Behavioural and Cognitive Psychotherapy, 2023, **51**, 230–245
doi:10.1017/S1352465822000662

BABCP
www.babcp.com

MAIN

Cognitive behavioural therapy and medication for treatment of adolescent depression: a network meta-analysis

Latefa Ali Dardas[1]*, Hanzhang Xu[2], Michelle Scotton Franklin[2], Jewel Scott[3], Ashlee Vance[4], Brittney van de Water[5] and Wei Pan[2]

[1]The University of Jordan, Amman, Jordan, [2]Duke University, Durham, North Carolina, USA, [3]University of South Carolina, Columbia, SC, USA, [4]Henry Ford Health, Detroit, MI, USA and [5]Boston College, Connell School of Nursing, Chestnut Hill, MA, USA
*Corresponding author. Email: L.dardas@ju.edu.jo

(Received 1 November 2021; revised 8 November 2022; accepted 17 November 2022; first published online 12 January 2023)

Abstract

Background: Cognitive behavioural therapy (CBT) and medication are widely accepted and useful interventions for individuals with depression. However, a gap remains in our current understanding of how CBT directly benefits adolescents with depression.

Aims: The purpose of this study was to examine the short- and long-term effectiveness of CBT only, CBT+Medication, or Medication alone in reducing the duration of major depressive episodes, lessening internalizing and externalizing symptoms and improving global functioning.

Methods: Data were extracted from 14 unique studies with a total of 35 comparisons. Network meta-analysis was conducted and *p*-scores, a measure of the extent of certainty that one treatment is better than another, were used to rank treatments.

Results: There was no significant difference between any two treatments for depression, nor internalizing or externalizing symptoms. For global functioning, CBT had significantly greater effect at the longest follow-up than CBT+Medication. CBT+Medication had the highest *p*-score for depression, short- and long-term effects, and internalizing and externalizing symptoms long-term effects. No indication of publication bias was found.

Conclusions: Neither modality, CBT nor medication, is superior for treating adolescent depression. However, CBT was superior in improving global functioning, which is essential for meeting developmental goals.

Keywords: adolescent depression; cognitive behavioural therapy; network meta-analysis

Introduction

In 2020, an estimated 17% of the U.S. adolescent population had a major depressive episode, with females having a prevalence of 25.2% and adolescents with two or more races having a startling 29.9% prevalence (National Institute of Mental Health, 2022). The prevalence of adolescents diagnosed with a major depressive episode (MDE) has increased significantly from 2005 to 2011, estimating that 1 in 11 reported a MDE (Mojtabai *et al.*, 2016). Globally, adolescent depression has a high disease burden with 34% of adolescents globally at risk of developing clinical depression and females from the Middle East, Africa and Asia having the highest risk of developing depression (Shorey *et al.*, 2022). Adolescent depression has been associated with increased morbidity (GBD 2017 Risk Factor Collaborators, 2018), increased risk of suicide

(Maughan *et al.*, 2013), difficulty with school performance (Clayborne *et al.*, 2019), and poor social functioning (Kupferberg *et al.*, 2016). The high disease burden of depression for adolescents is substantial, adversely affecting families and close friends. Half of adolescents who experience a MDE are more likely to have a recurrent episode within five years (Curry *et al.*, 2011) and struggle with current or long-term employment (Clayborne *et al.*, 2019). Thus, providing effective and appropriate therapy for depressed adolescents (behavioural and medication or a combination) is critical.

Cognitive behavioural therapy (CBT) is a widely accepted and useful intervention for adolescents with depression (Das *et al.*, 2016) and is a recommended psychotherapy intervention for child and adolescent depression within the American Pschological Association (2019) and National Institute for Health and Care Excellence (2019) treatment guidelines. CBT has been used with varying effectiveness for adolescents as described in a 2007 meta-analysis (Klein *et al.*, 2007). CBT remains the best psychological intervention for depression compared with interpersonal psychotherapy, for example (Weisz *et al.*, 2017). Often CBT is combined with pharmacological intervention to improve treatment outcomes. However, with the increasing risk of suicide as a major side-effect of many medications (Cipriani *et al.*, 2016), psychological interventions such as CBT are typically first-line treatment. There are many variations with regard to CBT protocols based on contextual factors such as setting (e.g. school, medical clinic, health department), use of pharmacological therapy, precise population of adolescents (e.g. incarcerated youth, high school *vs* middle school) and it may or may not include the family. A recent meta-analysis found that individual and group CBT are effective for anxiety disorders among children and adolescents (Sigurvinsdóttir *et al.*, 2020). Another meta-analysis concluded that CBT is effective for youth with subclinical depression (Oud *et al.*, 2019). However, a gap remains in our current understanding of how CBT directly benefits adolescents with MDE, and whether combining CBT with pharmacological interventions improves treatment outcomes.

Therefore, the aim of this network meta-analysis is to synthesize new evidence in order to quantify the effectiveness of CBT interventions for adolescents with MDE, with the goal of head-to-head comparison and ranking treatment options with a particular focus on pharmacological interventions. This meta-analysis is innovative and differs from prior reviews given its clear focus on adolescents and direct and indirect examination of treatment effects using an advanced statistical modeling (e.g. network meta-analysis). Specifically, we set out to identify if various treatment options (e.g. CBT only, CBT+Medication, or Medication alone) from current clinical trials have the same short- and/or long-term effects on global functioning, and internalizing and externalizing symptoms in adolescents with MDE.

Method

Literature search and study selection

We first searched the Database of Abstracts of Reviews of Effects (DARE) and the Cochrane Database of Systematic Reviews (CDSR) to identify the presence of similar reviews. Then, the databases PubMed, CINAHL, PsycINFO, Scopus, Cochrane Central Register of Controlled Trials, ClinicalTrials.gov and ProQuest Dissertations were chosen as the primary data sources for this review. Similar to prior meta-analyses, we used an exhaustive approach (Cooper, 2010) for the literature search using a variety of databases with multiple variations of search terms related to CBT in adolescent depression. An academic health centre reference librarian helped build a combination of index and MeSH terms, which was used according to the requirements of each database (see Table S1 in Supplementary material). In addition, we performed several snowball searches based on related previous reviews (Sigurvinsdóttir *et al.*, 2020; Wang *et al.*, 2017). We also conducted ancestral searches in retrieved studies and consulted experts in the field for leads on relevant studies.

https://doi.org/10.1017/S1352465822000662 Published online by Cambridge University Press

To be eligible, the study needed to include (i) an RCT design; (ii) a sample of adolescents aged between 9 and 18 years; (iii) a CBT intervention for adolescents; (iv) a comparison group to be CBT+Medication, or Medication only, (v) feature keywords in the title and/or abstract of full-length publications; and (vi) published in English. No restrictions were applied on publication status or date. The last search was updated in July 2022.

We adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher *et al.*, 2009) to guide the process of identification, selection and appraisal of the included studies. Each included study was reviewed twice against the study inclusion criteria by two independent reviewers. We developed a structured matrix for abstracting selected studies and building a database including extensive details regarding each research record.

In total, 7043 studies were identified from all databases. Of these, 3605 duplicates were removed, 2982 studies were excluded after title/abstract screening, and 609 studies were removed after full text review due to not meeting inclusion criteria, leaving a total of 83 studies. With the study purpose of comparing: (a) CBT for adolescents (CBT-A) *vs* CBT-A+Medication, (b) CBT-A *vs* Medication, and (c) CBT-A+Medication *vs* Medication, we further excluded studies that included alternative therapy (n=55), attention control (n=17), usual care (n=30) and CBT+placebo (n=1) as the control group. We also excluded another 10 studies that focused on CBT for both adolescents and parents. In case of multiple studies that used the same dataset, we selected the primary study that included the most complete data with the longest follow-up and was usually published in a later year. For example, TADS 2007, not TADS 2004, was selected. Thus, we did not miss important information about long-term follow-up outcomes.

