

Long-term effects of psychosocial interventions for adolescents on depression and anxiety: a systematic review and meta-analysis



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Summary

Background Adolescence represents a distinctive phase of development, and variables linked to this developmental period could affect the efficiency of prevention and treatment for depression and anxiety, as well as the long-term prognosis. The objectives of this study were to investigate the long-term effectiveness of psychosocial interventions for adolescents on depression and anxiety symptoms and to assess the influence of different intervention parameters on the long-term effects.

Methods In this systematic review and meta-analysis, we searched five databases (Cochrane Library, Embase, Medline, PsychInfo, Web of Science) and trial registers for relevant papers published between database inception and Aug 11, 2022, with no restrictions on the language or region in which the study was conducted. An updated search was performed on Oct 3, 2023. Randomised controlled trials of psychosocial interventions targeting specifically adolescents were included if they assessed outcomes at 1-year post-intervention or more. The risk of bias in the results was assessed using the Cochrane RoB 2.0. Between-study heterogeneity was estimated using the I^2 statistic. The primary outcome was depression and studies were pooled using a standardised mean difference, with associated 95% confidence interval, p-value and I^2 . The study protocol was pre-registered on PROSPERO (CRD42022348668).

Findings 57 reports (n = 46,678 participants) were included in the review. Psychosocial interventions led to small reductions in depressive symptoms, with standardised mean difference (SMD) at 1-year of -0.08 (95% CI: -0.20 to -0.03 , $p = 0.002$, $I^2 = 72\%$), 18-months SMD = -0.12 , 95% CI: -0.22 to -0.01 , $p = 0.03$, $I^2 = 63\%$ and 2-years SMD = -0.12 (95% CI: -0.20 to -0.03 , $p = 0.01$, $I^2 = 68\%$). Sub-group analyses indicated that targeted interventions produced stronger effects, particularly when delivered by trained mental health professionals ($K = 18$, SMD = -0.24 , 95% CI: -0.38 to -0.10 , $p = 0.001$, $I^2 = 60\%$). No effects were detected for anxiety at any assessment.

Interpretation Psychosocial interventions specifically targeting adolescents were shown to have small but positive effects on depression symptoms but not anxiety symptoms, which were sustained up to 2 years. These findings highlight the potential population-level preventive effects if such psychosocial interventions become widely implemented in accessible settings, such as schools. Future trials should include a longer term-follow-up at least at 12 months, in order to determine whether the intervention effects improve, stay the same or wear off over time.

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Research in context

Evidence before this study

Adolescence is a critical developmental phase during which variables specific to this period can impact the effectiveness of prevention and treatment interventions for depression and anxiety. However, the long-term prognosis and outcomes of these interventions in adolescents remain uncertain, with existing reviews focusing on short-term or medium term follow-up or particular sub-sets of interventions, such as school-based or targeted interventions. Few studies and reviews have focused on outcomes beyond 6 months, and none have assessed long term-follow up of interventions for adolescents beyond 12 months. To address this, we conducted a comprehensive search up to Aug 11, 2022 of five databases (the Cochrane Library, Embase, Medline, PsychInfo, and Web of Science) and registers of ongoing trials, and included randomised controlled trials of adolescents with at least 12 months follow-up.

Added value of this study

This study adds value to the existing evidence by specifically focusing on the long-term effectiveness of psychosocial interventions for adolescents on depression and anxiety symptoms. The present review found consistent, albeit modest, effects of psychosocial interventions for adolescents on long-term outcomes of 1–2 years for symptoms of depression, but not for anxiety. Larger effects were seen when the intervention was delivered by mental health professionals, rather than digital or teacher-delivered interventions. The

study also presents novel results showing that targeted interventions produce stronger effects at 1 year follow-up compared to universal interventions, but not at 18 months follow-up, when only universal interventions showed small but significant effects on depression symptoms. By assessing the longer-term effects of a wide range of psychosocial interventions, this study provides important insights into the durability of the intervention effects. The inclusion of a large number of studies (57 reports with a total of 46,678 participants) strengthens the generalisability and robustness of the findings.

Implications of all the available evidence

Our findings highlight the potential for implementing psychosocial interventions at a population level to improve depressive symptoms in adolescents. We believe these highlight the importance of having mental health professionals to deliver psychosocial interventions in accessible settings, such as schools. The study findings also emphasise the need for tailored approaches for early intervention and prevention efforts that consider the specific characteristics of adolescence to mitigate the long-term impact of depression and improve outcomes later in life. Further research is warranted to explore additional factors that may influence intervention effectiveness and to inform evidence-based strategies for preventing and treating depression and anxiety in adolescents.

Introduction

Depression is a major public health problem in adolescents due to its high morbidity rates¹ and association with poor outcomes during adulthood, including increased risk of mental illness,² inferior employment and educational outcomes, poorer general health later in life, social withdrawal, increased risk of intimate partner victimisation, unplanned pregnancy and substance abuse.^{3–6}

Up to 27% of adolescents have a lifetime prevalence of either subsyndromal depression or major depressive episodes by the age of 18,⁷ positioning adolescence as a key period for early intervention to prevent later escalation of the symptoms. Furthermore, adolescents with subsyndromal depression show similar functional impairment and poor mental health prognosis during later life as those with clinical depression,^{8–10} highlighting the importance of appropriate prevention and treatment of depressive symptoms at an early stage.

Psychosocial interventions can reduce symptoms of depression,¹¹ improve adolescents' emotional and social functioning,¹² increase self-esteem and resilience,¹³ and prevent future episodes of depression.^{14,15} The main approach is centred around changing cognitive and behavioural characteristics of the young person through

the development of skills, such as rational or optimistic thinking style, self-regulation, problem-solving, social and coping skills. These skills presumably decrease the likelihood that a young person will develop depression in the face of biological or environmental risk, or to minimize emotional, behavioural and cognitive risk factors for depression.¹⁶

The immediate effects of these interventions have been extensively reported. Previous meta-analyses are focused solely on short and medium-term effects (3–12 months)^{17,18} or were only conducted for a limited number of interventions, such as school-based^{19,20} or targeted interventions.²¹ However, less is known about the durability of these effects, with some reports identifying a gap in our understanding of their long-term effect.^{22,23} Given that early onset depression is associated with a chronic and relapsing course of illness,^{24,25} it is essential to understand whether prevention and early intervention programmes have long-lasting effects or whether their effects wear off over time.

While previous meta-analyses included a mix of children and adolescent samples,^{14,18–21,26,27} examining adolescents in their own right is important, as adolescence is a unique stage of development and factors associated with this developmental period may influence the

effectiveness of treatment for depressive disorders. Rates of depression increase more rapidly during mid-adolescence,²⁸ and depression symptomatology is more severe in adolescents than in children.^{29,30} Approaches for targeting depression and anxiety in children are different from those used in adolescents. For example, family and parenting interventions are almost exclusively delivered during childhood.³¹ Furthermore, the effectiveness of different modes of treatment delivery (such as individual, group, or online) may also be unique in adolescence because of adolescents' inclination towards autonomy,³² high levels of self-consciousness³³ and heightened sensitivity to others' perceptions of themselves.³⁴ Taken together, these factors raise questions about the best approach for different groups which may affect the long-term effectiveness of treatment.

This study's primary aim was to assess the long-term effect of psychosocial intervention on depression symptoms in adolescents. Secondary aims were to assess their effect on anxiety and examine how different delivery methods of the interventions influenced the long-term effects. Subgroup analyses were also performed to examine how different delivery methods of the interventions influenced their long-term effects.

Methods

Search strategy and selection criteria

This systematic review and meta-analysis adhered to the Cochrane Handbook for Systematic Reviews for Interventions guidelines and reported as per the Preferred Reporting Items for Systematic reviews and Meta-Analysis (PRISMA). A protocol was developed and registered on PROSPERO (CRD42022348668).

Five electronic databases were searched: PsycINFO, MEDLINE, EMBASE, The Cochrane Library, and Web of Science. Registers of ongoing trials ([ClinicalTrials.gov](https://www.clinicaltrials.gov) and International Clinical Trials Registry Platform) were systematically searched. The databases were searched from inception to 11th of August 2022, with no restrictions on the language or region in which the study was conducted. A comprehensive search strategy was developed using MeSH terms and keywords related to intervention setting (e.g., school, clinic, community), mode of delivery (e.g., group, internet, computerized), target problems (depression, anxiety), population age (teenage, adolescent), intervention (e.g., cognitive behavioural therapy, psychoeducation) and study type (RCT). Search strategies are included in the appendix. This search was supplemented with an update search conducted on the 3rd of October 2023.

