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Effectiveness of Psychotherapy on Prevention of Suicidal Re-Attempts in Psychiatric Emergencies: A Systematic Review and Network Meta-Analysis of Randomized Controlled Trials

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Keywords
Psychotherapy · Suicide · Systematic review · Network meta-analysis · Cognitive behavioral therapy

Abstract
Introduction: Many psychological interventions aim to prevent suicide, but there is limited information regarding their comparative effectiveness. ***Objectives:*** We conducted a systematic review and network meta-analysis to evaluate the relative effects of psychological interventions for preventing suicide re-attempts in psychiatric emergencies. ***Methods:*** We searched PubMed, Embase, Cochrane, and PsycINFO from inception to December 1, 2022. Selection and data extraction were conducted independently by two reviewers based on prespecified criteria. We evaluated the efficacy of interventions, potential effect moderators, and study quality both within individual studies and across studies. Global and local inconsistencies and publication bias were explored. The primary outcome was suicide re-attempt rate. The network meta-analysis was conducted using the "netmeta" package in R. The protocol was registered with PROSPERO (CRD42021291407). ***Results:*** There were 3,155 participants from 26 randomized controlled trials included in the network meta-analysis. Cognitive behavioral therapy (CBT) was the only intervention that was more effective than a common comparator for reducing suicide re-attempts among psychological interventions in both direct and indirect comparisons (odds ratio: [95% confidence interval], 0.46 [0.25–0.85] vs. 0.47 [0.27–0.83]). CBT had the highest score (p score = 0.8727) across the various psychological interventions. Neither global nor local inconsistencies were significant. There was no clear evidence of violations of the transitivity assumption when comparing characteristics of studies across interventions. Publication bias was not suspected for the primary outcome. ***Conclusions:*** CBT may be regarded as a reasonable first-line psychological intervention to prevent re-attempts among people with previous suicide attempts. We observed a moderate quality of evidence supporting an 87% probability of CBT being the best treatment available for preventing suicide re-attempts.

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Introduction

Suicide is not only a major cause of morbidity and mortality but also a major global public health problem, with an estimated 703,000 people dying by suicide worldwide each year. More than one in every 100 deaths (1.3%) in 2019 was the result of suicide [1].

Suicide attempts are far more common than the number of deaths from suicide. According to the World Health Organization (WHO) global health reports, >20 suicide attempts are made relative to each suicide [1]. An estimated 14 million adults attempt suicide each year. Although suicidal ideation is a well-documented risk factor for suicidal behavior, the majority of those with suicidal thoughts do not go on to make a suicide plan or attempt [2]. Attempted suicide, however, is a strong risk factor for subsequent suicidal behaviors [3]. Previous studies have reported that people with prior suicide attempts had a 50- to 100-fold higher risk of subsequent suicide attempts compared to the general population [4]. Evidence regarding interventions should be identified and aimed at those who have had a prior suicide attempt to prevent re-attempted or completed suicide.

Suicide behavior disorder (SBD) was introduced in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) for further research consideration and potential future acceptance as a clinical disorder. According to the DSM-5, SBD is characterized by attempted suicide within the past 2 years, emphasizing the intention of the individual by explicitly differentiating SBD from non-suicidal self-injury (NSSI) [5]. NSSI is defined as five or more days of intentional self-injury in the past year in anticipation of physical harm but without suicidal intent. NSSI is a complex behavior and differs from typical risk-taking behavior. It is not a by-product of the action but simply an example of harm to the body [6]. NSSI is associated with various poor outcomes, such as cognitive impairment, lack of interpersonal and familial relationships, and increased rates of mood disorders among adolescents and young adults [7, 8]. According to a systematic review, the combined incidence of NSSI and suicide attempt co-occurrence was 9.6% [9]. However, there has been controversy over whether NSSI and suicide attempts should be regarded as the same or different concepts. Although suicidal behavior often occurs in the context of psychiatric conditions, this is not invariably the case [10]. A longitudinal study suggested that NSSI and suicide attempts could only be considered partially overlapping phenomena and reported that NSSI did not increase the risk of future suicide attempts [11]. Therefore, the scope of interventions to prevent suicidal re-attempts needs to be aimed at people with previous suicide attempts rather than those with suicidal intentions.