A total of 14 studies were included in the final analyses. Figure S1 in the Supplementary material shows the PRISMA diagram of sample size evolution. These records were also re-reviewed by two independent researchers to ensure they met study inclusion criteria. The final 14 unique studies (with 35 comparison trials) with their descriptive characteristics are presented in Table 1.

Variables and coding

The effect size analysed in this network meta-analysis was based on Cohen's d (Cohen, 1988) a standardized mean difference of the outcome between the treatment and comparison groups. Because the research designs in all the 14 included studies (Brent *et al.*, 2008; Byford *et al.*, 2007; Clarke *et al.*, 2005; Clarke *et al.*, 2016; Goodyer *et al.*, 2007; Hilton *et al.*, 2013; Jacobs *et al.*, 2010; Kennard *et al.*, 2008; Kim *et al.*, 2012; March *et al.*, 2007; Melvin *et al.*, 2006; Melvin *et al.*, 2017; Riggs *et al.*, 2007; Wilkinson and Goodyer, 2008) were pre-test–post-test–control group designs, we followed Morris's alternative approach to obtain an estimate of Cohen's d using the pooled pre-test standard deviation (Morris, 2008). The cognitive behavioural outcome measures in this network meta-analysis were depression, internalizing and externalizing symptoms (Internal & External), and global functioning (Global). Internalizing symptoms refer to problems of withdrawal, somatic complaints and anxiety, while externalizing symptoms exhibit themselves in delinquent and aggressive behaviour (Levesque, 2011). Global functioning refers to the level of general functioning for adolescents in all areas (at home, at school, and with peers) (Aas, 2011). The lower the outcome measure score, the better the cognitive behaviour. Thus, a negative value of d indicates a greater improvement of the cognitive behavioural outcome from pre-test to post-test in treatment group than that in comparison group. For calculating the effect size, the quantitative information about means and standard deviations was extracted from tables and figures of descriptive statistics reported in the included studies. In case of figures the quantitative information was digitized using the WebPlotDigitizer, version 3.9 (Rohatgi, 2015).

https://doi.org/10.1017/S1352465822000662 Published online by Cambridge University Press

Table 1. A summary of characteristics of the 14 studies and their participants

Study	Number of participants (total *n*=2216)	Mean age	% of females	% of minority	% of suicide attempts	Intervention length + longest follow-up (months)	Number of treatment sessions	Session length (min)
Brent *et al.* (2008)	334	15.90	69.8%	17.1%		3 + 0	12	75
Byford *et al.* (2007)	188	14.00	72.3%			7 + 0	19	55
Clarke *et al.* (2005)	152	15.30	77.6%	13.9%	73.7%	3 + 12	5	60
Clarke *et al.* (2016)	208	14.60	68.4%		24.5%	3 + 23	12	50
Goodyer *et al.* (2007)	208	14.00	74.0%			3 + 4	19	55
Hilton *et al.* (2013)	334	15.90	69.8%	17.1%		3 + 3	12	75
Jacobs *et al.* (2010)	220	14.60	54.0%	26.0%	28.1%	3 + 0	15	60
Kennard *et al.* (2008)	46	14.30	47.8%	26.1%		6 + 0	10	60
Kim *et al.* (2012)	65	15.48	0%	100%		2 + 1	8	105
Melvin *et al.* (2006)	51	15.30	65.8%		11.1%	6 + 3	12	50
Melvin *et al.* (2017)	41	13.60	45.2%	6.5%	0.02%	2.5 + 12	15	55
Riggs *et al.* (2007)	126	17.16	32.6%	51.6%	39.0%	4 + 0	16	60
TADS (2007)	220	14.60	55.0%	26.0%	28.1%	3 + 6	15	60
Wilkinson and Goodyer (2008)	23	15.00	70.5%			7 + 0	12	55
Mean	*158*	*14.98*	*57.3%*	*31.6%*	*29.2%*	*3.96 + 8.00*	*13.00*	*62.50*

Besides the quantitative information for calculating the effect size, we coded several variables related to characteristics of the trials (e.g. year, authors, location), samples (e.g. age, gender, ethnicity, diagnosis), and methods (e.g. design, setting, measures, comparisons, treatment characteristics). Variables were initially coded by two independent reviewers. The coded variables were then cross-reviewed by two independent reviewers to identify and resolve any conflicts. The study team made several review rounds on the final coded sheet and ensured all studies were coded using the same standards. For example, while initial codes included several measures, researchers aggregated them into three major categories (depression, internalizing and externalizing symptoms, and global functioning).

Data analysis

All the extracted data were entered onto a Microsoft Office Excel spreadsheet for analysis in R. The variance of the effect size was estimated using Morris's formula (2008) as follows:

$$\sigma^2(d) = 2\left(c_p^2\right)(1-\rho)\left(\frac{n_T+n_C}{n_T n_C}\right)\left(\frac{n_T+n_C-2}{n_T+n_C-4}\right)\left(1+\frac{d^2}{2(1-\rho)\left(\frac{n_T+n_C}{n_T n_C}\right)}\right)-d^2$$

https://doi.org/10.1017/S1352465822000662 Published online by Cambridge University Press

where ρ is the population correlation between the pre-test and post-test scores. The value of ρ is usually unavailable in the studies, so it was set as 0.45 as suggested by Morris (2008).

Network meta-analyses were conducted for head-to-head comparisons among three treatment comparators: CBT, Medication, and CBT+Medication. Their effects on three outcome measures: Depression, Internal & External, and Global, were presented in forest plots and tested using fixed-effects models or random-effects models if there was a substantial amount of heterogeneity among effect sizes across the studies tested by Higgins' I^2 (Higgins and Thompson, 2002; Higgins *et al.*, 2003). According to Borenstein *et al.* (2009), I^2 =0–40% may suggest low, 30–60% moderate, 50–90% substantial, and 75–100% considerable heterogeneity. In addition to forest plots of head-to-head comparisons among treatment effects, the treatment ranking *p*-scores were also estimated for measuring the probability that a treatment is better than the competing treatments (Rücker and Schwarzer, 2015). A treatment with a *p*-score of 1 is ranked as the best treatment among all the competing treatments, and 0 ranked the worst. All the network meta-analyses within a frequentist framework were conducted using an R package, *netmeta* (Rücker *et al.*, 2019).

To quantify the overall heterogeneity and inconsistency across the whole network, the DerSimonian–Laird's τ^2 (1986), Higgins' I^2 (2002), and Cochran's Q_{total} (1950) were calculated. The Q_{total} can be further decomposed into $Q_{\text{within designs}}$ for assessing the heterogeneity between studies with the same design (i.e. the subset of treatments compared in a study) and $Q_{\text{between designs}}$ for assessing the design inconsistency. According to Borenstein *et al.* (2009), τ^2=0.04 indicates low, 0.09 moderate, and 0.16 high heterogeneity; while I^2=0–40% may suggest low, 30–60% moderate, 50–90% substantial, and 75–100% considerable heterogeneity. A statistically significant Q_{total}, $Q_{\text{within designs}}$ or $Q_{\text{between designs}}$ at the α=0.05 level was also used to indicate heterogeneity and inconsistency. In addition to forest plots of head-to-head comparisons between treatment effects estimated from network meta-analysis, the treatment ranking *p*-scores (Rücker and Schwarzer, 2015) were also estimated for measuring the probability that a treatment is better than the competing treatments. A treatment with a *p*-score of 1 is ranked as the best treatment and 0 is ranked as the worst, and the mean is always 0.5.

