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Review Article

### **Universal prevention programs for depression and anxiety disorders in children and adults: a systematic review and meta-analysis**

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## Universal prevention programs for depression and anxiety disorders in children and adults: a systematic review and meta-analysis

Universal Prevention for Depression and Anxiety

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### Abstract

**Objective:** Cognitive-behavioral therapy (CBT) is a first-line treatment for anxiety and depressive disorders, but its preventive efficacy remains uncertain. This study systematically reviewed and meta-analyzed randomized controlled trials of universal CBT-based interventions across all age groups, evaluating their effects on anxiety, depression, and quality of life.

**Methods:** We included randomized controlled trials of universal CBT programs delivered to general populations without prior risk or symptom screening. Eligible outcomes were depressive and anxiety symptoms and quality of life. Risk of bias was assessed using the Cochrane Risk of Bias tool. Separate three-level meta-analyses were conducted for each outcome, and subgroup analyses were performed by participant age and provider profession.

**Results:** Seventeen RCTs ( $n = 10,809$  participants) met inclusion criteria. Pooled effect sizes were  $SMD = -0.02$  (95% CI:  $-0.12$  to  $0.09$ ) for quality of life,  $SMD = -0.09$  (95% CI:  $-0.20$  to  $0.01$ ) for depressive symptoms, and  $SMD = -0.03$  (95% CI:  $-0.18$  to  $0.13$ ) for anxiety symptoms. None reached statistical significance. Subgroup analyses confirmed no significant effects in children/adolescents or adults. Interventions delivered by psychologists were more effective than those delivered by teachers ( $SMD = 0.18$ ), although overall preventive effects remained negligible.

**Conclusions:** Universal CBT interventions did not demonstrate significant preventive benefits for anxiety, depression, or quality of life across age groups. These findings suggest that universal CBT should not be adopted as a population-wide prevention strategy, and future research should prioritize targeted, data-driven approaches.

## Introduction

The burden of mental illness has become increasingly challenging in recent years. In 2019, approximately 1 in 8 individuals—970 million worldwide—were living with a mental disorder<sup>1</sup>. By 2020, the COVID-19 pandemic led to a sharp rise in mental health problems, with a 26% increase in anxiety disorders and a 28% increase in major depressive disorder<sup>2</sup>. Anxiety disorders are the most prevalent, affecting 301 million people globally, followed by depression with 280 million<sup>1</sup>. Alarming, more than 800,000 individuals die by suicide each year<sup>3</sup>.

Despite the availability of effective treatments, most people with mental disorders lack access to adequate care. The WHO's Comprehensive Mental Health Action Plan 2013–2030 highlights the need for promotion and prevention strategies<sup>1</sup>. In many countries, structured prevention programs have been implemented in schools and community settings, most commonly based on cognitive-behavioral therapy (CBT)<sup>4–18</sup>. CBT aims to help individuals identify emotions and related thoughts and behaviors, and develop skills to challenge unhelpful cognitions while engaging in healthier behaviors<sup>19</sup>.

Preventive programs can target different populations: the general population without prior screening (universal prevention), groups at elevated risk (selective prevention), or individuals with early symptoms (indicated prevention)<sup>20</sup>. The effectiveness of these programs can vary depending on the type of intervention<sup>21</sup>. Universal programs are inclusive and non-stigmatizing, potentially reaching people who would not otherwise seek care<sup>22</sup>. However, they tend to show small effects and limited cost-effectiveness<sup>23-24</sup>, especially when delivered by non-specialists<sup>25</sup>. Selective programs require accurate identification of risk factors, which is complex and probabilistic<sup>20</sup>. Indicated programs involve detailed assessments and trained professionals, increasing complexity and costs<sup>20</sup>. Importantly, these approaches are often tailored to developmental stages: school-based interventions for children and adolescents emphasize social-emotional learning and peer skills; in adults, programs commonly address stress management, parenting, and coping with work or health demands; and in older adults, prevention strategies focus on reducing loneliness and supporting cognitive and physical well-being. Such tailoring reflects differences in risk factors, developmental tasks, and intervention contexts across the lifespan. We adopted an inclusive approach, considering eligible any universal CBT program explicitly aimed at preventing depression or anxiety or improving quality of life, even when elements of promotion were integrated.

Several meta-analyses have examined CBT prevention in youth, but evidence remains limited. Caldwell et al.<sup>26</sup> found little support for school-based preventive interventions focused solely on depression or anxiety. Hetrick et al.<sup>19</sup> reviewed CBT, third-wave CBT, and interpersonal therapy in children and adolescents, also concluding that evidence was insufficient for broad implementation. For self-harm, Witt et al.<sup>27</sup> reported uncertain evidence on psychosocial prevention strategies.