Only randomised controlled trials (RCTs) were included. The eligibility criteria for the included studies were based on the PICOT framework.

Criterion 1—Population: Adolescents aged 11–18 (>70% of participants within this age range, or mean age \pm one standard deviation was between 11 and 18

years old); both universal (individuals with subthreshold symptoms) and targeted (individuals with symptoms above a certain threshold); *Criterion 2—Intervention:* Treatment included psychological, psychosocial, or educational interventions based on a clear theoretical rationale and psychological or social approaches aimed at the prevention or treatment of depression, depressive symptoms or anxiety that were implemented in educational, community or clinic settings to adolescents as individuals or in groups, as well as digital interventions; *Criterion 3—Comparator:* The effects of an intervention had to be compared to either a no intervention control group or usual curriculum; *Criterion 4—Outcome:* Studies were only included if they reported intervention effects on a measure of depressive symptoms; Measures of anxiety symptoms were also extracted if provided.

Criterion 5—Time: Studies were included only if they conducted a follow-up period of at least 12 months.

Studies were excluded if the intervention consisted of pharmacological or medical treatments, transcranial magnetic stimulation, treatments where depression/depressive symptoms/anxiety were not a specific focus of intervention, complementary and alternative treatments such as animal therapies, vitamin therapies, dietary therapies, or the trial arms represented an active intervention and did not include a control group meeting the criteria outlined above.

The main author screened 100% of titles and abstracts to identify articles meeting the above inclusion criteria and a secondary reviewer (MF) screened 20% of articles to check for consistency. DD and MF then screened the remaining articles full-text and extracted the data independently.

The risk of bias in the results was assessed using the Cochrane RoB 2.0 tool.³⁵ Each article was assessed independently by two authors and disagreements were resolved by discussion. The risk of bias was reported individually for each study included in the review using the labels of 'low risk' of bias, 'high risk' of bias, or 'some concerns'.

Data analysis

The meta-analysis was performed using RevMan Version 5.4. The summary measure used for continuous symptom severity data was the standardised mean difference (SMD). SMDs were computed by importing mean scores, standard deviations and total participants in the intervention and control arm as reported by each individual study according to the outcome (depression or anxiety) and follow-up time point. A random effects model was used to pool the SMDs and associated 0.5% confidence interval (95% CI) with p-value and associated between-study heterogeneity was estimated using the I^2 statistic.

Heterogeneity

Planned sub-group analyses undertaken to explain any potential heterogeneity were: age (mean age <15, versus

≥15), intervention delivery (universal versus targeted, delivered by teachers versus mental health professionals versus digital); intervention modality (CBT, IPT, combined CBT + IPT, CBMT, mindfulness, psychosocial skills training or other), format (group or individual), parental involvement, intervention duration (shorter than 8 weeks, between 8 and 15 weeks or longer than 15 weeks) or setting (school, clinic or community). Sub-group analyses were performed only if there were at least 3 studies per sub-group.

Ethics

Ethical approval was not required for this study, as the information reviewed was publicly available and desensitised.

Role of the funding source

The funder of the study had no role in study design, data collection, data analysis, data interpretation, writing or decision to submit the report.

Results

Fig. 1 shows the PRISMA Flow Diagram outlining the different stages of the identification and eligibility review. Systematic search of five databases included 21,895 articles. After removing duplicates, 13,193 articles were screened by title and abstract. The agreement rate between the two screeners was 98.82% (Cohen's $\kappa = 0.83$). The update search retrieved an additional 909 records, with no additional studies meeting inclusion criteria. This resulted in 57 reports from 57 unique studies consisting of 59 comparisons of 46,678 participants. Two reports^{36,37} presented long-term outcome data for two distinct interventions and have been reported separately.

Of the 57 reports, 44 targeted depression, eight studies targeted both depression and anxiety, while five studies were mainly focused on anxiety. Over a third of studies (22 studies, 38.6%) were cluster-randomised based on school. The majority of control group conditions (36 studies, 63.1%) were either treatment as usual (TAU) or had a no intervention control. Fifteen studies (26.3%) had attention controls consisting of programs matching the duration and format of the active intervention. The other control group conditions (13.7%) consisted of school counselling (2 studies), brochure controls (3 studies) and waitlist (1 study). Almost one third of studies (19 studies, 30%) were carried out in the United States, 14 studies were from Australia, 10 studies from the Netherlands, 3 studies from the United Kingdom, and 2 studies each from Belgium, New Zealand and Norway. Other studies were carried out in Chile, China, Germany, Iceland and South Africa (1 study each). In terms of participant characteristics, nearly half of the studies (28 studies, 47%) were almost evenly split between male and female participants, while

14 studies (23%) consisted of a majority of female participants. The study details are reported in Table 1.

More than half of the programmes implemented a targeted approach (33 comparisons, 55.9%) while the rest were universal programmes (26 comparisons, 44.1%). Two thirds of interventions (38 studies; 66.66%) were traditional cognitive behavioural therapy (CBT)-based programs (Table 2). Out of these, the most frequently taught strategies included: cognitive restructuring (30 studies, 78.9%), problem-solving (21 studies, 70%), social skills training (18 studies, 60%), behavioural activation (14 studies, 46%) and emotional regulation (12 studies, 40%). Three studies were based on interpersonal psychotherapy (IPT)^{38–40} which focused on interpersonal areas that trigger depressive symptoms such as grief, interpersonal disputes, role transitions, and relationship deficits. Five studies tested programs implementing both CBT and IPT.^{37,41–44} Another five studies provided psychosocial skills training such as problem-solving, self-awareness, communication, coping skills, assertiveness and conflict resolution.^{45–49} Mindfulness based cognitive therapy (MBCT) which incorporates techniques such as meditation and mindfulness was tested in three studies.^{50–52} Two approaches for cognitive bias modification training (CBMT) were tested in three studies: one approach targeting attention bias in order to encourage development of an attentional avoidance of negative responses to information (De Voogd et al., 2016; Yang et al., 2016) and another one targeting interpretation bias which encourage the tendency to interpret ambiguity in a benign manner (De Voogd et al., 2018). Other approaches included supporting adolescents in building peer support networks during the transition to high school (Makover et al., 2019), teaching adolescents that people can change (Calvete et al., 2019) and acceptance commitment therapy (Van der Gucht et al., 2017) which aims to improve psychological flexibility. Details of interventions are reported in Table 2 and Supplementary Table S1.

The majority (46 studies, 80.7%) of interventions were group sessions and were implemented in schools. Four studies delivered group interventions in the health service clinic^{53–56} and another four delivered group interventions in community settings (e.g., home, community research centres, youth residences).^{39,48,57,58} The average duration of the interventions was 12.95 weeks (SD = 19.64) and sessions were usually delivered weekly and lasted between 20 and 60 min for individual sessions and 40–90 min for group sessions.

Most interventions (31 studies, 54.4%) were delivered by mental health professionals. Some interventions were also co-delivered by school counsellors,^{59–62} mental health nurses,^{49,59,63} and social workers.^{55,60,64} In 14 studies (23.33%) interventions were delivered by teachers.

Of those included, 55 reports comprising of 55 unique studies and 59 comparisons were included in the primary outcome analysis of 38,169 participants.

