodGYM modules. The actual completion rates for Christensen et al. were much lower with 1.5 and 2.0 modules completed on average for the web-only and web with call-back conditions, respectively. The average number of visits to the website was 2.2 and 1.0, and the average length of time for each website visit was 7.4 and 3.8 min, respectively. It is not surprising that this study produced insignificant results with such low adherence rates.

Low completion rates raise the question as to whether people who are suicidal are suited to self-administered e-health treatments. Berk et al. (2004) suggest a variety of factors

that contribute to suicide attempters being difficult to engage in treatment, such as poor economic resources, chaotic lifestyles, negative beliefs about treatment, severe psychiatric symptoms and addiction issues. They advocate therapists taking a very active role in keeping the person in face-to-face therapy. Therapeutic alliance is widely regarded as a key component of treatment success (Wampold, 2015) and this could be considered a salient factor with e-health interventions usually involving less therapeutic contact. It may be that e-health interventions with minimal therapist contact are not well suited to this group. Newman, Szkodny, Llera, and Przeworski (2011) suggested that minimal-contact therapies are best suited to non-clinical level symptoms and motivated individuals, and therapist-administered treatments are better suited for those with clinical-level disorders.

A limitation of this study, and perhaps many studies investigating prevention of suicide, is the lack of clarity regarding the extent to which participants who have suicidal ideation or behaviours are comparable to suicide completers. Attempts were made to minimise clinical and methodology diversity through the inclusion and exclusion criteria, though it can be argued that clinical and methodological diversity is inevitable in meta-analysis (Higgins et al., 2003) and that heterogeneity will always exist. Suicidal ideation is a distressing condition that warrants intervention (Tarrier et al., 2014), yet while many people may think of suicide, far fewer ever attempt it, thus including suicidal ideation with suicidal behaviour in the selection of studies may have added to heterogeneity which has been noted as problematic.

Research that includes participants with higher levels of suicidal ideation and suicidal behaviours is vital to increase knowledge of effective treatments for this population. In most studies, potential participants who are assessed as having a high suicide risk are excluded (Linehan, 1997). This was the case for some of the studies included in the present meta-analysis. Exclusion is often due to ethical concerns when allocating suicidal individuals to control conditions and the risk of legal ramifications if a participant were to die by suicide during a clinical trial. The unintended consequence is an ongoing lack of evidence-based treatments for this group, and "best-practice" guidelines and protocols are published despite limited empirical supporting data. A lack of significant results in psychotherapeutic efficacy studies may be due to the low base rate of suicidal ideation and suicidal behaviour with actively suicidal participants being excluded. Linehan (1997) suggested the inclusion of participants with higher baseline suicidal ideation and suicidal behaviour scores could be achieved by developing a crisis intervention protocol to be followed when participants become acutely suicidal during RCTs.

Finally, much depends on the adequacy of the outcome measures used to assess efficacy and whether or not the depression, general health and other commonly used outcome measures are sensitive enough to changes in a person's suicidal thoughts is pertinent.

Conclusion

CBT delivered face-to-face appears promising for reducing suicidal ideation and suicidal behaviours in adults, however, it is apparent that time alone, TAU or general information may also reduce symptoms. There was insufficient evidence to demonstrate the efficacy of CBT delivered via e-health for the treatment of suicidal ideation and suicidal behaviours in adults.

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