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REVIEW ARTICLE

# Preventing depression and anxiety in young people: a review of the joint efficacy of universal, selective and indicated prevention

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Depression and anxiety (internalizing disorders) are the largest contributors to the non-fatal health burden among young people. This is the first meta-analysis to examine the joint efficacy of universal, selective, and indicated preventive interventions upon both depression and anxiety among children and adolescents (5–18 years) while accounting for their co-morbidity. We conducted a systematic review of reviews in Medline, PsycINFO and the Cochrane Library of Systematic Reviews, from 1980 to August 2014. Multivariate meta-analysis examined the efficacy of preventive interventions on depression and anxiety outcomes separately, and the joint efficacy on both disorders combined. Meta-regressions examined heterogeneity of effect according to a range of study variables. Outcomes were relative risks (RR) for disorder, and standardized mean differences (Cohen's *d*) for symptoms. One hundred and forty-six randomized controlled trials (46 072 participants) evaluated universal (children with no identified risk, $n = 54$) selective (population subgroups of children who have an increased risk of developing internalizing disorders due to shared risk factors, $n = 45$) and indicated prevention (children with minimal but detectable symptoms of an internalizing disorder, $n = 47$), mostly using psychological-only strategies ($n = 105$). Reductions in internalizing disorder onset occurred up to 9 months post-intervention, whether universal [RR 0.47, 95% confidence interval (CI) 0.37–0.60], selective (RR 0.61, 95% CI 0.43–0.85) or indicated (RR 0.48, 95% CI 0.29–0.78). Reductions in internalizing symptoms occurred up to 12 months post-intervention for universal prevention; however, reductions only occurred in the shorter term for selective and indicated prevention. Universal, selective and indicated prevention interventions are efficacious in reducing internalizing disorders and symptoms in the short term. They might be considered as repeated exposures in school settings across childhood and adolescence. (PROSPERO registration: CRD42014013990.)

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**Key words:** Depression, anxiety, prevention, child and adolescent, school, early intervention.

## Introduction

Depressive and anxiety disorders, often termed 'internalizing disorders', are the leading contributors to health burden among children and adolescents globally (Whiteford *et al.* 2013, Erskine *et al.* 2015). Efforts to prevent these disorders are now considered a public health priority (WHO, 2008), as once established, many disorders persist with resultant disability and life impacts (Andrews & Tolkein II team, 2006, Patton *et al.* 2014).

There is growing evidence that prevention programs in children and adolescents can reduce depressive symptoms and delay the onset of major depressive disorder (Merry *et al.* 2011). To date the effect sizes have been small, one reason why they have not been adopted widely (NICE, 2013), yet it is possible that we have underestimated these effects. Anxiety often co-occurs with depression in children and adolescents and is often more prevalent at younger ages, particularly the phobias and separation anxiety (Kessler *et al.* 2007). These disorders share major risk factors and may be effectively treated with similar treatment regimens (Axelson & Birmaher, 2001). Thus, preventive

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strategies for depression may similarly have secondary benefits for anxiety (Kessler & Price, 1993, Garber & Weersing, 2010), and the conjoint effects may be larger than those for depression alone.

Although some separate reviews examining the efficacy of preventive interventions for depression (Merry *et al.* 2011) and anxiety (Lau & Rapee, 2011) exist, there has been no quantitative assessment of the joint efficacy of such interventions in preventing both disorders. A simultaneous meta-analysis taking into account both depressive and anxiety outcomes while accounting for their co-morbidity would better estimate burden averted by these preventive interventions and provide a firm basis for cost-effectiveness analyses. The aim of this meta-review was to review evidence on the efficacy of preventive interventions for both depression and anxiety among children and adolescents. Specifically, we aimed to determine:

(1) The efficacy of universal, selective, and indicated prevention interventions for depression, anxiety and both disorders simultaneously (while accounting for their co-morbidity), measured as both impact upon incident disorder and reductions in symptoms.
(2) Examine how these outcomes may vary depending on a variety of factors related to both study design and intervention characteristics.

## Method

### *Search strategy*

Given the large and growing literature base examining the efficacy of interventions to prevent internalizing disorders, we conducted a series of systematic meta-reviews and updated the most recent reviews by conducting a systematic search of empirical studies to pragmatically ensure comprehensive coverage of the literature (Smith *et al.* 2011). The systematic review methods adhered to the guidelines described by Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement (Moher *et al.* 2009), and were developed in consultation with a research librarian. A systematic meta-review was conducted in August 2013 searching electronic databases: Medline, PsycINFO and the Cochrane Library of Systematic Reviews. An additional search of empirical studies dating from August 2010 to August 2014 was conducted to identify recently published randomized controlled trials not included in the existing reviews. Databases were searched using a combination of MeSH terms and text words pertaining to depression, dysthymia, anxiety and intervention trials. For full details see online Supplementary Appendix A.

### *Inclusion and exclusion criteria*

Reviews were eligible for inclusion in the review if: (1) they were published between 1980 and August 2014 in the English language; (2) authors employed systematic methods of reviewing the literature, including a predetermined and replicable search strategy; (3) the data are reported in a usable form, or usable data could be obtained from the study authors; (4) assignment of individuals to the intervention and control groups in included studies was random (i.e. conducted as a randomized controlled trial); (5) the included studies employed a control group who received either no intervention, placebo, or usual care; (6) the intervention of the included studies focused on the prevention of the onset of major depression, dysthymia, or an anxiety disorder [including generalized anxiety disorder (GAD), panic disorder, social phobia, agoraphobia, post-traumatic stress disorder (PTSD), and obsessive-compulsive disorder (OCD)] or, where the intervention included both prevention and treatment, data for prevention were reported separately in a usable form; (7) participants had no existing mental diagnoses as determined by structured diagnostic interviews (e.g. World Mental Health Composite International Diagnostic Interview) or validated clinical scales (Stockings *et al.* 2014); (8) participants were aged between 5 and 18 years; (9) outcome data were collected for at least one internalizing disorder and comprised either a clinical diagnosis of at least one internalizing disorder, or clinically relevant symptoms of at least one internalizing disorder as measured using validated symptom rating scales (Stockings *et al.* 2014).

### *Intervention characteristics*

We defined 'prevention' as any intervention occurring prior to the initial onset of a clinically recognized mental disorder. Consistent with the Institute of Medicine definition (Mrazek & Haggerty, 1994) such interventions were further classified as 'universal' – where the target population was the general public or a whole population that has not been identified on the basis of any individual risk; 'selective' – where the target population was a subgroup whose risk of developing the target disorder (in this instance, depressive or anxiety disorders) is significantly higher than average; and 'indicated' – where the intervention targeted high-risk individuals with detectable symptoms of the target disorder (i.e. elevated symptoms of depression or anxiety; Mrazek & Haggerty, 1994). We further classified each intervention approach based on the techniques and strategies used as either 'psychological' – where the intervention comprised psychological strategies (e.g. cognitive behaviour therapy; CBT) or 'educational' – where the intervention

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comprised solely of information provision without any cognitive restructuring techniques (e.g. lectures or pamphlets) or 'physical' – where the intervention comprised physical-based exercises (e.g. team sports). We also classified each intervention on the basis of the facilitator type (teacher or other school employee, trained external expert or clinician), intervention setting (school, health clinic, community setting, home and other), comparator type (treatment as usual, wait-listed control, monitoring control, no-intervention, placebo or attention control), the diagnostic tool used to determine disorder onset (standardized clinical interview or cut-off score on a symptom screening scale) the country's income [high, middle and low income (based on the Organization for Economic Cooperation and Development; OECD)], and determined the total intervention exposure time (in minutes).