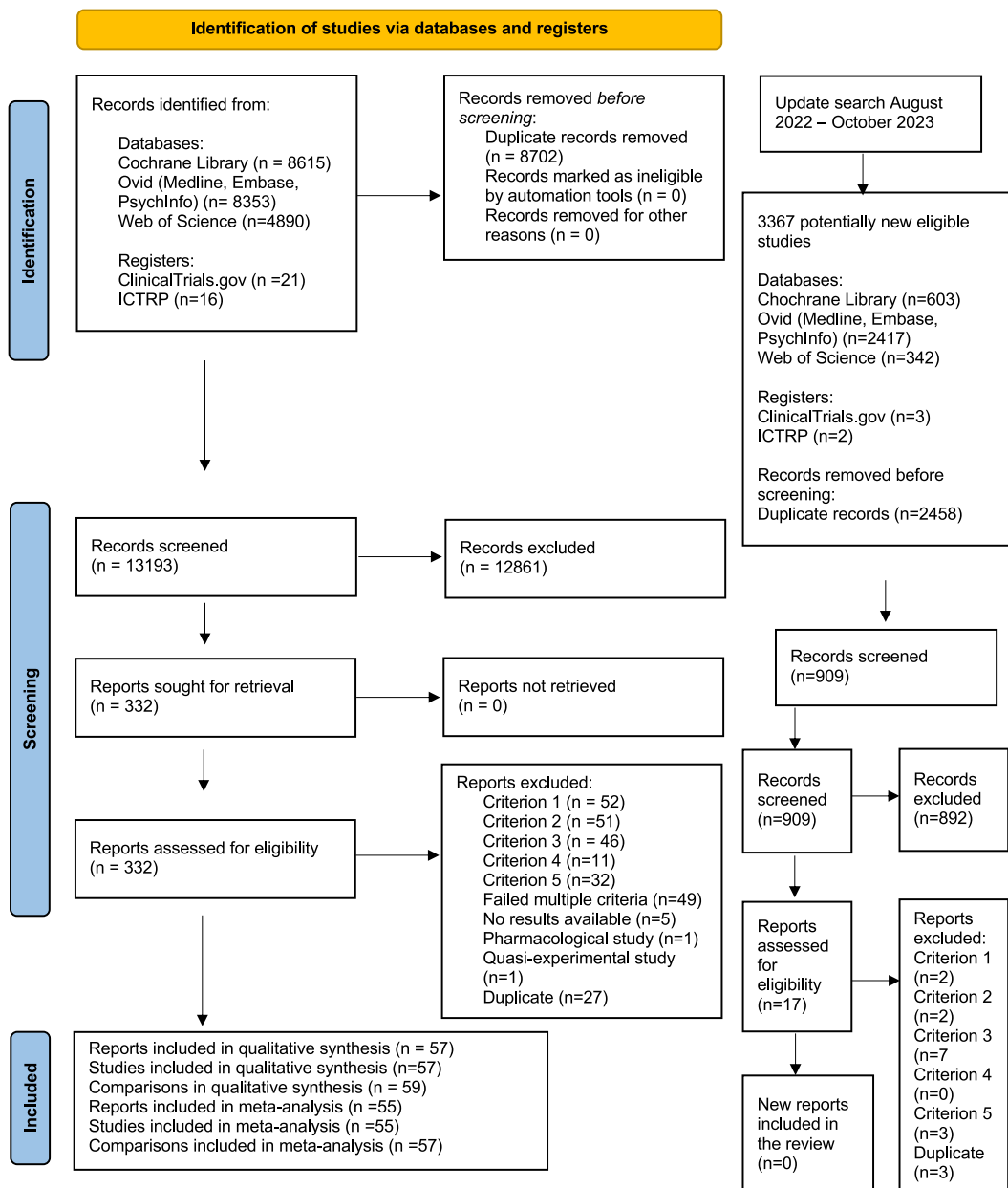


Fig. 1: PRISMA flowchart of the article selection process.

Two trials did not provide data suitable for the meta-analysis^{43,52} because mean scores were not provided individually for each follow-up time point.

Differences in depression symptoms for the experimental and control groups were found at 1-year follow-up ($K = 54$, $SMD = -0.08$, 95% CI: $-0.22, -0.03$, $p = 0.002$, $I^2 = 72\%$; Figs. 2 and 3), 18 months ($K = 11$, $SMD = -0.12$, 95% CI: $-0.22, -0.01$, $p = 0.03$, $I^2 = 63\%$ (Fig. 3A); and 2-year follow-up ($K = 14$, $SMD = -0.12$, 95% CI: $-0.20, -0.03$, $p = 0.01$, $I^2 = 68\%$ (Fig. 3B).

Sub-group analyses revealed that school-based targeted interventions appear to be the most effective ($K = 18$, $SMD = -0.22$; 95% CI: $-0.37, -0.07$; $p = 0.004$; $I^2 = 69\%$) (Table 3). Those delivered by mental health professionals had the largest effects for targeted interventions ($K = 19$, $SMD = -0.24$, 95% CI: $-0.38, -0.08$, $p = 0.002$, $I^2 = 60\%$, Fig. 2A) compared to digital interventions and teacher-delivered interventions. For universal interventions, only those delivered by mental health professionals produced significant effects at

Study	Target condition	Country	N	Gender (%F)	Ethnicity	Control	Attrition	Depression measure	Anxiety measure	Other measures
Andrews et al., 2022	Depression and anxiety	Australia	2539	61%	NR	TAU	11%	PHQ-8	GAD 7	SDQ
Araya et al., 2013	Depression	Chile	3142	44%	NR	TAU	23%	BDI-II	RCADS	CTAS, SPSP-R
Arnarson et al., 2011	Depression	Iceland	171	52%	NR	TAU	34%	CAS; CDI	NR	NR
Aune et al., 2009	Anxiety	Norway	1748	43%	NR	NI	12%	MFQ	SCARED	NR
Beardslee et al., 2013	Depression	USA	316	59%	24.7% non-white	TAU	9%	CES-D	NR	CDRS-R, GAF
Buttigieg et al., 2015	Depression and conduct problems	Australia	2539	56%	NR	TAU	20%	CES-D	NR	NR
Callear et al., 2016	Anxiety	Australia	1767	63%	3% indigenous	WLT	61%	CES-D	GAD-7	SAS-A, CASI, WEMWBS
Calvete et al., 2019	Depression	Spain	867	48%	NR	AC	19%	CES-D	NR	YSQ-3, hormone levels
Cardemil et al., 2007	Depression	USA	168	53%	32% Latino; 68% African American	NI	30%	CDI	NR	ATQ
Clarke et al., 2001	Depression	USA	94	60%	11.5% non-white	TAU	10%	CES-D	NR	GAF, HAM-D
Clarke et al., 2016	Depression	USA	212	68%	16.0% Hispanic, 11.8% racial minority status	TAU	18%	CES-D	NR	ISI, DAS, PES, TCC
Clarke et al., 1995	Depression	USA	150	70%	7.7% non-white	TAU	27%	CES-D	NR	KSADS
Clarke et al., 2002	Depression	USA	88	64%	11% non-white	TAU	7%	CES-D	NR	KSADS, CAF, HAM-D
de Jonge-Heesen et al., 2020	Depression	Netherlands	130	68%	NR	BT	20%	CDI	STAI	NR
De Voogd et al., 2016	Anxiety	Netherlands	368	58%	NR	AC	61%	CDI	SCARED	REC-T, RSES, PMT-K,PTQ, SDQ, stress reactivity (Cyberball)
De Voogd et al., 2018	Anxiety	Netherlands	173	76%	NR	AC	54%	CDI	SCARED	REC-T, RSES, PMT-K,PTQ, SDQ, stress reactivity (Cyberball)
Duong et al., 2016	Depression	USA	120	61%	43% non-white	AC	15%	MFQ	NR	KSADS, BASC-2
Gillham et al., 2006	Depression	USA	271	53%	27% non-white	TAU	28%	CDI	NR	CASQ
Gillham et al., 2007	Depression	USA	697	37%	26% non-white	NI	60%	CDI	NR	CDRS-R
Gladstone et al., 2020	Depression	USA	369	68%	57% non-white	AC	51%	CES-D	SCARED	KSADS, DBD, SAS-SR, BHS, CRPBI, TPB
Hunt et al., 2009	Anxiety	Australia	260	43%	NR	NI	22%	CDI	SCAS	RCMAS
Ip et al., 2016	Depression	China	257	68%	NR	AC	3%	CESD	NR	DASS, CRAFT
Johnson et al., 2017	Depression and anxiety	Australia	555	45%	NR	TAU	16%	DASS-21 Depression	DASS-21 (anxiety subscale)	EDE-Q, WEMWBS, CHIME-A
Keles et al., 2021	Depression	Norway	228	88%	NR	TAU	42%	CES-D	NR	ATQ, DAS, RRS, ERQ
Kindt et al., 2014	Depression	Netherlands	1440	52%	52.3% non-Dutch	TAU	24%	CDI	NR	NR
Kuyken et al., 2022	Depression and anxiety	UK	8376	55%	24.3% non-white	TAU	13%	CES-D	RCADS (anxiety subscale)	BRIEF-2, SDQ, WEMWBS, SCCS, CAMM
Makover et al., 2019	Depression and anxiety	USA	497	62%	45% non-white	NI	NR	SMFQ	HSQ	NR
Melnyk et al., 2015	Depression and obesity	USA	779	52%	86% non-white	AC	20%	BYI-II	NR	NR
Merry et al., 2004	Depression	New Zealand	392	52%	Pakeha 59.9%, Maori 24.5%, Pacific people 9.9%, Asian 1%, other 4.7%	AC	19%	RADS	NR	NR
Pannebakker et al., 2019	Depression	Netherlands	1505	47%	NR	TAU	34%	BDI	NR	GSES, RSES, SIG-A, SDQ
Perry et al., 2017	Depression	Australia	540	63%	NR	AC	79%	MDI	SCAS GAD	DSS, YRBSS
Poppelaars et al., 2016 (Studies a, b)	Depression	Netherlands	208	100%	5.3% non-Dutch	NI	24%	RADS-2	NR	NR
Possel et al., 2013	Depression	USA	518	63%	27.2% non-white	AC	12%	CDI	NR	NR
Possel et al., 2011	Depression	Germany	301	47%	NR	TAU	12%	SBB-DES	NR	Program knowledge, SDQ
Puskar et al., 2003	Depression	USA	89	82%	NR	TAU	20%	RADS	NR	NR
Rasing et al., 2018	Depression and anxiety	Netherlands	142	100%	2.8% non-Dutch	TAU	9%	CDI-2	SCAS	BSI
Reissner et al., 2015	Depression and anxiety	Germany	112	34%	NR	TAU	46%	SCL-90-R depression	SCL-90-R (anxiety subscale)	NR
Roberts et al., 2004	Depression and anxiety	Australia	189	50%	7% other non-English speaking	TAU	15%	CDI	RCMAS	CBCL

