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Mental health in university students: an umbrella review grading the evidence for psychosocial interventions

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ABSTRACT

Question Psychological distress is increasingly prevalent among university students, raising concerns about their mental health. This review aimed to assess the strength and credibility of evidence on the efficacy of psychosocial interventions for improving mental health in this population.

Study selection and analysis We conducted an umbrella review of systematic reviews (SRs) with meta-analyses of randomised controlled trials assessing psychosocial interventions among university students. Searches were performed in Medline, PubMed, Cochrane Central, PsycINFO, CINAHL, Epistemonikos and Campbell Collaboration from 1 January 2014 to 1 February 2026. Data on intervention type, comparator, outcome and study-level effect sizes were analysed using inverse-variance random-effects models with restricted maximum likelihood estimation of between-study heterogeneity (τ^2). Strength of associations was evaluated according to umbrella review criteria, reporting quality using A MeaSurement Tool to Assess systematic Reviews 2 (AMSTAR-2) and certainty of evidence using Grading of Recommendations Assessment, Development and Evaluation (GRADE).

Findings A total of 34 SRs were identified. After excluding overlapping syntheses, 28 unique meta-analyses from 12 SRs were included. Mindfulness-based interventions versus inactive controls for distress (standardised mean difference (SMD) −0.40; 95% CI −0.53 to −0.28) showed highly suggestive evidence (class II; GRADE: low; AMSTAR: high). Seven associations provided suggestive evidence (Class III): mindfulness-based interventions versus inactive controls for anxiety (SMD −0.54; 95% CI −0.81 to −0.27) and depression (SMD −0.52; 95% CI −0.65 to −0.39); cognitive-based interventions versus inactive controls for anxiety (SMD −0.48; 95% CI −0.62 to −0.34) and depression (SMD −0.60; 95% CI −0.75 to −0.45); cognitive-based interventions versus active controls for well-being (SMD −0.30; 95% CI −0.42 to −0.18); positive psychology interventions versus inactive controls for distress (SMD −0.22; 95% CI −0.35 to −0.10); and multimodal interventions versus inactive controls for distress (SMD −0.85; 95% CI −1.32 to −0.87). The remaining associations were weak or non-significant, generally supported by low or very low certainty and mostly low or very low reporting quality.

Conclusions The most robust evidence emerged for mindfulness and cognitive-based interventions, with some support also for positive psychology approaches. These interventions appear to improve depression, anxiety, distress and well-being among university students, though further rigorous research is needed.

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BACKGROUND

Mental health disorders have become a pressing global concern, with prevalence increasing in recent decades.[1] University students have been identified as a vulnerable population regarding psychological distress, a well-established risk factor for mental health disorders.[1]

This vulnerability is further compounded by the developmental phase of emerging adulthood, which is characterised by an increased risk of onset of various mental health symptoms, including anxiety, depression, substance abuse and suicidal behaviour.[2] The World Mental Health Surveys reported a 12-month prevalence of any mental health disorder among university students of approximately 20%.[1] More recent data from the World Mental Health International College Student (WMH-ICS) initiative indicate that about one-third of university students meet criteria for at least one mental health disorder within a 12-month period.[2]

Psychosocial interventions aim to improve mental health and well-being in university students and can be applied across three domains: promotion, prevention and treatment of mental health disorders.[3]

Prevention may target the general population (universal), high-risk groups such as university students (selective), or individuals with subclinical symptoms (indicated). In contrast, mental health promotion focuses on enhancing well-being and protective factors.[3] Interventions across these domains may be delivered at the individual, group or family level. Treatment interventions, instead, aim to reduce symptoms of diagnosable conditions such as anxiety and depression.

Despite the availability of multiple interventions across these categories, evidence on their effectiveness for university students remains fragmented. Given the growing number of systematic reviews (SRs) and meta-analyses in this field, an umbrella review is appropriate to synthesise the evidence and assess its overall strength and credibility. This study builds on a previous umbrella review[4] by focusing specifically on meta-analyses of randomised controlled trials (RCTs), applying a structured approach to managing overlapping meta-analyses, and integrating quantitative credibility assessment with outcome-level evaluation using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach. This approach

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Psychological distress, depression and anxiety are highly prevalent among university students. A recent umbrella review synthesised findings from 74 meta-analyses covering a broad range of intervention studies in university students. However, the evidence remains heterogeneous and often of limited methodological quality, making it difficult to determine which interventions are supported by the most credible evidence.

WHAT THIS STUDY ADDS

⇒ This umbrella review synthesised evidence from 28 meta-analyses of randomised controlled trials (RCTs) evaluating psychosocial interventions for mental health in university students. By restricting the evidence base to meta-analyses of RCTs, systematically addressing overlapping syntheses based on Population, Intervention, Comparator, Outcome (PICO) criteria, and combining quantitative credibility assessment with outcome-level Grading of Recommendations Assessment, Development and Evaluation (GRADE) evaluation, the present study provides a structured appraisal of the robustness and certainty of the available evidence. Mindfulness and cognitive-based interventions showed the most consistent evidence of benefit, although overall certainty remained limited.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This work clarifies which psychosocial interventions are most credible and where uncertainty persists, offering a clearer evidence hierarchy for clinicians and policymakers. Mindfulness and cognitive-based approaches are supported by the most consistent evidence of efficacy. These findings highlight the need for future research to develop and rigorously evaluate scalable intervention formats that can be delivered at the population level within university settings.

prioritises internal validity and provides a transparent appraisal of the robustness and certainty of the available evidence.

