Journal of Affective Disorders 407 (2026) 121806

Contents lists available at ScienceDirect

Journal of Affective Disorders

journal homepage: www.elsevier.com/locate/jad

Identifying (effective) elements in the psychological treatment of suicidality: A systematic review and meta-analysis

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ARTICLE INFO

Keywords:
Suicide prevention
Psychotherapy
Component analysis
Psychotherapeutic interventions
Suicidality
Meta analysis

ABSTRACT

Introduction: Various psychotherapeutic interventions have shown promise in reducing suicidality. However, it is unclear which components make interventions successful. Studying components individually rather than evaluating interventions as one (e.g. cognitive-behavioural therapy) could help us develop more effective interventions. The current study systematically recorded and evaluated individual components used in interventions aimed at reducing suicidality.

Methods: We systematically searched six databases for randomised controlled trials up to April 1, 2024. Included studies directly targeted suicidality, and reported on suicide attempts. Data extraction and assessment was conducted by two researchers. Components were extracted using a specified codebook that led to 21 possible components. This study was preregistered in OSF Registries.

Results: We included 56 studies with a total of 60 interventions. The median number of components employed was 7. The most common components were cognitive techniques (68%), crisis management and safety planning (65%) and assessment strategies (62%). We were able to test 18 out of 21 components in a series of meta-analyses, and treatments containing 11 of these components were associated with a significant reduction in suicide attempts. The largest effects were found for treatments containing interpersonal effectiveness training (RR = 0.47, $p = .016$), and emotion regulation training (RR = 0.58, $p = .003$).

Conclusions: Our findings suggest that components used in psychotherapeutic interventions for suicidality vary significantly, with many but not all elements contributing to lower suicide attempt rates. Individual elements can be used to create a modular approach to treatment, thereby optimizing results.

1. Introduction

1.1. Background

Over the years, a variety of psychotherapeutic interventions have shown promise in reducing suicidal thoughts and behaviours. Cognitive-behavioural therapy (CBT), dialectical behaviour therapy (DBT), psychodynamic therapies, and brief psychotherapeutic interventions are just a few of the approaches that have been studied (Bahji et al., 2021; Hu et al., 2024; Jeong et al., 2023; Setkowski et al., 2023). Furthermore, more interventions directly targeting suicidality have been developed, such as the Collaborative Assessment & Management of Suicidality (CAMS), and the Attempted Suicide Short Intervention Program (ASSIP) (Comtois et al., 2011; Gysin-Maillart et al., 2016). To date, much of the research focused on whether a given therapy is effective overall, with interventions being treated as single units of analysis. This makes it

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https://doi.org/10.1016/j.jad.2026.121806
Received 21 January 2026; Received in revised form 5 April 2026; Accepted 13 April 2026
Available online 16 April 2026
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difficult to pinpoint which elements are truly driving the observed outcomes. For instance, while both CBT and DBT have shown efficacy in reducing suicidality, they also share several therapeutic techniques, such as problem-solving skills and emotion regulation strategies. Secondly, within the field of CBT, specific interventions might apply different components while all being grouped within the same category. Without isolating these components, it remains unclear which elements are responsible for the therapy's success, and whether some components might be redundant or even harmful. A mixture of more and less effective components could lead to lower overall effect sizes when studying interventions as a single unit of analysis. Studying components individually could help us find larger treatment effects and develop more effective interventions.

Attempting to find elements in the psychological treatment of suicidality is not new. However, when compared to other problems targeted in the medical literature, interventions targeting suicidality are limited, with dismantling trials to study effective components being even more limited. Therefore, some researchers have taken different approaches to identify treatments that work. An evaluation of five manualised treatments for suicidal patients led to the conceptualisation of the Interventions for Suicidality Rating Scale (Weinberg et al., 2010). The twelve factors in this scale consist of both client-centred components, such as between-session self-monitoring, as well as therapist-centred components, such as self-disclosure and support for therapists. Another approach was taken by Knapp (2020), who lists specific suicide-related symptoms and potential interventions for each symptom. For example, self-hatred might be tackled using cognitive restructuring, while impulsivity could be handled by improving emotion regulation skills. In a chapter on the psychological and behavioural treatment of suicidal behaviour, the authors identified 65 effective treatment studies targeting suicidality, from which they examined similarities (Rudd and Perez-Munoz, 2021). The authors conclude in their review that what most treatments have in common is having an easily understandable theoretical framework, a focus on adherence and compliance, they target clearly identifiable skill sets, include a degree of personal responsibility for the patient, and focus on effective crisis management. Concluding, various ways of conceptualising common elements have been proposed, but there seems to be no consensus on the detail of the elements, nor have they been formally tested in trials or meta-analyses. Moreover, no studies have looked at potentially harmful or redundant effects, by including trials regardless of their efficacy.

1.2. Current study

Therapeutic components often target specific psychological processes, for example by aiming to improve coping, challenge dysfunctional thoughts, decrease perceived burdensomeness, or reduce impulsivity. Taking the integrated motivational-volitional (IMV) model of suicidal behaviour as an example, making changes to these moderators has the potential to impact entrapment, suicidal ideation, or the transition from thoughts to behaviour (O'Connor and Kirtley, 2018). Here, it is important to distinguish between reducing suicidal ideation and preventing suicide attempts. While many studies report larger effect sizes for interventions targeting suicidal thoughts, effects for suicide attempts are generally smaller. The relatively smaller effect sizes for reducing suicide attempts may indicate that current interventions are missing vital therapeutic components or that the components being used are not optimally designed to address these high-risk behaviours. Moreover, research suggests that people who attempt suicide differ on key psychological processes from those with suicidal ideation only (Souza et al., 2024). This further supports the notion that preventing suicide attempts may require components that target psychological processes in the volitional phase compared to earlier phases.

In light of this, the current study aims analyse individual components used in psychotherapeutic interventions for suicidality and examine their effect on suicide attempts. By systematically extracting and evaluating components from randomised controlled trials, we hope to determine whether specific components, as well as combinations of components, are common in interventions targeting suicidality. After that, we aim to investigate which components are associated with reduced suicide attempts. Through various statistical methods we will systematically assess which elements of an intervention contribute most significantly to reducing suicide attempts, thereby providing a clearer understanding of how to optimise treatment.

2. Methods

This systematic review and component network meta-analysis is based on studies included in the meta-analytic database on suicide prevention interventions provided by Metapsy (www.metapsy.org/suicide-prevention). This meta-analytic research domain (MARD) aims to investigate the effect of psychotherapy on suicidality. All studies investigating direct interventions for suicidality in adult populations that report on suicide attempts as an outcome were eligible for inclusion. This study was registered on OSF Registries prior to data extraction (van Eijk, 2024).