There is growing evidence that specific psychosocial interventions aimed at reducing suicidal re-attempts would be valuable clinical tools. Multiple psychological interventions are being investigated in randomized controlled trials (RCTs) to analyze their efficacy and effectiveness. Although the absolute effectiveness of individual psychosocial interventions for reducing suicidal behaviors has been analyzed using conventional pairwise meta-analytic approaches [12–16], the evidence supporting their relative effects remains inconclusive. To gain a better understanding of the relative effectiveness of psychological interventions for reducing suicide re-attempts, it is important to combine direct and indirect evidence from as many clinical trials as possible. Network meta-analyses can combine multiple comparisons in a single analysis, use both direct and indirect evidence, and make optimal use of all available evidence.

The comparative performance of psychotherapies for suicide re-attempts is unknown since few head-to-head RCTs have been conducted. A better understanding of the comparative efficacy of psychological interventions for suicide re-attempts is important for clinical practice. Therefore, we conducted a network meta-analysis to evaluate the relative treatment effects of psychological interventions for preventing suicide re-attempts.

Methods

Eligibility Criteria

The study protocol was registered in PROSPERO under the identifier CRD42021291407 (https://www.crd.york.ac.uk/prospero/) and adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses reporting guideline and its extension for network meta-analyses (http://www.prisma-statement.org/) (online suppl. File 1; for all online suppl. material, see www.karger.com/doi/10.1159/000529753). We used the population, intervention, comparator, and outcome frameworks to define the clinical question and evaluate the effectiveness of psychotherapy on the prevention of suicidal re-attempts among people with previous attempts. Participants were those who visited either the emergency department or psychiatric inpatient or outpatient department after at least one suicide attempt or were referred to a mental health center after visiting the emergency department or psychiatric hospital. Limited information was provided for patients with psychiatric comorbidities, which were not considered exclusion criteria. Age and sex were not restricted. The identified RCTs investigated psychotherapy interventions targeting people who had recently attempted suicide. To

categorize psychological interventions, we coded psychotherapies as follows: cognitive behavioral therapy (CBT), dialectical behavior therapy (DBT), acceptance and commitment therapy, skill-based treatment (SBT), family based therapy (FBT), case management (CM), individual and group supportive therapy (IGST), and no psychological intervention (none). The primary outcome was suicide re-attempt during the study period. Secondary outcomes were suicidal ideation, depressive symptoms, and hopelessness measured using clinician- or self-rated instruments.

Because of ethical considerations, adopting a no treatment condition or a condition in which standard treatments are withheld from suicidal patients was unacceptable. Since individuals who underwent CM have been designated as a control group for psychological interventions in multiple studies, we defined CM as a common comparator. We compared data using both direct comparisons of psychological interventions within RCTs and indirect comparisons across trials based on a common comparator using network meta-analysis. CM was defined as coordination of community services by a professional or team to provide mental health care customized according to the individual's social needs or health to aid them in recovery. During CM, case managers evaluate participant safety and factors related to suicide. Case managers further evaluate participant compliance with psychiatric outpatient treatment, encourage patient motivation to seek treatment, and discuss solutions to the problems faced by those with suicide attempts [17].

Search Strategy and Selection Criteria

We searched PubMed, Embase, Cochrane, and PsycINFO for articles published from inception to December 1, 2022, using search terms relevant to the combination of suicidal behaviors and psychotherapy (online suppl. File 2). We used the following selection criteria: (1) articles reporting RCTs, (2) articles in which participants committed recent suicide attempts and were provided any psychotherapy for the suicidal behaviors, and (3) studies published in English. We excluded (1) studies of NSSI to differentiate suicidal self-harm from NSSI in terms of intent to die; (2) review articles, editorials, and comments; (3) studies other than RCTs (e.g., single-arm, non-randomized trials); and (4) protocols or poster presentations.

Article selection procedures were independently conducted by a pair of authors (H.J. and H.W.Y.) with customized data extraction forms. After duplicate removal, both investigators independently screened all titles and abstracts to identify relevant studies that met the inclusion and exclusion criteria and then independently conducted full-text reviews of relevant studies. Disagreements were resolved by consensus.