Although mental health problems occur across the lifespan, no previous meta-analysis has synthesized universal CBT prevention programs spanning all age groups. In addition, prior reviews have not considered quality of life as an outcome, nor examined moderators such as participant age or the professional background of the provider. To address these gaps, we conducted a systematic review and multilevel meta-analysis of randomized controlled trials

testing universal CBT interventions. To our knowledge, this is the first study to: (1) synthesize evidence across all age groups; (2) include quality of life alongside depression and anxiety outcomes; (3) examine whether effects vary by participant age (children/adolescents vs. adults) and provider profession (e.g., psychologist vs. teacher); and (4) apply a multilevel meta-analytic approach to account for nested data structures.

We hypothesized that universal CBT interventions would yield small positive effects on depression, anxiety, and quality of life, and that these effects would vary by age group and provider profession.

## Methods

This systematic review and meta-analysis was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines<sup>28</sup> (Supplemental S1 Table A) and was prospectively registered in PROSPERO (CRD42020167109; April 28, 2020). Ethical approval was not required, as the study synthesized data from previously published trials.

Studies were included if they met the following criteria: (a) randomized controlled trials (RCTs); (b) interventions designed as universal prevention for depressive or anxiety disorders, or aimed at improving quality of life; and (c) reporting outcomes related to depressive symptoms, anxiety symptoms, or quality of life. We adopted the National Research Council and Institute of Medicine definition of primary prevention, which targets entire populations regardless of individual risk status<sup>29</sup>. In this review, the term *general population* refers to participants recruited without prior risk or symptom screening, consistent with universal prevention.

No restrictions were applied regarding participants' age, sex, language, country, publication date, setting (e.g., schools, workplaces), CBT delivery format (individual, group, internet-based), or intervention duration. Only universal interventions explicitly based on CBT, including traditional and third-wave protocols, were eligible. Interventions solely based on lifestyle changes, general psychoeducation, or other non-CBT frameworks were excluded.

One included trial targeted maternal mental health in the context of postnatal depression prevention<sup>10</sup>, with interventions delivered to couples during the perinatal period; however, no studies focused on newborns or exclusively on infant development.

A comprehensive search of PubMed, Embase, and Web of Science was conducted from database inception through May 10, 2022. Search terms included combinations of keywords related to cognitive, behavioral, and third-wave therapies, primary prevention, and universal prevention of depression and anxiety (Supplemental S1 Text A). Strategies were adapted for each database using Boolean operators. Additional records were identified by manual screening of reference lists and consultation with field experts.

Two reviewers independently screened titles and abstracts (Bermudez MB, de Amorim Macedo MJ), removed duplicates, and retrieved full-texts for potentially eligible studies. RCTs were assessed against inclusion criteria. Data were managed in Excel spreadsheets, analyzed independently, and cross-checked. Discrepancies were resolved through discussion or adjudication by a third reviewer (Dreher CB).

Data extraction was performed using a standardized form and included study characteristics (e.g., author, year), participant demographics, intervention details (e.g., type, duration, provider), outcomes, and results. Extraction was conducted by one reviewer and verified by a second. Study authors were contacted when clarification was required, incomplete data were reported, or unpublished results were available. For consistency, a 3-month follow-up period was adopted, corresponding to the most common endpoint across trials.

Risk of bias was assessed with the Cochrane Risk of Bias tool<sup>30</sup>, evaluating selection, performance, detection, attrition, reporting, and other biases. Studies were classified as: low risk (no domains rated high risk and  $\leq 3$  rated unclear), moderate risk (one high-risk domain or  $\geq 4$  unclear), or high risk (all other cases).

Small-study effects were examined through funnel plot inspection, and publication bias was assessed using Egger's regression test<sup>31</sup>, considered appropriate given that more than ten studies were included.