2.1. Study search and selection

The MARD contains studies derived from a systematic search of papers published up to April 1st, 2024 in PubMed, Embase, PsycINFO, Web of Science, Scopus and The Cochrane Central Register of Controlled Trials. From all studies that have been included in the MARD, we selected a subset of studies that met the following criteria: 1) the study involves adult participants, 2) the intervention is a direct psychological therapy aimed at reducing suicidality, and 3) suicide attempts are reported as an outcome. The definition for direct psychological therapy is taken from Ballegooijen and colleagues, stating that at least part of the treatment should be aimed at reducing suicidality or self-harm (Van Ballegooijen et al., 2025). For all eligible articles, authors were contacted to obtain detailed treatment manuals. If treatment manuals were not readily available, we requested supplemental materials or additional details from the authors to ensure accuracy in component extraction. If the treatment manual or additional information could not be obtained, we extracted what possible information was available from the published article and associated published protocols, trial registrations, or other (grey) literature.

2.2. Codebook

A combination of deductive and inductive coding was used. The first version of the codebook was based on a combination of the three resources that have so far provided common elements in treatments for suicidality (Weinberg et al., 2010; Knapp, 2020; Rudd and Perez-Munoz, 2021). This initial codebook was drafted by NvE, and checked before extraction by RdW and DC, two clinical researchers with decades of expertise working with suicidal patients. During extraction, we added one component (referral to further treatment) and removed another (reduce rumination) and optimised several names and definitions. After extracting all data, the codebook was finalised, and two components were merged with another, leading to a total of 21 possible components as seen in Table 1. The previous iterations of the codebook are available upon request.

2.3. Data extraction

The extraction process was led by NvE and AM. Using the codebook, each paper in the database was searched for these components. The authors extracted components independently, with conflicts being resolved through discussion. Components were scored as not present, optional, or present. Where possible, components were extracted for the control conditions, to ensure a more detailed comparison rather than

Table 1
List of components, their definitions and prevalences.

Component	Definition of component	Present	Optional	Total prevalence
Cognitive techniques	Techniques targeting maladaptive thoughts, such as cognitive restructuring, thought challenging, and addressing distortions.	39	2	68%
Crisis management and safety planning	Interventions to prepare for and manage suicidal crises, including safety planning strategies and restriction to lethal means.	36	3	65%
Assessment strategies	A detailed assessment of the suicidality is conducted as part of the intervention, focusing on suicide-related cognitions, behaviours, emotions, or triggers.	36	1	62%
Problem-solving techniques	Teaching and applying skills to address real-life problems and develop adaptive solutions.	31	2	55%
(Psycho)education	Providing knowledge about the patient's condition, treatment rationale, or strategies to help manage symptoms.	33	0	55%
Insight development	Techniques aimed at increasing the patient's understanding of their own thoughts, emotions, and behaviours.	28	1	48%
Emotion regulation training	Techniques aimed at understanding, accepting, and managing (negative) emotions effectively.	23	4	45%
Homework and self-monitoring	Assignments given to the patient for practice outside of therapy sessions, such as self-monitoring or skill application.	25	2	45%
Behavioural techniques	Interventions focused on behaviour modification, including behavioural activation, analysis, and activity scheduling.	19	3	37%
Referral to further treatment	The patient is directly referred to a (mental) health care provider or other professional resources, or is instructed to do so.	14	7	35%
Increasing social support	Practices emphasizing talking with others, getting advice, information, understanding, and comfort from others, acquiring and strengthening relationships	19	1	33%
Relapse prevention	Strategies focused on preventing future suicidal crises after the intervention has ended.	20	0	33%
Treatment motivation enhancement	Techniques focusing on improving motivation for treatment and preventing early dropout or low adherence.	19	0	32%
Interpersonal Effectiveness training	Skills training aimed at improving social skills and enhancing interpersonal relationships.	13	4	28%
Mindfulness and relaxation	Practices emphasizing relaxation, present-moment awareness, and nonjudgmental observation of thoughts and emotions.	16	1	28%
Follow-up contact	Keeping in contact with the patient after treatment has ended, such as sending cards	13	0	22%
Involving next of kin	Session(s) that involve next of kin of the patient	3	9	20%
Self-compassion training	Interventions focused on cultivating a kind and supportive attitude toward oneself, particularly during moments of distress.	8	0	13%
Exposure techniques	Techniques for avoidance reduction of triggers and negative situations	7	0	12%
Psychodynamic techniques	Techniques from psychodynamic or psychoanalytic approaches such as mentalization or free association	2	0	3%
Imagery based techniques	Interventions using mental imagery to reprocess, reframe, or rehearse emotional experiences or memories, such as rescripting, rehearsal, and EMDR.	1	0	2%

comparing interventions against the overarching control condition. A random selection of 10% of the studies was checked by a third researcher (RdW). For study outcomes, we examined suicide attempts (SA), for which we calculated the relative risk (RR) as the proportion of people who attempted suicide in the psychotherapy group divided by the proportion in the control group. When a trial had multiple treatment or control groups, all groups of interest were extracted. These types of trials were distinguished as "multiarm" trials in the dataset, so that these can be handled accordingly in the analyses (i.e., accounting for effect size dependency). Other extracted data consisted of participant characteristics (e.g. percentage of women), treatment characteristics (e.g. treatment format), and general characteristics (e.g. country of origin). Risk of bias of the included studies was assessed using the 'Risk of bias' (RoB) tool 2.0, developed by the Cochrane Collaboration. The RoB tool 2.0 assesses possible bias in randomised trials in the following domains: adequate randomisation and allocation, knowledge of the allocation among participants and those delivering the intervention, adequate handling of missing data, adequate measuring of the outcome, analysing and reporting the outcomes. All data extraction and quality assessments were conducted by two independent researchers, with agreements being solved by discussion. If necessary, a third researcher was consulted.

2.4. Data synthesis

Descriptive analyses were conducted using Jamovi (The Jamovi Project, 2023), with the main analyses being conducted using RStudio with R version 4.3.1 (R Core Team, 2023; Posit Team, 2024). We conducted several analyses to study the relationships between the components, such as hierarchical clustering using the *hclust* package. We also conducted a regression analysis to investigate the relationship between the effect size and the number of components present in an intervention. The main analyses consisted of a series of univariate meta-analyses, as well as a component network meta-analysis (CNMA), which was conducted to examine the relationship between individual components and the outcome of interest, namely, suicide attempts. The meta-analyses were conducted using the *metapsytools* and the *netmeta* package (Balduzzi et al., 2023; Harrer et al., 2022). Heterogeneity between studies was reported using I^2. The R code used to produce these results can be found in the Supplementary material.

2.5. Deviations from the protocol

The original protocol only included the CNMA as main part of the data synthesis, with no other analyses. Univariate meta-analyses were added as the main analysis. Not all exploratory analyses are reported in this manuscript, though they can be found in the code used for this study. Furthermore, the protocol states assessing publication bias. However, this was not feasible within the CNMA framework. When conducting the CNMA, we found the results to be unstable after several sensitivity analyses, and have moved the results into the supplementary materials.