Objective

Against this background, this study aims to: (1) map the evidence on the efficacy of psychosocial interventions for mental health disorders among university students tested in RCTs; (2) quantify the strength of the associations between these interventions and mental health outcomes, as well as to assess the credibility of the evidence using the GRADE approach, in accordance with quantitative umbrella review criteria (URC).[5]

STUDY SELECTION AND ANALYSIS

We conducted an umbrella review of SRs and meta-analyses on psychosocial interventions for university students to synthesise evidence and assess consistency across findings.[6] This study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines[7] and was registered in advance on the International Prospective Register of Systematic Reviews (PROSPERO) (CRD42023493618).

Search strategy and study selection

We conducted a systematic search of the electronic databases Medline, PubMed, Cochrane Central, PsycINFO, CINAHL, Epistemonikos and Campbell Collaboration from 1 January 2014 to 1 February 2026, without language restrictions (online supplemental table S1). Reference lists of relevant studies were also screened.

Two reviewers (GM, BC) independently screened titles and abstracts, and discrepancies were resolved by discussion with a third reviewer (MN or GT). Full texts were assessed by at least two reviewers (GM, BC or AC).

Inclusion and exclusion criteria

We included SRs of RCTs evaluating the efficacy of psychosocial interventions to improve mental health and well-being in university students. This restriction to RCT-based meta-analyses was intended to prioritise internal validity and reduce potential bias related to confounding and selection effects that may affect non-randomised evidence. Outcomes included anxiety, depression, distress, post-traumatic stress disorder (PTSD), quality of life (QoL) and well-being. Any comparator was eligible. The population included university students regardless of mental health status or sociodemographic characteristics. SRs published between January 2014 and February 2026 were included.

For quantitative synthesis, SRs had to include a meta-analysis with study-level effect sizes (ESs) with 95% CIs. When multiple meta-analyses addressed the same PICO, we retained the one including the largest number of primary studies to avoid duplication and maximise data coverage, in line with previous umbrella reviews.[8 9] Details are present in online supplemental table S3.

To facilitate a consistent synthesis across reviews including heterogeneous psychological interventions, we grouped interventions into conceptual categories based on the most frequently reported intervention types and their underlying therapeutic approach. Interventions sharing similar theoretical foundations or therapeutic mechanisms were aggregated under the same overarching category. This approach standardised the classification of interventions across reviews while preserving the main conceptual distinctions between intervention families.

Eight categories were defined: (1) mindfulness-based interventions; (2) cognitive-based interventions; (3) positive psychology interventions; (4) relaxation-based interventions; (5) psychoeducational interventions; (6) social support interventions; (7) art therapy interventions; and (8) multimodal interventions. If multiple types of interventions were included, we applied a ≥50% rule: if at least half of the trials used the same intervention type, the meta-analysis was classified under that dominant category. If no single category reached the 50% threshold, the intervention was classified as multimodal. This classification was applied at the meta-analysis level for the quantitative umbrella review objective.

Comparators were classified as active (structured interventions) or inactive (eg, waitlist, no intervention). If a meta-analysis included only active or only inactive comparators, it was classified accordingly. Whenever meta-analyses reported subgroup-specific effect estimates according to comparator type (active vs inactive), these estimates were retained for the analysis. When subgroup estimates were not available and meta-analyses included a mixture of active and inactive control groups, we applied a ≥50% rule to classify the comparator category based on the proportion of trials using each type of control. Outcomes included measures of mental health symptoms (anxiety,

depression, distress, PTSD) as well as broader outcomes related to psychological functioning, including QoL and well-being.

Data extraction and quality assessment

Three reviewers (GM, BC, AC) independently extracted data, resolving disagreements by consensus with a fourth reviewer (MN) if needed. When study-level ESs or other data required for the reanalysis were not available, we first examined the primary studies included in the SRs to determine whether the necessary information could be retrieved. When the required data were still unavailable, we contacted the corresponding authors of the SRs to request additional information. If the data could not be obtained, the review was excluded from the quantitative reanalysis.

Reporting quality was assessed using AMSTAR-II.[10]

Statistical analysis

For each included meta-analysis, we re-estimated summary standardised mean differences (SMDs) with 95% using inverse-variance random-effects models, given the expected methodological and clinical heterogeneity. Between-study heterogeneity was quantified using τ^2 and estimated using the restricted maximum likelihood method, and further assessed using Cochran's Q statistic ($p<0.10$) and described with the I^2 metric.[11] ESs extracted from the included meta-analyses were re-estimated using a consistent metric and orientation. Reported SMD, including variants such as Hedges' *g*, were analysed within a common SMD framework, as these metrics represent closely related estimators of the same standardised effect. Specifically, all outcomes were expressed as SMDs, and the direction of the effects was harmonised so that negative values consistently indicated effects favouring the intervention, whereas positive values indicated effects favouring the control condition. Numbers-needed-to-treat were calculated using the formula proposed by Furukawa and Leucht.[11] Additionally, we estimated 95% prediction intervals (PIs) for random-effects estimates to account for between-study heterogeneity and uncertainty in future studies. Potential publication bias and small-study effects were evaluated using Egger's regression asymmetry test.[12] A p value ≤0.10 in this test, combined with a more conservative ES in the largest study, was considered evidence of small-study effects bias.