### *Data extraction*

Data were extracted from individual studies by one of the review authors (E.A.S.) and a research assistant and were double checked in consultation with a third author (Y.L.). A data-extraction database was developed in Microsoft Excel 2010 prior to commencement of the review and included: details of the study, sample, the intervention, control group comparator, and primary outcomes at each follow-up assessment (including diagnostic criteria and number of cases and non-cases, and means and standard deviations on symptom rating scales for depression, dysthymia and anxiety). In instances where studies reported internalizing outcomes for particular subgroups of the sample rather than for the control and intervention groups at an aggregate level, we calculated these values using the pooled variance and weighted mean. Where papers included multiple comparisons, intervention arms or separate trials, these were treated as independent studies for the purposes of both data extraction and analysis (Higgins & Green, 2011).

### *Risk of bias*

Risk of bias in the included studies was examined using the Cochrane Collaboration tool for assessing risk of bias (Higgins & Green, 2011). One author (Y.L.) and a research assistant independently examined each study for randomized sequence generation method, allocation concealment, blinding of participants and assessors, the methods of addressing incomplete outcome data, potential selective reporting, and any other bias that may have affected the outcome of the study. Studies were rated as 'low risk', 'high risk', or 'risk unable to be determined' for each domain. All discrepancies were resolved in consultation with a third author (E.S.). To quantify the effect of risk of bias on study outcomes, we assigned a numerical value to 'low risk' (3), 'risk unable to be determined' (2) and 'high risk' (1) and summed these values across each of the six domains to create a total risk score for each study.

### *Measures of treatment effect*

#### *Outcome 1: internalizing disorder diagnosis*

We extracted the number of participants meeting criteria for a depressive or anxiety disorder at follow-up using standardized clinical interviews yielding diagnoses based on DSM or ICD classification systems (such as the Schedule for Affective Disorders and Schizophrenia–Kiddie Version; K-SADS), or where cut-off scores on reliable symptom rating scales were used as a proxy for a diagnosis (such as scores >21 on the Center for Epidemiologic Studies – Depression Scale; CES-D) (Stockings *et al.* 2014). This outcome measured changes in the number of incident depression and anxiety cases occurring pre- and post-intervention

#### *Outcome 2: internalizing symptoms*

We extracted the means and standard deviations of participants' scores on reliable and valid symptom rating scales for depression [such as the Children's Depression Inventory (CDI), Beck Depression Inventory (BDI), and the CES-D] (Stockings *et al.* 2014), and anxiety [such as the Revised Children's Manifest Anxiety Scale (RCMAS) and Screen for Child Anxiety Related Disorders (SCARED)]. This outcome measured changes in depressive symptomology over time.

### *Data analysis*

All data were synthesized using the statistical software program Stata/SE version 13.1 (StataCorp, 2013). We used multivariate meta-analysis (White, 2011) to obtain separate estimates of the intervention effects targeting depression and anxiety at each time point. Effect sizes were calculated using relative risk (RR) for disorder diagnosis and Cohen's $d$ for changes in disorder symptomatology. To estimate the combined effect of the interventions on both depression and anxiety disorder onset at each time point, we generated a variable ('internalizing disorder diagnosis') which was calculated by taking the average of the natural logs of the depression and anxiety RRs and their standard errors and calculating their covariance before generating the inverse log to produce final estimates. To estimate the combined effect of the interventions on both depression and anxiety symptoms at each time point, we generated a second variable named 'internalizing

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disorder symptoms' by taking the mean of the depression and anxiety Cohen's *d* values and calculating their covariance (Borenstein *et al.* 2009, Mills *et al.* 2012). To account for the correlation between depression and anxiety outcomes, the covariance calculations included an estimation of the co-morbidity of depression and anxiety derived from the 2007 Australian National Survey of Mental Health and Wellbeing (Australian Bureau of Statistics, 2007) (Supplementary Fig. A1). These variables ('internalizing disorder diagnosis' and 'internalizing disorder symptoms') were pooled using multivariate meta-analysis at each time point to determine overall intervention efficacy. Data were analysed separately on the basis of intervention classification (universal *v.* selective *v.* indicated) and on the basis of intervention type (psychological *v.* educational *v.* physical). Where only one outcome was examined (depression or anxiety, but not both), no combined effect was generated and the final estimate is based on the single outcome only, and is denoted as such.

In order to identify heterogeneity in the pooled estimates, the $I^2$ index was employed, and heterogeneity was classified as low, moderate or high according to an $I^2$ value of 25%, 50% and 75%, respectively, with statistical significance determined using the *Q* statistic (Higgins *et al.* 2003). To explain any further causes of heterogeneity on the basis of study characteristics and characteristics of the intervention, random effects meta-regression was performed on the primary outcomes at both post-test and 12 months follow-up. The effects of the intervention type (psychological *v.* educational *v.* physical), facilitator type (teacher or other school employee *v.* clinician), intervention setting (school *v.* other), comparator type (treatment as usual *v.* active control), diagnostic tool (diagnosis determined using diagnostic interview *v.* cut-off score on symptom screening scale), total intervention exposure time (in minutes), risk of bias (low '3', unable to be determined '2' or high '1'), and country's income (high *v.* low and middle income) were evaluated by individually adding them as covariates in the regression models. The adjusted $R^2$ index was employed to quantify goodness-of-fit for each model. Statistical significance for all analyses was set at $p < 0.05$. Number needed to treat for universal samples was calculated using depression and anxiety incidence estimates for children aged 12.5 years from the Global Burden of Disease Study 2013 (Global Burden of Disease Study 2013 Collaborators, 2015).

## Results

The meta-review yielded 110 potentially eligible systematic reviews of preventive interventions for mental disorders of which 84 were excluded. Of the excluded studies, 51 were conducted using adult samples, 30 included disorders other than depression or anxiety, and three included special populations (e.g. children with epilepsy). The remaining 26 reviews contained a total of 792 individual papers, of which 313 were duplicates. We assessed the 479 unique studies for eligibility (Fig. 1) and 146 studies (based on 117 publications) met our inclusion criteria, of which 94 reported data for depression outcomes alone, 24 reported data for anxiety outcomes alone, and 28 reported outcomes for both anxiety and depression. A total of 47 754 participants were randomly assigned in the trials; 46 072 were included in the analysis because some trials did not report outcomes for all participants. There were between 21 and 5634 participants per study. Follow-up periods ranged from immediate post-intervention to 48 months.

### *Risk of bias*

We assessed all included studies for risk of bias (see Supplementary Figs A2 and A3). Reporting of sequence generation and allocation concealment was mostly unclear, and was only adequately described in 43 and 19 of the 146 studies, respectively. Most studies ($n = 91$) were at high risk of bias for participant blinding although this was often due to an ethical requirement for interventions delivered in school settings. Assessor blinding was mostly unclear and was identified to be high in 27 studies, primarily when chief investigators of the studies were actively involved in data collection. Risk of bias due to incomplete outcome data was low overall ($n = 69$). Most included studies were not registered and thus selective reporting was unable to be determined ($n = 130$). Only two studies were at low risk of bias for all other domains and 42 were deemed to be high, mostly due to lead authors being involved in the development of the specific intervention component.