Publication bias

The publication bias was tested using funnel plots (Light and Pillemer, 1984). A symmetric funnel plot with a non-significant Egger test (Egger *et al.*, 1997) suggests no publication bias among the included studies.

Results

The 14 studies with 35 comparison trials involving 2216 unique participants were included in the network meta-analysis. Table 1 shows a summary of the characteristics of the 14 studies and their participants. The mean age of participants in the 14 studies was 15 and 53% of the participants were female. Six studies were non-U.S.-based, and most samples were recruited from clinical settings (93%). Racial and ethnic backgrounds of study samples were not provided in 36% of the studies, and in the remaining nine studies, five included a sample with 25% or greater racial and ethnic minorities. Suicidality was addressed in half of the studies.

Table 2 displays the effect size of each outcome for the 35 trials within the 14 studies. Three pairs of network meta-analyses were conducted, one for each of the three outcomes: Depression, Internal & External, and Global. For each outcome, its short-term effect d_0 (i.e. immediate effect at the end of intervention) and long-term effect d_1 (i.e. lasting effect at the longest follow-up) were analysed separately.

https://doi.org/10.1017/S1352465822000662 Published online by Cambridge University Press

Table 2. The effect sizes of each outcome for the 35 trials within the 14 studies

Study	Comparison trial	Outcome	d_0[a]	d_1[b]
Brent *et al.* (2008)	CBT+Medication vs Medication	Depression	−0.12	
		Internal & External	0.04	
Byford *et al.* (2007)	CBT+Medication vs Medication	Global	0.31	
		Internal & External	0.04	
Clarke *et al.* (2005)	CBT+Medication vs Medication	Depression	0.02	−0.34
		Global	0.07	0.33
		Internal & External	−0.09	−0.16
Clarke *et al.* (2016)	CBT+Medication vs Medication	Internal & External	−0.03	0.13
Goodyer *et al.* (2007)	CBT+Medication vs Medication	Depression	0.21	0.28
		Global	−0.04	−0.04
Hilton *et al.* (2013)	CBT+Medication vs Medication	Internal & External	0.04	0.04
Jacobs *et al.* (2010)	CBT vs Medication	Global	0.32	
	CBT+Medication vs Medication	Global	−0.11	
	CBT vs CBT+Medication	Global	0.43	
Kennard *et al.* (2008)	CBT+Medication vs Medication	Depression	−1.12	
Kim *et al.* (2012)	CBT+Medication vs Medication	Depression	−0.70	−0.68
		Global	−0.51	−0.60
		Internal & External	−0.52	−0.49
Melvin *et al.* (2006)	CBT vs Medication	Depression	−0.46	−0.46
		Global	−0.21	−0.71
		Internal & External	−0.04	0.09
	CBT+Medication vs Medication	Depression	−0.02	−0.21
		Global	0.00	−0.26
		Internal & External	−0.01	0.12
	CBT vs CBT+Medication	Depression	−0.44	−0.25
		Global	−0.21	−0.45
		Internal & External	−0.03	−0.03
Melvin *et al.* (2017)	CBT vs CBT+Medication	Depression	0.26	0.45
		Global	−0.15	−1.43
		Internal & External	−0.19	0.19
Riggs *et al.* (2007)	CBT vs CBT+Medication	Depression	0.43	
TADS (2007)	CBT vs Medication	Depression	0.56	−0.05
	CBT+Medication vs Medication	Depression	−0.66	−0.53
	CBT vs CBT+Medication	Depression	1.22	0.48
Wilkinson and Goodyer (2008)	CBT+Medication vs Medication	Depression	−0.72	
Mean			*−0.07*	*−0.18*

[a]d_0, short-term effect size at the end of intervention; [b]d_1, long-term effect size at the longest follow-up.

Depression

There were 14 comparison trials within 10 studies (Brent *et al.*, 2008; Clarke *et al.*, 2005; Goodyer *et al.*, 2007; Kennard *et al.*, 2008; Kim *et al.*, 2012; March *et al.*, 2007; Melvin *et al.*, 2006; Melvin *et al.*, 2017; Riggs *et al.*, 2007; Wilkinson and Goodyer, 2008) regarding treatment effect on depression. Ten of the 14 trials also had long-term follow-up ranging from 1 to 12 months. Supplementary Figure S2 displays two networks of direct comparison trials – one for short-term effect the other for long-term effect.

Short-term effect

Figure 1A displays the forest plot of the short-term effects of treatments on depression. The estimated treatment effects were based on a random-effects model because there was substantial overall heterogeneity among the effect sizes across the 14 studies (τ^2=0.18; I^2=81.9%; Q_{total}=55.10, d.f.=10, p<.001). There was also significant heterogeneity within designs ($Q_{within\ designs}$=46.03, d.f.=8, p<.001) and inconsistency between designs ($Q_{between\ designs}$=9.07, d.f.=2, p=.01). The forest plot shows that there was no significant difference between any two treatments because all the 95%CIs covered zero although the treatment ranking p-scores

https://doi.org/10.1017/S1352465822000662 Published online by Cambridge University Press