Data Collection

Two investigators independently abstracted data and performed quality assessments using a spreadsheet. Extracted variables were study location, demographic characteristics, sample size at both enrollment and follow-up, psychological intervention characteristics (modality and number of sessions), and follow-up period. For dichotomous outcomes (e.g., suicide attempts), the number of events and total sample size at final follow-up were recorded for both intervention and control groups. To estimate rates of suicide attempts, we analyzed the number of subjects who completed the maximum follow-up as the denominator because the suicide attempt rate may be underestimated when the enrollment number is used as the denominator. For continuous outcomes, the means, standard deviations, and total sample sizes at enrollment were recorded for both the intervention and control groups. If studies expressed outcome data with the standard error, we changed the data from standard error values to standard deviation values [18–20]. When data were presented graphically, we extracted the numerical data using WebPlotDigitizer version 3.8 (https://automeris.io/Web-PlotDigitizer) [20, 21]. For studies that reported outcomes at more than one time point, the maximum follow-up outcome data were extracted. The effects of psychotherapy were evaluated based on differences between treatment and control groups. All data were extracted in accordance with criteria based on the Cochrane Handbook for Systematic Reviews of Interventions [22].

Risk of Bias Assessment

The risk of bias within studies was assessed using the Cochrane risk-of-bias tool, which assigns a low, high, or unclear risk of bias based on randomization, allocation concealment, blinding of participants, blinding of evaluators, incomplete outcome reporting, and selective reporting. Overall quality was divided into low risk of bias and high risk of bias. Low risk of bias in overall quality was defined when all quality assessment domains were evaluated as anything other than "high risk of bias." Quality assessments were conducted independently by a pair of authors, and disagreements were resolved by discussion.

Statistical Analysis (Data Synthesis Methods)

Network meta-analysis using a frequentist approach was implemented through the "netmeta" statistical package (version 2.5-1) in R for Windows (R Foundation for Statistical Computing, Vienna, Austria) [23]. For dichotomous data, psychotherapy intervention effects were calculated as odds ratios (ORs) with 95% confidence intervals (CIs). For continuous data, psychotherapy intervention effects were presented as weighted mean differences if outcomes were measured in the same way across trials. For outcomes measured using different methods, treatment effect data were combined using standardized mean differences. ORs <1 and negative weighted mean differences or standardized mean differences indicated that the treatment reduced the parameter of interest relative to the control condition (signifying beneficial effects in preventing suicide re-attempts, suicidal ideation, depressive symptoms, and hopelessness). We produced a network plot by integrating all randomized psychological interventions. A common estimate of heterogeneity variance was assumed for all comparisons in the network, and we assessed the presence of statistical heterogeneity using the magnitude of the heterogeneity variance parameter (τ^2) and the total I^2 statistic. An I^2 value of 0–50% was considered to indicate low heterogeneity, that of 50–75% was considered to indicate moderate heterogeneity, and that of 75–90% was considered to indicate high heterogeneity [22]. Global inconsistency was assessed considering a full design-by-treatment interaction model framework [24]. Local inconsistency was measured with a loop-specific approach to assess agreement between direct and indirect estimates for each outcome. Inconsistency between direct and indirect estimates was assessed using the "netsplit" function in the netmeta R package and measured by generalized Cochran Q statistics for multivariate meta-analysis as described by Krahn and colleagues [25]. We created league tables

Table 1. League table of the primary outcome of suicide re-attempt during follow-up

CBT	0.84 (0.31–2.32)	0.80 (0.34–1.90)	**0.47 (0.27–0.83)**	0.41 (0.09–1.77)	0.51 (0.18–1.46)	0.17 (0.03–1.13)
0.77 (0.04–14.41)	SBT	0.94 (0.28–3.52)	0.56 (0.22–1.38)	0.48 (0.08–2.77)	0.41 (0.09–1.78)	0.20 (0.03–1.40)
0.94 (0.25–3.52)		DBT	0.59 (0.26–1.37)	0.51 (0.16–1.67)	0.63 (0.19–2.10)	0.21 (0.03–1.63)
0.46 (0.25–0.85)	0.55 (0.21–1.43)	0.65 (0.24–1.77)	CM	0.86 (0.19–3.88)	0.87 (0.21–3.63)	0.36 (0.05–2.53)
		0.51 (0.15–1.78)		IGST	0.85 (0.10–7.49)	0.42 (0.04–4.75)
			0.73 (0.15–3.54)		FBT	0.33 (0.04–2.74)
0.16 (0.02–1.68)	0.21 (0.02–2.28)					None

Results from mixed and indirect comparisons are presented in the upper right triangle, and results from pairwise direct comparisons are presented in the lower left triangle. Relative treatment effects are measured by odds ratio with 95% CI. Significant results are presented in bold. CBT, cognitive behavioral therapy; DBT, dialectical behavior therapy; SBT, skill-based treatment; FBT, family based therapy; CM, case management; IGST, individual and group supportive therapy; none, no intervention.

to display the primary outcome (suicidal re-attempt) for all pairwise comparisons of studied psychotherapeutic interventions. We calculated the relative ranking of psychological interventions to reduce suicide re-attempts among the included interventions using *p* scores. The *p* scores ranged from 0 to 1, with larger values indicating better performance [26].