3. Results

After screening a total of 15,249 abstracts (8224 after removal of duplicates), we retrieved 1194 full-text papers for consideration. After the full-text screening, a total of 56 studies met the inclusion criteria from which we extracted 60 different interventions with a total of 4627 participants in the intervention groups. The PRISMA flowchart describing the inclusion process is presented in Fig. 1. We tried to contact the authors of all included studies, and sent a follow-up after one month. For 4 studies, no contact details could be found. We received a

response from 21 authors. In total, we received treatment manuals, protocols or additional information for 15 studies. For 3 studies we were able to retrieve treatment manuals through other means. For the remaining studies, we relied on information available online or in the published paper(s).

Most studies indicates their intervention was CBT-based (N = 20) (Brown et al., 2005; Davidson et al., 2014; Evans et al., 1999; Eylem et al., 2021; Ghahramanlou-Holloway et al., 2018; Haddock et al., 2019; LaCroix et al., 2018; Lin et al., 2020; Morley et al., 2014; O'Connor et al., 2017; Patsiokas and Clum, 1985; Pratt et al., 2015; Rudd et al., 2015; Sedghy et al., 2020; Slee et al., 2008; Springer et al., 1996; Tyrer et al., 2003; Van Beek, 2013; Wei et al., 2013; Ilgen et al., 2023). Other interventions were problem-solving therapy (PST, N = 6) (Patsiokas and Clum, 1985; Hatcher et al., 2016; Hatcher et al., 2011; Hatcher et al., 2015; Morthorst et al., 2012; Salkovskis et al., 1990), DBT-based (N = 6) (Koons et al., 2001; Linehan et al., 2006; McMain et al., 2017; Verheul et al., 2003; Goodman et al., 2016; Andreasson et al., 2016), psychodynamic therapies (N = 6) (Bateman and Fonagy, 1999; Britton et al., 2020; Guthrie et al., 2001; Walker et al., 2017), CAMS (N = 4) (Comtois et al., 2011; Gutierrez et al., 2022; Jobes et al., 2017; Ryberg et al., 2019), ASSIP (N = 3) (Gysin-Maillart et al., 2016; Arvilommi et al., 2022; Conner et al., 2021), safety planning interventions (SPI, N = 2) (Bryan et al., 2017), mindfulness-based cognitive therapy (MBCT, N = 1) (Interian et al., 2021), mentalisation-based therapy (MBT, N = 1) (Bateman and Fonagy, 2009), and a family-based intervention (N = 1) (Goodman et al., 2022). Ten studies were classified as other, meaning that they did not follow a specific therapeutic movement (Wei et al., 2013; Bentley et al., 2017; Crawford et al., 2018; Hvid et al., 2011; Malakouti et al., 2022; Naidoo et al., 2014; Pfeiffer et al., 2019; Van der Sande et al., 1997; Ward-Ciesielski et al., 2017). Often, this included

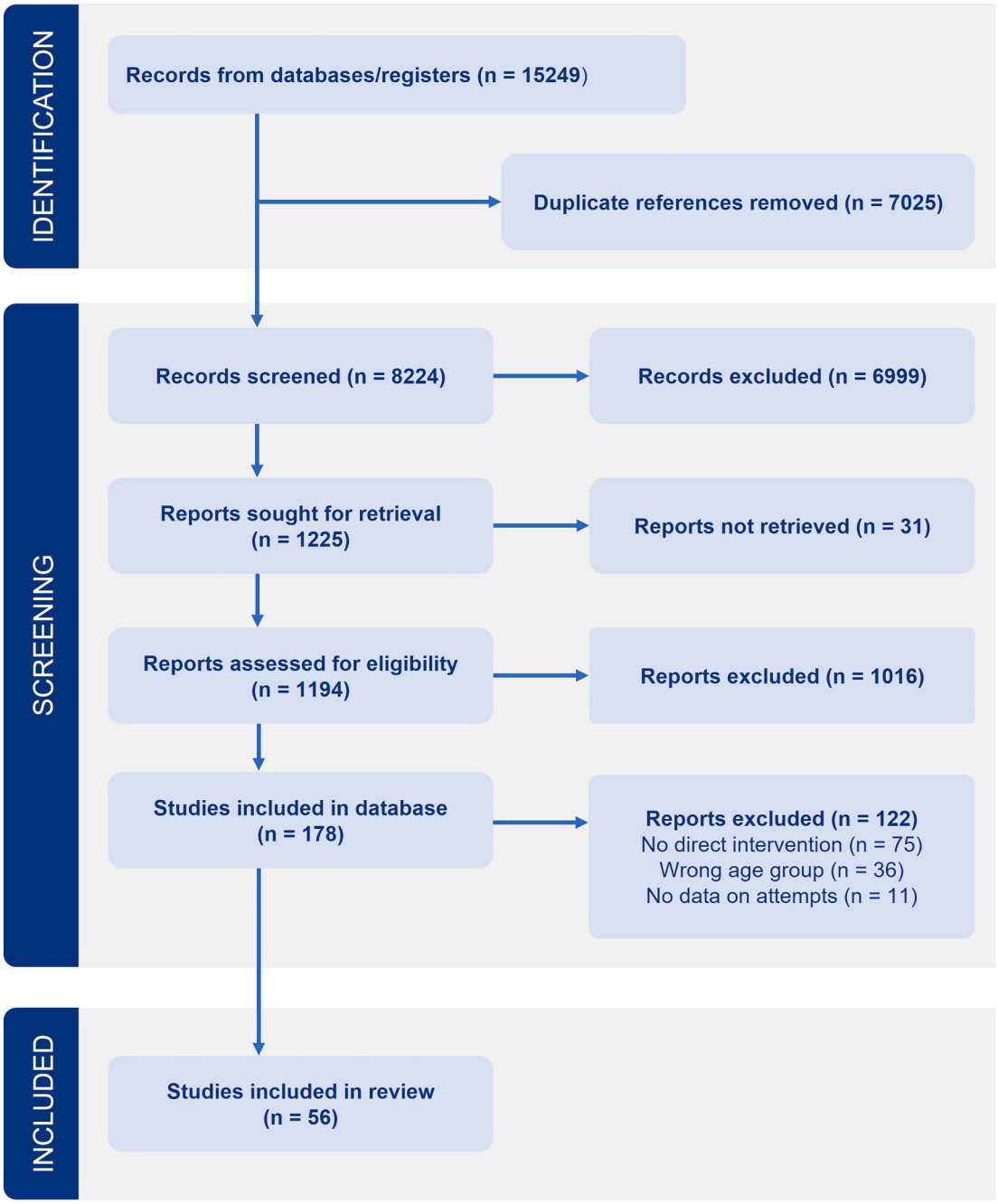

Fig. 1. PRISMA flowchart for inclusion of studies.