Excess significance bias was assessed by comparing the observed number of significant results (*O*; positive studies, $p<0.05$) with the expected number (*E*).[13] For each meta-analysis, *E* was calculated as the sum of the statistical power estimates for all included studies. Statistical power of each study was computed using an algorithm based on the non-central *t* distribution, implemented in R, following previously described methods for excess significance testing.[14] The estimated power depended on the plausible ES, which was assumed to correspond to the ES of the largest study within the meta-analysis. Excess significance bias was considered present at a p value ≤0.10.

Evidence strength was classified using URC[6] as 'convincing', 'highly suggestive', 'suggestive' or 'weak' based on statistical significance, sample size, heterogeneity, PIs and bias indicators.[6] Because analyses were based on RCTs with continuous outcomes, the sample-size threshold for evidence grading was defined using the total number of participants contributing to each pooled estimate rather than the number of outcome 'cases'. Meta-analyses were deemed free from biases and classified as convincing (Class I) if they satisfied the following criteria: p value $<10^{-6}$ in random-effects meta-analysis; inclusion of more than 1000 participants; low or moderate between-study heterogeneity (I^2 <50%); 95% PI excluding the null value; no evidence of small-study effects or excess significance bias; and the largest study showing a nominally significant result ($p<0.05$). Associations were classified as highly suggestive (Class II) if they involved more than 1000 participants, exhibited highly significant summary associations (p value $<10^{-6}$ by random-effects) and had the largest study showing a nominally significant result ($p<0.05$). Suggestive evidence (Class III) was defined by meta-analyses with more than 1000 participants and p value ≤0.001 in random-effects models. Weak associations (Class IV) required only a p value ≤0.05. Associations were considered non-significant if $p>0.050$.[6]

Statistical analyses were performed using R through RStudio V.1.3.1056 for Windows, using the *meta* package for meta-analysis and *pwr*, *dplyr* and *sqldf* for supporting analyses.

Credibility of evidence

Credibility was additionally assessed using GRADE, considering risk of bias (RoB), inconsistency, indirectness, imprecision and publication bias.[5] Summary of findings tables were generated using the Grading of Recommendations Assessment, Development and Evaluation Pro Guideline Development Tool (GRADEpro GDT) application.

FINDINGS

Description of studies included in the meta-analyses

The study selection process is illustrated in figure 1. The search identified 18 130 records; after deduplication and screening of titles and abstracts, 79 full-text articles were assessed, and 34 SRs met inclusion criteria. Of these, four did not provide a meta-analysis and two did not report accessible study-level ES data (figure 1). After managing overlapping PICO-defined syntheses according to predefined criteria described in the study selection and analysis section, 12 SRs were retained, providing 28 unique meta-analyses for reanalysis. Meta-analyses excluded due to overlap were examined to compare the direction of pooled effects with those retained for quantitative reanalysis, with no materially conflicting findings observed. Table 1 summarises the characteristics of the included SRs. The 'Type of psychosocial intervention' column reflects the range of interventions included in the primary trials of each review, which may include multiple intervention types. For the quantitative analysis, interventions were subsequently classified into eight categories. Characteristics and results of the 28 meta-analyses are reported in online supplemental table S4.

Among the included SRs, 13 analysed unselected university students, while the others included participants with elevated symptoms of anxiety, depression or distress. Interventions were heterogeneous and grouped according to theoretical orientation. Mindfulness-based interventions were the most frequent, appearing in 26 (76.5%) of the 34 reviews. Cognitive behavioural therapy (CBT)-based interventions were included in 15 (44.1%) reviews. Other approaches included positive psychology and relaxation-based interventions (each in six reviews; 17.6%), as well as acceptance and commitment therapy (five reviews; 14.7%), stress management (four reviews; 11.8%) and psychoeducational-based interventions (three reviews; 8.8%). Less frequently represented approaches included resilience, dialectical behaviour therapy, expressive writing and cognitive-based interventions (each in two reviews; 5.9%). A small number of reviews included art and music therapy, peer education, social support, personalised feedback and animal-assisted interventions (each in one review; 2.9%). Because several SRs included more than one type of psychosocial intervention, reviews could