### *Study characteristics*

Of the 146 studies, 54 ($n = 30\,159$) were trials of universal prevention (children with no identified risk; 30 depression only, $n = 16\,142$; 12 anxiety only, $n = 5719$; 12 both disorders, $n = 8298$), 45 ($n = 6485$) were trials of selective prevention (children whose risk of developing an internalizing disorder was elevated, e.g. parent with current depression, exposure to trauma, children of displaced families, low socioeconomic status; 32 depression only, $n = 4041$; 7 anxiety only, $n = 652$; 6 both disorders, $n = 1937$), and 47 ($n = 9283$) were trials of indicated prevention (children with minimal detectable symptoms of the target disorder in the absence of clinically diagnosable mental disorder; 31 depression only,

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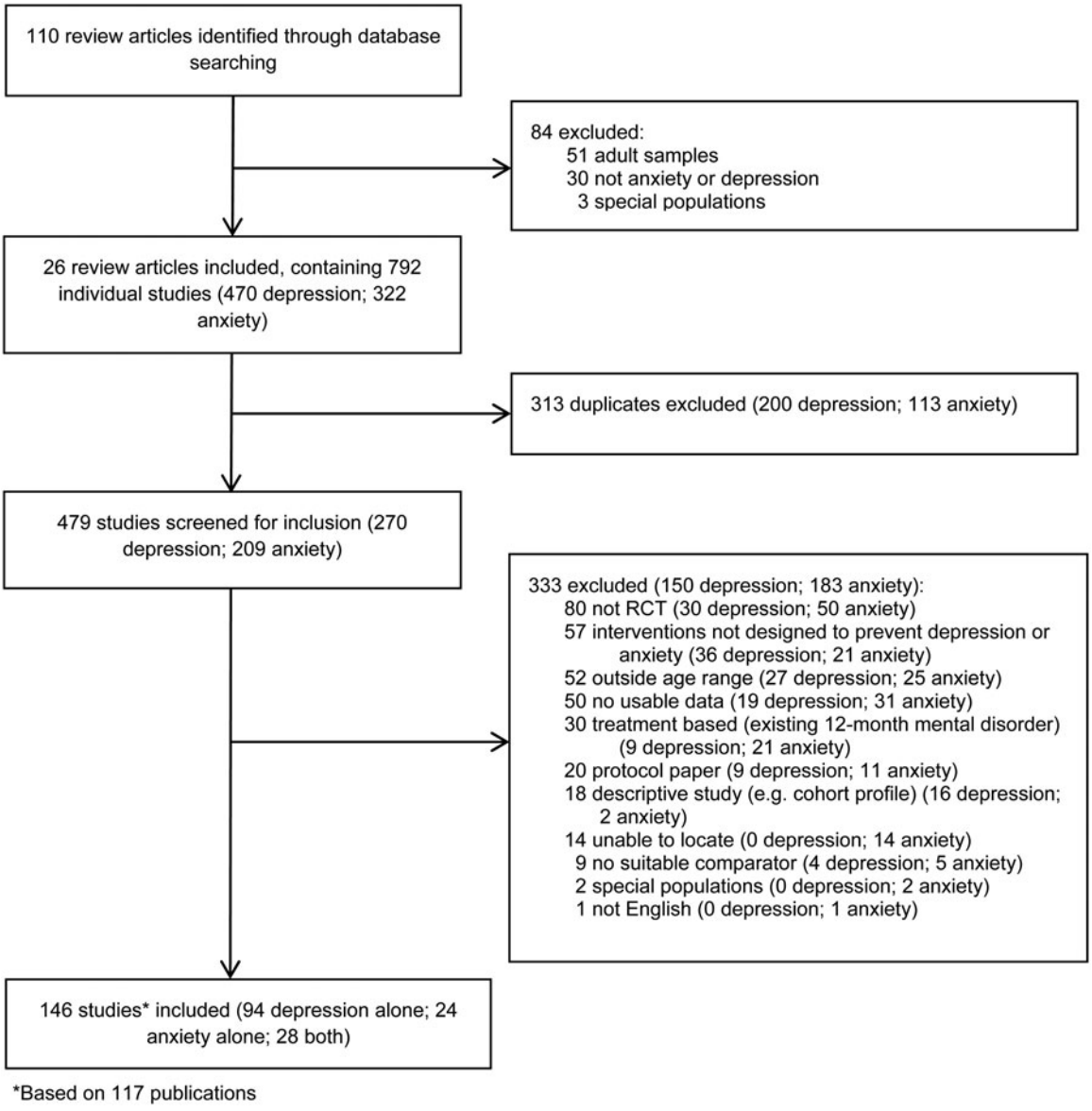


**Fig. 1.** PRISMA (Preferred Reporting Items for Systematic reviews and Meta-analyses) flowchart for selection of studies in the review.

$n = 5666$; 7 anxiety only, $n = 1617$; 9 both disorders, $n = 2000$).

The mean age of participants was 12.6 years (range 2.58–18), and 53.7% were female. Studies were conducted primarily in OECD regions, including high-income North America (United States, $n = 77$; Canada, $n = 8$), Australasia (Australia, $n = 25$; New Zealand, $n = 1$), Western Europe (UK, $n = 7$; Israel, $n = 4$; The Netherlands, $n = 3$; Germany, $n = 3$; Iceland, $n = 1$; Norway, $n = 1$; Spain, $n = 1$; Italy, $n = 1$) and high-income Asia Pacific (South Korea, $n = 1$), with a minority of studies conducted in non-OECD regions including Central Europe (Bosnia and Herzegovina, $n = 2$), East Asia (China, $n = 1$; Hong Kong, $n = 1$; Taiwan, $n = 1$), Southeast Asia (Indonesia, $n = 1$), Central Latin America (Mexico, $n = 1$; Chile, $n = 1$) and East sub-Saharan Africa (Uganda, $n = 1$; Mauritius, $n = 1$).

### *Intervention characteristics*

Most interventions comprised of psychological-only components ($n = 105$), with the majority of these employing CBT (Supplementary Table A1). Educational approaches were used by 19, 19 used a combination of psychological and educational components, and three studies employed physical-based interventions.

Most studies were conducted in school settings ($n = 113$), with a minority conducted in health clinics ($n = 14$), non-health-based community settings, e.g. prison ($n = 8$), in the home ($n = 4$), and several were

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not described ($n = 7$). Only two studies used the internet as the delivery platform (Calear *et al.* 2009; Wong *et al.* 2014).

The mean intervention session length was 66 min (range 20–180, S.D. = 26.7), the mean number of intervention sessions was 10 (range 1–116, S.D. = 12.1), and most often occurred weekly ($n = 85$), with a total mean intervention exposure time of 28 565 min (range 20.2–23 865 500, S.D. = 228 651.18). Where attendance data was collected, the mean proportion of sessions attended was 69% (range 0–100%, S.D. = 24.7%).

Most studies employed clinicians or trained external experts (e.g. research fellows) to deliver in the intervention component ($n = 127$). In the remaining studies, the program facilitator was a teacher or other school employee e.g. school counsellor ($n = 19$).