interventions specifically developed for the study. Most studies compared their intervention to treatment as usual (N = 42), or enhanced treatment as usual (N = 7). The remaining studies used other types of comparison groups. Some studies studied their intervention on top of treatment as usual (N = 22), whereas most studies studied the intervention only (N = 38). The majority of the studies were conducted in the United States (N = 27), followed by the United Kingdom (N = 11), and the European Union (N = 11). The remaining studies were conducted in Australia (N = 4), East Asia (N = 3), Iran (N = 2), Canada (N = 1), and South Africa (N = 1). The average percentage of women was 53.3%, ranging from 0% to 100% across studies. The mean age of participants across all studies was 35.1, with a minimum mean age of 24.7 and a maximum mean age of 52.6. 68.4% of studies were conducted in outpatient settings, 26.7% in inpatient settings, and 5% used a combination of both. The majority of interventions was delivered individually (N = 44). Ten interventions used a combination of individual and group sessions, and four only used group therapy. One intervention was family-based, and one was a combination of individual and family-based sessions. Most studies directly targeted suicidal patients regardless of other mental problems (N = 44), with borderline personality disorder patients being the second most common target group (N = 10). Other mental problems included substance use (N = 3) and post-traumatic stress disorder (N = 1). Two studies did not recruit for specific mental problems. 81.8% of studies had a high risk of bias, with only 1 study having low risk of bias. Nine studies (16.4%) were rated as some concerns. Psychotherapeutic studies often see a high risk of bias due to a lack of blinding. An overview of all characteristics for each study can be found in the supplementary materials.

3.1. Components

We coded 21 separate treatment components. On average, interventions included 6.7 components (SD = 2.53). Table 1 shows the prevalence of each component across the interventions, and a full overview of the included components in each intervention can be found in Table 2. The component most commonly included was *cognitive techniques* (N = 39). Cognitive techniques often consisted of cognitive restructuring, addressing thought distortions, or other techniques with cognitive elements such as determining reasons for living (Britton et al., 2020; Bryan et al., 2017; Goodman et al., 2022). The second most common element was *assessment strategies* (N = 36). The level of detail of this component varied widely, from in-depth exploration of the most recent suicide attempt to more generic risk assessments. *Crisis management and safety planning* (N = 36) was equally common. Some studies specifically reporting on a single session brief crisis intervention such as the safety planning intervention (SPI) (Bryan et al., 2017; Goodman et al., 2022), while many others included safety plans as part of a larger intervention. A large number of studies included crisis management as part of their treatment as usual which was offered to both groups, which often included resources for when crises arose, or assessment by a clinician (O'Connor et al., 2017; Britton et al., 2020; Ryberg et al., 2019; Bateman and Fonagy, 2009; Barnes et al., 2021). The next most commonly used component was *(psycho)education* (N = 33). (Psycho) education was common across many different therapeutic frameworks, and often involved explaining the rationale for the treatment, or general information on emotions, thoughts and behaviours. In some studies, education was offered specifically for the target group, such as information on the link between substance use and suicidality (Conner et al., 2021). After that, we see *problem-solving techniques* (N = 31). Problem-solving is generally a broad component, encompassing any problem that patients may present with. Some studies explicitly stated using problem-solving therapy (PST) as their overarching therapeutic model (Patsiokas and Clum, 1985; Hatcher et al., 2016; Hatcher et al., 2011; Hatcher et al., 2015), while others employ problem-solving strategies as part of their intervention, such as CAMS (Comtois et al., 2011; Andreasson et al., 2016; Gutierrez et al., 2022; Jobes et al., 2017; Ryberg et al., 2019). *Insight development* was the sixth common component (N = 28) followed by *homework and self-monitoring* (N = 25). Insight development has some overlap with other components, such as *assessment strategies*, but was considered to have enough separation to be included as its own component. Tasks in between sessions were often aimed at monitoring one's suicidality, general moods, or cognitions, but in some cases also included specific activities (Barnes et al., 2021). Following that, *emotion regulation training* was the most common element (N = 23). Among others, this included DBT-based interventions (Koons et al., 2001; Linehan et al., 2006; McMain et al., 2017; Verheul et al., 2003; Goodman et al., 2016; Ward-Ciesielski et al., 2017), which were specifically developed for emotion regulation problems in borderline personality disorder. However, emotion regulation was also common among many C(*B*)T-based interventions (Davidson et al., 2014; Evans et al., 1999; Ghahramanlou-Holloway et al., 2018; Haddock et al., 2019; Lin et al., 2020; Pratt et al., 2015; Rudd et al., 2015; Tyrer et al., 2003; Barnes et al., 2021). *Relapse prevention* was employed 20 times. Relapse prevention strategies were almost always directly mentioned by this name, making it one of few therapeutic components on which there seems to be consensus of its contents and terminology. After this, three components were used 19 times: *treatment motivation enhancement*, *behavioural techniques*, and *increasing social support. Treatment motivation enhancement* is an element commonly used to prevent early drop-out and improve adherence to the intervention. The following component was *behavioural techniques.* While many studies stated using a cognitive-behavioural approach, specific behavioural elements were less commonly mentioned. Only one study employed behaviour therapy on its own (Liberman, 1981). I*ncreasing social support* often included encouraging patients to engage in social activities, which in some cases were part of the treatment as usual (Rudd et al., 2015; Britton et al., 2020). This component differed from *interpersonal effectiveness training* (N = 13), which specifically focused on developing social skills and resolving interpersonal conflicts. *Mindfulness and relaxation* was used 16 times. A focus on nonjudgemental awareness and physical relaxation were often part of this. *Referral to further treatment* (N = 14) referred to situations where patients were encouraged to engage in further interventions after termination of the study. While often aimed at further psychotherapeutic treatment, some studies encouraged patients to find care related to psychosocial problems such as financial struggles or substance use. *Follow-up contact* (N = 13) is a low-cost and relatively old intervention in suicide prevention (Skopp et al., 2023), which has consistently been employed in various studies since the 1970s. While most interventions employed cards, some studies included follow-up calls (Gysin-Maillart et al., 2016; Britton et al., 2020; Arvilommi et al., 2022; Conner et al., 2021). *Self-compassion training* (N = 8) was used mostly by DBT interventions (Koons et al., 2001; Linehan et al., 2006; McMain et al., 2017; Verheul et al., 2003; Goodman et al., 2016; Andreasson et al., 2016), which include a focus on radical acceptance of the self, though it was also mentioned in two other interventions (Interian et al., 2021; Crawford et al., 2018). *Exposure techniques* were employed in 7 interventions. However, exposure was never the main focus and it was mentioned as a relatively limited part of the interventions. The least used components were *involving next-of-kin* (N = 3), *psychodynamic techniques* (N = 2), and *imagery based techniques* (N = 1).