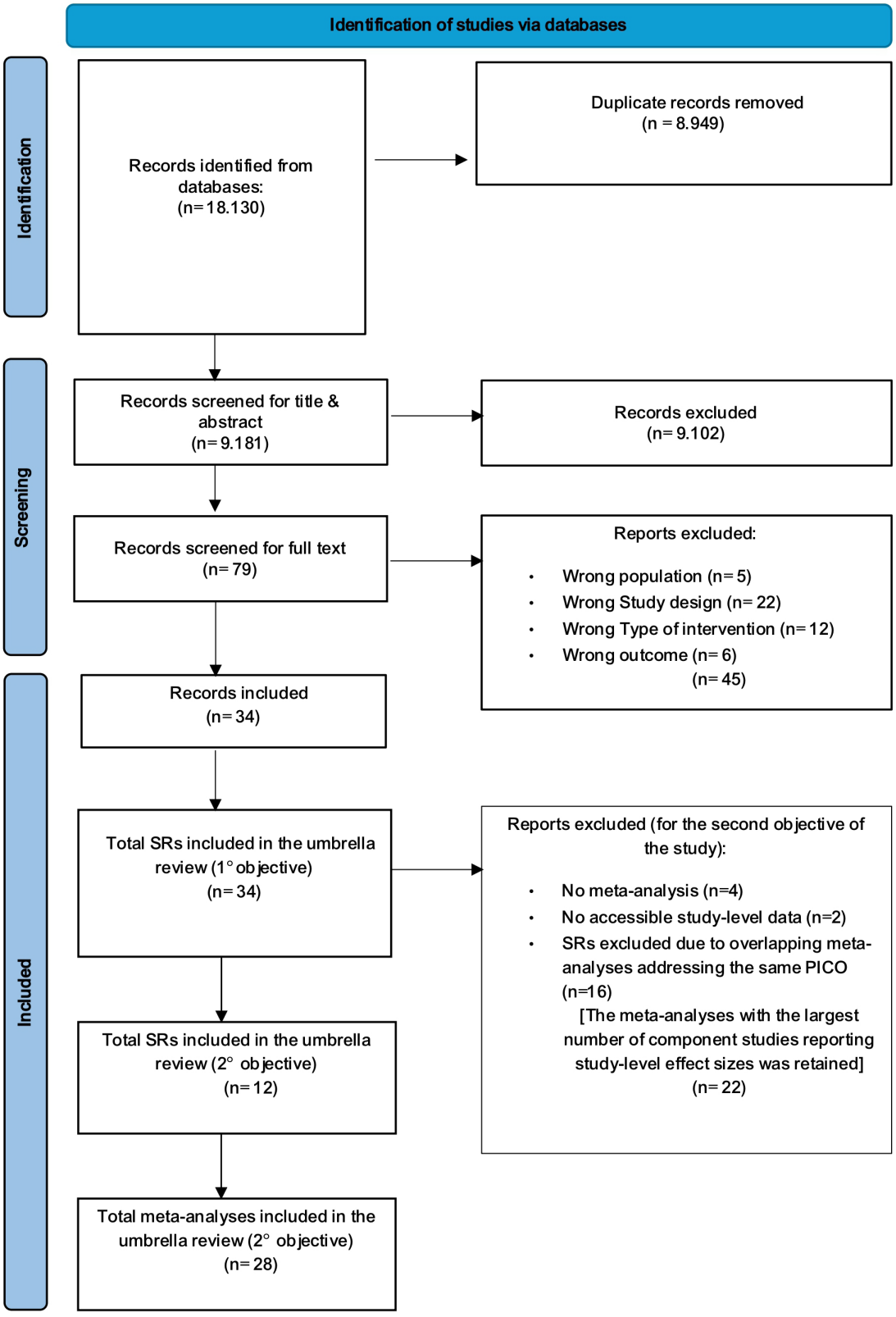

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram. SRs, systematic reviews; PICO, Population, Intervention, Comparator, Outcome.

contribute to more than one category and percentages may therefore exceed 100%. Most SRs included inactive control groups. 15 (44.1%) reviews included only inactive comparators, 1 (2.9%) only active comparators, 17 (50.0%) included both and 1 (2.9%) did not report the comparator type.

Depression was the most frequently reported outcome, appearing in 25 (73.5%) of the 34 SRs, followed by anxiety in 23 (67.6%), distress in 21 (61.8%) and well-being in 9 (26.5%) reviews. Because several SRs examined more than one mental health outcome, reviews could contribute to more than one

Table 1 Characteristics of the 34 systematic reviews included in the primary objective of the study