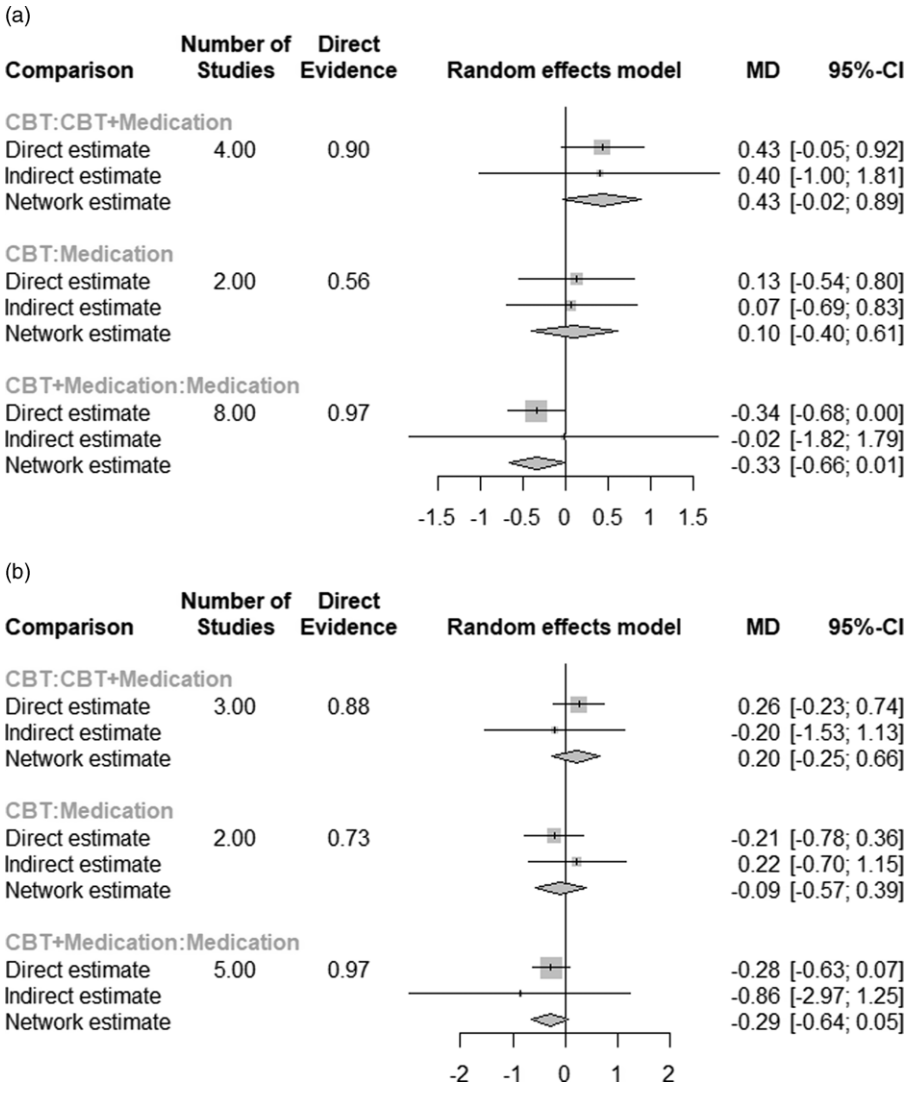

Figure 1. Forest plots of treatment effects on depression. MD, standardized mean difference (*d*). A, short-term effect (end of intervention); B, long-term effect (longest follow-up).

indicated that CBT+Medication had the highest *p*-score (0.97) followed by Medication (0.34) and CBT (0.18). From the symmetrical funnel plot with a non-significant Egger test (p=.56) (Supplementary material Fig. S3a), we found no indication of publication bias among the 14 short-term trials on depression.

Long-term effect

Figure 1B displays the forest plot of the long-term effects of treatments on depression. The estimated treatment effects were based on a random-effects model because there were substantial overall heterogeneity among the effect sizes across the 10 studies (τ^2=0.12; I^2=73.6%; Q_{total}=22.77, d.f.=6, p<.001). There was also significant heterogeneity within designs ($Q_{within\ designs}$=17.77, d.f.=4, p<.001) and marginal inconsistency between designs

https://doi.org/10.1017/S1352465822000662 Published online by Cambridge University Press

($Q_{\text{between designs}}$=4.99, d.f.=2, p=.08). The forest plot shows that there is no significant difference between any two treatments because all the 95% CIs covered zero although the treatment ranking p-scores indicated that CBT+Medication had the highest p-score (0.88) followed by CBT (0.42) and then Medication only (0.20). From the symmetrical funnel plot with a non-significant Egger test (p=.69) (Supplementary Fig. S3b), we found no indication of publication bias among the 10 long-term trials on depression.

Internalizing and externalizing symptoms

There were 10 comparison trials within eight studies (Brent *et al.*, 2008; Byford *et al.*, 2007; Clarke *et al.*, 2005; Clarke *et al.*, 2016; Hilton *et al.*, 2013; Kim *et al.*, 2012; Melvin *et al.*, 2006; Melvin *et al.*, 2017) about treatment effect on internalizing and externalizing symptoms. Eight of the 10 trials also had long-term follow-up ranging from 1 to 23 months. Supplementary Fig. S4 displays two networks of direct comparison trials. One network is for short-term effect at the end of intervention and the other network is for long-term effect at the longest follow-up.

Short-term effect

Figure 2A displays the forest plot of the short-term effects of treatments on internalizing and externalizing symptoms. The estimated treatment effects were based on a fixed-effects model because there was no overall heterogeneity among the effect sizes across the 10 studies (τ^2=0; I^2=0%; Q_{total}=4.47, d.f.=7, p=.72). There was also no heterogeneity within designs ($Q_{\text{within designs}}$=4.33, d.f.=5, p=.50) or inconsistency between designs ($Q_{\text{between designs}}$=0.14, d.f.=2, p=.93). The forest plot shows that there was no significant difference between any two treatments because all the 95% CIs covered zero. Although the treatment ranking p-scores indicated that CBT had a slightly higher p-score (0.68) than CBT+Medication (0.45) and Medication only (0.37), they all cluster around the p-score mean of 0.5 suggesting similar efficacy (Rücker and Schwarzer, 2015). From the symmetrical funnel plot with a non-significant Egger test (p=.18) (Supplementary Fig. S5a), we found no indication of publication bias among the 10 short-term trials on internalizing and externalizing symptoms.

Long-term effect

Figure 2B displays the forest plot of the long-term effects of treatments on internalizing and externalizing symptoms. The estimated treatment effects were based on a fixed-effects model because there was no overall heterogeneity among the effect sizes across the eight studies (τ^2=0.002; I^2=6.4%; Q_{total}=5.34, d.f.=5, p=.38). There was also no heterogeneity within designs ($Q_{\text{within designs}}$=5.01, d.f.=3, p=.17) or inconsistency between designs ($Q_{\text{between designs}}$=0.34, d.f.=2, p=.85). The forest plot shows that there was no significant difference between any two treatments because all the 95% CIs covered zero, and the treatment ranking p-scores close to the mean of 0.5 also indicated similar efficacy: CBT+Medication (0.62), Medication (0.54), and CBT (0.34). From the symmetrical funnel plot (Supplementary Fig. S5b), we found no indication of publication bias among the eight long-term trials on internalizing and externalizing symptoms. The Egger test was unavailable due to the insufficient number of trials.

Global functioning

There were 11 comparison trials within seven studies (Byford *et al.*, 2007; Clarke *et al.*, 2005; Goodyer *et al.*, 2007; Jacobs *et al.*, 2010; Kim *et al.*, 2012; Melvin *et al.*, 2006; Melvin *et al.*, 2017) about treatment effect on global functioning. Seven of the 11 trials also had long-term follow-up ranging from 1 to 12 months. Supplementary Fig. S6 displays two networks of

https://doi.org/10.1017/S1352465822000662 Published online by Cambridge University Press