3.1.1. Optional components

22 studies included optional components. Components most often coded as optional were *involving next of kin* (N = 9) (LaCroix et al., 2018; Morley et al., 2014; Slee et al., 2008; Van Beek, 2013; Morthorst et al., 2012; Britton et al., 2020; Crawford et al., 2018; Van der Sande et al., 1997). and *referral to further treatment* (N = 6) (Lin et al., 2020; Pratt et al., 2015; Rudd et al., 2015; Morthorst et al., 2012; Jobes et al., 2017; Eylem et al., 2015). This is in stark contrast with how often these components were included as mandatory component, with next-of-kin being one of the least used elements. When referral to further

treatment was optional, referral was often only encouraged based on risk assessments of whether patients were deemed to benefit from further care. For some studies, optional components indicated a more personalised approach to the treatment, with a specific focus being applied depending on the patient's needs. These included components such as *interpersonal effectiveness training* (Slee et al., 2008; Ilgen et al., 2023; Bateman and Fonagy, 1999; Britton et al., 2020; Crawford et al., 2018), *emotion regulation training* (Brown et al., 2005; Slee et al., 2008; Wei et al., 2013; Barnes et al., 2021), and *behavioural techniques* (Slee et al., 2008; Crawford et al., 2018; Barnes et al., 2021). Interventions stated that specific techniques would be employed depending on areas that needed work.

Table 2
List of included components per study.

Study	*Intervention*	*Component*																			
		ASS	*B*	*CT*	*CM*	*ER*	*EX*	*F*	*HW*	*IM*	*IS*	*ID*	*IE*	*MR*	*NOK*	*PS*	*PD*	*PE*	*RF*	*RP*	*S*	*TM*
Andreasson 2016a	DBT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Andreasson 2016b	CAMS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Arvilommi 2022	ASSIP	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Barnes 2021	ACT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Bateman 1999	Psychoanalytic therapy	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Bateman 2009	MBT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Bentley 2017	Unified Protocol	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Britton 2020a	MI-SI	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Britton 2020b	MI-SI-R	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Brown 2005	CT-SP	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Bryan 2017a	SPI	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Bryan 2017b	SPI	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Comtois 2011	CAMS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Conner 2021	ASSIP	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Crawford 2020	SPS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Davidson 2014	MACT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Evans 1999	MACT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Eylem 2021	GSH	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Study	*Intervention*	*Component*																			
		ASS	*B*	*CT*	*CM*	*ER*	*EX*	*F*	*HW*	*IM*	*IS*	*ID*	*IE*	*MR*	*NOK*	*PS*	*PD*	*PE*	*RF*	*RP*	*S*	*TM*
Ghahramanlou-Holloway 2018	PACT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Goodman 2016	DBT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Goodman 2022	Family-based SPI	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Guthrie 2001	PIT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Gutierrez 2022	CAMS (group)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Gysin-Maillart 2016	ASSIP	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Haddock 2019	CBSP	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Hatcher 2011	PST	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Hatcher 2015	PST	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Hatcher 2016	PST	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Hvid 2011	OPAC	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Ilgen 2023	CBT-SP	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Interian 2021	MCBT-S	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Jobes 2017	CAMS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Koons 2001	DBT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
LaCroix 2018	PACT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Liberman 1981	BT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Lin (Y-C) 2020	CT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Study	Intervention	Component																			
		ASS	B	CT	CM	ER	EX	F	HW	IM	IS	ID	IE	MR	NOK	PS	PD	PE	RF	RP	S	TM
Linehan 2006	DBT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Malakouti 2022	BIC	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
McMain 2017	DBT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Morley 2014	OCB	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Morthorst 2012	AID	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Naidoo 2014	BIS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
O'Connor 2020	TMBI	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Patsiokas 1985a	CT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Patsiokas 1985b	PST	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Pfeiffer 2019	PREVAIL	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Pratt 2015	CTSP	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Rudd 2015	BCBT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Ryberg 2019	CAMS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Salkovskis 1990	CB-PS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Sedghy 2022	MI	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Slee 2008	CBT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Springer 1996	CC	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Tyrer 2003	MACT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Van Beek 2013	FOGT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Van der Sande 1997	Psychosocial intervention	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Verheul 2003	DBT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Walker 2016	PIT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Ward-Ciesielski 2017	DBT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Wei 2013a	CT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Wei 2013b	Telephone counselling	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Note. Green indicates a component was present in the intervention; yellow indicates a component was optional; red indicates a component was not present.
Component abbreviations. ASS: assessment strategies, B: behavioural techniques, CT: cognitive techniques, CM: crisis management and safety planning, ER: emotion regulation training, EX: exposure techniques, F: follow-up contact, HW: homework and self-monitoring, IM: imagery based techniques, IS: increasing social support, ID: insight development, IE: interpersonal effectiveness training, MR: mindfulness and relaxation, NOK: involving next of kin, PS: problem-solving techniques, PD: psychodynamic techniques, PE: (psycho)education, RF: referral to further treatment, RP: relapse prevention, S: self-compassion training, TM: treatment motivation enhancement.
Treatment abbreviations. AID: assertive intervention for deliberate self-harm, ACT: acceptance and commitment therapy, ASSIP: attempted suicide short intervention program, BCBT: brief cognitive behavioural therapy for suicide prevention, BIC: brief intervention and contact, BIS: buddy intervention support, BT: behaviour therapy, CAMS: collaborative assessment and management of suicidality, CB-PS: cognitive behavioural problem solving, CBSP: cognitive behavioural suicide prevention therapy, CC: crisis counselling, CBT-SP: cognitive behaviour therapy for suicide prevention, CTSP: cognitive therapy for suicide prevention, DBT: dialectical behaviour therapy, FOGT: future oriented group training, GSH: guided self-help, MACT: manual assisted cognitive therapy, MCBT-S: mindfulness-based cognitive therapy for suicide prevention, MBT: mentalisation based therapy, MI-SI(−R): motivational interviewing for suicidal ideation (revised), OCB: opportunistic cognitive behavioural intervention package, OPAC: outreach, problem solving, adherence, continuity, PACT: post-admission cognitive therapy, PIT: psychodynamic interpersonal therapy, PREVAIL: peers for valued living, PST: problem-solving therapy, SPI: safety planning intervention, SPS: structured psychological support, TMBI: teachable moment brief intervention.

3.2. Clustering of components

We visualised components in a heatmap (Fig. 2) to investigate which components are often used together in a multi-component intervention. Here, optional components were coded as present in the intervention so all components could be converted to binary variables. As it was impossible to determine the proportion of patients receiving the component, it was deemed unfair to rate the optional component as absent. Components are ordered by their total prevalence.