First author, year	Population		Intervention	Comparison	Mental health outcomes	Meta-analysis
	Sample	No. of participants (I/C)	Type of psychosocial intervention included in the review			No. of meta-analyses
Amanvermez 2022[16]	University students	2635/2324	Stress management, CBT-based	I/A	Distress	MA not included
Barrantes-Braisetal 2016[29]	University students	636/706	CBT-based, relaxation-based, positive psychology, stress management	NA	Depression, anxiety	MA not included
Chen 2021[30]	University students	604/600	Mindfulness-based	I	Depression, anxiety, distress	MA not included
Chen 2023[31]	University students	461/497	Mindfulness-based	I/A	Depression, anxiety, distress, well-being	MA not included
Chiodelli 2020[32]	University students	2166	Mindfulness-based	I/A	Depression, anxiety, distress, well-being	MA not included
Da Silva 2023[33]	University students	344/350	Mindfulness-based	I	Well-being, distress	MA not included
Davies 2014[17]	University students	1795	Mindfulness-based, CBT-based, stress management	I/A	Depression, anxiety	MA not included
Dawson 2020[34]	University students	5066	Mindfulness-based	I/A	Depression, anxiety, distress, well-being	MA not included
Fu 2020[21]	University students	1462/1421	CBT-based	I	Depression	MA not included
Hathaisaard 2022[35]	University students	689	Mindfulness-based	I	Distress	MA not included
Johnson 2023[24]	University students	3746	Mindfulness-based	I/A	Depression, anxiety, distress	MA not included
Li 2018[37]	University students	391/360	Mindfulness-based, stress management, art therapy, relaxation-based	I	Depression, anxiety, distress	MA not included
Liu 2022[38]	University students	2215	Mindfulness-based, CBT-based	I	Anxiety, distress	MA not included
Ma 2021[39]	University students	1620/1454	CBT-based, ACT-based, mindfulness-based	I/A	Depression	MA not included
Ma 2022[40]	University students	2716	Mindfulness-based, ACT-based	I/A	Depression, anxiety	MA not included
Oliveira 2023[42]	University students	1619	CBT-based	I	Anxiety	MA not included
Parbery-Clark 2021[18]	University students	NA	Animal-assisted	I	Depression, anxiety, distress	MA not included
Riboldi 2022[43]	University students	1403	CBT-based, DBT-based, relaxation-based, positive psychology, mindfulness-based	I	Depression, anxiety	MA not included
Wang 2023[27]	University students	2355/2125	DBT-based, CBT-based, mindfulness-based	I/A	Depression, anxiety	MA not included
Zuo 2023[46]	University students	846/849	Mindfulness-based	I/A	Depression, anxiety, distress	MA not included
Gong 2023[45]	University students	557/543	Mindfulness-based	I/A	Depression, anxiety, distress, well-being	MA not included
Lu 2024[47]	University students	493/528	Mindfulness-based	I/A	Distress	MA not included
Juniar 202525	**University students**	**1384/1550**	**Mindfulness-based, relaxation-based, positive psychology, psychoeducational, CBT-based**	**I/A**	**Distress**	**1**
Ang 202219	**University students**	**1342/993**	**Resilience**	**I/A**	**Depression, distress**	**2**
Barnett 202128	**University students**	**7158**	**Mindfulness-based, CBT-based, relaxation-based, positive psychology, psychoeducational, expressive writing, music therapy, social support**	**I/A**	**Depression, anxiety**	**6**
Ferrari 202220	**University students**	**3268**	**ACT-based, mindfulness-based, positive psychology**	**A**	**Well-being**	**1**
Halladay 201 915	**University students**	**4211**	**Mindfulness-based**	**I/A**	**Depression, anxiety, distress**	**5**

Continued

Table 1 Continued

First author, year	Population		Intervention	Comparison	Mental health outcomes	Meta-analysis
	Sample	No. of participants (I/C)	Type of psychosocial intervention included in the review			No. of meta-analyses
Harrer 2019[22]	**University students**	**10 583**	**CBT-based, ACT-based, mindfulness-based, skills training, expressive writing, personalised feedback, peer support**	**I/A**	**Depression, anxiety, distress, well-being**	**2**
Howell 2019[36]	**University students**	**585**	**ACT-based**	**I**	**Well-being**	**1**
Huang 2018[23]	**University students**	**NA**	**CBT-based, mindfulness-based**	**I**	**Depression, anxiety**	**2**
Lo 2018[44]	**University students**	**2422**	**CBT-based, mindfulness-based, psychoeducational**	**I**	**Depression, anxiety, distress**	**5**
Ma 2019[26]	**University students**	**2472**	**Mindfulness-based**	**I**	**Depression**	**1**
Malinauskas 2022[41]	**University students**	**5086**	**CBT-based, mindfulness-based, positive psychology**	**I**	**Depression, anxiety, distress**	**1**
Pan 2024[48]	**University students**	**1397/1425**	**Mindfulness-based**	**I**	**Depression, anxiety, distress, well-being**	**1**

Systematic reviews included in the secondary objective are highlighted in bold.
No. of participants: total or intervention/control.
A, active; AC, attention control; ACT, acceptance and commitment therapy; CAU, care as usual; CBT, cognitive behavioural therapy; DBT, dialectical behaviour therapy; I, inactive; MA, meta-analysis; NA, information not available.

outcome category. Most SRs included mixed student samples, often combining trials with unselected students and students with elevated symptoms of anxiety, distress or depression. Interventions were delivered through multiple formats, including online, face-to-face or blended approaches, and were implemented across different settings such as university campuses, laboratories, health clinics or home environments. Further details are reported in online supplemental table S2. Mental health outcomes were assessed using a range of validated psychometric instruments. Anxiety was commonly measured using instruments such as the Generalized Anxiety Disorder-7 (GAD-7), State-Trait Anxiety Inventory (STAI), Depression Anxiety Stress Scales-21 (DASS-21) and Beck Anxiety Inventory (BAI); depression using the Beck Depression Inventory (BDI), Patient Health Questionnaire-9 (PHQ-9), Center for Epidemiologic Studies Depression Scale (CES-D) and DASS-21; distress using the DASS-21 and Perceived Stress Scale (PSS); and well-being using the MHC-SF and WEMWBS. The use of different measurement tools across the underlying trials may have contributed to heterogeneity in the pooled effect estimates.

Reporting quality of the SRs

Of the 34 included SRs, 1 (3%) was rated as 'high' quality,[15] 3 (9%) as 'moderate',[16–18] 9 (26%) as 'low'[19–27] and 21 (62%) as 'critically low'.[28–48] Common methodological limitations identified in low and critically low-quality reviews included the absence of an excluded studies list with justifications for exclusion, failure to mention the protocol of the SR, lack of assessment of the potential impact of RoB and failure to account for RoB in individual studies when interpreting the results. Additionally, publication bias was often not examined or discussed. Details are present in online supplemental table S5.