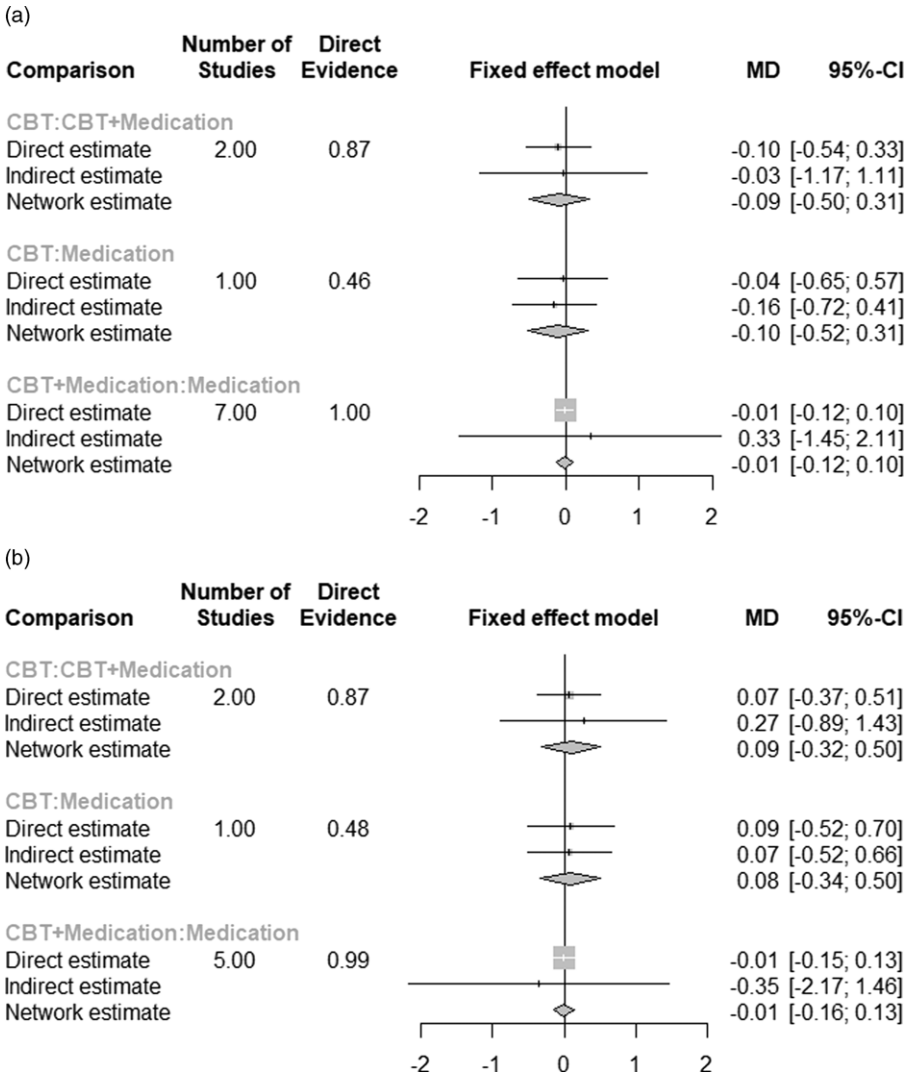

Figure 2. Forest plots of treatment effects on internalizing and externalizing symptoms. MD, standardized mean difference (*d*). A, short-term effect (end of intervention); B, long-term effect (longest follow-up).

direct comparison trials. One network is for short-term effect at the end of intervention and the other network is for long-term effect at the longest follow-up.

Short-term effect

Figure 3A displays the forest plot of the short-term effects of treatments on global functioning. The estimated treatment effects were based on a random-effects model because there was moderate overall heterogeneity among the effect sizes across the 11 studies (τ^2=0.04, I^2= 50.5%; Q_{total}=14.13, d.f.=7, p=.05). There was also heterogeneity within designs ($Q_{within\ designs}$=11.85, d.f.=5, p=.04) although no inconsistency between designs ($Q_{between\ designs}$=2.28, d.f.=2, p=.32). The forest plot shows that there was no significant difference between any two treatments because all the 95% CIs covered zero although the treatment ranking p-scores indicated that CBT+Medication (0.65) and Medication (0.65) had higher p-scores than CBT

https://doi.org/10.1017/S1352465822000662 Published online by Cambridge University Press

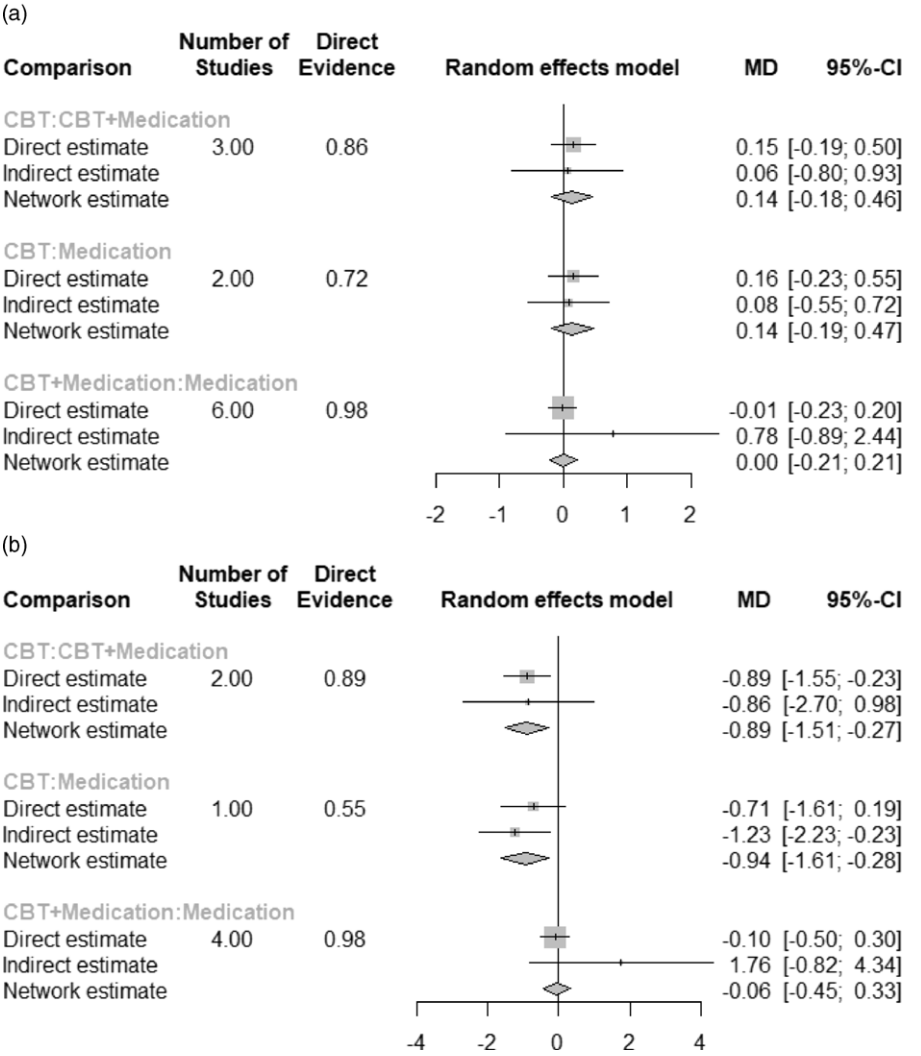

Figure 3. Forest plots of treatment effects on global functioning. MD, standardized mean difference (*d*). A, short-term effect (end of intervention); B, long-term effect (longest follow-up).

(0.20). From the symmetrical funnel plot with a non-significant Egger test (p=.91) (Supplementary Fig. S7a), we found no indication of publication bias among the 11 short-term trials on global functioning.

Long-term effect

Figure 3B displays the forest plot of the long-term effects of treatments on global functioning. The estimated treatment effects were based on a random-effects model because there was moderate overall heterogeneity among the effect sizes across the seven studies (τ^2=0.11; I^2=69.4%; Q_{total}=13.08, d.f.=4, p=.01). There was also heterogeneity within designs ($Q_{within\ designs}$=8.76, d.f.=2, p=.01) although no inconsistency between designs ($Q_{between\ designs}$=4.33, d.f.=2, p=.11). The forest plot shows that CBT had a significantly more long-term effect on global functioning than both CBT+Medication (d=–0.89, 95% CI=[–1.51, –0.27]) and Medication

https://doi.org/10.1017/S1352465822000662 Published online by Cambridge University Press

(*d*=–0.94, 95% CI=[–1.61, –0.28]) although there was no significant difference between CBT+Medication and Medication (*d*=–0.06, 95% CI=[–0.45, 0.33]). Such findings echoed the treatment ranking *p*-scores which indicated that CBT (1.00) had a much higher *p*-score than CBT+Medication (0.31) and Medication only (0.19). From the symmetrical funnel plot (Supplementary Fig. S7b), we found no indication of publication bias among the seven trials on global functioning. The Egger test was unavailable due to the insufficient number of trials.