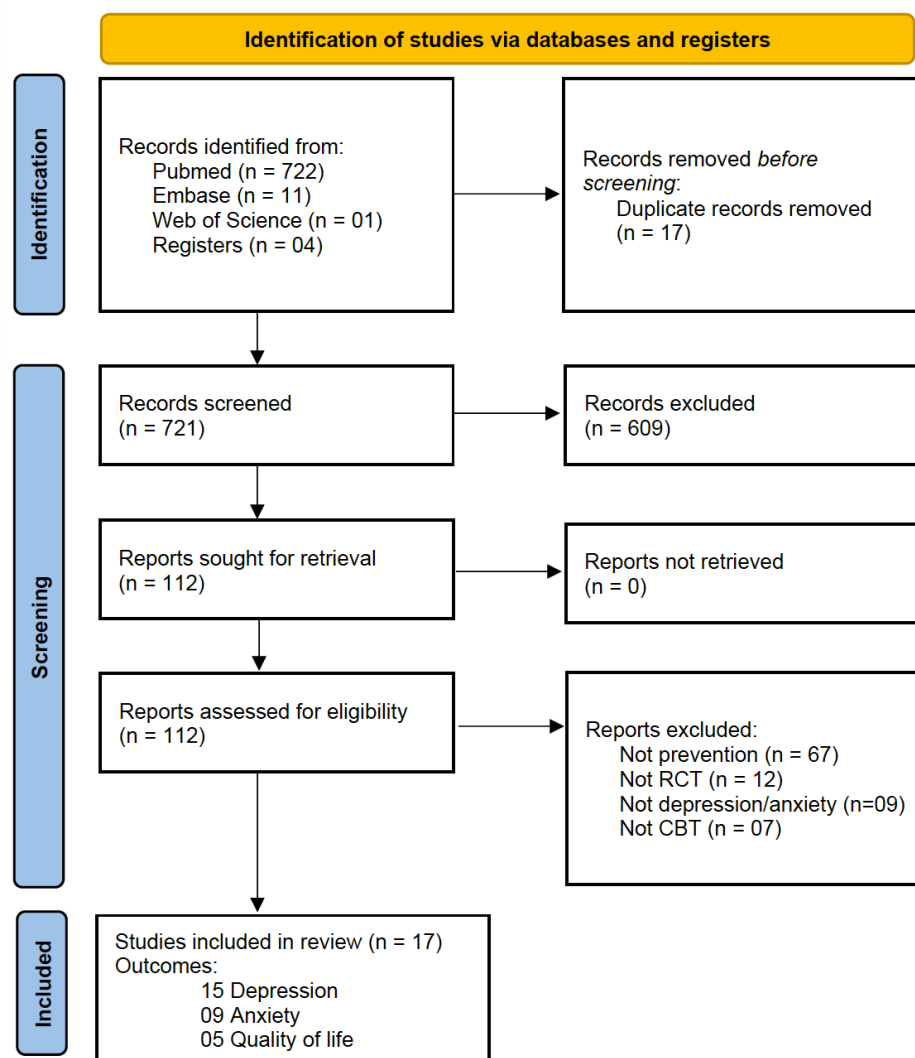
A three-level meta-analysis was conducted with random slopes by study, modeling variability across interventions and provider background<sup>32</sup>. Separate models were performed for anxiety, depression, and quality of life outcomes. In addition, subgroup analyses stratified by age groups were performed to examine their potential influence on effect size estimates.

Effect sizes were reported as standardized mean differences (SMDs), calculated by estimating the standardized mean change (final minus baseline score) within each group, then subtracting the change in the control group from that of the intervention<sup>33</sup>. A correlation of 0.25 between pre- and post-intervention scores was assumed, based on prior meta-analyses<sup>34</sup>. SMDs of 0.2, 0.5, and 0.8 were interpreted as small, moderate, and large, respectively<sup>35</sup>. Ninety-five percent confidence intervals (CIs) were calculated, and heterogeneity was assessed with the  $I^2$  statistic. If a control group contributed to multiple comparisons, its sample size was proportionally divided<sup>30</sup>.

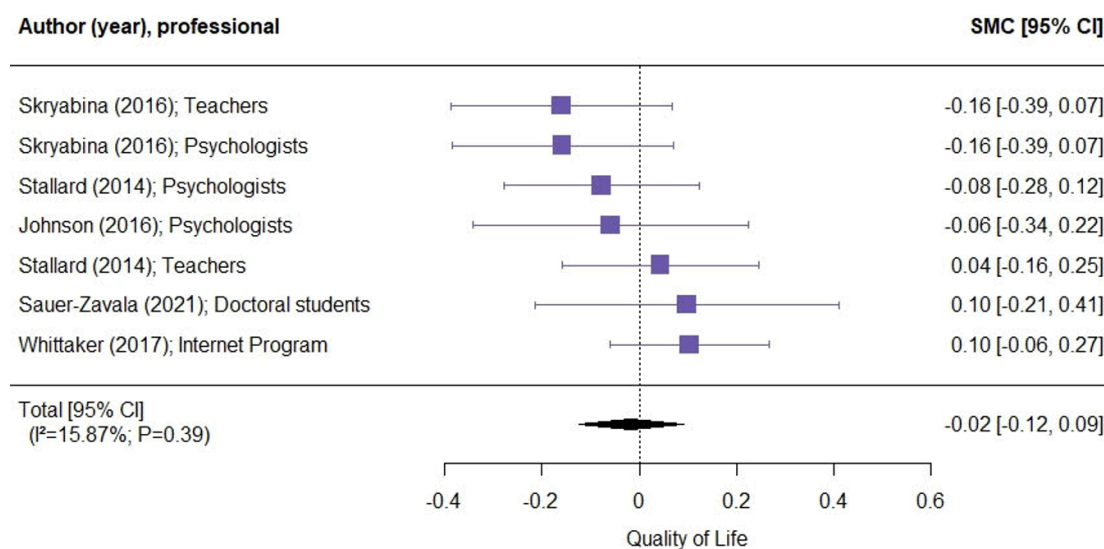
An a priori power analysis was conducted assuming moderate heterogeneity, a small effect (0.3), and five studies with ~100 participants per arm, based on prior meta-analyses of CBT for prevention<sup>19 26</sup>. This indicated 92% statistical power<sup>35</sup>. Analyses were performed in R (version 3.5.1) using the *metafor* package<sup>37</sup>.

