

Universal school-based digital mental health interventions for children and adolescents: a systematic review and meta-analysis

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University, Beijing, China.**ADMINISTRATIVE INFORMATION****Support** - National Natural Science Foundation of China [Grant Number 72442021].**Review Stage at time of this submission** - Data extraction.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY2025100058**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 17 October 2025 and was last updated on 17 October 2025.**INTRODUCTION**

Review question / Objective What are the effects of universal school-based digital mental health interventions on children and adolescents? How robust are these effects? What factors moderate their effectiveness?

Condition being studied The rising prevalence of mental health challenges among children and adolescents is a significant global concern, making schools a critical setting for delivering universal preventive interventions. The rapid growth of technology positions digital interventions as a uniquely scalable and accessible approach to address this issue. However, while previous reviews have assessed specific outcomes like anxiety or depression, a comprehensive meta-analytic synthesis for universal, school-based digital interventions across a broad spectrum of outcomes is currently lacking. Accordingly, the conditions studied are intentionally extensive, encompassing several key

domains. These include internalizing problems (e.g., depression, anxiety), externalizing problems (e.g., bullying, cyberbullying), and substance use or addictive behaviors (e.g., tobacco and alcohol use, internet addiction). Furthermore, this review will assess the interventions' impact on positive psychological constructs such as resilience, emotional regulation, and mental health literacy.

METHODS

Search strategy A comprehensive literature search was conducted in nine electronic databases: PubMed, Embase, Web of Science, Scopus, PsycINFO, ERIC, ACM Digital Library, IEEE Xplore, and the Cochrane Central Register of Controlled Trials (CENTRAL). Keywords and their synonyms were entered in various combinations, such as: ("universal" OR "primary prevention") AND ("digital" OR "online" OR "web-based") AND ("mental health" OR "anxiety" OR "depression") AND ("children" OR "adolescents" OR "students") AND ("school" OR "school-based" OR

"classroom"). The search was restricted to randomized controlled trials published between January 2015 and July 2025.

Participant or population Children and adolescents aged 6 to 18 years from mainstream school settings.

Intervention The intervention of interest is any universal, school-based mental health program delivered, wholly or in part, through a digital medium. The intervention must be a universal prevention or promotion strategy, defined as being offered to all students within a school setting. Eligible digital modalities primarily include, but are not limited to, four main forms: remote video interventions, web-based interventions, virtual reality interventions, and mobile application interventions. Multi-component programs are eligible provided at least one core component is delivered digitally.

Comparator Eligible comparators include passive controls (e.g., waitlist, no-intervention) and active controls (e.g., treatment-as-usual, alternative non-digital interventions).

Study designs to be included Only Randomized Controlled Trials (RCTs) will be included.

Eligibility criteria Included studies will be randomized controlled trials (RCTs) evaluating universal, school-based digital mental health interventions for children and adolescents (6-18 years old). Studies must report on at least one mental health outcome and be published in English between January 1, 2015, and July 23, 2025. The exclusion criteria are as follows: 1) studies with selective or indicated interventions; 2) research focusing on specific clinical populations or specialized educational settings; 3) interventions where the digital component is not integral to delivery; and 4) non-RCT designs or unpublished grey literature.

Information sources PubMed, Embase, Web of Science, Scopus, PsycINFO, ERIC, ACM, IEEE, Cochrane Library.

Main outcome(s) The main outcomes are a broad range of mental health and well-being indicators, which can be grouped into several key domains. These include internalizing problems (e.g., depression, anxiety, stress), externalizing and behavioral problems (e.g., substance use, internet addiction, bullying), and positive psychological constructs (e.g., resilience, self-esteem, well-being). Additionally, outcomes related to

knowledge and attitudes, such as mental health literacy, will be examined.

Quality assessment / Risk of bias analysis Risk of bias assessed by Cochrane Risk of Bias tool.

Strategy of data synthesis A narrative synthesis will be conducted to describe the characteristics and findings of all included studies. Where studies are sufficiently homogeneous, a meta-analysis will be performed using RevMan (Version 5.4). Effect measures will be selected based on the nature of the outcome data. For continuous outcomes, the standardized mean difference (SMD) and its 95% confidence interval (CI) will be used. For dichotomous outcomes, the Odds Ratio (OR) or Risk Ratio (RR) with its 95% CI will be calculated. Heterogeneity among studies were evaluated using the I² statistic with a value above 50% indicating high heterogeneity.

Subgroup analysis Subgroup analysis will be conducted for different outcomes, different participants characteristics, different intervention characteristics (e.g., delivery mode, duration, intensity), and different comparator type.

Sensitivity analysis The stability of the results was tested using the sensitivity analysis through the "leave-one-out method", where individual studies were removed sequentially. $P < 0.05$ was considered statistically significant (two-tailed).

Language restriction English only.

Country(ies) involved China.

Keywords Universal; school-based; digital health; child and adolescent mental health; randomized controlled trial; systematic review and meta-analysis.

Contributions of each author

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