The number of psychological intervention sessions is an important issue both clinically and cost-effectively. Establishing an effective psychotherapy duration is not consistent across countries or policies, and it is difficult to generalize conclusions about the optimal number of psychotherapy sessions [27]. Because an adequate frequency of treatment might be a prerequisite for a favorable outcome, we conducted a sensitivity analysis after excluding studies with 1–3 sessions.

The likelihood of publication bias was tested graphically and quantitatively using comparison-adjusted funnel plots and Egger tests. Contributions of comparisons to each network estimate by the overall risk of bias were estimated using a Confidence in Network Meta-Analysis (CINeMA) approach [28].

Before running the network meta-analysis, we assessed the transitivity assumption, which implies that studies comparing different sets of psychological interventions are sufficiently similar to provide valid indirect inferences. We compared the distributions of clinical and methodological variables (e.g., treatment duration, follow-up period, and sample size) that could act as effect modifiers across treatment comparisons.

Results

Study Selection and Characteristics of Included Studies

The systematic search identified 7,373 studies. After removing duplicate articles, 5,294 records remained. We excluded 5,117 records as ineligible in the first screening based on title and abstract, leaving 177 full-text articles to be assessed for eligibility. Of those, 26 studies (online suppl. File 3) were included in the network meta-analysis after excluding others for the following reasons: 58 were not RCTs; 42 were review articles, editorials, or comments; 24 included ineligible populations; and 27 were descriptions of study protocols (online suppl. File 4).

A total of 3,155 participants across 26 RCTs were included in the network meta-analysis. The psychological interventions provided to either intervention or control group were CBT, DBT, FBT, acceptance and commitment therapy, SBT, IGST, CM, or no treatment (none). As shown in online supplementary File 5, 60% of studies were conducted in the USA. Included studies were published over a period of 23 years (1998–2021). Of the 26 included studies, 14 (54%) comprised more than three-quarter female participants, and all but one study had more than 50% female participants. Five studies (58%) were conducted with teenagers, and 11 studies (42%) were conducted with adults. For treatment setting, 4 studies (31%) recruited patients from emergency departments, 12 studies (46%) analyzed patients with psychological inpatient or outpatient treatment, and 4 studies (15%) were conducted at mental health centers. Patients recruited from the mental health center were referred from the emergency department or psychiatric clinic. In most studies, subjects were provided 2–12 sessions of face-to-face psychotherapy (86%). The mean number of follow-up months was approximately 10 per RCT.

Summary of Network Geometry

The network plot of the primary outcome of suicide re-attempt during follow-up is presented in Figure 1. The effect estimates include CM as a common comparator with CBT, DBT, FBT, SBT, IGST, and no treatment.

Risk of Bias within Studies

We used the Cochrane risk-of-bias tool to assess the quality of the included 26 studies. As shown in online supplementary File 6, 23 studies (88%) adopted a random sequence generation process using a computer random

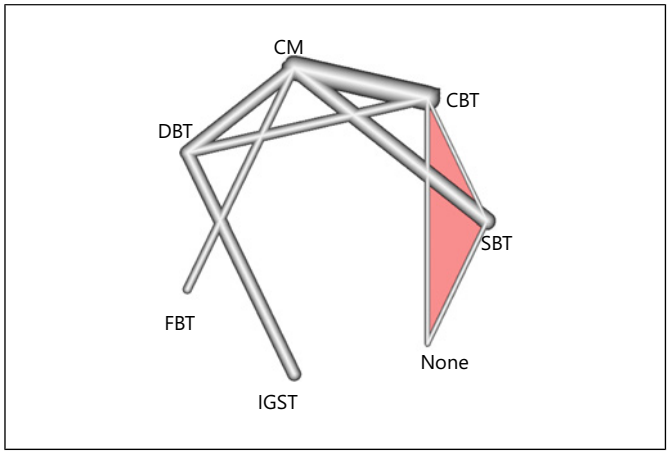


Fig. 1. Network plot of the primary outcome of suicide re-attempt during follow-up. The lines link treatments with direct comparisons in trials. The thickness of the lines corresponds to the number of trials evaluating the comparison. CBT, cognitive behavioral therapy; CM, case management; DBT, dialectical behavior therapy; FBT, family based therapy; IGST, individual and group supportive therapy; none, no intervention; SBT, skill-based treatment.