## Results

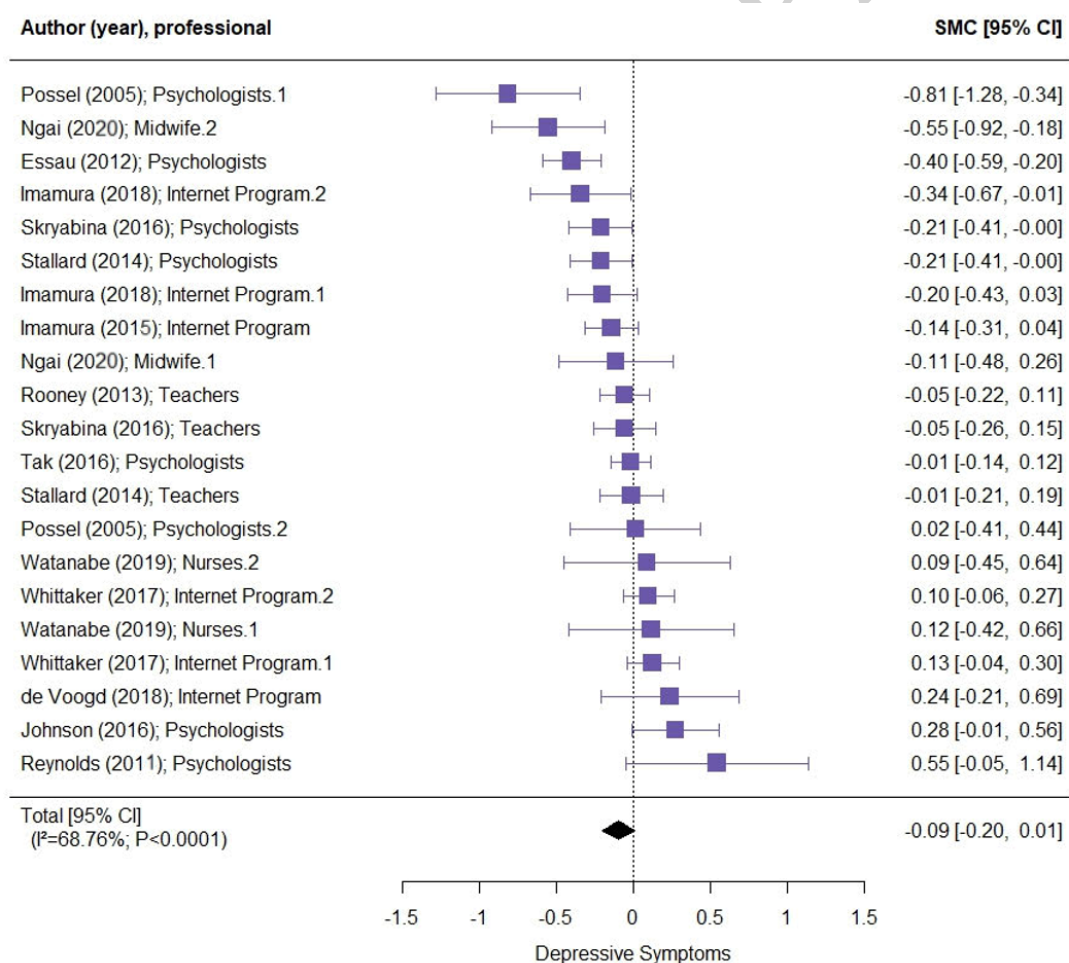
We screened 738 records and retrieved 112 full-text articles (Figure 1). Seventeen RCTs met the inclusion criteria, reporting 40 outcome measures with a combined sample size of 10,809 participants. Interventions primarily consisted of universal CBT aimed at improving quality of life or preventing depressive and anxiety disorders. Outcomes were assessed with standardized measures of quality of life and depressive or anxiety symptoms. Five (29.4%) trials targeted adults, 11 (64.7%) children and adolescents, and one (5.9%) included both. In adult trials, the mean age was 37.6 years (SD = 4.45), while in child/adolescent trials it was 12.3 years (SD = 2.95). The mean number of participants per intervention arm was 293 for quality of life trials, 240 for depression, and 209 for anxiety.