On a pairwise level, *assessment strategies* often co-occurred with both *cognitive techniques* and *crisis management and safety planning*. *Cognitive techniques* were also often used in combination with *problem-solving techniques*. This corresponds with the popularity of these components overall, as these all rank in the top 5 of most used components. Interestingly, *(psycho)education*, another popular component, seemed more evenly balanced across other components, though it had a strong link to

homework and self-monitoring. To investigate deeper relationships, we also used hierarchical clustering to create a dendrogram (Fig. 3). Here, we see several patterns emerge. There is a cluster containing *interpersonal effectiveness training*, *emotion regulation training*, *mindfulness and relaxation*, and *self-compassion training*. This cluster maps relatively well onto the core components of DBT, which was a common treatment in our sample. *Increasing social support* and *involving next-of-kin* form a cluster together, which is separate from *interpersonal effectiveness training*, suggesting that training social skills was seen as separate from encouraging patients to engage in social contact and seek connection from loved ones. A cluster with *homework and self-monitoring*, *(psycho)education*, and *relapse prevention* emerged. These three components tend to be well-structured and manualised, with a specific purpose in the treatment relatively separate from the techniques aimed at understanding and changing behaviour. Overall, this cluster together with the cluster containing *behavioural strategies* and *problem-solving techniques* represent a common pattern across our sample. Many interventions start out with psychoeducation, then use various techniques during the intervention while giving out homework where appropriate, and finish with a relapse prevention task. A similar cluster with relatively straight-forward components was *treatment motivation enhancement*, *referral to further treatment*, and *follow-up*. This cluster might represent a set of strategies aimed at long-term engagement with care, that stand relatively separate from specific techniques aimed at changing behaviour or thoughts. Lastly, the two least-used components cluster together, *psychodynamic techniques* and *imagery based techniques*.

3.3. Synthesis of findings

Firstly, we were interested in whether using more components was associated with a better outcome. To study this, we conducted a regression analysis with the log RR for suicide attempts as outcome. The results were contrary to what we expected, with more components being associated with a higher log RR, $b = 0.1, F(1, 45) = 4.6, p = .037$. The variance explained by the number of components was small to moderate at 9%. This suggests that treatments with fewer but personalised or dedicated components may be more effective than simply including more components.

To study the effect of each component on suicide attempts, we undertook two steps. First, we studied the effect of interventions including each component separately with one meta-analysis per component. Here, we excluded studies where the component was offered to both the intervention and the control condition, as this would not allow us to compare interventions with and without the component. The results for each component can be found in Table 3. We were unable to investigate interventions including *referral to further treatment*, *psychodynamic techniques* and *imagery based techniques* as there were not enough studies to conduct a meta-analysis. Out of the 18 remaining components, all showed a reduction in the risk of suicide attempts, of which 11 were statistically significant. To account for dependency within multi-arm trials, we used a three-level model with correlated and hierarchical effects (CHE) to estimate the effects. However, other estimation methods can be found in the supplementary materials. Interventions that included *interpersonal effectiveness training* as a component showed the largest reduction in risk, with a 53% decrease in suicide attempts in the intervention group compared to the control group.

To investigate the effect of each component in relation to the other components we conducted a component network meta-analysis (CNMA). The aim of this analysis was to investigate the effect of each component controlling for all other components. The univariate analysis only allowed us to look at interventions including a certain component, without stating that the effect is due to that specific component. A CNMA is able to look within and across interventions to distil specific additive effects per component. However, we were only able to include studies for which we were able to extract components in both the intervention group and the control group. We were able to include 30 studies with 34 pairwise comparisons and 48 treatments. The network was highly disconnected, with 17 subnetworks. This led to reduced power to detect effective components. Such disconnection is not unsurprising perhaps, as interventions tend to be studied as bundles rather than modular units, with limited overlap. This was reflected by unusual and unstable effect sizes, which is why we have chosen not to report the

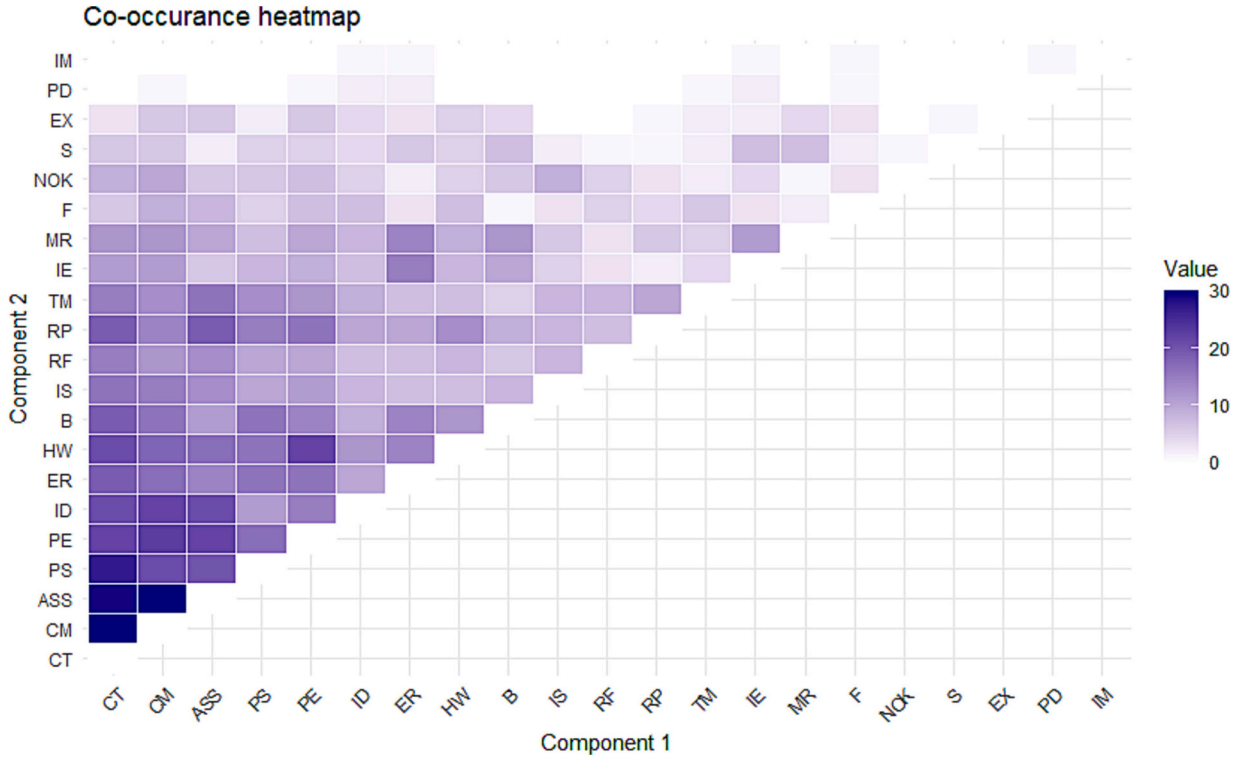

Fig. 2. Heatmap of all 21 components.

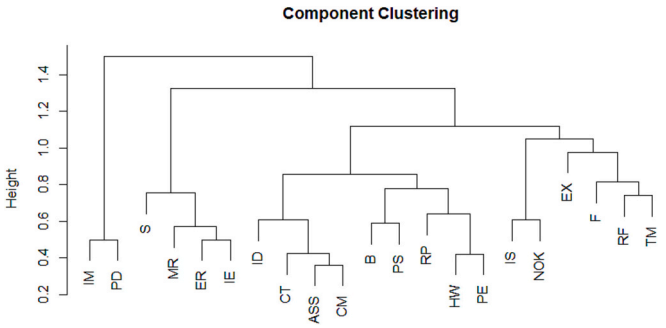

Fig. 3. Dendrogram of the clustering of components.

results as part of the main findings. However, the full output of the CNMA and the sensitivity analyses can be found in the supplementary materials for transparency.