Umbrella review criteria

According to the URC,[6] no association reached convincing evidence (Class I). One association provided highly suggestive evidence (Class II): mindfulness-based interventions versus inactive controls for distress. Seven associations provided suggestive evidence (Class III): mindfulness-based and cognitive-based interventions versus inactive controls for anxiety and depression, cognitive-based interventions versus active controls for well-being, and positive psychology and multimodal interventions versus inactive controls for distress. Nine associations showed weak evidence (Class IV): social-support interventions versus inactive controls for anxiety; cognitive-based interventions versus active controls for depression; art-therapy and multimodal interventions versus inactive controls for depression; cognitive-based interventions versus inactive controls for distress and well-being; and relaxation interventions versus inactive controls for anxiety, depression and distress. Finally, evidence was non-significant in the remaining 11 associations (table 2).

Certainty of evidence according to GRADE

Certainty of evidence was rated as moderate in three meta-analyses: cognitive-based interventions versus inactive controls for depression and anxiety, and mindfulness-based interventions versus inactive controls for well-being; low in six: mindfulness and relaxation-based interventions versus inactive controls for anxiety, mindfulness and positive psychology-based interventions versus inactive controls for distress, and cognitive-based interventions versus both active and inactive controls for well-being; and very low in the remaining 19. The most frequent reasons for downgrading were RoB and imprecision. In several cases, publication bias could not be formally assessed because the number of included studies was below the recommended threshold for statistical or visual evaluation (eg, Egger's test or funnel plot). Consequently, the overall certainty of the evidence supporting the effectiveness of psychosocial interventions in university students is generally low, and results should be interpreted with caution. Details are present in table 3 and in online supplemental table S6.

Table 2 Strength of reported associations according to umbrella review criteria

Meta-analysis*	Number of participants†	Random effects p value	I^2	Meta-analysis predictive intervals	Random-effects effect size (95% CI) of the largest study	Egger's test p value	Class of evidence
Mindfulness-based for distress with inactive control (Halladay 2019)[15]	1643	2.59×10^{-10}	0.1	−0.76, −0.05	−0.27 (−0.5, −0.04)	<0.05	II
Mindfulness-based for depression with inactive control (Ma 2019)[26]	1819	2.22×10^{-15}	0.4	−0.93, −0.1	−0.19 (−0.45, 0.07)	<0.05	III
Positive psychology-based for distress with inactive control (Ang 2022)[19]	1112	5.29×10^{-04}	0.2	−0.37, −0.08	−0.3 (−0.66, 0.06)	0.47	III
Cognitive-based for well-being with active control (Ferrari 2022)[20]	1314	1.38×10^{-06}	0.2	−0.57, −0.02	−0.05 (−0.3, 0.2)	0.82	III
Mindfulness-based for anxiety with inactive control (Halladay 2019)[15]	1185	7.75×10^{-05}	0.7	−1.68, 0.59	0.14 (−0.15, 0.43)	<0.05	III
Cognitive-based for depression with inactive control (Huang 2018)[23]	2581	2.09×10^{-15}	0.6	−1.38, 0.17	−0.07 (−0.37, 0.23)	<0.05	III
Cognitive-based for anxiety with inactive control (Huang 2018)[23]	1507	2.06×10^{-11}	0.3	−0.98, 0.02	−0.32 (−0.66, 0.02)	<0.05	III
Multimodal for distress with inactive control (Juniar 2025)[25]	3048	4.5×10^{-04}	0.93	−3.57, 1.88	−0.75 (−1.05, −0.45)	0.31	III
Multimodal for depression with inactive control (Ang 2022)[19]	1127	0.0094	0.6	−0.83, 0.33	0.04 (−0.22, 0.3)	0.46	IV
Social support for anxiety with inactive control (Barnett 2021)[28]	126	2.22×10^{-04}	0	−3.68, 2.02	−0.81 (−1.3, −0.32)	NA	IV
Cognitive-based for depression with active control (Barnet 2021)[28]	551	0.0077	0.5	−1.01, 0.32	−0.54 (−0.88, −0.2)	NA	IV
Art therapy for depression with inactive control (Barnett 2021)[28]	123	0.0116	0.8	−4.93, 2.54	−1.89 (−2.46, −1.32)	NA	IV
Cognitive-based for distress with inactive control (Harrer 2019)[22]	4186	0.0183	0.8	−0.88, 0.47	−0.05 (−0.16, 0.06)	0.21	IV
Cognitive-based for well-being with inactive control (Howell 2019)[36]	492	0.0224	0.7	−1.08, 0.47	0.05 (−0.17, 0.26)	NA	IV
Relaxation-based for anxiety with inactive control (Lo 2018)[44]	335	2.79×10^{-12}	0	−1.07, −0.53	−0.64 (−1.09, −0.19)	NA	IV
Relaxation-based for depression with inactive control (Lo 2018)[44]	110	0.0233	0.2	−1.65, 0.67	−0.68 (−1.31, −0.06)	NA	IV
Relaxation-based for distress with inactive control (Lo 2018)[44]	150	0.0414	0	−1.07, 0.38	−0.23 (−0.74, 0.29)	NA	IV
Multimodal for anxiety with inactive control (Malinauskas 2022)[41]	2099	0.0780	0.9	−2.86, 1.7	0.15 (−0.08, 0.38)	NA	NSA
Mindfulness-based for well-being with inactive control (Pan 2024)[48]	1352	0.5866	0.8	−1.02, 0.88	−0.25 (−0.47, −0.03)	0.49	NSA
Cognitive-based for anxiety with active control (Barnett 2021)[28]	194	0.3523	0.6	−1.75, 1.26	−0.03 (−0.57, 0.5)	NA	NSA