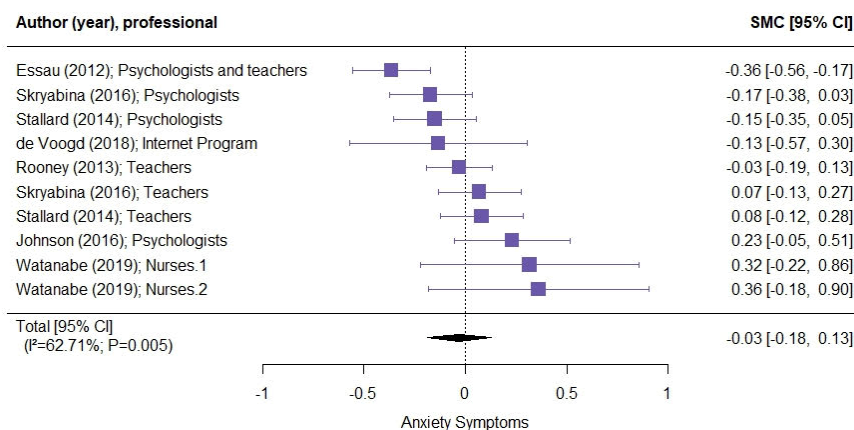
The pooled effect sizes were  $SMD = -0.02$  (95% CI:  $-0.12$  to  $0.09$ ,  $I^2 = 15.9\%$ ) for quality of life (Figure 2),  $SMD = -0.09$  (95% CI:  $-0.20$  to  $0.01$ ,  $I^2 = 68.8\%$ ) for depressive symptoms (Figure 3), and  $SMD = -0.03$  (95% CI:  $-0.18$  to  $0.13$ ,  $I^2 = 62.7\%$ ) for anxiety symptoms (Figure 4). Negative SMD values indicate that the intervention group improved less than the control group, rather than an actual decline in quality of life. None of the pooled estimates reached statistical significance.