4. Discussion

Psychotherapeutic interventions for suicidality are widely varied. In this systematic review and meta-analysis, a total of 21 distinct treatment components were identified across 60 interventions from 56 randomised controlled trials. *Cognitive techniques*, *crisis management and safety planning*, *assessment strategies*, *problem-solving techniques* and *(psycho)education* emerged as the most frequently utilised components. *Cognitive techniques*, *crisis management and safety planning* and *assessment strategies* often co-occurred, as did the core components of DBT. Treatments typically incorporated an average of six to seven components, and a weak inverse association was observed between the number of components and effect size. Although treatments incorporating *interpersonal effectiveness training* produced the largest reduction in suicide attempts, there was no compelling evidence to suggest that specific components were consistently more effective or associated with adverse effects.

4.1. Most commonly used components

We found that *cognitive techniques*, *crisis management and safety planning*, *assessment strategies*, *problem solving techniques*, and *(psycho) education* were the most used components in direct interventions for suicidality, with prevalences above 50%. This is consistent with previous research showing that CBT-based interventions are some of the most well-studied interventions (Hofmann et al., 2012). Surprisingly, we found that *behavioural techniques* did not scale equally with its cognitive counterpart, suggesting a stronger reliance on the cognitive approach. *Crisis management and safety planning* is a component directly addressing suicide risk, with a strong evidence base supporting its effect. A previous meta-analysis has shown that safety planning interventions have an effect on suicide attempts but not ideation (Nuij et al., 2021). *Assessment strategies* involved any technique that systematically assessed the suicidality, going beyond mere risk assessment. Slowly, some evidence is emerging about the importance of a detailed assessment. For example, a recent meta-analysis showed that CBT interventions with a narrative assessment showed greater reductions in suicide attempts than those without (Janssen et al., 2025). However, interventions such as CAMS and ASSIP which include a detailed assessment have mixed results, with CAMS showing effects on suicidal ideation but not attempts (Swift et al., 2021), and ASSIP showing mixed results (Gysin-Maillart et al., 2016; Arvilommi et al., 2022). Looking at the results of our cluster analysis, we see *assessment strategies* together with *crisis management and safety planning*, *cognitive techniques* and *insight development*. It is possible that while a detailed assessment on its own is not sufficient to reduce suicide attempts, it can help lay the foundation for building insight or making a good safety plan.

Table 3
Meta-analysis outcomes for interventions per component, sorted by effect size.

Component	*k*	RR	CI	I^2	*p*
Interpersonal effectiveness training	12	0.47	[0.26; 0.83]	55.1%	**0.016**
Emotion regulation training	17	0.58	[0.42; 0.79]	37.8%	**0.003**
Mindfulness and relaxation	13	0.59	[0.41; 0.83]	22.5%	**0.008**
Self-compassion training	7	0.60	[0.31; 1.18]	40.3%	0.108
Insight development	21	0.60	[0.42; 0.86]	43.6%	**0.009**
Increasing social support	13	0.61	[0.39; 0.96]	28.5%	**0.037**
Follow-up contact	9	0.62	[0.40; 0.95]	63.6%	**0.034**
Crisis management and safety planning	15	0.63	[0.46; 0.88]	24.9%	**0.012**
Behavioural techniques	11	0.66	[0.40; 1.06]	8.5%	0.074
Cognitive techniques	26	0.72	[0.58; 0.91]	32%	**0.009**
Homework and self-monitoring	17	0.75	[0.59; 0.94]	37.4%	**0.019**
Problem-solving techniques	21	0.75	[0.58; 0.96]	36.4%	**0.027**
(Psycho)education	22	0.76	[0.60; 0.95]	39.6%	**0.021**
Treatment motivation enhancement	14	0.76	[0.50; 1.06]	38.6%	0.085
Assessment strategies	23	0.83	[0.67; 1.02]	23%	0.072
Relapse prevention	13	0.83	[0.63; 1.10]	28.6%	0.152
Exposure techniques	6	0.84	[0.61; 1.16]	0%	0.157
Involving next-of-kin	8	0.88	[0.44; 1.75]	52.4%	0.640

Note. Based on the three-level model (CHE).
For referral to further treatment, psychodynamic techniques, and imagery based techniques, no meta-analysis could be performed as there were not enough studies.
Bold data indicate statistically significant.

4.2. The number of components

While many components were moderately prevalent, the highest prevalence of any component was 68%, suggesting a large variety of components across interventions, with no clear consensus on what to include. Expanding on this, in our review we found that including more components is associated with a lower effectiveness. This is in line with other research, showing that simpler interventions often perform similarly to complex ones (Wang et al., 2025). This may be particularly salient for preventing suicide attempts, as people in suicidal crisis may be less able to focus on multiple treatment goals, and simple actions to keep themselves and their environment safe may be more effective. This has been linked to attentional burden, overlapping mechanisms between components, and potential negative interactions between components, reducing the effect (Baker et al., 2021). With current interventions including around 7 components on average, we suggest new interventions could focus only on some core components, or adopting a modular approach to treatment as needed. This tailored approach is also recommended in a review for suicide prevention interventions in youth, which found that individualised tailoring was more common in effective interventions (Meza et al., 2023). Around one third of included studies in our review included optional components, suggesting a growing interest in this modular and personalised treatment approach. Future research should focus more on what works best for whom, allowing clinicians to even further personalise treatment packages.

4.3. Effectiveness of components

When looking at the effectiveness of the components, we see some familiar patterns emerge. In total, 18 components were suitable for investigation in a meta-analysis. Of these, interventions containing 11 of these components were associated with a significant reduction in suicide attempts compared to interventions without that component. We found no evidence of iatrogenic effects for any component. The four components with the largest effects, *interpersonal effectiveness training*, *emotion regulation training*, *mindfulness and relaxation*, and *self-compassion training*, were all in one cluster when looking at the co-occurrence rates, and are reminiscent of the core components of DBT. DBT has a large evidence base supporting its effect on suicide attempts and self-harm

(DeCou et al., 2019), which is only further supported by our findings. However, we are unable to state that any components are significantly more or less effective than others. A finding that surprised us was the low prevalence and lack of significance of *involving next-of-kin*. If it was included in an intervention, it was often an optional component, leaving us unsure of whether clinicians adopted this regularly. However, in a Delphi study, experts ranked involving family and significant others as one of the top priorities for improving the quality of care in suicide prevention, and our own research shows that a combination of individual treatment with family-based sessions is more effective in reducing suicide attempts than individual treatment alone (Setkowski et al., 2020; van Eijk et al., 2025).