The majority of studies used a no-intervention comparator ($n = 123$; either treatment as usual, wait-listed control, monitoring control, or no intervention), with 23 employing active comparators (including attention and placebo controls).

### *Universal prevention interventions (Supplementary Table A2a)*

#### *Disorder onset*

The impact of universal prevention upon risks of developing depressive or anxiety disorders, or any internalizing disorder, is shown in Table 1. In total, 16 studies ($n = 8170$; 14 depression, $n = 7798$; 7 anxiety, $n = 4623$) examined the impact of universal prevention on anxiety or depression disorder onset. Universal prevention interventions significantly reduced the risk of developing depressive disorder immediately post-intervention (RR 0.41, 95% CI 0.24–0.69); however, heterogeneity was high ($I^2 = 73\%$, $Q = 29.7$, $p < 0.05$). A reduction in risk of depressive disorder was observed until 6–9 months post-intervention (RR 0.45, 95% CI 0.35–0.58). The relative risk of an anxiety disorder was reduced among intervention participants immediately post-intervention (RR 0.25, 95% CI 0.01–0.65); however, heterogeneity was high ($I^2 = 87\%$, $Q = 7.52$, $p = 0.05$), but there was no reduction in risk at any later time point. When considered together, the relative risk of developing an internalizing disorder among intervention participants was 0.47 (95% CI 0.37–0.60) at 6–9 months post-intervention. This effect appeared to decay by the 12 months assessment. There were no studies for either disorder with follow-up after 18 months. At the 6–9 months assessment, the number needed to prevent one internalizing disorder case per 100 children was estimated to be 70.92 (95% CI 41.7 – 135.12), or equivalent to just over two regular school classes.

#### *Disorder symptoms*

In total 54 studies ($n = 30\,159$; 42 depression, $n = 24\,440$; 24 anxiety, $n = 14\,017$) examined the impact of universal prevention on depression or anxiety symptoms (Supplementary Table A3). Significant reductions in depressive symptoms were identified from immediate post-intervention ($d = -0.11$, 95% CI −0.16 to −0.05) to 12 months follow-up ($d = -0.09$, 95% CI −0.17 to −0.01) and decayed by 18 months. Significant reductions in anxiety symptoms were identified at post-test ($d = -0.16$, 95% CI −0.27 to −0.06) through to the 6–9 months follow-up ($d = -0.12$, 95% CI −0.24 to −0.01); however, heterogeneity was high, and these effects decayed by 12 months. Combined internalizing disorder symptoms among intervention participants were identified from immediate post-intervention ($d = -0.15$, 95% CI −0.21 to −0.08) to 12 months follow-up ($d = -0.13$, 95% CI −0.25 to −0.01), and were no longer significant at 12 months post-intervention. There was no data available to assess intervention efficacy at 24–48 months follow-up.

### *Selective prevention interventions (Supplementary Table A2b)*

#### *Disorder onset*

The impact of selective prevention upon risks of developing depressive or anxiety disorders, or any internalizing disorder, is shown in Table 2. In total 10 studies ($n = 1380$, 9 depression, $n = 1234$; 1 anxiety, $n = 146$) examined the impact of selective prevention on depression or anxiety disorder onset. Reductions in the relative risk of developing depression were identified at immediate post-intervention (RR 0.64, 95% CI 0.41–0.98) and at 6–9 months (RR 0.61 95% CI 0.43–0.85) but not beyond. Only one study examined the efficacy of selective interventions in preventing the onset of anxiety, with no significant result found at 12 months follow-up (RR 0.80, 95% CI 0.60–1.07). The estimated reduction in the risk of developing internalizing disorders combined was based on depression data only, as no studies examined both depression and anxiety (see Table 3). There was no data available to assess intervention efficacy for either disorder at 24–48 months follow-up.

#### *Disorder symptoms*

A total of 38 studies ($n = 5859$; 34 depression, $n = 5395$; 9 anxiety, $n = 2275$) examined the impact of selective prevention on depression or anxiety symptoms (Supplementary Table A4). Significant reductions in depressive symptoms were identified at post-test ($d = -0.23$, 95% CI −0.36 to −0.09) but were not retained at any other follow-up assessment. Significant

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**Table 1.** *Impact of universal prevention interventions upon depressive (14 studies, n = 7798), anxiety (7 studies, n = 4623) and combined internalizing disorder (16 studies, n = 8170) by intervention type and time since intervention*

| | Depressive disorders | | | Anxiety disorders | | | Internalizing disorders | | |
|---|---|---|---|---|---|---|---|---|---|
| | Studies (*n*) | *N* | RR (95% CI) | Studies (*n*) | *N* | RR (95% CI) | Studies (*n*)[a] | *N* | RR (95% CI) |
| **Psychological only** | **13** | **7390** | | **6** | **4481** | | **14** | **7620** | |
| Immediately post-intervention | 9 | 5115 | **0.41 (0.24–0.69)*[d]** | 3 | 2023 | **0.25 (0.10–0.65)*** | 9 | 5115 | **0.39 (0.26 to 0.59)*** |
| 1–3 months | 2 | 102 | **0.35 (0.24–0.53)*** | – | – | – | 2 | 102 | **0.35 (0.24 to 0.53)*[b]** |
| 6–9 months | 9 | 1507 | **0.46 (0.35–0.62)*** | 2 | 1046 | 1.10 (0.45–2.51) | 9 | 1507 | **0.49 (0.37 to 0.64)*** |
| 12 months | 7 | 4503 | 0.86 (0.59–1.26) | 2 | 1571 | 0.66 (0.03–17.5)[d] | 7 | 4503 | 0.86 (0.47 **to** 1.60) |
| 18 months | 5 | 3876 | 1.03 (0.81–1.31)[d] | 2 | 1046 | 1.10 (0.44–2.76) | 5 | 3876 | 1.01 (0.27 **to** 3.73) |
| 24–48 months | – | – | – | – | – | – | – | – | – |
| **Educational only** | | | | **1** | **142** | | **1** | **142** | |
| Immediately post-intervention | – | – | – | – | – | – | – | – | – |
| 1–3 months | – | – | – | 1 | 142 | 0.20 (0.01–4.21)[c] | 1 | 142 | 0.20 (0.01 **to** 4.21)[c,e] |
| 6–9 months | – | – | – | – | – | – | – | – | – |
| 12 months | – | – | – | – | – | – | – | – | – |
| 18 months | – | – | – | – | – | – | – | – | – |
| 24–48 months | – | – | – | – | – | – | – | – | – |
| **Psychological + educational** | **1** | **408** | | | | | **1** | **408** | |
| Immediately post-intervention | – | – | – | – | – | – | – | – | – |
| 1–3 months | – | – | – | – | – | – | – | – | – |
| 6–9 months | 1 | 408 | **0.36 (0.20–0.64)[c]*** | – | – | – | 1 | 408 | **0.36 (0.20 to 0.64)*[b,c]** |
| 12 months | – | – | – | – | – | – | – | – | – |
| 18 months | – | – | – | – | – | – | – | – | – |
| 24–48 months | – | – | – | – | – | – | – | – | – |
| **Physical interventions** | – | – | – | – | – | – | – | – | – |
| **All interventions** | **14** | **7798** | | **7** | **4623** | | **16** | **8170** | |
| Immediately post-intervention | 9 | 5115 | **0.41 (0.24–0.69)*[d]** | 3 | 2023 | **0.25 (0.10–0.65)*** | 9 | 5115 | **0.39 (0.26 to 0.59)*** |
| 1–3 months | 2 | 102 | **0.35 (0.24–0.53)*** | 1 | 142 | 0.20 (0.01–4.21)[c] | 3 | 244 | **0.33 (−0.18 to 0.61)*** |