Discussion

The prevalence of adolescent depression is rising (Mojtabai *et al.*, 2016) and its impact on adolescents' school performance, social functioning, suicide risk, as well as adulthood psychosocial and health outcomes (Clayborne *et al.*, 2019; Keenan-Miller *et al.*, 2007) are far reaching. Therefore, we conducted this systematic review and meta-analysis to evaluate and compare the effectiveness of CBT only, CBT+Medication, or Medication only in reducing duration and frequency of MDE in the adolescent population. This meta-analysis indicates there is no significant difference between any two treatments (CBT only, CBT+Medication, or Medication) for MDE, internalizing and externalizing symptoms in the short- or long-term effects. It is noteworthy that the CBT+Medication *p*-score (measure of certainty that one treatment is better than the other) for depression short-term effects and long-term effects was 50% larger than the *p*-scores for CBT or Medication alone. For global functioning, CBT had significantly longer lasting effect at the longest follow-up than CBT+Medication or Medication alone. These findings suggest the importance of CBT in improving global functioning but raises questions about the role of CBT over medication for treating adolescent depression, internalizing, and externalizing symptoms.

Overall, the results were clear. There were no difference in effectiveness of the three comparators for improving internalizing and externalizing symptoms, both in the short and long term. The absence of heterogeneity in effect sizes and quite similar *p*-scores further strengthens this observation that CBT alone, medication alone, or combination therapy all have similar effectiveness for internalizing and externalizing symptoms. However, there is more uncertainty in the results for MDE, with considerable heterogeneity in effects sizes and substantial differences in the *p*-scores for combination therapy (CBT+Medication) *vs* either alone. The uncertainty in our findings is consistent with the literature which shows that response rate for depression in youths treated with psychotherapy is 39% compared with 24% for control groups (Cuijpers *et al.*, 2021), indicating a relatively low response rate. Pharmacological treatment of depression in adolescents is also challenging. A recent meta-analysis examined comparative efficacy of anti-depressants in youth and found that most were not significantly better than placebo (Cipriani *et al.*, 2016), which could re-ignite conversation about the most appropriate first-line treatment for adolescent depression. Our findings suggest that there is room for both modalities in the treatment of adolescent depression, and a need for other therapeutic techniques. Also, a focus on longer term outcomes, such as functioning, may be an important consideration for measuring treatment outcomes.

The results indicate that CBT may not be better in the short term, but there are long-term benefits of CBT over medication for overall functioning. This is somewhat consistent with what could be expected, as CBT focuses on teaching techniques to challenge cognitive distortions (e.g. catastrophizing) and enhance behavioural adaptation (e.g. identifying and coping with difficult emotions) that the adolescent can use in the present and carry forward into the future. As a result, after depressive symptoms, measures of global functioning are the most frequently measured in clinical trials because of their importance in predicting future outcomes. In addition, the growing focus on patient-centred research indicates a need for more attention to general wellbeing outcomes beyond the disease pathology (Krause *et al.*,

https://doi.org/10.1017/S1352465822000662 Published online by Cambridge University Press

2019). Data from 80 youth seeking care in the UK National Health Service identified that the types of goals that young people set when in therapy are often related to functioning such as being able to attend social events and to improve school performance (Bradley *et al.*, 2013). In addition, improving global functioning in adolescents with depression has meaningful implications for meeting future developmental milestones (e.g. establishing career and independent living) and possibly future quality of life (Peters *et al.*, 2016). Follow-up with 196 adolescents in the TADS study (March *et al.*, 2007), found that randomization to any of the three clinical arms (CBT, CBT+Medication, or Medication alone) was associated with improved functioning and success with developmental targets four years later (Peters *et al.*, 2016). However, most meta-analytic work has necessarily focused on symptom improvement and not functioning. Our findings add insight into the benefits of CBT for both the short and longer term, and the broader, whole-person perspective.

The long-term effects of CBT for global functioning suggest that pediatric healthcare providers should establish strong connections with youth-focused psychotherapy services in their area, and consider collaborative models of care that integrate psychotherapy into the primary care setting. Telehealth services could be advantageous for reaching communities with reduced access to traditional mental health services, but research is needed to identify potential barriers (e.g. internet access, mistrust, establishing a therapeutic relationship). Additionally, evidence on models of care that will bring services to adolescents such as mental health models in school are needed. While CBT is the most studied psychotherapy modality, other therapies focused on interpersonal therapy and behavioural activation are promising. CBT that includes components of behavioural activation is associated with better outcomes than CBT alone (Oud *et al.*, 2019) and behavioural activation interventions are more economical to deliver than CBT (Richards *et al.*, 2016). Future research could explore innovative delivery models such as telehealth which may increase access to psychotherapy, and the delivery of behavioural activation interventions using community health workers. Lastly, there remains a need to determine the effectiveness of other psychotherapies compared with medication and combination therapy.

Limitations

Several limitations of this study should be noted. First, we recognize that family-based CBT (parent and adolescent) may be meaningfully different from CBT focused only on adolescents. We originally included evaluation of this additional approach as a study aim. However, due to the lack of needed comparisons to run the analysis, we decided to exclude the studies that focused on CBT for both adolescents and parents. There is a need for future research to examine the benefits and differences in outcomes based on a family-based CBT approach. Similarly, we did not compare other psychotherapies such as interpersonal therapy or behavioural activation. As CBT has the largest literature base, we made the decision to focus on this modality. Second, a lack of recent publications on this topic makes it difficult to assess if depression experiences may differ for the contemporary cohort of adolescents. Third, we were unable to further examine the important contextual factor of suicidality due to the lack of consistent reporting. Incomplete reporting on suicidality could reflect that the publications analysed within this study had a lower burden of symptoms. Fourth, due to the scope of this review study, we needed to exclude some studies with other control treatments (e.g. attention control, usual care, placebo, etc.). This could introduce potential selection bias and might limit the interpretation of our findings. Lastly, there were substantial heterogeneity and inconsistency in studies on depression and global functioning; thus, further investigation is warranted to explain this. One such further investigation would be meta-regression in multivariate meta-analysis with a larger number of studies.

https://doi.org/10.1017/S1352465822000662 Published online by Cambridge University Press

Conclusions

Adolescent depression is on the rise and innovative efficacious treatment models are critically needed. Our findings emphasize the important role of CBT for improving global functioning, but we did not find CBT to be superior to medication for MDE and other outcomes. Improving the overall functioning of adolescents with depression supports their ability to meet future developmental milestones. More research is needed to develop or refine other psychotherapeutic techniques for adolescents. Ideally, newer treatment modalities would translate to community and clinical settings easily to support equitable access for all adolescents with depression.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/S1352465822000662

Data availability statement. The data that support the findings of this study are available from the corresponding author (L.D.) upon reasonable request.

Acknowledgements. None.

Author contributions. **Latefa Dardas:** Conceptualization (lead), Data curation (equal), Formal analysis (equal), Methodology (equal); **Hanzhang Xu:** Conceptualization (supporting), Formal analysis (equal), Methodology (equal); **Michelle Franklin:** Conceptualization (supporting), Data curation (equal), Formal analysis (supporting), Methodology (equal); **Jewel Scott:** Conceptualization (equal), Data curation (equal), Formal analysis (supporting), Methodology (equal); **Ashlee Vance:** Conceptualization (supporting), Data curation (equal), Methodology (equal); **Brittney van de Water:** Conceptualization (equal), Data curation (equal), Formal analysis (supporting), Methodology (equal); **Wei Pan:** Conceptualization (equal), Formal analysis (lead), Investigation (equal), Methodology (equal).

Dr Dardas and Dr Pan conceptualized and designed the study, carried out the analyses, and reviewed and revised the manuscript. Dr Xu collected data, carried out the initial analysis, and reviewed and revised the manuscript. Dr Franklin and Dr Scott collected data, drafted the initial manuscript, and reviewed and revised the manuscript. Dr Vance and Dr van de Water collected data and reviewed and revised the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Financial support. None.