number generator or a random number table, 14 (54%) described the use of allocation or concealment methods, only 2 (8%) described blinding of either researchers or participants, and 18 (69%) described the blinding methods of the outcome assessment. In terms of incomplete outcome data, 15 (58%) performed data analysis based on the intention-to-treat principle. A total of 11 (42%) studies presented research protocols and reported preplanned outcomes (online suppl. File 6).

To assess the transitivity assumption, we compared the distributions of clinical and methodological variables (e.g., sample size, follow-up length, number of psychotherapy sessions) that could act as effect modifiers across treatment comparisons. We found no evidence of violations of the transitivity assumption when comparing characteristics of studies across psychological interventions in terms of the primary outcome (suicide re-attempt). Due to limited data or poor reporting of the possible effect modifiers in the studies, it might not be possible to detect a certain level of intransitivity using the collected data (online suppl. File 7).

Fifteen studies with seven psychological interventions (CBT, CM, DBT, FBT, IGST, SBT, and none) including 1,631 participants were included in the network meta-analysis using suicide re-attempt as the primary outcome during the study period. The OR compared with the common comparator (CM) and corresponding participants who re-attempted suicide (95% CI) with CBT was 0.49 (0.33–0.74), that with DBT was 0.56 (0.30–1.02), that with SBT was 0.58 (0.31–1.07), that with FBT was 0.86 (0.48–1.56), that with IGST was 1.09 (0.40–2.98), and that with none was 2.90 (0.52–16.16). Only CBT was associated with a lower probability of preventing suicide re-attempt among psychological interventions. The heterogeneity in estimates of the same comparison between studies was low to moderate. *p* scores were used to rank the preventive effect of suicide re-attempt. As shown in Figure 2, CBT had the highest score (*p* score = 0.8727) across the psychological interventions, showing the highest probability of effectively preventing a suicide re-attempt. Global inconsistency was not statistically significant between designs ($p = 0.9754$). We evaluated suicidal ideation, depressive symptoms, and hopelessness as secondary outcomes. The network geometries and forest plots of each outcome measure are presented in Figure 2. For secondary outcomes, the networks were thin and the power was low, indicating undetected inconsistencies. Node-splitting analysis comparing results between direct and indirect estimates suggested no significant local inconsistency for seven comparisons of primary outcomes, with *p* values ranging from 0.826 to 0.957 (online suppl. File 8).

We created a league table to display the primary outcomes for all pairwise comparisons of psychotherapies. Only CBT was more effective for preventing suicide re-attempts than the common comparator in both direct and indirect comparisons across psychological interventions (OR [95% CI: 0.46 [0.25–0.85] vs. 0.47 [0.27–0.83]) among individuals with previous suicide attempts (Table 1).

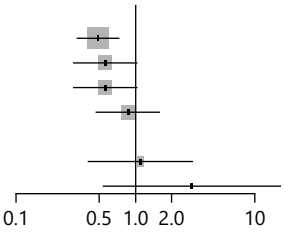
Sensitivity analysis after excluding studies with 1–3 sessions showed robustness of the main findings in treatment effects and corresponding ranking probability in reducing suicide re-attempt when comparing each psychological intervention with CM (online suppl. File 9). Based on the forest plots, no comparison-adjusted funnel plots or Egger's test excluded publication bias for the primary outcome (online suppl. File 10). We calculated the risk of bias for each comparison and constructed a matrix detailing the contributions of each direct comparison to all network estimates using CINeMA. A bar chart shows the percentage of low or moderate risk of bias for each network estimate based on the average risk of bias of the contributing studies (online suppl. File 11).