4.4. Comparing our findings to previous work

Translating our findings back to the IMV model, most components seem to tackle psychological processes in the motivational phase, with poor problem-solving skills being considered a strong moderator of the defeat-entrapment relationship, and social support and belongingness affecting the link between entrapment and suicidal ideation (Zortea et al., 2020). Cognition-related factors are present throughout the entire IMV model, from memory biases and ruminative processes to norms and attitudes and fearlessness about death. In the volitional phase, crisis management aims to prevent the transition from ideation to attempt. We believe our findings also align well with the Interpersonal Theory of Suicide (Van Orden et al., 2010), where thwarted belongingness and perceived burdensomeness are key drivers for suicidality. Our review shows that *interpersonal effectiveness training*, *increasing social support* and even small actions fostering connection through *follow-up contact* such as letters have an impact on suicide attempts.

When we look back at the previous attempts to identify key components in treatment for suicidality, we see many similarities. Rudd and Perez-Munoz highlight that effective interventions for suicidality should target clear, identifiable skills (Rudd and Perez-Munoz, 2021). We see this in the effectiveness of techniques such as *interpersonal effectiveness training*, *emotion regulation training*, *cognitive techniques*, and *problem-solving techniques*. The impact of *emotion regulation training* was also highlighted by Weinberg and colleagues (Weinberg et al., 2010), as well as active crisis management and homework. Naturally, there are some differences too. For example, we did not find a significant effect for interventions including *treatment motivation enhancement* techniques. However, it is possible that this component may not have a direct effect on suicide attempts but may impact other relevant factors such as drop-out.

4.5. Strengths, limitations and future directions

One of the major limitations of this study was the fact the CNMA did not perform as hoped, limiting us tot interpreting the univariate results. Since components likely occur together for a reason, perhaps it is a certain combination of components that makes the interventions most effective, which we were unable to investigate. When interventions are seen as a combination of modular units rather than pre-specified bundles, it will be easier to compare the effect of components across and between studies. Combining modular approaches with individual patient-data meta-analyses will allow future research to gain fine-grained insights into what works for whom. Overall, modular approaches outperform standard treatment, further emphasizing their importance (Weisz et al., 2012). Moreover, we did investigate the co-occurrence of components both bivariate and in clusters. While co-occurrence does not automatically reflect effectiveness, we have shown that theoretically relevant patterns emerge, such as those stemming from DBT and CBT. Another limitation is the subjectivity of this work. We did not calculate formal interrater agreement scores, but we found that initial agreement was varied. Through discussion, consensus was always reached, though if this study were to be replicated, it is possible that other researchers come to different conclusions. Reporting quality of the elements or themes in an intervention was low, and it is therefore also possible that we have missed or misinterpreted some components. However, our findings do align with the previous studies investigating common elements across treatments for suicidality. As highlighted before, our review yielded similar common elements, such as between-session monitoring, effective crisis management, cognitive techniques, and emotion regulation skills (Weinberg et al., 2010; Knapp, 2020; Rudd and Perez-Munoz, 2021).

4.5.1. Roadmap for future trials

Future psychotherapy research should focus on several points: improving the reporting of the intervention and the control condition, further personalising treatment, assessing and increasing fidelity, and reducing risk of bias. Unfortunately, out of the 56 studies, for 26 of them, we could not code any components in the control groups. This is crucial, as comparing two groups on a component only yields valid results if you can be sure only one of the groups received the component. Reports often only stated treatment as usual, without a clear indication of what this meant. Previous studies have criticised this practice and suggested criteria for improvements (Pascoe et al., 2022; Arch and Stanton, 2019). Furthermore, using the results from our and previous work, new trials can be conducted focussing on specific promising components to optimise treatment effects. In a modular approach, work on treatment moderators can be conducted to optimise treatment for different patient groups. However, research should go beyond simply studying the inclusion of a component. An issue we were unable to investigate but shows significant importance is the level of treatment fidelity (Sanetti et al., 2021). Taking a safety plan as an example, this can be simply handed to a patient to fill in on their own, be conducted collaboratively, or even include next-of-kin. The presence of a safety plan in a protocol does not necessarily mean that the safety plan was completed in a meaningful way (Richards et al., 2021). Given that high fidelity is associated with better patient outcomes (Marques et al., 2019), studying fidelity is crucial for interpreting trials: without it, it is hard to distinguish between a 'failed' treatment or if it was simply not delivered as intended. Lastly, almost all trials in this review were ranked as high risk of bias, primarily due to a lack of blinding or insufficient handling of missing data. While these are common problems in psychotherapy research, using independent (blinded) outcome assessors can help mitigate this risk. Moreover, pre-registered protocols and registered reports force researchers to critically evaluate their research methods before conducting a study. A detailed analysis plan with attention to handling missing data can reduce risk of bias in this domain and lead to higher quality studies.

4.6. Clinical recommendations and conclusions

Our goal with this review was to combine previous efforts into a comprehensive review and meta-analysis of common elements across interventions targeting suicidality. Our results can aid guideline development and clinical decision-making by offering insight into which components are supported by evidence. Previous research shows a modular approach to treatment to be more effective than standard manualised interventions in treatment of depression, with steeper trajectories of improvement (Weisz et al., 2012). This review can be a start of introducing such manualised interventions for suicide prevention, allowing clinicians to use these building blocks to collaboratively create a treatment plan that works best for each patient. Core components such as effective crisis management, managing emotions, and an attention to interpersonal connection should sit at the foundation of every suicide prevention intervention. Going beyond components only, adding group or family-based sessions to individual treatment can further enhance outcomes (van Eijk et al., 2025). Considering the majority of interventions included in this review offered only individual treatment, significant improvements can be made to further reduce suicide risk.

In conclusion, most components showed a reduction in suicide attempts, and a modular approach building on some key components may enhance clinical applicability of these techniques. A focus on interpersonal relationships, managing negative emotions, and crisis management seem crucial to prevent future suicide attempts.

CRediT authorship contribution statement

N.L. van Eijk: Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **D.H.M. Creemers:** Writing – review & editing, Supervision, Investigation. **A.C.E. Marchand:** Writing – review & editing, Investigation, Formal analysis. **R.F.P. de Winter:** Writing – review & editing, Investigation. **L.J.S. Schweren:** Writing – review & editing, Supervision, Project administration, Funding acquisition. **R. Gilissen:** Writing – review & editing, Supervision, Resources. **W. van Ballegooijen:** Writing – review & editing, Validation, Supervision, Software, Methodology, Funding acquisition, Data curation.

Declaration of competing interest

No funding was received to assist with the preparation of this manuscript.

All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

Acknowledgements

We wish to thank all the researchers and students over the years for contributing to the Metapsy database.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jad.2026.121806.

Data availability

Related documentation and data are available online on www.metapsy.org/suicide-prevention. Previous iterations of the codebook used in this study can be accessed upon request. The R code used in this manuscript is available as part of the supplementary materials.

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