(Table 1 continues on next page)

Study	Target condition	Country	N	Gender (%F)	Ethnicity	Control	Attrition	Depression measure	Anxiety measure	Other measures
(Continued from previous page)										
Roberts et al., 2010	Depression and anxiety	Australia	496	54%	7.9% other non-English speaking	TAU	25%	CDI	RCMAS	CBCL
Rohde et al., 2015	Depression	USA	378	68%	28% non-white	BT	6%	K-SADS	NR	SAS-SR, substance use
Rohde et al., 2004	Depression and conduct disorder	USA	93	45%	19.4% non-white	AC	6%	BDI-II	NR	CBCL, GAF
Rose et al., 2014	Depression	Australia	210	44%	20.4% non-white (Asian, Middle East)	NI	11%	RADS-2	NR	CDI, PSSM, CAIR, MSLSS
Roux et al., 2021	Depression	Belgium	141	32%	NR	AC	65%	MDI-C	NR	SNAP-IV
Sawyer et al., 2010	Depression	Australia	5633	53%	3% indigenous	NI	38%	CES-D	NR	ICQ, MSPSS, CAS, thinking style (beyondblue)
Sheffield et al., 2006	Study a: Depression	Australia	634	54%	NR	NI	17%	CDI	SCAS	ADIS-C, SPSSI-R, CATS, CASAFS
	Study b: Depression	Australia	636	69%	NR	NI	12%	CDI	SCAS	ADIS-C, SPSSI-R, CATS, CASAFS
Spence et al., 2005	Depression	Australia	1500	53%	NR	NI	29%	BDI	NR	SPSSI-R, CASQ, CASAFS, YSR
Stallard et al., 2012	Depression	UK	690	49%	13% non-white	AC	21%	SMFQ	RCADS (anxiety subscale)	CATS, RSES, PSSM
Stice et al., 2010	Depression	USA	341	56%	54% non-white	BT	15%	K-SADS	NR	BDI, SAS-SR
Tak et al., 2016	Depression	Netherlands	1341	47%	17.9% non-Dutch	TAU	11%	CDI	NR	NR
Thurman et al., 2017	Depression	South Africa	489	50%	NR	TAU	5%	CES-DC	NR	NR
Van der Gucht et al., 2017	Depression	Belgium	586	53%	NR	TAU	35%	YSR (Affective subscale)	YSR (anxiety subscale)	WHOQoL, AFQ-Y
Whittaker et al., 2017	Depression	New Zealand	855	68%	40% non-white	AC	8%	CDRS-R	NR	RADS-2, MFQ, Q-LES-Q
Woods et al., 2011	Depression	New Zealand	56	NR	16.5% Māori; 14.6% pacific	TAU	57%	CDI	NR	NR
Wright et al., 2020	Depression	UK	139	64%	2% non-white	AC	46%	MFQ	SCAS	EQ-5D-Y, HUI2
Yang et al., 2016	Depression	China	45	56%	NR	AC	42%	CES-D	STAI-T	HAM-D, KSADS, RRS
Young et al., 2009	Depression	USA	41	84%	92% Hispanic	TAU	2%	CES-D	NR	K-SADS, CGAS
Young et al., 2010	Depression	USA	57	60%	73.7% Hispanic, 38.6% African American	TAU	16%	CES-D	NR	K-SADS, CGAS

Table 1: Study details.

1-year follow-up (K = 9, SMD = -0.06, 95% CI: -0.11, -0.01, p = 0.01, I² = 0%; Fig. 2B), while digital and teacher-delivered interventions produced no significant effects. There were no significant differences when comparing between different age sub-groups, intervention formats and parental involvement.

There were mixed findings in sub-group analyses for universal and targeted interventions at longer term follow-up. Targeted interventions had significant effects at 1-year (K = 29, SMD = -0.16, 95% CI: -0.27, -0.05, p = 0.004, I² = 67%, Fig. 2A) and 2-year (K = 9, SMD = -0.13, 95% CI: -0.25, -0.02, p = 0.03, I² = 29%, Fig. 3B). For universal interventions, there was no effect at 1-year (K = 25, SMD = -0.04, 95% CI: -0.09, 0.01, p = 0.13, I² = 74%, Fig. 2B) or 2-year (K = 5, SMD = -0.10, 95% CI: -0.24, 0.03, p = 0.14, I² = 85%; Fig. 3B). However, there were mixed results at the 18-months follow-up, with targeted interventions having no significant effects (K = 5, SMD = -0.07, 95%

CI: -0.34, 0.21, p = 0.63, I² = 76%; Supplementary Figure S1), and universal interventions producing a statistically significant reduction in depression symptoms (K = 6, SMD = -0.09, 95% CI: -0.18, 0.00, p = 0.05, I² = 37%, Fig. 3A).

For our secondary outcome analysis of anxiety symptoms, there were no statistically significant effects at 12 months (K = 8, SMD = -0.01, 95% CI: -0.13, 0.12, p = 0.13, I² = 93%) (Fig. 4A) and 18 months (K = 5, SMD = -0.20, 95% CI: -0.45, 0.06, p = 0.14, I² = 88%) (Fig. 4B). There were no differences between universal and targeted interventions for anxiety symptoms at 12 months follow-up (p = 0.58, I² = 0%) (Fig. 4).

The majority of studies (48, 84.2%) were rated as high risk for overall bias (RoB) (Fig. 5; Supplementary Figure S1). This was largely due to the high risk of performance bias in the measurement of outcome due to the lack of blinding of participants. Two studies (3.5%) were a low RoB, and seven studies (12.3%)

Study	Program name	Type	Format	Setting	Delivery/agent	Modality	Duration (wk)	Format	Participant adherence	Fidelity	Parental involvement
Andrews et al., 2022	Climate Schools	Universal	Combined	School	Digital and teacher (individual online cartoon component and group activity delivered by teacher)	CBT	6	one 40-min classroom lesson per week	NR	A sub-sample of the teachers reported fidelity; range 88–97%.	None
Araya et al., 2013	I Think, Feel and Act (ITFA)	Universal	Group	School	Professional	CBT	13	11 weekly sessions and 2 booster sessions (1 h each)	medium	10% of sessions were evaluated by supervisors; no measure given	None
Arnanson et al., 2011	Prevention Program	Targeted	Group	School	Professional	CBT, IPT, problem-solving	11	14 sessions	NR	NR	None
Aune et al., 2009	Norwegian Universal Preventive Program for Social Anxiety (NUPP-SA)	Universal	Group	School	Teacher	CBT	3	one 45 min session per week	high	Good to excellent ratings were reported	60-min lecture
Beardslee et al., 2013	CB prevention program	Targeted	Group	Clinic	Professional	CBT	8	one 90-min group sessions per week	high	Therapist compliance rating scores ranged from 88.1% to 95.8%	2 informational meetings
Buttigieg et al., 2015	Resilient Families	Universal	Group	School	Teacher	Psychosocial skills training	10	one 50-min session per week	NR	Integrity checklist completed by teacher; measure not reported	Brief parent education evenings
Calear et al., 2016	e-couch Anxiety and Worry program	Universal	Individual	School	Digital, teachers and health education officers	CBT + psychoeducation	6	one 30–40 min session per week	low	N/A (digital program)	None
Calvete et al., 2019	Incremental theory of personality intervention (ITPI)	Universal	Group	School	Professional	Incremental theory of personality	1	one session (50–60 min)	NR	NR	None
Cardemil et al., 2007	Penn Resiliency Programme	Targeted	Group	School	Professional	CBT	12	one 90-min session per week	NR	NR	None
Clarke et al., 2001	Coping with Stress Course (CWS)	Targeted	Group	Clinic	Professional	CBT	15	one 1-h session per week	medium	Fidelity checklist: mean therapist compliance was 95.9%	3 informational sessions for parents
Clarke et al., 2016	Individual CBT	Targeted	Individual	Clinic	Professional	CBT	14	8 sessions plus up to 6 elective continuation sessions	low	10% of sessions were audio-recorded; a mean of 96% of session content delivered per the CBT manual.	None
Clarke et al., 1995	Coping with Stress Course (CWS)	Targeted	Group	School	Professional	CBT	15	three 45-min sessions per week	medium	NR	None
Clarke et al., 2002	Group CBT	Targeted	Group	Clinic	Professional	CBT	15	one 1-h session per week	medium	Mean therapist compliance was 90.8% across 12 rated sessions	3 parent information meetings
de Jonge-Heesen et al., 2020	OVK 2.0	Targeted	Group	School	Professional	CBT	8	one 1-h session per week	NR	Treatment fidelity was 84.7% (range from 74.6 to 94.7%).	Information sessions, presence at booster sessions
De Voogd et al., 2016	Cognitive Bias Modification for Interpretations for Attention (CBM-A)	Universal	Individual	School	Digital (computerized training sessions)	CBMT (Attention)	4	two 15-min sessions per week	medium	N/A (digital program)	None
De Voogd et al., 2018	Cognitive Bias Modification for Interpretations (CBM-I)	Universal	Individual	School	Digital (computerized training sessions)	CBMT (Interpretation)	4	two 15-min sessions per week	medium	N/A (digital program)	None