Continued

Table 2 Continued

Meta-analysis*	Number of participants†	Random effects p value	I^2	Meta-analysis predictive intervals	Random-effects effect size (95% CI) of the largest study	Egger's test p value	Class of evidence
Psychoeducational for depression with active control (Barnett 2021)[28]	407	0.0746	0.2	−0.59, 0.25	−0.07 (−0.36, 0.22)	NA	NSA
Social support for depression with inactive control (Barnett 2021)[28]	146	0.2835	0	−2.8, 2.37	−0.13 (−0.57, 0.31)	NA	NSA
Mindfulness-based for depression with active control (Halladay 2019)[15]	830	0.6525	0.3	−0.37, 0.45	0.32 (0.04, 0.6)	NA	NSA
Mindfulness-based for anxiety with active control (Halladay 2019)[15]	663	0.2269	0.4	−0.37, 0.63	0.3 (0.02, 0.58)	NA	NSA
Mindfulness-based for distress with active control (Halladay 2019)[15]	605	0.5130	0.5	−0.71, 0.54	0.26 (−0.02, 0.54)	NA	NSA
Mindfulness-based for well-being with active control (Harrer 2019)[22]	368	0.1308	0	−0.49, 0.18	−0.22 (−0.57, 0.13)	NA	NSA
Psychoeducational for anxiety with inactive control (Lo 2018)[44]	385	0.4086	1	−16.94, 18.28	−0.12 (−0.34, 0.1)	NA	NSA
Psychoeducational for depression with inactive control (Lo 2018)[44]	385	0.0512	0	−1.5, 1.1	−0.23 (−0.45, −0.01)	NA	NSA

Convincing evidence (class I): ≥1000 cases, significant summary associations ($p<10^{-6}$) per random-effects calculations, no evidence of small-study effects (Egger's test p>0.05), no evidence of excess of significance bias, prediction intervals not including the null value, largest study nominally significant (p<0.05) and not large heterogeneity (I^2 <50%). Highly suggestive evidence (class II): ≥1000 participants, significant summary associations ($p<10^{-6}$) per random-effects calculation and the largest study statistically significant (p<0.05). Suggestive evidence (class III): ≥1000 participants and significant summary associations ($p<10^{-3}$) per random-effects calculations. Weak evidence (class IV): all other associations with p ≤0.05. Non-significant associations: all associations with p>0.05.
*Meta-analysis with unique Population, Intervention, Comparator, Outcome (PICO) framework.
†Total number of participants included in the meta-analysis.
NSA, non-significant association.

Overall ranking

For the outcome of depression, cognitive-based interventions compared with inactive controls (moderate certainty, low-quality SR) and mindfulness-based interventions compared with inactive controls (very low certainty, low-quality SR) were supported by suggestive evidence (Class III). All other interventions showed weak or non-significant evidence, mostly with very low GRADE ratings.

For the outcome of anxiety, cognitive-based interventions compared with inactive controls (moderate certainty, low-quality SR) and mindfulness-based interventions compared with inactive controls (low certainty, high-quality SR) were supported by suggestive evidence (Class III). All other interventions showed weak or non-significant evidence, typically characterised by very low GRADE ratings.

For the outcome of distress, mindfulness-based interventions compared with inactive controls showed highly suggestive evidence (Class II, low certainty, high-quality SR). Positive psychology interventions compared with inactive controls (low certainty, low-quality SR) and multimodal interventions compared with inactive controls (very low certainty, low-quality SR) were supported by suggestive evidence (Class III). The remaining associations were weak or non-significant, with very low GRADE ratings.

For the outcome of well-being, only cognitive-based interventions compared with active controls showed suggestive evidence (Class III, low certainty, low-quality SR), while all others were weak or non-significant, with certainty ranging from very low to moderate and mostly low methodological quality (table 3).

CONCLUSIONS AND CLINICAL IMPLICATIONS

Although psychosocial interventions appear effective in improving student mental health, the strength and credibility of evidence vary across intervention types and outcomes. By applying standardised criteria, this umbrella review identifies more robust versus uncertain associations, addressing previously inconsistent findings. Across outcomes, mindfulness and cognitive-based interventions showed the most consistent evidence.

Mindfulness-based interventions provided highly suggestive evidence for reducing distress compared with inactive controls (Class II; GRADE: low; high-quality SRs) and suggestive evidence for anxiety and depression, also against inactive comparators (Class III), with variable certainty and review quality (for anxiety: GRADE low, AMSTAR high; for depression: GRADE very low, AMSTAR low). Cognitive-based interventions demonstrated suggestive evidence for improving depression and anxiety versus inactive controls (Class III; GRADE moderate, AMSTAR low), and for well-being versus active controls (Class III; GRADE low, AMSTAR low). Positive psychology (Class III; GRADE low, AMSTAR low) and multimodal interventions (Class III; GRADE: very low; AMSTAR: low) similarly showed suggestive