**Figure 2:** Measures of quality of life at the 3-month follow-up.

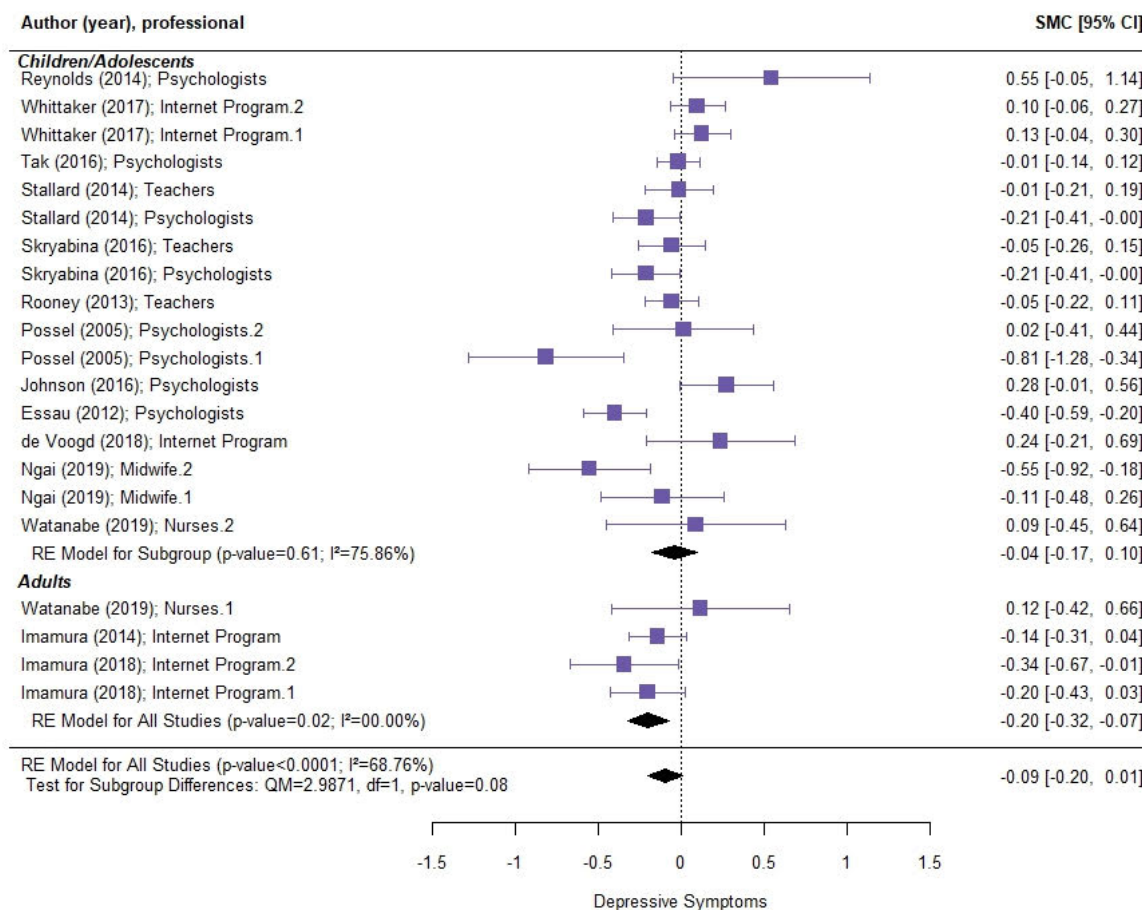


**Figure 3:** Measures of depressive symptoms at the 3-month follow-up.

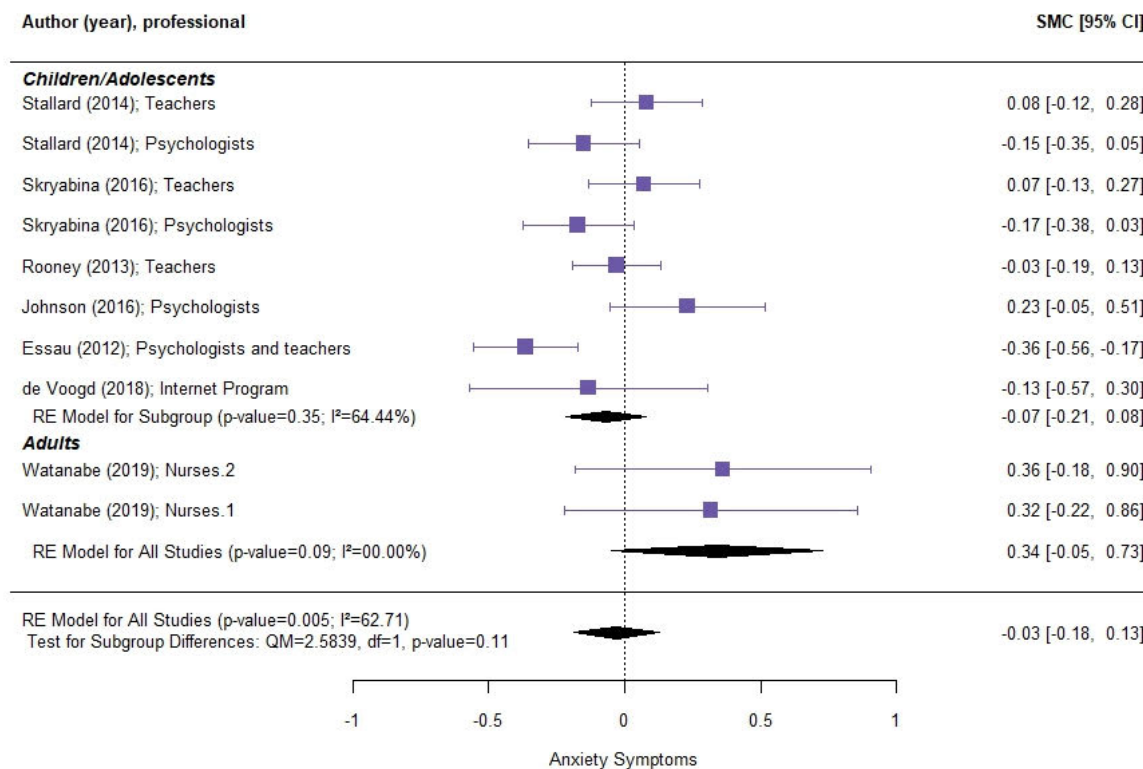


**Figure 4:** Measures of anxiety symptoms at the 3-month follow-up.

Subgroup analysis by age group showed no robust evidence for differences. For depression, the pooled effect size was  $SMD = -0.04$  (95% CI:  $-0.17$  to  $0.10$ ,  $I^2 = 75.9\%$ ) in children/adolescents and  $SMD = -0.20$  (95% CI:  $-0.32$  to  $-0.07$ ,  $I^2 = 0.0\%$ ) in adults, with no significant subgroup difference ( $QM = 2.99$ ,  $df = 1$ ,  $p = 0.08$ ; Figure 5). For anxiety, the pooled effect was  $SMD = -0.07$  (95% CI:  $-0.21$  to  $0.08$ ,  $I^2 = 64.4\%$ ) in children/adolescents and  $SMD = 0.34$  (95% CI:  $-0.05$  to  $0.73$ ,  $I^2 = 0.0\%$ ) in adults, again with no significant subgroup difference ( $QM = 2.58$ ,  $df = 1$ ,  $p = 0.11$ ; Figure 6). For quality of life, age-stratified analyses were not possible, as available studies did not report separate results for children/adolescents and adults.