Conflicts of interest. The authors have no conflicts of interest to disclose.

Ethical standards. Authors have abided by the Ethical Principles of Psychologists and Code of Conduct as set out by the BABCP and BPS. An IRB review and exemption was obtained from the University of Jordan School of Nursing.

References

Aas, I. H. M. (2011). Guidelines for rating Global Assessment of Functioning (GAF). *Annals of General Psychiatry*, *10*, 2. doi: 10.1186/1744-859X-10-2

American Pschological Association (2019). Available at: https://www.apa.org/depression-guideline/children-and-adolescents (accessed 4 October 2022).

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to Meta-Analysis*. West Sussex, UK: John Wiley & Sons.

Bradley, J., Murphy, S., Fugard, A. J., Nolas, S. M., & Law, D. (2013). What kind of goals do children and young people set for themselves in therapy? Developing a goals framework using CORC data. *Child and Family Clinical Psychology Review*, *1*, 8–18. https://www.corc.uk.net/media/1905/bradley.pdf

Brent, D., Emslie, G., Clarke, G., Wagner, K. D., Asarnow, J. R., Keller, M., ... & Zelazny, J. (2008). Switching to another SSRI or to venlafaxine with or without cognitive behavioral therapy for adolescents with SSRI-resistant depression: the TORDIA randomized controlled trial. *JAMA*, *299*, 901–913. doi: 10.1001/jama.299.8.901

Byford, S., Barrett, B., Roberts, C., Wilkinson, P., Dubicka, B., Kelvin, R. G., ... & Goodyer, I. (2007). Cost-effectiveness of selective serotonin reuptake inhibitors and routine specialist care with and without cognitive behavioural therapy in adolescents with major depression. *British Journal of Psychiatry*, *191*, 521–527. doi: 10.1192/bjp.bp.107.038984

Cipriani, A., Zhou, X., Del Giovane, C., Hetrick, S. E., Qin, B., Whittington, C., ... & Xie, P. (2016). Comparative efficacy and tolerability of antidepressants for major depressive disorder in children and adolescents: a network meta-analysis. *The Lancet*, *388*, 881–890. doi: 10.1016/S0140-6736(16)30385-3

Clarke, G., Debar, L., Lynch, F., Powell, J., Gale, J., O'Connor, E., ... & Hertert, S. (2005). A randomized effectiveness trial of brief cognitive-behavioral therapy for depressed adolescents receiving antidepressant medication. *Journal of the American Academy of Child and Adolescent Psychiatry*, *44*, 888–898.

Clarke, G., DeBar, L. L., Pearson, J. A., Dickerson, J. F., Lynch, F. L., Gullion, C. M., & Leo, M. C. (2016). Cognitive behavioral therapy in primary care for youth declining antidepressants: a randomized trial. *Pediatrics*, *137*. doi: 10.1542/peds.2015-1851

Clayborne, Z. M., Varin, M., & Colman, I. (2019). Systematic review and meta-analysis: adolescent depression and long-term psychosocial outcomes. *Journal of the American Academy of Child and Adolescent Psychiatry*, *58*, 72–79. doi: 10.1016/j.jaac.2018.07.896

Cochran, W. G. (1950). The comparison of percentages in matched samples. *Biometrika*, *37*, 256–266. doi: 10.1093/biomet/37.3-4.256

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd edn). Hillsade, NJ: Lawrence Erlbaum Associates.

Cooper, H. M. (2010). *Research Synthesis and Meta-Analysis: A Step-by-Step Approach* (4th edn, vol. *2*). Sage.

Cuijpers, P., Karyotaki, E., Ciharova, M., Miguel, C., Noma, H., Stikkelbroek, Y., ... & Furukawa, T. A. (2021). The effects of psychological treatments of depression in children and adolescents on response, reliable change, and deterioration: a systematic review and meta-analysis. *European Child & Adolescent Psychiatry*, 1–16.

Curry, J., Silva, S., Rohde, P., Ginsburg, G., Kratochvil, C., Simons, A., ... & March, J. (2011). Recovery and recurrence following treatment for adolescent major depression. *JAMA Psychiatry*, *68*, 263–269. doi: 10.1001/archgenpsychiatry.2010.150

Das, J. K., Salam, R. A., Lassi, Z. S., Khan, M. N., Mahmood, W., Patel, V., & Bhutta, Z. A. (2016). Interventions for adolescent mental health: an overview of systematic reviews. *Journal of Adolescent Health*, *59*, S49–S60. doi: 10.1016/j.jadohealth.2016.06.020

DerSimonian, R., & Laird, N. (1986). Meta-analysis in clinical trials. *Controlled Clinical Trials*, *7*, 177–188. doi: 10.1016/0197-2456(86)90046-2

Egger, M., Smith, G. D., Schneider, M., & Minder, C. (1997). Bias in meta-analysis detected by a simple, graphical test. *BMJ*, *315*, 629–634. doi: 10.1136/bmj.315.7109.629

GBD 2017 Risk Factor Collaborators (2018). Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet*, *392*, 1923–1994. doi: 10.1016/S0140-6736(18)32225-6

Goodyer, I., Dubicka, B., Wilkinson, P., Kelvin, R., Roberts, C., Byford, S., ... & Harrington, R. (2007). Selective serotonin reuptake inhibitors (SSRIs) and routine specialist care with and without cognitive behaviour therapy in adolescents with major depression: randomised controlled trial. *BMJ*, *335*, 142. doi: 10.1136/bmj.39224.494340.55

Higgins, J. P., & Thompson, S. G. (2002). Quantifying heterogeneity in a meta-analysis. *Stat Med*, *21*, 1539–1558. doi: 10.1002/sim.1186

Higgins, J. P., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. *BMJ*, *327*, 557–560. doi: 10.1136/bmj.327.7414.557

Hilton, R. C., Rengasamy, M., Mansoor, B., He, J., Mayes, T., Emslie, G. J., ... & Brent, D. A. (2013). Impact of treatments for depression on comorbid anxiety, attentional, and behavioral symptoms in adolescents with selective serotonin reuptake inhibitor-resistant depression. *Journal of the American Academy of Child and Adolescent Psychiatry*, *52*, 482–492. doi: 10.1016/j.jaac.2013.02.013

Jacobs, R. H., Becker-Weidman, E. G., Reinecke, M. A., Jordan, N., Silva, S. G., Rohde, P., & March, J. S. (2010). Treating depression and oppositional behavior in adolescents. *Journal of Clinical Child and Adolescent Psychology*, *39*, 559–567. doi: 10.1080/15374416.2010.486318

Keenan-Miller, D., Hammen, C. L., & Brennan, P. A. (2007). Health outcomes related to early adolescent depression. *Journal of Adolescent Health*, *41*, 256–262. doi: 10.1016/j.jadohealth.2007.03.015

Kennard, B. D., Emslie, G. J., Mayes, T. L., Nightingale-Teresi, J., Nakonezny, P. A., Hughes, J. L., ... & Jarrett, R. B. (2008). Cognitive-behavioral therapy to prevent relapse in pediatric responders to pharmacotherapy for major depressive disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, *47*, 1395–1404. doi: 10.1097/CHI.0b013e31818914a1

Kim, S. M., Han, D. H., Lee, Y. S., & Renshaw, P. F. (2012). Combined cognitive behavioral therapy and bupropion for the treatment of problematic on-line game play in adolescents with major depressive disorder. *Computers in Human Behavior*, *28*, 1954–1959. doi: 10.1016/j.chb.2012.05.015