Discussion

To the best of our knowledge, this is the first network meta-analysis evaluating psychological interventions for

Suicide reattempt

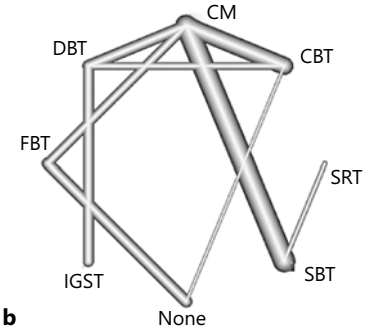
Treatment	Comparison: other vs 'CM'	OR	95% CI	P-score	
CBT		0.49	[0.33; 0.74]	CBT	0.8727
DBT		0.56	[0.30; 1.02]	DBT	0.7673
SBT		0.58	[0.31; 1.07]	SBT	0.7281
FBT		0.86	[0.48; 1.56]	FBT	0.4343
CM		1.00		IGST	0.3145
IGST		1.09	[0.40; 2.98]	CM	0.3041
None		2.90	[0.52; 16.16]	None	0.0790



Quantifying heterogeneity/inconsistency: $\tau^2 = 0.1970$; $I^2 = 37.7\%$
Tests of heterogeneity (within designs) and inconsistency (between designs):

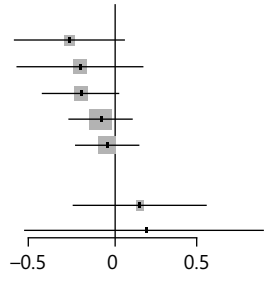
	Q	d.f.	*p* value
Total	15.39	9	0.0984
Within designs	15.34	7	0.0425
a Between designs	0.05	2	0.9754

Suicide ideation

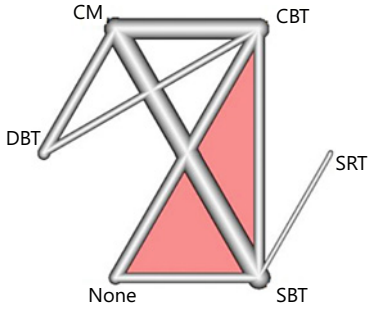


b

Treatment	Comparison: other vs 'CM'	SMD	95% CI
FBT		−0.25	[−0.57; 0.08]
IGST		−0.20	[−0.58; 0.19]
DBT		−0.20	[−0.43; 0.04]
SBT		−0.07	[−0.22; 0.07]
CBT		−0.03	[−0.19; 0.14]
CM		0.00	
None		0.16	[−0.24; 0.56]
SRT		0.21	[−0.51; 0.93]

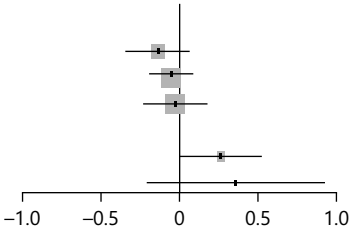


Depressive symptoms

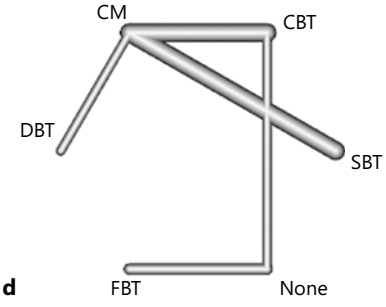


c

Treatment	Comparison: other vs 'CM'	SMD	95% CI
DBT		−0.14	[−0.37; 0.10]
SBT		−0.05	[−0.18; 0.09]
CBT		−0.02	[−0.16; 0.12]
CM		0.00	
None		0.26	[0.00; 0.51]
SRT		0.30	[−0.42; 1.03]

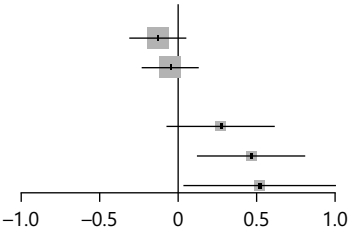


Hopelessness



d

Treatment	Comparison: other vs 'CM'	SMD	95% CI
SBT		−0.12	[−0.31; 0.06]
CBT		−0.04	[−0.23; 0.14]
CM		0.00	
DBT		0.31	[−0.07; 0.69]
None		0.51	[0.08; 0.95]
FBT		0.57	[0.04; 1.11]



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preventing suicide re-attempt. This network meta-analysis included 26 RCTs including 3,155 patients and found that CBT was the only psychological intervention with superior outcomes compared to a common comparator (CM) for preventing suicide re-attempts across psychological interventions. There was no evidence that any psychological intervention reduced suicidal ideation, depressive symptoms, or hopelessness compared to CM, perhaps reflecting several specific factors of CM relevant to suicidal patients. CM is a collaborative process that assesses, plans, implements, coordinates, and monitors patients in health care settings and is administered by mental health professionals working and trained in such settings. Psychotherapy techniques other than CBT may not have differed from CM in terms of reducing suicidal re-attempt, suicidal ideation, depression, and hopelessness given that CM also includes some psychotherapeutic elements.