(Table 2 continues on next page)

Study	Program name	Type	Format	Setting	Delivery/agent	Modality	Duration (wk)	Format	Participant adherence	Fidelity	Parental involvement
(Continued from previous page)											
Duong et al., 2016	Positive Thoughts and Actions (PTA)	Targeted	Group	School	Professional	CBT	12	one 50-min session per week	NR	Mean intervention integrity across group leaders was 92%	Parental workshop and two home visits
Gillham et al., 2006	Penn Resiliency Programme	Targeted	Group	Clinic	Professional	CBT	12	one 90-min session per week	medium	On average, group leaders covered 81% of content	None
Gillham et al., 2007	Penn Resiliency Programme (PRP)	Universal	Group	School	Teachers	CBT	12	one 90-min session per week	medium	Each lesson was rated on a 7-point scale; average rating was 4.9, percentage covered was 80%	None
Gladstone et al., 2020	Competent Adulthood Transition with Cognitive Behavioral Humanistic and Interpersonal Training (CATCH-IT)	Targeted	Individual	Primary care	Digital and professional (online modules with guidance from psychologists and primary care physician)	CBT + IPT	N/A	14 online modules, 1–3 phone coaching calls and 3 motivational interviews with primary care physician	low	NR	Four parent modules plus an optional module for parents who think they are depressed
Hunt et al., 2009	FRIENDS	Targeted	Group	School	Teacher and school counsellors	CBT	10	one 50-min session per week	NR	55% of session aims were rated as having been met either moderately or extremely well	1 or 2 sessions equivalent to the child-based sessions
Ip et al., 2016	Grasp the Opportunity (adaped from CATCH-IT)	Targeted	Individual	School	Digital (online modules)	CBT	N/A	10 online modules	low	N/A (digital program)	No
Johnson et al., 2017	Dot Be' mindfulness in schools	Universal	Group	School	Professional	Mindfulness	9	one 40–60 min lesson per week	NR	Only measured indirectly through parental uptake	One information session and weekly e-mails with links to videos with content related to mindfulness
Keles et al., 2021	Adolescent Coping with Depression Course (ACDC)	Targeted	Group	Community	Professional	CBT	10	eight weekly 120 min sessions and two 90 min follow-up sessions	NR	80% fidelity based on fidelity checklist	None
Kindt et al., 2014	Op Volle Kracht (OVK)	Universal	Group	School	Teacher	CBT	16	one 1-h classroom lesson pe week	NR	NR	None
Kuyken et al., 2022	School-based mindfulness training (SBMT)	Universal	Group	School	Teacher	Mindfulness	10	one 30–50 min session per week	high	Facilitators adhered to 83% of the standardised curriculum	None
Makover et al., 2019	Highschool Transition Programme	Universal	Group	School	Professional	High-school transition program focused on coping skills and building peer networks	12	one 1-h session per week	NR	NR	4 home visit sessions
Melnyk et al., 2015	COPE/Healthy Lifestyles TEEN (Thinking, Emotions, Exercise and Nutrition)	Universal	Group	School	Teacher	CBT + nutrition and exercise education	15	one 1-h classroom lesson pe week	NR	Observers rated 25% of lessons and reported decreases in fidelity at least once in approximately half of the classrooms	4 newsletters sent to parents and teens asked to review the newsletter with them.
Merry et al., 2004	Resourceful Adolescent Programme (RAP)-Kiwi	Universal	Group	School	Teacher	CBT + IPT	11	11 sessions run either weekly or bi-weekly (differed in each school)	NR	Integrity checklist conducted by teachers who delivered the intervention; results not provided	None
Pannebakker et al., 2019	Skills 4 Life	Universal	Group	School	Teacher	Psychosocial skills training	17	one 1-h session per week	NR	NR	None

(Table 2 continues on next page)

Study	Program name	Type	Format	Setting	Delivery/agent	Modality	Duration (wk)	Format	Participant adherence	Fidelity	Parental involvement
(Continued from previous page)											
Perry et al., 2017	SPARX-R	Universal	Individual	School	Digital (video game)	CBT	5	seven 20–30 min sessions	NR	N/A (digital program)	No
Poppelaars et al., 2016	Study a: OVK	Targeted	Group	School	Professional	CBT	8	one 1-h classroom lesson pe week	high	NR	None
	Study b: SPARX	Targeted	Individual	School	Digital (video game)	CBT	8	one module (level) of 20–40 min per week	high	N/A (digital program)	None
Possel et al., 2013	TIM&SARA, Together Initiating More Socially Advantageous & Realistic Attitudes (american version of LARS&LISA)	Universal	Group	School	Professional	CBT	10	one 90 min classroom session per week	high	Recordings were used; no measure was given	None
Possel et al., 2011	LARS&LISA	Universal	Group	School	Professional	CBT	10	one 90 min classroom session per week	NR	Recordings were used; no measure was given	None
Puskar et al., 2003	Teaching Kids to Cope (TKC)	Targeted	Group	School	Professional	Psychosocial skills training	10	one 45 min session per week	high	Integrity checks in a third of sessions; results not reported	None
Rasing et al., 2018	Een Sprong Vooruit (A Leap Forward)	Targeted	Group	School	Teacher	CBT	6	one 90 min classroom session per week	high	NR	None
Reissner et al., 2015	Multimodal teratment (MT)	Targeted	Individual	Clinic	Professional	CBT	23	therapy and/or counselling sessions of 1 h per week	low	86% of sessions rated as true to the manual	None
Roberts et al., 2004	Penn Prevention program (PPP)	Targeted	Group	School	Professional	CBT	12	one 1-h session per week	high	Mean percentage of programme implemented was 74.11%	None
Roberts et al., 2010	Aussie Optimism Program (AOP)	Trageted	Group	School	Teacher	Psychosocial skills training	20	one 1-h session per week	medium	Independent observers' mean ratings of overall lesson success was 8.4 on a 10-item checklist	None
Rohde et al., 2015	CB group	Targeted	Group	School	Professional	CBT	6	one 1-h session per week	high	Fidelity measured on 10-point scales (M = 7.0, SD = 0.7)	None
Rohde et al., 2004	Coping with Depression for Adolescents (CWD-A)	Targeted	Group	Community	Professional	CBT	16	one 2-h session per week	medium	91% full adherence, 7% partial adherence, 3% skill component missing or incompletely administered	Information sessions and problem-solving training
Rose et al., 2014	RAP- PIR (Peer Interpersonal Relatedness)	Universal	Group	School	Professional	CBT, IPT, social skills training	20	one 45–50 min session per week	NR	40% of group sessions were assessed; no deviations were observed	No
Roux et al., 2021	Mindfulness-Based Intervention (MBI)	Targeted	Group	Community	Professional	Mindfulness	16	one 50-min session per week	NR	NR	None
Sawyer et al., 2010	BoeyondBlue	Universal	Group	School	Teacher	Psychosocial skills training	156	ten 40–45-min sessions across the school term in each of the three years of the trial	NR	NR	None
Sheffield et al., 2006 a	The Problem Solving for Life (PSFL)	Universal	Group	School	Teacher	CBT	8	one 45–50 min classroom sessions per week	high	Fidelity was reported by teachers; average of 85% of elements completed	None
Sheffield et al., 2006 b	ACE (Adolescents Coping with Emotions)	Targeted	Group	School	Lay counsellors, community health practitioners	CBT + IPT	8	one 90-min session per week	medium	Fidelity was reported by group leaders; 92% of elements were covered	None