**Table 1** (*cont.*)

| | Depressive disorders | | | Anxiety disorders | | | Internalizing disorders | | |
|---|---|---|---|---|---|---|---|---|---|
| | Studies (*n*) | *N* | RR (95% CI) | Studies (*n*) | *N* | RR (95% CI) | Studies (*n*)[a] | *N* | RR (95% CI) |
| 6–9 months | 10 | 1915 | **0.45 (0.35–0.58)*** | 2 | 1046 | 1.10 (0.45–2.51) | 10 | 1915 | **0.47 (0.37 to 0.60)*** |
| 12 months | 7 | 4503 | 0.86 (0.59–1.26) | 2 | 1571 | 0.66 (0.03–17.5)[d] | 7 | 4503 | 0.86 (0.47 **to** 1.60) |
| 18 months | 5 | 3876 | 1.03 (0.81–1.31)[d] | 2 | 1046 | 1.10 (0.44–2.76) | 5 | 3876 | 1.01 (0.27 **to** 3.73) |
| 24–48 months | – | – | – | – | – | – | – | – | – |

RR, Relative risk; CI, confidence interval.
–, No data available.
[a] Note that number of studies and participants is not additive across columns, as some studies examined both outcomes.
[b] Estimate based on depression data only.
[c] Estimate based on one data point only.
[d] Significant heterogeneity where $I^2 > 75\%$ and should be interpreted with caution (Melsen *et al.* 2014).
[e] Estimate based on anxiety data only.
*$p < 0.05$. Bold text indicates significant results.

reductions in anxiety symptoms were identified at 1–3 months post-intervention ($d = -0.69$, 95% CI −1.08 to −0.30); however, this estimate was based on only one study, and was not sustained at any other follow-up. No data were available to assess intervention efficacy on preventing depressive symptoms at 24–48 months. Significant reductions in combined internalizing disorder symptoms among intervention participants were identified at immediate post-intervention only ($d = -0.20$, 95% CI −0.35 to −0.05).

### *Indicated prevention interventions (Supplementary Table A2c)*

#### *Disorder onset*

The impact of indicated prevention upon risks of developing depressive or anxiety disorders, or any internalizing disorder, is shown in Table 3. In total 21 studies ($n = 3565$; 20 depression, $n = 3437$; 1 anxiety, $n = 128$) examined the impact of indicated prevention on depression or anxiety disorder onset. Reductions in the relative risk of developing depression were identified at 6–9 months (RR 0.79 95% CI 0.62–0.99) and 18 months (RR 0.23, 95% CI 0.08–0.67) post-intervention but not beyond; however, heterogeneity was high ($I^2 = 91\%$, $Q = 35.5$, $p < 0.05$). Only one study examined the efficacy of indicated interventions in preventing the onset of anxiety, with significant reductions in the risk of developing anxiety found at 12 months follow-up (RR 0.31, 95% CI 0.10–0.98). Reductions in the relative risk of developing internalizing disorders combined were identified at 6–9 months post-intervention (RR 0.48, 95% CI 0.29–0.78), and at 18 months; however, the latter was based on depression data only, and had high heterogeneity (see Table 3). There was no data available to assess intervention efficacy for either disorder at 24–48 months follow-up.

#### *Disorder symptoms*

A total of 46 studies ($n = 9283$; 39 depression, $n = 7495$; 17 anxiety, $n = 3659$) examined the impact of indicated prevention on depression or anxiety symptoms (Supplementary Table A5). Significant reductions in depressive symptoms were identified at post-test ($d = -0.33$, 95% CI −0.46 to −0.20) and retained up to 6–9 months ($d = -0.26$, 95% CI −0.39 to −0.12) but decayed by 12 months. No significant reductions in anxiety symptoms were identified at any assessment. Significant reductions in combined internalizing disorder symptoms among intervention participants were identified from immediate post-intervention ($d = -0.26$, 95% CI −0.39 to −0.13) to 6–9 months follow-up ($d = -0.23$, 95% CI −0.36 to −0.11), and decayed by 12 months.

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**Table 2.** *Impact of selective prevention interventions upon depressive (9 studies, n = 1234), anxiety (1 study, n = 146) and combined internalizing disorder (10 studies, n = 1380) by intervention type and time since intervention*

| | Depressive disorder | | | Anxiety disorder | | | Internalizing disorder | | |
|---|---|---|---|---|---|---|---|---|---|
| | Studies (*n*) | *N* | RR (95% CI) | Studies (*n*) | *N* | RR (95% CI) | Studies (*n*)[a] | *N* | RR (95% CI) |
| **Psychological only** | **5** | **805** | | | | | **5** | **805** | |
| Immediately post-intervention | 3 | 334 | **0.10 (0.02–0.42)*** | – | – | – | 3 | 334 | **0.10 (0.02–0.42)*[b]** |
| 1–3 months | | | – | – | – | – | – | – | – |
| 6–9 months | 3 | 556 | **0.64 (0.44–0.93)*** | – | – | – | 3 | 556 | **0.64 (0.44–0.93)*[b]** |
| 12 months | 2 | 249 | **0.56 (0.35–0.91)*** | – | – | – | 2 | 249 | **0.56 (0.35–0.91)*[b]** |
| 18 months | 2 | 249 | 0.63 (0.37–1.08) | – | – | | 2 | 249 | 0.63 (0.37–1.08)[b] |
| 24–48 months | | | – | – | – | – | – | – | – |
| **Educational only** | **2** | **217** | | | | | **2** | **217** | |
| Immediately post-intervention | 2 | 111 | 0.71 (0.42–1.20) | – | – | – | 2 | 111 | 0.71 (0.42–1.20)[b] |
| 1–3 months | | | – | – | – | – | – | – | – |
| 6–9 months | 1 | 106 | 0.44 (0.18–1.08)[c] | – | – | – | 1 | 106 | 0.44 (0.18–1.08)[b,c] |
| 12 months | | | – | – | – | – | – | – | – |
| 18 months | | | – | – | – | – | – | – | – |
| 24–48 months | | | – | – | – | – | – | – | – |
| **Psychological + educational** | **2** | **212** | | **1** | **146** | | **3** | **358** | |
| Immediately post-intervention | 2 | 212 | 0.81 (0.42–1.53) | – | – | – | 2 | 212 | 0.81 (0.42–1.53)[b] |
| 1–3 months | | | – | – | – | – | – | – | – |
| 6–9 months | | | – | – | – | – | – | – | – |
| 12 months | 1 | 84 | 0.97 (0.72–1.32)[c] | 1 | 146 | 0.47 (0.17–1.32)[c] | 2 | 230 | 0.66 (0.33–1.36) |
| 18 months | | | – | – | – | – | – | – | – |
| 24–48 months | | | – | – | – | – | – | – | – |
| **Physical interventions** | | | – | – | – | – | – | – | – |
| **All interventions** | **9** | **1234** | | **1** | **146** | | **10** | **1380** | |
| Immediately post-intervention | 7 | 657 | **0.64 (0.41–0.98)*** | – | – | – | 7 | 657 | **0.64 (0.41–0.98)*[b]** |
| 1–3 months | | | – | – | – | – | – | – | – |
| 6–9 months | 4 | 662 | **0.61 (0.43–0.85)*** | – | – | – | 4 | 662 | **0.61 (0.43–0.85)*[b]** |
| 12 months | 3 | 333 | 0.73 (0.38–1.40) | 1 | 146 | 0.80 (0.60–1.07)[c] | 4 | 479 | 0.75 (0.56–2.06) |
| 18 months | 2 | 249 | 0.63 (0.37–1.08) | – | – | | 2 | 249 | 0.63 (0.37–1.08)[b] |
| 24–48 months | – | – | – | – | – | – | – | – | – |

RR, Relative risk; CI, confidence interval.