We found that CBT compared to CM in patients with a previous suicide attempt halved the risk of a repeat suicide attempt among all psychological interventions. This is a very large effect; further, if the control group had received no treatment at all, the effect might have been even greater. On the basis of our findings, CM was twice as effective for preventing suicide re-attempt compared to no treatment, even though the 95% CI was not statistically significant, perhaps due to the small sample size.

CBT is based on the theory that individual perception of a situation is more closely connected to reaction than to the situation itself. Individual perceptions are often distorted and unhelpful, particularly when patients are distressed. When vulnerable patients exhibit increasing hopelessness and automatic negative thoughts, they may reach "suicide mode" [29]. In such circumstances, negative thoughts may lead individuals to believe that the only option for solving their problems is suicide. One of the techniques in CBT is an improvement of coping abilities. Active coping strategies have been substantiated to be effective in changing the maladaptive beliefs of patients with suicidal ideation. Four coping strategies – namely, problem-solving, emotional regulation, support seeking, and acceptance – were found to predict a reduction in suicidal ideation. Coping skill training in CBT holds promise as a potential intervention that can help people better manage stress and not consider suicide as a solution to life's problems [30]. In addition, both mental pain and allosteric load have been associated with a number of negative outcomes, including mental health problems and suicide. Suicide risk is much higher when the mental pain reaches intolerable intensity. Suicide can be viewed as a means of alleviating a painful internal state [31]. In the context of stress that has overrun existing biological regulatory processes and adaptive mechanisms, suicide can be viewed as an extreme manifestation of allosteric overload and escape response [32]. CBT assists people with identifying their distressing thoughts and evaluating their reality, helping them to change their distorted thinking. When they think more realistically, they feel better. Thus, CBT might serve to prevent people with previous suicide attempts from going into "suicide mode."

Apparently, CBT reduces the risk of suicide re-attempt but does not eliminate the risk. Although psychotherapy has been focused on healing people and bringing them up to their usual level of functioning, a number of patients with mood disorders have experienced residual symptoms. Enhancing psychological well-being seems more effective for minimizing residual symptoms and recurrence [33]. Fava and Guidi (2020) [34] proposed that evaluation of positive emotions and thoughts should occur within an integrative framework, looking at each of these dimensions of psychological well-being as a bipolar continuum where a balanced level is a target. Applied enhancing psychological well-being components after CBT sequentially were effective in preventing relapse in depression [35, 36]. Furthermore, the positive impact of psychotherapeutic interventions stems from their efficacy, although they are not delivered during so-called "manual-driven psychotherapy" (MDP). As a previous finding derived from a cross-sectional study, use of additional MDP was not associated with a superior treatment outcome in adult MDP patients, though favorable clinical aspects like a lower depression severity and lower odds for suicidality were observed [37].

The findings of the present systematic review and network meta-analysis are consistent with those from randomized trials comparing psychotherapies head-to-head and are generally aligned with the results of previous pairwise meta-analyses showing that psychotherapeutic

Fig. 2. Forrest plots and network plots of the primary and secondary outcomes comparing each psychotherapy with CM in reducing suicide re-attempt (**a**) with the corresponding ranking probability (*p* score) for each intervention, suicidal ideation (**b**), depressive symptoms (**c**), and hopelessness (**d**). CBT, cognitive behavioral therapy; CM, case management; DBT, dialectical behavior therapy; FBT, family based therapy; IGST, individual and group supportive therapy; none, no intervention; SBT, skill-based treatment.

interventions and specifically CBT are efficacious in reducing suicide risk [38–40]. The current network meta-analysis also included studies involving adolescents as well as adults which provide evidence that CBT is an effective intervention in reducing suicide re-attempts. Unlike adults, adolescents are more likely to make risky decisions when confronted with psychosocial problems due to their high levels of impulsivity and immature thinking at their developmental stage. CBT can be suggested as an intervention that can reduce suicide re-attempts for adolescents with a history of suicide attempts.