(Table 2 continues on next page)

Study	Program name	Type	Format	Setting	Delivery/agent	Modality	Duration (wk)	Format	Participant adherence	Fidelity	Parental involvement
(Continued from previous page)											
Spence et al., 2005	The Problem Solving for Life (PSFL)	Universal	Group	School	Teacher	CBT + problem-solving	8	one 45–50 min session per week	NR	Fidelity assessed by teachers through qualitative evaluation after each session; majority of program content was implemented	No
Stallard et al., 2012	The Resourceful Adolescent Programme (adapted after the Australian RAP programme)	Targeted	Group	School	Trained facilitators with undergraduate degree	CBT	11	9 classroom lessons and 2 booster sessions each about 60 min over two school terms	high	Subset of classes assessed for fidelity; 86.1% of classes covered all intervention elements	None
Stice et al., 2010	CB intervention	Targeted	Group	School	Professional	CBT	6	one 1- h session per week	medium	Fidelity checklist–96% compliance	None
Tak et al., 2016	OVK	Universal	Group	School	Professional	CBT	16	one 50-min lesson per week	NR	NR	None
Thurman et al., 2017	Interpersonal Psychotherapy for Groups	Targeted	Group	Community	Trained facilitators from youth community	IPT	16	one 90-min session per week	medium	NR	None
Van der Gucht et al., 2017	Acceptance Commitment therapy (ACT)	Universal	Group	School	Teacher	Acceptance and Commitment Therapy	4	one 120-min classroom session per week	NR	NR	None
Whittaker et al., 2017	MEMO-CBT	Universal	Individual	School	Digital	CBT	9	2 messages per day with 30 s videos	low	N/A (digital program)	None
Woods et al., 2011	Kiwi- ACE (Adolescents Coping with Emotions)	Targeted	Group	School	Professional	CBT	8	one 90 min classroom session per week	NR	NR	None
Wright et al., 2020	Stressbusters	Targeted	Individual	Primary Care	Digital	CBT	8	one 30–45 min session per week	NR	N/A (digital program)	None
Yang et al., 2016	Attention Bias Modification (ABM)	Targeted	Individual	School	Digital	CBMT (Attention)	4	8 × 20 min sessions over 2 weeks, + booster sessions 4 × 30 min sessions over 2 weeks	NR	N/A (digital program)	None
Young et al., 2009	Interpersonal Psychotherapy- Adolescent Skills Training (IPT-AST)	Targeted	Group	School	Professional	IPT	10	two pre-group individual sessions (40 min each) and eight weekly group sessions (90 min each).	medium	NR	None
Young et al., 2010	IPT-AST	Targeted	Group	School	Professional	IPT	10	two pre-group individual sessions (40 min each) and eight weekly group sessions (90 min each).	medium	NR	2 parent-adolescent sessions to tackle an interpersonal problem and review progress

Table 2: Intervention characteristics.

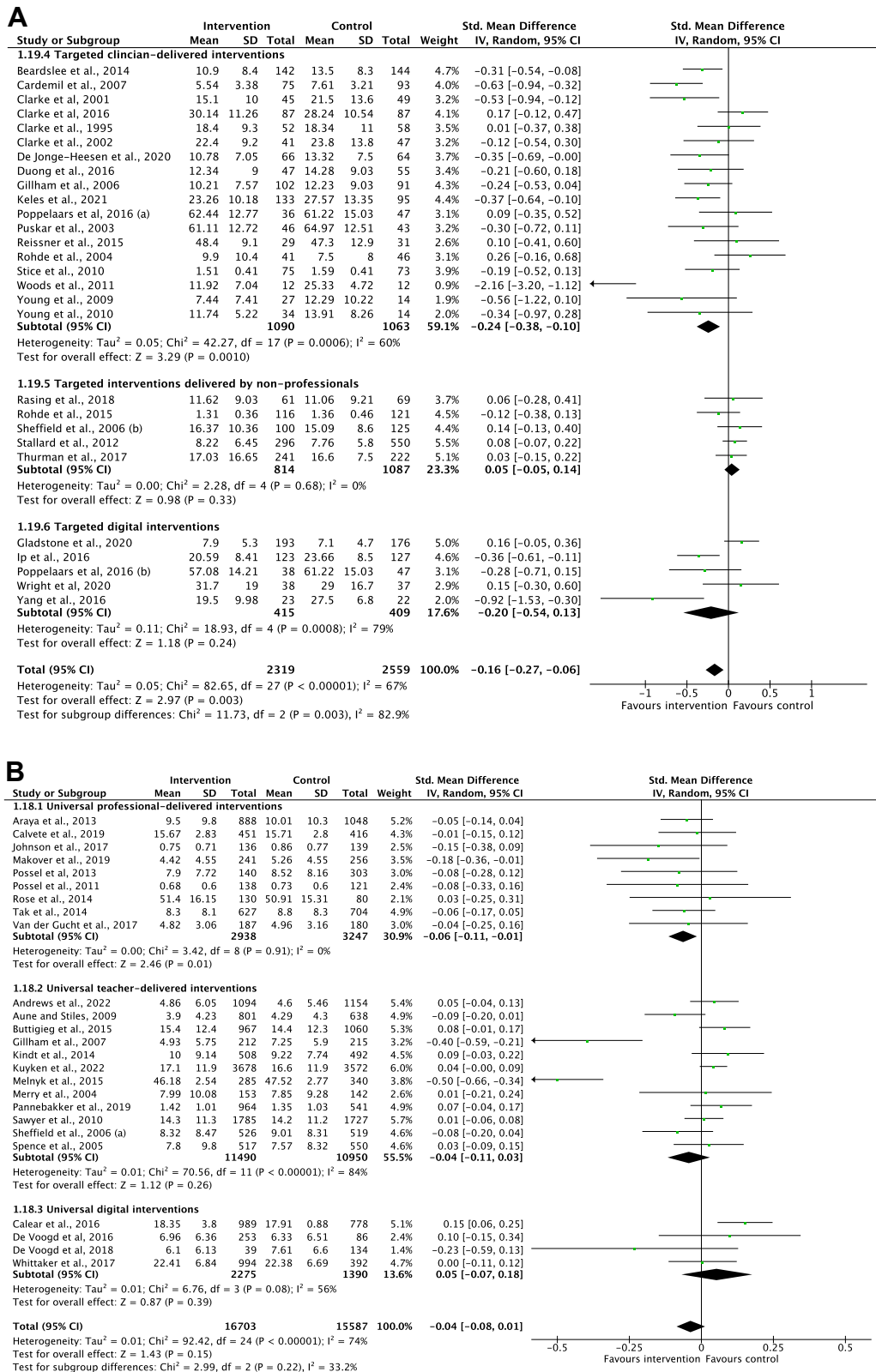


Fig. 2: Forest plots for the meta-analysis of depression symptoms at 12 months follow-up in (A) targeted interventions and (B) universal interventions.