–, No data available.

[a] Note that number of studies and participants is not additive across columns, as some studies examined both outcomes.

[b] Estimate based on depression data only.

[c] Estimate based on one data point only.

*$p < 0.05$. Bold text indicates significant results.

### *Intervention and study variables associated with intervention efficacy*

We used meta-regression to examine whether there was an association between a range of variables and intervention efficacy immediately post-completion and also at 12 months post-intervention for disorder diagnosis and disorder symptoms separately for universal, selective and indicated prevention (Table 4).

At post-test, meta-regressions revealed that interventions containing a psychological component (whether

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**Table 3.** *Impact of indicated prevention interventions upon depressive (20 studies, n = 3437), anxiety (1 study, n = 128) and combined internalizing disorder (21 studies, n = 3565) by intervention type and time since intervention*

| | Depressive disorder | | | Anxiety disorder | | | Internalizing disorder | | |
|---|---|---|---|---|---|---|---|---|---|
| | Studies (*n*) | *N* | RR (95% CI) | Studies (*n*) | *N* | RR (95% CI) | Studies (*n*)[a] | *N* | RR (95% CI) |
| **Psychological only** | **17** | **3059** | | **1** | **128** | | **18** | **3187** | |
| Immediately post-intervention | 7 | 1069 | 0.77 (0.59–1.00) | – | – | – | 7 | 1069 | 0.77 (0.59–1.00)[b] |
| 1–3 months | 3 | 369 | 0.52 (0.16–1.68) | – | – | – | 3 | 369 | 0.52 (0.16–1.68)[b] |
| 6–9 months | 10 | 2115 | 0.83 (0.65–1.04) | 1 | 128 | **0.31 (0.10–0.98)[c]*** | 11 | 2243 | **0.46 (0.25–0.83)*** |
| 12 months | 8 | 1607 | 0.92 (0.76–1.13) | – | – | – | 8 | 1607 | 0.92 (0.76–1.13)[b] |
| 18 months | 3 | 612 | 0.35 (0.12–1.02)[d] | – | – | – | 3 | 612 | 0.35 (0.12–1.02)[b,d] |
| 24–48 months | – | – | – | – | – | – | – | – | – |
| **Educational only** | | | | | | | | | |
| Immediately post-intervention | – | – | – | – | – | – | – | – | – |
| 1–3 months | – | – | – | – | – | – | – | – | – |
| 6–9 months | – | – | – | – | – | – | – | – | – |
| 12 months | – | – | – | – | – | – | – | – | – |
| 18 months | – | – | – | – | – | – | – | – | – |
| 24–48 months | – | – | – | – | – | – | – | – | – |
| **Psychological + educational** | **3** | **378** | | | | | **3** | **378** | |
| Immediately post-intervention | 1 | 108 | 0.81 (0.43–1.53)[c] | – | – | – | 1 | 108 | 0.81 (0.43–1.53)[b] |
| 1–3 months | 1 | 108 | 0.61 (0.16–2.34)[c] | – | – | – | 1 | 108 | 0.61 (0.16–2.34)[b,c] |
| 6–9 months | 3 | 378 | 0.54 (0.21–1.34) | – | – | – | 3 | 378 | 0.54 (0.21–1.34)[b] |
| 12 months | – | – | – | – | – | – | – | – | – |
| 18 months | 1 | 341 | **0.04 (0.01–0.15)*[c]** | – | – | – | 1 | 341 | **0.04 (0.01–0.15)*[b,c]** |
| 24–48 months | – | – | – | – | – | – | – | – | – |
| **Physical interventions** | | | – | | | – | – | – | – |
| **All interventions** | **20** | **3437** | | **1** | **128** | | **21** | **3565** | |
| Immediately post-intervention | 8 | 1177 | 0.79 (0.62–1.00) | – | – | – | 8 | 1177 | 0.79 (0.62–1.00)[b] |
| 1–3 months | 4 | 477 | 0.74 (0.44–1.25) | – | – | – | 4 | 477 | 0.74 (0.44–1.25)[b] |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 6–9 months | 13 | 2493 | **0.79 (0.62–0.99)*** | 1 | 128 | **0.31 (0.10–0.98)[c]*** | 14 | 2621 | **0.48 (0.29–0.78)*** |
| 12 months | 8 | 1607 | 0.92 (0.76–1.13) | – | – | – | 8 | 1607 | 0.92 (0.76–1.13)[b] |
| 18 months | 4 | 953 | **0.23 (0.08–0.67)*[d]** | – | – | – | 4 | 953 | **0.23 (0.08–0.67)*[b,d]** |
| 24–48 months | – | – | – | – | – | – | – | – | – |

RR, Relative risk; CI, confidence interval.
–, No data available
[a] Note that number of studies and participants is not additive across columns, as some studies examined both outcomes.
[b] Estimate based on depression data only.
[c] Estimate based on one data point only.
[d] Significant heterogeneity where $I^2 > 75\%$ and should be interpreted with caution (Melson *et al.* 2014).
*$p < 0.05$. Bold text indicates significant results.

alone, or in combination with educational materials) resulted in greater reductions in internalizing disorder onset for selective prevention ($t_7 = -2.51$, $p = 0.04$, adjusted $R^2 = 100\%$) and greater reductions in internalizing symptoms for both universal ($t_{52} = -2.16$, $p = 0.04$, adjusted $R^2 = 20.12\%$) and selective prevention ($t_{33} = -3.78$, $p = 0.001$, adjusted $R^2 = 63.22\%$; Table 4) than other intervention types. No other study variables were found to impact intervention efficacy at post-test.

At 12 months post-intervention, for universal prevention meta-regressions revealed greater reductions in internalizing disorder onset when the intervention facilitator was a teacher or other school employee compared to a clinician ($t_7 = -2.64$, $p = 0.04$, adjusted $R^2 =$ 100%; Table 4). No study variables were found to impact intervention efficacy for selective or indicated prevention for either disorder onset or disorder symptoms at 12 months post-intervention.

## Discussion

To our knowledge, this is the first review to examine the joint efficacy of universal, selective, and indicated interventions for preventing depression and anxiety disorders and symptoms in young people, while accounting for their co-morbidity and also examining potential intervention- and study-level variables related to their efficacy. Several major findings emerged from this review.