**Figure 5:** Depressive symptoms at 3-month follow-up, stratified by age group



**Figure 6:** Anxiety symptoms at 3-month follow-up, stratified by age group

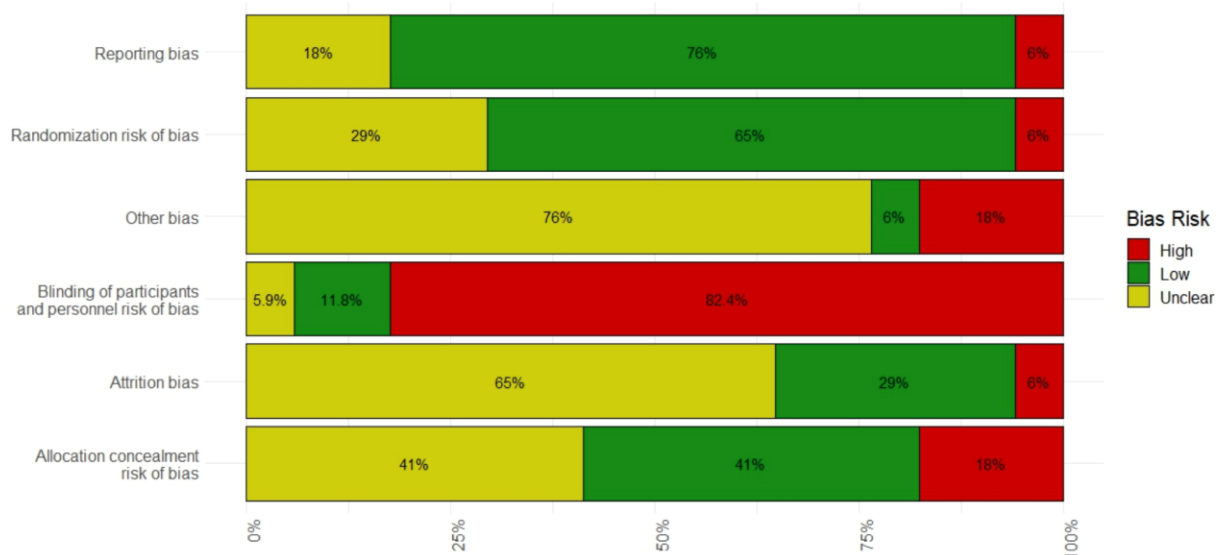
Provider background influenced outcomes. Interventions delivered by psychologists were significantly more effective than those delivered by teachers (SMD = 0.18), while no significant differences were observed when comparing psychologists with other professionals (e.g., nurses, counselors). This suggests that professional training may influence outcomes, although the overall preventive effects of universal CBT interventions remained small and non-significant (Figure 7).

| Internet                                                                |                            |                             |                                         |                            |          |
|-------------------------------------------------------------------------|----------------------------|-----------------------------|-----------------------------------------|----------------------------|----------|
| -0.25 (-0.73; 0.24)<br>0.32                                             | Midwives                   |                             |                                         |                            |          |
| 0.31 (-0.18; 0.80)<br>0.21                                              | 0.56 (-0.08; 1.19)<br>0.09 | Nurses                      |                                         |                            |          |
| -0.03 (-0.27; 0.21)<br>0.81                                             | 0.22 (-0.25; 0.69)<br>0.37 | -0.34 (-0.81; 0.13)<br>0.16 | Psychologists                           |                            |          |
| -0.06 (-0.40; 0.28)<br>0.73                                             | 0.19 (-0.34; 0.71)<br>0.49 | -0.37 (-0.90; 0.16)<br>0.17 | -0.03 (-0.29; 0.23)<br>0.82             | Psychologists - Teachers   |          |
| 0.15 (-0.11; 0.41)<br>0.25                                              | 0.40 (-0.08; 0.87)<br>0.10 | -0.16 (-0.64; 0.32)<br>0.52 | <b>0.18 (0.05; 0.32)</b><br><b>0.01</b> | 0.21 (-0.08; 0.50)<br>0.15 | Teachers |
| <div>Professional</div> <div>Efficacy (SMD with 95% CI / p-value)</div> |                            |                             |                                         |                            |          |

Legend: SMD; standardized mean difference; RR, risk ratio; CI, Confidence Interval. Comparisons between professionals should be read from left to right and the estimate is in the cell in common between the column-defining treatment and the row-defining treatment. Estimates below 0 favour the column-defining treatment.

**Figure 7:** Comparisons of efficacy for the aggregate measure of internalizing symptoms according to professional categories.

Regarding risk of bias, six trials (35.3%) were rated as high risk, nine (52.9%) as moderate, and two (11.8%) as low (Figure 8). Visual inspection of funnel plots did not suggest systematic small-study effects, and Egger's regression tests indicated no evidence of publication bias for anxiety ( $p = 0.12$ ), depression ( $p = 0.61$ ), or quality of life ( $p = 0.68$ ) (Supplemental Figures S1A–C).



**Figure 8:** Risk of bias summary.

Although some trials included participants over age 60, data were insufficient to conduct subgroup analyses for this group. Overall, none of the pooled effect sizes reached statistical significance, confirming that universal CBT interventions were ineffective for quality of life, depressive symptoms, and anxiety symptoms. Subgroup analyses likewise confirmed a lack of effectiveness in both children/adolescents and adults.