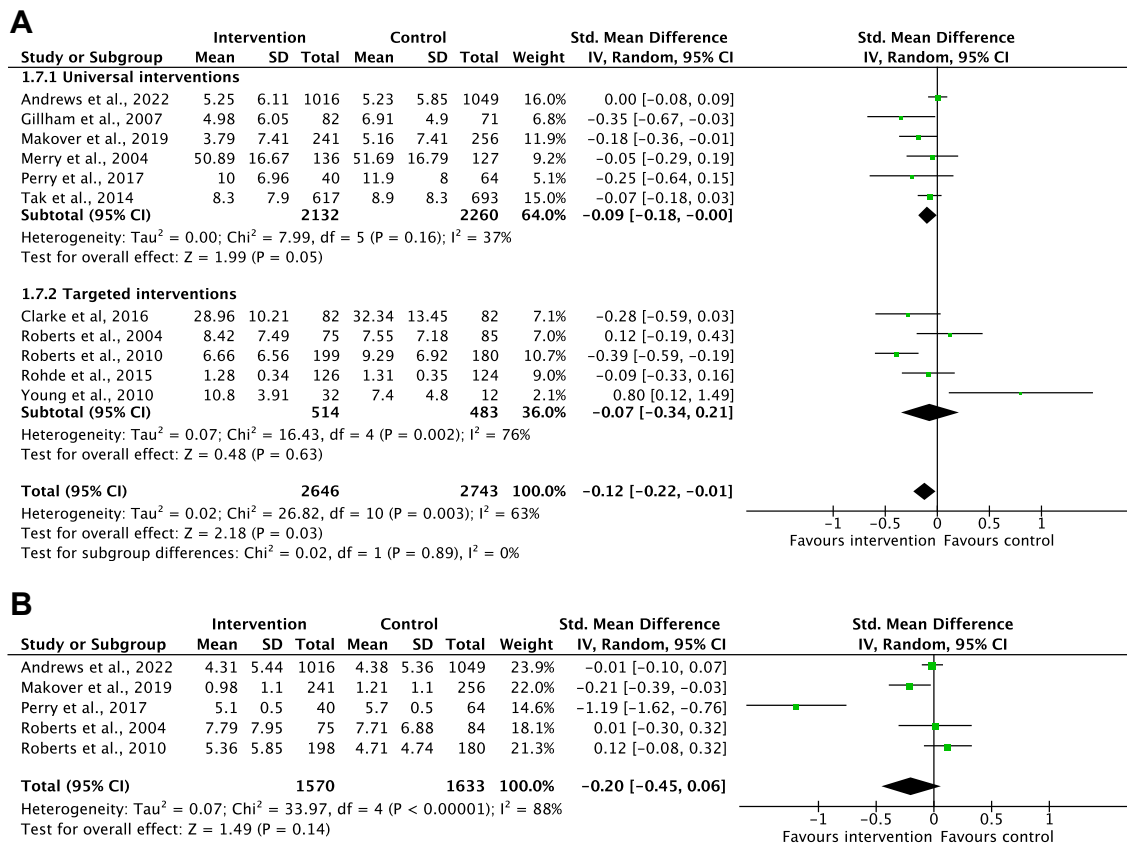


Fig. 3: Forest plots for the meta-analysis of depression symptoms at (A) 18 months and (B) 24 months follow-up.

incurred some concerns on the different domains of the RoB. Finally, the funnel plot for depression symptoms at 12 months follow-up showed evidence of potential publication bias (Fig. 6; Egger’s test of bias: $p < 0.001$).

Discussion

This systematic review and meta-analyses included 57 studies of 46,678 participants and found consistent, albeit modest, effects of psychosocial interventions for adolescents on long term outcomes of 1–2 years for symptoms of depression, but not for anxiety. The largest effects were seen when the intervention was delivered by mental health professionals or delivered in schools. The effects on depression were larger in targeted, compared to universal samples.

These results support findings from several previous reviews of mixed child and adolescent studies which also found similar effect sizes at short- and medium-term follow-up.^{15,19,20,57} Consistent with those studies, we also found that targeted programs are significantly more effective in reducing depressive symptoms at 12 months follow-up.^{14,19,20,27,58} However, our review also identified a small (SMD = -0.10), but statistically

significant effect for universal interventions at 18 months follow-up, but not at 12-months. The differences in effects between universal and targeted interventions may be related to the increased severity of symptoms of participants in targeted interventions, or a “floor effect” (“unchanged normals”) affecting universal interventions more markedly.⁵⁸ Other factors are the questionable face validity of depression measures in universal samples⁶⁵ and lack of statistical power given that large sample sizes needed to detect effects in universal populations make such studies impractical or prohibitively expensive to conduct.⁶⁶ The effects of universal preventative programs may only be determined over longer periods of time and only become apparent at long-term follow-up,⁶⁷ a trend which is apparent in our review between the 12 months and 18 months follow-ups, when the effects of universal interventions increase and reach statistical significance. This suggests that universal interventions could have a preventative effect for vulnerable individuals who scored below the threshold at the time of interventions, but practiced and used their newly acquired skills over time.

However, unlike previous meta-analyses for mixed children and adolescent samples, we found no significant

	Studies	Effect estimate			Sub-group differences		
	K	SMD (95% CI)	I ²	p	Chi ²	p	df
Population							
Age							
Under 15	47	-0.08 [-0.13, -0.03]	74	0.001			
Over 15	7	-0.02 [-0.12, 0.09]	18	0.77	1.23	0.27	1
Severity							
Universal	25	-0.04 [-0.09, 0.01]	74	0.13			
Targeted	29	-0.16 [-0.27, -0.05]	67	0.004	10.30	0.05	1
Intervention							
Modality							
CBT	36	-0.05 [-0.07, -0.02]	76	0.002			
IPT	3	-0.03 [-0.20, 0.14]	49	0.69			
CBT + IPT	3	0.02 [-0.12, 0.17]	0	0.77			
CBMT	3	-0.09 [-0.29, 0.10]	80	0.33			
Mindfulness	2	0.04 [-0.01, 0.08]	58	0.13			
Skills	4	0.04 [-0.01, 0.08]	34	0.12			
Other	3	-0.07 [-0.16, 0.02]	15	0.15	16.25	0.01	6
Format							
Group	44	-0.08 [-0.13, -0.03]	74	0.002			
Individual	10	-0.06 [-0.21, 0.09]	63	0.45	0.07	0.79	1
Parents							
Involved	13	-0.16 [-0.30, -0.03]	80	0.02			
Not involved	41	-0.05 [-0.09, 0.00]	65	0.06	2.54	0.11	1
Duration							
<8 weeks	10	-0.03 [-0.12, 0.07]	66	0.59			
8-15 weeks	34	-0.13 [-0.20, -0.06]	76	0.0002			
>15 weeks	8	0.02 [-0.02, 0.07]	0	0.3	14.02	0.0009	2
Setting							
School	18	-0.22 [-0.37, -0.07]	69	0.004			
Clinic	8	-0.08 [-0.27, 0.11]	63	0.41			
Community	3	-0.05 [-0.38, 0.28]	76	0.77	1.78	0.41	2
Delivery							
Professional (universal)	9	-0.06 [-0.11, -0.01]	0	0.01			
Teacher (universal)	12	-0.04 [-0.11, 0.03]	84	0.26			
Digital (universal)	4	0.5 [-0.07, 0.18]	56	0.39	2.99	0.22	2
Professional (targeted)	19	-0.24 [-0.38, -0.08]	60	0.002			
Non-professional (targeted)	5	0.05 [-0.05, 0.14]	0	0.33			
Digital (targeted)	5	-0.20 [-0.54, 0.13]	79	0.24	10.72	0.005	2

Table 3: Sub-group analysis.

effects on anxiety symptoms at any time point. This is most likely because most interventions in this review targeted depression and studies did not consistently assess effects on anxiety.^{15,23} Given that the age of onset for anxiety disorders is before adolescence,⁶⁸ most interventions are delivered for younger children. Therefore, due to the age restrictions in this review, programs which have shown promising results for anxiety in young people under the age of 12⁶⁹⁻⁷¹ have not been included in the analysis.

An important finding was that both universal and targeted interventions produced significant long-term effects when delivered in schools by mental health professionals,^{21,72} highlighting the need to improve

access to professional mental health support for adolescents. One approach that has been recently introduced in the UK is offering specialized training for a new group of staff to deliver mental health interventions in schools on a national scale. Creating and training a new workforce of education mental health practitioners such as in the Children and Young People’s Mental Health Trailblazer programme in the UK has shown promising results in its early stages,⁷³ showing a clear and compelling rationale for offering support in school settings. However, our review did not identify sufficient studies investigating other settings such as community settings to draw conclusions about these settings.