First, prevention interventions are effective in preventing internalizing disorder onset and reducing associated symptoms for up to 12 months. There have been more studies pertaining to the prevention of depression as compared to anxiety. However, our findings demonstrate that prevention interventions have a significant impact upon both disorders collectively. By contrast to previous findings for depression (Merry *et al.* 2011), we found larger reductions in disorder onset for universal preventions compared to selective and indicated prevention. We do not consider this finding to necessarily indicate that such approaches have greater efficacy as the difference may be due to the large effect sizes found for anxiety disorders among universal samples compared to the lack of data for selective and indicated samples. This explanation is supported by the high rates of anxiety disorders among young people (Kessler *et al.* 2007), and suggests that preventive intervention approaches may be more efficacious than previously considered (NICE, 2013) when the combined impact of such interventions on both depression and anxiety are taken into account. Further, as expected and in keeping with previous findings for depression (Merry *et al.* 2011), effect sizes for reduction in internalizing symptoms increased with the risk gradient–with the lowest effect sizes identified among universal samples and highest among indicated samples.

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**Table 4.** *Results of meta-regressions examining factors related to intervention efficacy, immediately post-intervention and 12 months post-intervention completion for internalizing disorder onset and internalizing symptoms for universal, selective and indicated prevention*

| | Universal prevention | | Selective prevention | | Indicated prevention | |
|---|---|---|---|---|---|---|
| | Internalizing disorder | Internalizing symptoms | Internalizing disorder | Internalizing symptoms | Internalizing disorder | Internalizing symptoms |
| **Immediately post-intervention** | | | | | | |
| Intervention type[a] | N.A. | **$t_{52} = -2.16$, $p = 0.04$*** **$R^2 = 20.12\%$** | **$t_7 = -2.51$, $p = 0.04$*** **$R^2 = 100\%$** | **$t_{33} = -3.78$, $p = 0.001$**** **$R^2 = 63.22\%$** | $t_8 = 0.54$, $p = 0.61$ $R^2 = -23.65\%$ | $t_{46} = -0.49$, $p = 0.63$ $R^2 = -4.22\%$ |
| Facilitator type[b] | $t_9 = -0.17$, $p = 0.87$ $R^2 = -0.62\%$ | $t_{52} = -0.03$, $p = 0.98$ $R^2 = -5.76\%$ | $t_7 = -0.24$, $p = 0.82$ $R^2 = -32.35\%$ | $t_{33} = -0.76$, $p = 0.451$ $R^2 = -4.84\%$ | $t_8 = -0.99$, $p = 0.36$ $R^2 = -45.65\%$ | $t_{43} = 0.10$, $p = 0.92$ $R^2 = -5.45\%$ |
| Setting of intervention[c] | N.A. | N.A. | $t_7 = -0.66$, $p = 0.54$ $R^2 = 0.05\%$ | $t_{33} = 0.40$, $p = 0.69$ $R^2 = -5.93\%$ | $t_7 = 1.05$, $p = 0.34$ $R^2 = -5.18\%$ | $t_{43} = 0.10$, $p = 0.92$ $R^2 = -5.45\%$ |
| Exposure time of intervention[d] | $t_7 = -0.16$, $p = 0.88$ $R^2 = 0\%$ | $t_{52} = 0.09$, $p = 0.93$ $R^2 = -7.25\%$ | $t_4 = -0.01$, $p = 0.99$ $R^2 = -4.9\%$ | $t_{33} = 0.43$, $p = 0.67$ $R^2 = -10.91\%$ | $t_7 = 1.00$, $p = 0.36$ $R^2 = -11.74\%$ | $t_{43} = -0.25$, $p = 0.80$ $R^2 = -6.12\%$ |
| Comparator type[e] | N.A. | $t_{52} = 0.54$, $p = 0.53$ $R^2 = -0.84\%$ | $t_7 = -0.30$, $p = 0.78$ $R^2 = -54.56\%$ | $t_{33} = -0.48$, $p = 0.63$ $R^2 = -10.58\%$ | $t_7 = -0.15$, $p = 0.89$ $R^2 = -3.71\%$ | $t_{43} = 1.71$, $p = 0.09$ $R^2 = 8.58\%$ |
| Diagnostic tool[f] | $t_7 = -0.03$, $p = 0.98$ $R^2 = 92.2\%$ | | $t_6 = -0.26$, $p = 0.81$ $R^2 = 0\%$ | | $t\ t_7 = 2.14$, $p = 0.12$ $R^2 = 100\%$ | |
| Risk of bias total score[g] | $t_9 = 0.47$, $p = 0.65$ $R^2 = 57.3\%$ | $t_{52} = 0.61$, $p = 0.54$ $R^2 = 0.03\%$ | $t_7 = -1.95$, $p = 0.11$ $R^2 = 100\%$ | $t_{33} = -0.61$, $p = 0.55$ $R^2 = -3.43\%$ | $t_7 = -0.95$, $p = 0.38$ $R^2 = 38.01\%$ | $t_{43} = 1.19$, $p = 0.24$ $R^2 = -1.28\%$ |
| Country income[h] | $t_8 = 0.07$, $p = 0.95$ $R^2 = 26.6\%$ | $t_{51} = -0.36$, $p = 0.72$ $R^2 = -5.61\%$ | N.A. | $t_{33} = -1.12$, $p = 0.27$ $R^2 = 2.26\%$ | $t_7 = 0.99$, $p = 0.36$ $R^2 = -45.65\%$ | $t_{43} = 0.32$, $p = 0.75$ $R^2 = -5.33\%$ |
| **12 months post-completion** | | | | | | |
| Intervention type[a] | N.A. | N.A. | $t_4 = 0.16$, $p = 0.89$ $R^2 = 0\%$ | $t_9 = 0.13$, $p = 0.90$ $R^2 = -24.45\%$ | N.A. | $t_{16} = -0.79$, $p = 0.44$ $R^2 = 7.02\%$ |
| Facilitator type[b] | **$t_7 = -2.64$, $p = 0.04$*** **$R^2 = 100\%$** | $t_{19} = -0.26$, $p = 0.80$ $R^2 = -5.33\%$ | $t_4 = -0.32$, $p = 0.78$ $R^2 = 0\%$ | $t_9 = 0.09$, $p = 0.93$ $R^2 = -30.59\%$ | $t_8 = -0.66$, $p = 0.53$ $R^2 = 0\%$ | $t_{16} = 0.97$, $p = 0.35$ $R^2 = -28.75\%$ |
| Setting of intervention[c] | N.A. | N.A. | $t_4 = 0.16$, $p = 0.91$ $R^2 = 0\%$ | $t_9 = -1.54$, $p = 0.17$ $R^2 = 14.14\%$ | N.A. | $t_{16} = -1.27$, $p = 0.22$ $R^2 = 39.67\%$ |
| Exposure time of intervention[d] | $t_6 = -1.64$, $p = 0.18$ $R^2 = 78.6\%$ | $t_{16} = 0.72$, $p = 0.48$ $R^2 = -3.84\%$ | $t_3 = 0.25$, $p = 0.85$ $R^2 = 0\%$ | $t_5 = 1.04$, $p = 0.37$ $R^2 = -5.88\%$ | $t_8 = 0.55$, $p = 0.60$ $R^2 = 0\%$ | $t_{15} = 0.49$, $p = 0.63$ $R^2 = -44.76\%$ |
| Comparator type[e] | N.A. | $t_{19} = 1.42$, $p = 0.17$ $R^2 = 5.52\%$ | $t_4 = -0.24$, $p = 0.84$ $R^2 = 0\%$ | $t_9 = -0.56$, $p = 0.59$ $R^2 = -20.97\%$ | $t_8 = -0.60$, $p = 0.57$ $R^2 = 0\%$ | $t_{16} = -0.74$, $p = 0.47$ $R^2 = 3.89\%$ |