Klein, J. B., Jacobs, R. H., & Reinecke, M. A. (2007). Cognitive-behavioral therapy for adolescent depression: a meta-analytic investigation of changes in effect-size estimates. *Journal of the American Academy of Child and Adolescent Psychiatry*, *46*, 1403–1413. doi: 10.1097/chi.0b013e3180592aaa

Krause, K. R., Bear, H. A., Edbrooke-Childs, J., & Wolpert, M. (2019). What outcomes count? Outcomes measured for adolescent depression between 2007 and 2017. *Journal of the American Academy of Child & Adolescent Psychiatry*, *58*, 61–71. https://doi.org/10.1016/j.jaac.2018.07.893

Kupferberg, A., Bicks, L., & Hasler, G. (2016). Social functioning in major depressive disorder. *Neuroscience & Biobehavioral Reviews*, *69*, 313–332. doi: 10.1016/j.neubiorev.2016.07.002

Levesque, R. J. R. (2011). Externalizing and internalizing symptoms. In R. J. R. Levesque (ed), *Encyclopedia of Adolescence* (pp. 903–905). New York, USA: Springer.

Light, R. J., & Pillemer, D. B. (1984). *Summing Up: The Science of Reviewing Research*. Cambridge, MA, USA: Harvard University Press.

March, J. S., Silva, S., Petrycki, S., Curry, J., Wells, K., Fairbank, J., … **& Severe, J.** (2007). The Treatment for Adolescents With Depression Study (TADS): long-term effectiveness and safety outcomes. *Archives of General Psychiatry*, *64*, 1132–1143. doi: 10.1001/archpsyc.64.10.1132

Maughan, B., Collishaw, S., & Stringaris, A. (2013). Depression in childhood and adolescence. *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, *22*, 35–40.

Melvin, G. A., Dudley, A. L., Gordon, M. S., Klimkeit, E., Gullone, E., Taffe, J., & Tonge, B. J. (2017). Augmenting cognitive behavior therapy for school refusal with fluoxetine: a randomized controlled trial. *Child Psychiatry Human Development*, *48*, 485–497. doi: 10.1007/s10578-016-0675-y

Melvin, G. A., Tonge, B. J., King, N. J., Heyne, D., Gordon, M. S., & Klimkeit, E. (2006). A comparison of cognitive-behavioral therapy, sertraline, and their combination for adolescent depression. *Journal of the American Academy of Child and Adolescent Psychiatry*, *45*, 1151–1161. doi: 10.1097/01.chi.0000233157.21925.71

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Medicine*, *6*, e1000097. doi: 10.1371/journal.pmed.1000097

Mojtabai, R., Olfson, M., & Han, B. (2016). National trends in the prevalence and treatment of depression in adolescents and young adults. *Pediatrics*, *138*, e20161878. doi: 10.1542/peds.2016-1878

Morris, S. B. (2008). Estimating effect sizes from pretest-posttest-control group designs. *Organizational Research Methods*, *11*, 364–386. doi: 10.1177/1094428106291059

National Institute for Health and Care Excellence (2019). Treatment guidelines, https://www.nice.org.uk/ (accessed 4 October 2022).

National Institute of Mental Health (2022). https://www.nimh.nih.gov/health/statistics/major-depression (accessed 4 October 2022).

Oud, M., de Winter, L., Vermeulen-Smit, E., Bodden, D., Nauta, M., Stone, L., … **& Stikkelbroek, Y.** (2019). Effectiveness of CBT for children and adolescents with depression: a systematic review and meta-regression analysis. *European Psychiatry*, *57*, 33–45. doi: 10.1016/j.eurpsy.2018.12.008

Peters, A. T., Jacobs, R. H., Feldhaus, C., Henry, D. B., Albano, A. M., Langenecker, S. A., … **& Curry, J. F.** (2016). Trajectories of functioning into emerging adulthood following treatment for adolescent depression. *Journal of Adolescent Health*, *58*, 253–259. https://doi.org/10.1016/j.jadohealth.2015.09.022

Richards, D. A., Ekers, D., McMillan, D., Taylor, R. S., Byford, S., Warren, F. C., … **& Finning, K.** (2016). Cost and Outcome of Behavioural Activation versus Cognitive Behavioural Therapy for Depression (COBRA): a randomised, controlled, non-inferiority trial. *The Lancet*, *388*, 871–880.

Riggs, P. D., Mikulich-Gilbertson, S. K., Davies, R. D., Lohman, M., Klein, C., & Stover, S. K. (2007). A randomized controlled trial of fluoxetine and cognitive behavioral therapy in adolescents with major depression, behavior problems, and substance use disorders. *Archives of Pediatric and Adolescent Medicine*, *161*, 1026–1034. doi: 10.1001/archpedi.161.11.1026

Rohatgi, A. (2015). WebPlotDigitizer (version 3.9). Austin, TX, USA: Ankit Rohatgi. Available at: http://arohatgi.info/WebPlotDigitizer

Rücker, G., Krahn, U., König, J., Efthimiou, O., & Schwarzer, G. (2019). Package 'netmeta': network meta-analysis using frequentist methods (version 1.1-0): CRAN. Available at: https://github.com/guido-s/netmeta

Rücker, G., & Schwarzer, G. (2015). Ranking treatments in frequentist network meta-analysis works without resampling methods. *BMC Medical Research Methodology*, *15*, 58. doi: 10.1186/s12874-015-0060-8

Shorey, S., Ng, E. D., & Wong, C. H. (2022). Global prevalence of depression and elevated depressive symptoms among adolescents: a systematic review and meta-analysis. *British Journal of Clinical Psychology*, *61*, 287–305

Sigurvinsdóttir, A. L., Jensínudóttir, K. B., Baldvinsdóttir, K. D., Smárason, O., & Skarphedinsson, G. (2020). Effectiveness of cognitive behavioral therapy (CBT) for child and adolescent anxiety disorders across different CBT modalities and comparisons: a systematic review and meta-analysis. *Nordic Journal of Psychiatry*, *74*, 168–180. doi: 10.1080/08039488.2019.1686653

Wang, Z., Whiteside, S. P. H., Sim, L., Farah, W., Morrow, A. S., Alsawas, M., … **& Murad, M. H.** (2017). Comparative effectiveness and safety of cognitive behavioral therapy and pharmacotherapy for childhood anxiety disorders: a systematic review and meta-analysis. *JAMA Pediatrics*, *171*, 1049–1056. doi: 10.1001/jamapediatrics.2017.3036

Weisz, J. R., Kuppens, S., Ng, M. Y., Eckshtain, D., Ugueto, A. M., Vaughn-Coaxum, R., ... **& Fordwood, S. R.** (2017). What five decades of research tells us about the effects of youth psychological therapy: a multilevel meta-analysis and implications for science and practice. *American Psychologist*, *72*, 79–117. doi: 10.1037/a0040360

Wilkinson, P. O., & Goodyer, I. M. (2008). The effects of cognitive-behavioural therapy on mood-related ruminative response style in depressed adolescents. *Child and Adolescent Psychiatry and Mental Health*, *2*, 3. doi: 10.1186/1753-2000-2-3

Cite this article: Dardas LA, Xu H, Franklin MS, Scott J, Vance A, van de Water B, and Pan W (2023). Cognitive behavioural therapy and medication for treatment of adolescent depression: a network meta-analysis. *Behavioural and Cognitive Psychotherapy* **51**, 230–245. https://doi.org/10.1017/S1352465822000662