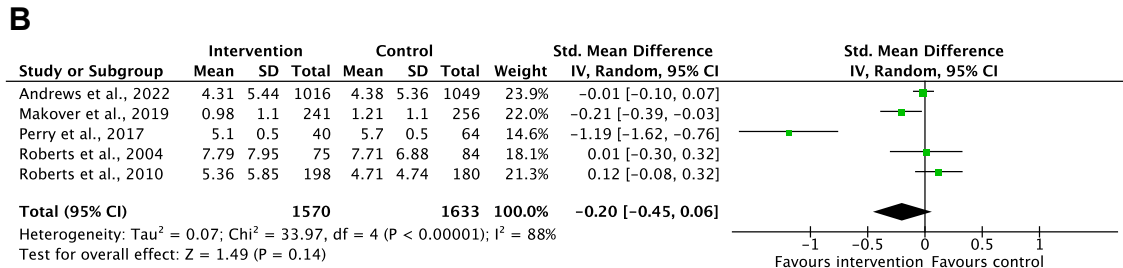
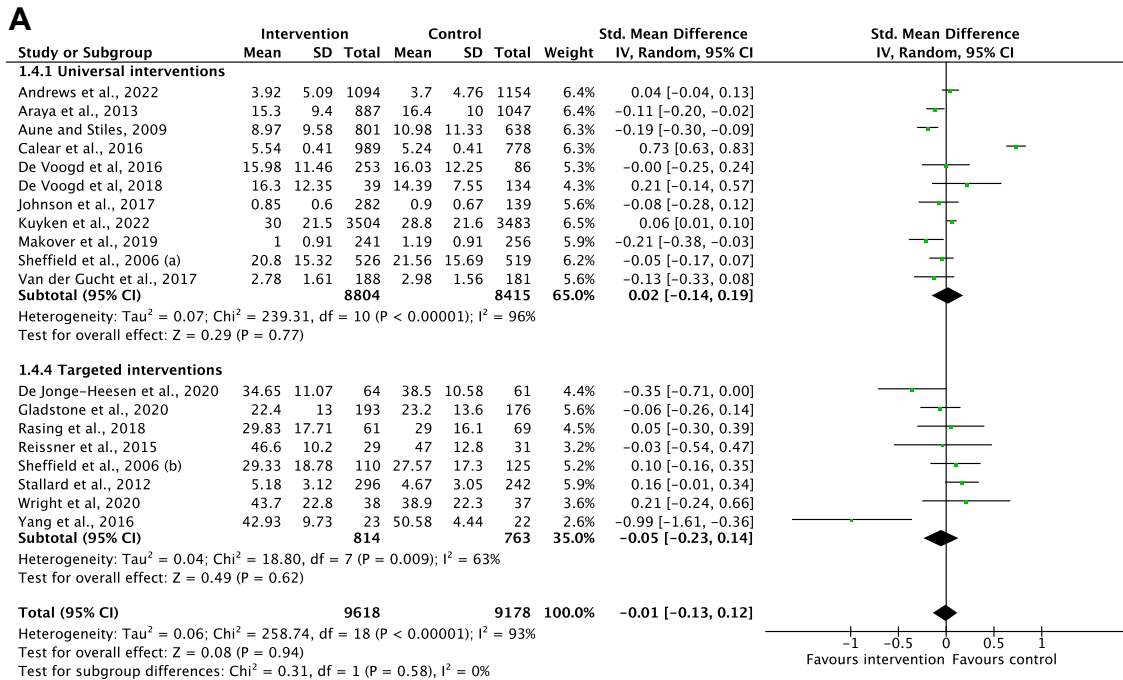


Fig. 4: Forest plots for the meta-analysis of anxiety symptoms at (A) 12 months and (B) 18 months follow-up.

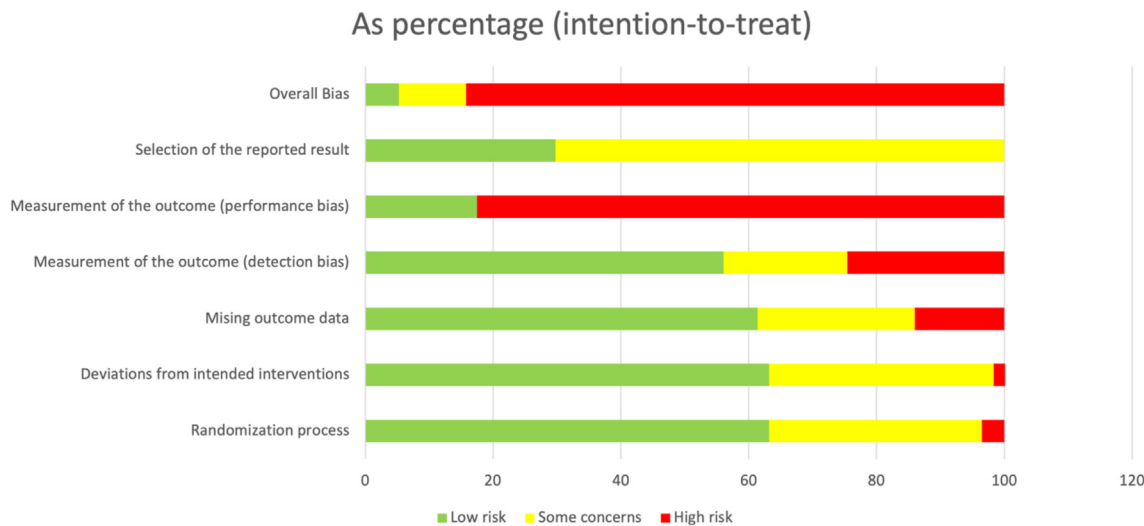


Fig. 5: Risk of bias summary graph.

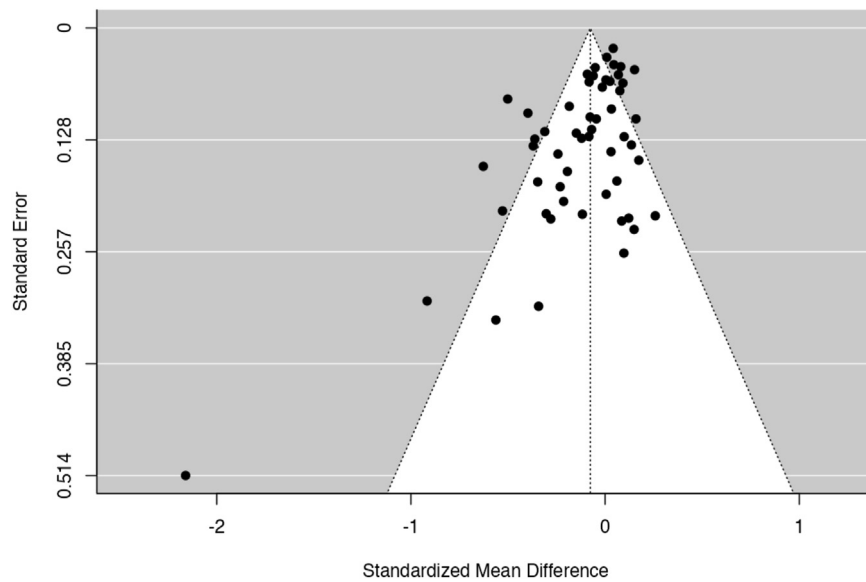


Fig. 6: Funnel plot for depression symptoms at 12 months.

Given that most studies utilised similar approaches, our analysis had less statistical power to identify subgroup effects. Interventions for younger adolescents, those involving parents and those using novel approaches such as cognitive bias modification showed relatively stronger effects in the long-term, but too few studies were available to determine their true impact. Therefore, further research is needed to investigate the ideal age for delivering psychosocial interventions with the longest lasting effect and careful consideration should be given to the developmental stage and their potential support networks when designing such interventions for adolescents.

Although this systematic review and meta-analysis addressed some important gaps in the literature, there are some limitations in the studies reviewed. First, there was a high risk of bias in the measurement of the outcome because most participants and assessors were unblinded. However, due to the therapeutic nature of psychosocial interventions, it is often not possible to blind participants and personnel to treatment, and it can be argued that downgrading evidence because of this alone may not be reasonable.⁷⁴ Second, even though we attempted to explore the variability introduced by different intervention parameters by using sub-group analyses, there was still a high level of unaccounted heterogeneity. This could be due to the use of different measurement instruments and administration methods between studies. Third, there was evidence of publication bias, meaning that the effect size estimates may have been overestimated. Fourth, although adverse effects were out of the scope of this review, it is important to acknowledge the possibility that some individuals

may deteriorate or experience harm as a result of such interventions, and future studies should measure and report cases of symptom deterioration and other adverse effects.⁷⁵ Taken together, these limitations mandate caution in interpreting the results and greater rigour in the design and reporting of future studies. Nonetheless, this review presents a meta-analysis of a large number of studies showing consistent findings over longer periods of time, strengthening the generalisability and robustness of the results. This approach provides a more precise estimate of their preventative effect, given that depressive symptoms are a high-risk factor for disorder onset.^{8,76}

Finally, the present review highlights the importance of conducting studies that measure the impact of interventions over longer follow-up periods. This is particularly relevant due to the importance of providing early intervention with enduring effects. The data on the duration of effect will also be valuable in economic modelling to simulate the important lifetime benefits of interventions for adolescent mental disorders on future health service use and the wider economy. Long-lasting reductions in depressive symptoms could offer protection throughout a period of considerable vulnerability for the onset of internalising disorders which extends from adolescence into young adulthood.²⁸

Contributors

The study was conceptualised by DD with input from BC and JB. DD and MF screened the text and extracted the data. DD analysed the data and wrote the manuscript with input from BC, SL and JB. JS, SB and KJ revised the manuscript. DD and MF accessed and verified the underlying data. All authors had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Data sharing statement

All data used for the study has been included in the manuscript and supplementary material.

Declaration of interests

We declare no competing interests.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.eclinnm.2023.102382>.

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