| | | | | | | |
|---|---|---|---|---|---|---|
| Diagnostic tool[f] | $t_7 = -1.26$, $p = 0.26$<br>$R^2 = 38.47\%$ | | | | $t_8 = -0.34$, $p = 0.74$<br>$R^2 = 0\%$ | |
| Risk of bias total score[g] | $t_7 = 1.83$, $p = 0.09$<br>$R^2 = 9.3\%$ | $t_{19} = 1.76$, $p = 0.10$<br>$R^2 = 10.75\%$ | $t_4 = -0.52$, $p = 0.65$<br>$R^2 = 0\%$ | $t_9 = 0.28$, $p = 0.79$<br>$R^2 = -31.19\%$ | $t_8 = -0.52$, $p = 0.62$<br>$R^2 = 0\%$ | $t_{16} = 0.96$, $p = 0.35$<br>$R^2 = -8.22\%$ |
| Country income[h] | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. |

[a] Psychological *v.* educational *v.* physical.
[b] Teacher *v.* clinician-delivered intervention.
[c] School *v.* other settings.
[d] Length of exposure to intervention in minutes.
[e] Treatment as usual *v.* placebo/active control.
[f] Structured clinical interview *v.* cut-off used in a symptom screening scale.
[g] Risk of bias total score (determined by summing the risk categories (low risk = 3, risk unable to be determined = 2, high risk = 1) across each of the six risk of bias domains).
[h] High-income *v.* low- and middle-income countries.
$R^2$ = adjusted $R^2$.
N.A., Could not be estimated as there were too few studies in the different groups.
*Significant at $p < 0.05$, **Significant at $p < 0.01$. Bold text indicates significant results.

Second, prevention interventions have largely been psychologically centred and delivered within the school setting. Universal interventions utilizing such approaches appear to be efficacious in reducing risk of internalizing disorders for up to 9 months post-intervention, with an estimated number needed to treat to prevent one case to be 70 (approximately equivalent to two large classes). Such approaches also appear to be efficacious in reducing internalizing symptoms for up to 12 months. Selective and indicated interventions also appear to be efficacious although it was unclear for how long they might reduce risk of disorder or disorder symptoms as the small number of studies available meant that significant impacts were detected at some follow-up time points but not others. Given that most studies utilized similar intervention approaches, there is little evidence available in this review to support other types of prevention intervention approaches, however, there appeared to be some promising results for physical interventions among selective and indicated samples but too few studies were available to determine their true impact.

Third, as noted above, the impact of prevention interventions markedly deteriorates over time. It was unclear whether the lower effect sizes observed at longer follow-up periods were due to: (1) a natural decay process; (2) a reduction in power; or (3) a combination of the two. If the observed deterioration was largely due to natural decay, then an argument could be made for the widespread implementation of such prevention programs despite their declining long-term efficacy. For instance, many programmes that aim to prevent the onset of general medical problems require repeated exposures to a preventive agent (e.g. vaccinations for infectious diseases). Likewise, it may be necessary to provide children and adolescents with repeat exposures of a psychological intervention to maintain an acceptable level of benefit over time.

Fourth, meta-regressions revealed that several features of the interventions were associated with the magnitude of impact. This finding has clear importance with respect to the feasibility of the scale-up of prevention interventions whether universal, selective, or indicated. Psychological interventions – whether delivered alone or in combination with educational material – appeared to result in greater reductions in internalizing disorder onset and internalizing symptoms than other intervention types for both universal and selective samples. There was also an improvement in the interventions' impact on disorder onset if teachers (or other school employees) delivered the interventions as opposed to clinicians or clinical researchers. However, this was only the case for universal prevention at 12 months follow-up. Importantly, the setting in which the intervention was delivered was not

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associated with the magnitude of effect of the intervention over 12 months. In many countries school retention is high and increasing over time, providing the environment for interventions to be delivered to scale if included as part of existing curricula, delivered by school staff, and repeated in each school year as seems to be warranted given the apparent limited time across which exposure to an intervention might be expected to be effective. The internet may provide a cost-effective platform from which to deliver such interventions yet there were too few studies available to comment separately on the efficacy of studies delivered in this way.

### *Limitations of the evidence*

There are a number of limitations in the existing evidence on prevention interventions for depression and anxiety. The first limitation was the paucity of studies providing information on the long-term follow-up of trial participants, particularly those focusing on the prevention of anxiety. This review has highlighted a need for future prevention studies to continue measuring the impact of an intervention over longer follow-up periods to increase the statistical power of long-term observations and, in turn, enable better inferences on the true long-term impacts of these interventions. This is particularly important given that the period of risk for the onset of internalizing disorders extends from adolescence into young adulthood (Kessler *et al.* 2005, 2007).

Second, there were a number of biases in existing studies. This included the validity of the symptom screening scales used to assess depression and anxiety. For instance, while these measures mostly have good internal reliability and validity, their diagnostic utility is poor, and using cut-off scores to determine cases of these disorders may result in many false positives among children and adolescents (Stockings *et al.* 2014).

Further, while we attempted to adjust estimates for intervention heterogeneity, we identified significant heterogeneity for some pooled estimates, and these values should be interpreted with caution. This is not surprising given the large variation in the characteristics of participants and intervention methods used, and mostly occurred where the number of available studies for the same outcomes and time points was low. More reliable and homogenous estimates may be generated in the future as more studies examining such interventions are published.

Third, while the aim of this review was to examine the joint efficacy of intervention programs on both depression and anxiety, most of the studies focused on depression. It follows that the paucity of anxiety disorder studies led to the calculation of pooled internalizing outcomes for several intervention types, using depression data only. Further, we grouped interventions addressing different anxiety disorders together. This is consistent with DSM-5's approach to a more dimensional classification of anxiety disorders, which assesses common symptoms between categorical diagnoses of anxiety disorders (APA, 2013). Although some might argue that by combining studies focusing on (for example) phobias and GAD, that we were not comparing similar issues, there simply were too few studies focusing on individual anxiety problems to disaggregate anxiety prevention interventions any further.

## Conclusions

Prevention interventions – universal, selective and indicated – were shown to reduce risk of disorder onset and reduce symptom levels for internalizing disorders for up to 12 months. The efficacy of large-scale implementation of prevention interventions in school settings, and within existing school-staffing resources, is supported by existing studies. Limited long-term follow-up of participants in these studies means that it is not clear whether the lack of apparent efficacy over longer periods reflects the limited evidence to date. Prevention programs that target disorders with shared risk factors may result in larger effect sizes than targeting separate disorders alone, and such approaches might be considered useful on a repeated basis through childhood and adolescence. By incorporating co-morbidity into the effect size calculation, this review also provides a firm basis for cost-effectiveness analyses.

## Supplementary material

For supplementary material accompanying this paper visit http://dx.doi.org/10.1017/S0033291715001725.

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## Declaration of Interest

None.

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