Compared to conventional meta-analytical approaches, network meta-analysis yields comparisons of the intervention compared to all others, using a higher degree of precision by rank probabilities, which can have important implications for treatment decisions in clinical practices. We followed the most recent methodological recommendations about evidence synthesis for evaluation of the effectiveness of psychological interventions in reducing suicide re-attempts. Network meta-analysis makes an additional assumption in order to obtain consistent results from direct and indirect estimates of relative effects, and we found no evidence of inconsistency between direct and indirect estimates. There were also no clear violations of the transitivity assumption when comparing studies with different interventions, indicating that they were sufficiently similar in characteristics.

This study has limitations that should be considered. First, methodological issues may have affected treatment estimates. For instance, it is rarely possible to blind participants to psychological interventions, which can lead to bias. However, the primary outcome of suicide re-attempt is objective. Compared to self-report symptom scale scores, suicide attempt as a variable is less sensitive to performance bias. Second, there were differences in treatment dose (i.e., the number of outpatient sessions offered to patients) across studies, although we applied stringent inclusion criteria and identified no clear transitivity problem. However, an adequate frequency of treatment might be a prerequisite for a favorable outcome. We conducted sensitivity analysis after excluding studies with 1–3 sessions, and the results confirmed the robustness of the main findings. Third, since study participants had recently attempted suicide, the possibility of pharmacological treatment combinations other than psychotherapy affecting our results cannot be excluded, and details on medications received and doses were very rarely provided. In addition to the joint effect of combination therapy, possible discontinuation from psychotropic prescriptions prior to the study enrollment to evaluate the efficacy of psychotherapeutic modalities may have exerted detrimental effects on the clinical outcomes. Various withdrawal symptoms, including depression and anxiety, have been reported due to discontinuation or reduction of psychotropic drugs [41]. Fourth, some clinical features, including psychiatric comorbidities, family history of mental illness, previous treatments, availability of further concurrent treatments such as psychopharmacotherapy, onset of the previous suicide attempt, and the number of previous suicide attempts, could affect treatment response. These clinical features might act as potential effect modifiers. However, we did not evaluate transitivity assumptions for these features because relevant data were not provided consistently in the examined papers. Fifth, the risk of bias in the included studies was classified as unclear, leading to a low to moderate degree of confidence in CINeMA estimates, introducing an unavoidable source of bias.

Conclusion

Based on the current findings, CBT is a reasonable first-line psychological intervention to prevent suicide re-attempts in people with previous suicide attempts. The present review strengthens the evidence for the efficacy of CBT, as we found a moderate quality of evidence supporting the finding that CBT has an 87% probability of being the best treatment available for people with previous suicide attempts. CBT can be recommended as a psychotherapeutic intervention for clinicians who want to implement a treatment for the purpose of reducing suicide re-attempts in patients who have previously attempted suicide. CBT in psychiatric care settings can be actively considered as part of sequential therapy in preventing relapse of symptoms.

Statement of Ethics

The Institutional Review Board (IRB) of Catholic University of Korea determined that this study could be exempted from needing ethics approval as this literature review did not involve the participation of human subjects (exemption approval No. MC22EESE0090). All authors consent to publication.

Conflict of Interest Statement

The authors declare no conflicts of interest with respect to the content of the manuscript. Dr. Potenza has consulted for and

advised Opiant Pharmaceuticals, Idorsia Pharmaceuticals, BariaTek, AXA, Game Day Data, and the Addiction Policy Forum. He has been involved in a patent application with Yale University and Novartis. He has received research support from the Mohegan Sun Casino and Connecticut Council on Problem Gambling. He has participated in surveys, mailings, and telephone consultations related to drug addiction, impulse control disorders, and other health topics and has consulted for law offices and gambling entities on issues related to impulse control and addictive disorders.

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Author Contributions

H.J. participated in the design and implementation of search strategies, eligibility screening, protocol preparation, data extraction, quality assessment, data analysis and interpretation, and writing the manuscript; H.W.Y. participated in the scientific concept, eligibility screening, data extraction, quality assessment, interpretation of data, scientific guidance, and critical review of the manuscript; S.Y.L. participated in clinical guidance, comments on protocol, and critical review of the manuscript; M.N.P. reviewed scientific content and edited the manuscript; and N.J.K. implemented search strategies and searched databases as a medical librarian. All authors have read, edited, and approved the final manuscript.

Data Availability Statement

All data generated or analyzed during this study are included in this article or the supplement. Further inquiries can be directed to the corresponding author.

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