## Discussion

In this study, we assessed the efficacy of universal CBT-based interventions for preventing depression and anxiety and for improving quality of life across the lifespan. We included RCTs with varied providers (psychologists, teachers, nurses, and internet-based programs) and without age restrictions. Overall, we found insufficient evidence that universal CBT interventions are effective. Although such interventions are conceptually attractive due to their inclusive and non-stigmatizing nature, our results indicate that they do not appear to translate into meaningful preventive outcomes.

Our analyses consistently showed that universal CBT interventions were ineffective in preventing depression or anxiety or in improving quality of life. None of the pooled effect sizes reached statistical significance. The small negative or near-zero values suggest a lack of

preventive benefit, and subgroup analyses confirmed ineffectiveness among both children/adolescents and adults.

To our knowledge, this is the first multilevel meta-analysis of universal CBT prevention programs for depression and anxiety across all age groups, with comparisons by participant age and provider background. However, older adults were underrepresented in the available literature, with only a few studies including participants over 60 years and none reporting separate data. As a result, the generalizability of our findings to older adults remains limited.

Our results align with prior evidence. Caldwell et al.<sup>26</sup>, for example, reported that school-based universal interventions for children and adolescents showed little preventive effect. Similarly, Hetrick et al.<sup>19</sup> found insufficient evidence to support the broad implementation of CBT, third-wave CBT, or interpersonal therapy for the prevention of depression in youth. Evidence for self-harm prevention is also uncertain, as shown by Witt et al.<sup>27</sup>. By contrast, meta-analyses in high-risk populations have demonstrated that CBT can reduce symptoms of anxiety and depression, including among hemodialysis patients<sup>38</sup>, cancer survivors<sup>39</sup>, unemployed individuals<sup>40</sup>, trauma survivors<sup>41</sup>, and adults with chronic conditions<sup>42</sup>. These findings suggest that targeted prevention strategies may be more effective than universal approaches.

Future research should therefore focus on selective and indicated prevention. Targeting individuals with mild or subthreshold symptoms, or addressing well-established risk factors such as bullying, may yield stronger preventive effects. Evidence shows that anti-bullying programs can reduce bullying rates and improve mental health in youth<sup>43-44</sup>. In our review, however, only one protocol explicitly addressed bullying, using it as an example stressor in children<sup>22</sup>. Similarly, broader social determinants such as exposure to violence, neighborhood crime, and early substance use are strongly associated with adverse mental health outcomes<sup>45-47</sup>. Preventive interventions that build life skills, promote social competence, and strengthen problem-solving and emotional regulation have been shown to reduce risk in these contexts. In our review, only one RCT addressed substance use, focusing on alcohol<sup>18</sup>.

One secondary finding was that interventions delivered by psychologists were more effective than those delivered by teachers. This difference likely reflects professional training and expertise: psychologists receive extensive preparation in psychotherapy, including theoretical foundations, structured techniques, and competencies for delivering CBT with fidelity. Teachers, by contrast, typically receive only brief training focused on protocol delivery, with less emphasis on therapeutic processes. These differences may account for the observed variation in effectiveness. Future prevention strategies should consider the training required for non-specialist providers to achieve consistent results.

While universal interventions remain appealing, recent developments point toward more tailored strategies, including precision and personalized approaches. In mental health, these approaches face challenges but may ultimately offer better alignment with individual needs. There is ongoing debate about whether specific therapeutic components (e.g., behavioral activation) or non-specific factors (e.g., empathy, rapport) drive clinical improvement<sup>51- 52</sup>. A recent theoretical model of personalized CBT integrates both structured and process-based elements<sup>53</sup>, suggesting that effective prevention may lie between universal and individualized interventions.

Several limitations should be acknowledged. First, most included trials were rated as moderate or high risk of bias, potentially compromising the reliability of results. Second, the limited number of studies restricted our ability to explore moderators in detail, limiting insights into which characteristics influence outcomes. Third, universal prevention trials remain scarce, especially outside school settings and in adult or older adult populations, reducing generalizability. Fourth, we did not conduct sensitivity analyses stratified by instrument family or excluding non-validated/single-item measures, which may have influenced effect size estimates. Finally, we did not analyze specific CBT components or methodological moderators, which may help identify the most effective elements of preventive interventions.

In summary, although CBT has been widely promoted as a universal preventive approach, our findings provide little evidence to support its effectiveness in preventing depression, anxiety, or improving quality of life across age groups. Effect sizes were small,

not statistically significant, and in some cases associated with moderate heterogeneity. These results suggest that universal CBT should not be adopted as a population-wide prevention strategy. Instead, future research should prioritize targeted and data-driven approaches to prevention, which may provide more meaningful benefits for mental health across the lifespan.

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### Conflict of Interest Declaration

The authors declare no conflicts of interest related to this study.

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