Table 3 Ranking of intervention effects on different outcomes

Type of intervention	Number of studies	Sample size	SMD (95% CI)	URC	GRADE	AMSTAR-2
Depression						
Cognitive-based interventions (I)	42	2581	−0.60 (−0.75, −0.45)	III	Moderate	Low
Mindfulness-based interventions (I)	23	1819	−0.52 (−0.65, −0.39)	III	Very low	Low
Multimodal interventions (I)	12	1127	−0.25 (−0.44, −0.06)	IV	Very low	Low
Cognitive-based interventions (A)	8	551	−0.34 (−0.59, −0.09)	IV	Very low	Very low
Art therapy interventions (I)	3	123	−1.19 (−2.12, −0.27)	IV	Very low	Very low
Relaxation interventions (I)	3	110	−0.49 (−0.91, −0.07)	IV	Very low	Very low
Mindfulness–based interventions (A)	9	830	0.04 (−0.14, 0.22)	NSA	Very low	High
Social support interventions (I)	2	146	−0.22 (−0.62, 0.18)	NSA	Very low	Very low
Psychoeducational interventions (A)	3	407	−0.17 (−0.37, 0.02)	NSA	Very low	Very low
Psychoeducational interventions (I)	2	385	−0.20 (−0.40, 0.00)	NSA	Very low	Very low
Anxiety						
Cognitive-based interventions (I)	32	1507	−0.48 (−0.62, −0.34)	III	Moderate	Low
Mindfulness-based interventions (I)	20	1185	−0.54 (−0.81, −0.27)	III	Low	High
Relaxation interventions (I)	8	335	−0.80 (−1.03, −0.58)	IV	Low	Very low
Social support interventions (I)	2	126	−0.83 (−1.27, −0.39)	IV	Very low	Very low
Mindfulness-based interventions (A)	7	663	0.13 (−0.08, 0.34)	NSA	Very low	High
Cognitive-based interventions (A)	5	194	−0.24 (−0.76, 0.27)	NSA	Very low	Very low
Multimodal interventions (I)	9	2099	−0.58 (−1.22, 0.06)	NSA	Very low	Very low
Psychoeducational interventions (I)	2	385	0.67 (−0.92, 2.26)	NSA	Very low	Very low
Distress						
Mindfulness-based interventions (I)	23	1643	−0.40 (−0.53, −0.28)	II	Low	High
Positive psychology-based interventions (I)	13	1112	−0.22 (−0.35, −0.10)	III	Low	Low
Multimodal interventions (I)	31	3048	−0.85 (−1.32, −0.37)	III	Very low	Low
Cognitive-based interventions (I)	16	4186	−0.21 (−0.38, −0.04)	IV	Very low	Low
Relaxation interventions (I)	3	150	−0.34 (−0.67, −0.01)	IV	Very low	Very low
Mindfulness-based interventions (A)	6	605	−0.08 (−0.33, 0.16)	NSA	Very low	High
Well-being						
Cognitive-based interventions (A)	11	1314	−0.30 (−0.42, −0.18)	III	Low	Low
Cognitive-based interventions (I)	5	492	−0.31 (−0.57, −0.04)	IV	Low	Very low
Mindfulness-based interventions (I)	12	1352	−0.07 (−0.33, 0.19)	NSA	Moderate	Very low
Mindfulness-based interventions (A)	4	368	−0.16 (−0.37, 0.05)	NSA	Very low	Low

A, active control; GRADE, Grading of Recommendations Assessment, Development and Evaluation; I, inactive control ; NSA, non-significant association; SMD, standardised mean difference; URC, umbrella review criteria.

evidence for reducing distress compared with inactive controls. Most other intervention types yielded weak or non-significant results, generally supported by low or very low certainty and mostly low or very low reporting quality.

This synthesis offers a clearer hierarchy of evidence to inform the selection and implementation of interventions that are most likely to yield reliable benefits in university settings.

To our knowledge, this study represents the first quantitative reanalysis of psychosocial interventions targeting university students that applies, in combination, standardised credibility criteria (URC, GRADE and AMSTAR-2) to depression, anxiety, distress and well-being simultaneously. Our findings align with that of Cuijpers *et al*[49] who highlighted the suboptimal quality of many meta-analyses. Harith *et al*[50] found that CBT interventions were effective, particularly against inactive controls. This pattern is consistent with our comparator-harmonised reanalysis. Finally, Huang *et al*[4] showed that the positive effects of psychosocial interventions often declined once heterogeneity and bias were accounted for, mirroring our credibility and grading evaluations of CBT and mindfulness-based interventions.

Across these reviews, three themes emerged: modest benefits across outcomes; limited certainty due to methodological weaknesses and stronger effects against inactive controls. Compared with previous studies, ours add a unified, outcome-specific appraisal that integrates standardised credibility frameworks and methodological quality assessments. It also applies a systematic harmonisation of comparator groups. This may explain why only a few associations reached suggestive or higher evidence under stricter grading.

This umbrella review has several methodological strengths, including prospective registration, Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidance, comprehensive search, independent duplicate screening and data extraction, and reanalysis of meta-analysis using a uniform random-effects framework with 95% PI, small-study effect and excess-significance tests. This approach applied a credibility lens consistently across comparisons. By integrating multiple methods and standardising comparator groups, we improved the clarity and comparability of results across interventions and outcomes.

However, important limitations should be considered. Most included reviews were of low or critically low quality, often lacking protocols, exclusion lists or adequate RoB assessment. Certainty of evidence was generally low, with only three meta-analyses rated as moderate. Publication bias testing was frequently underpowered due to the small number of trials.

Furthermore, the quantitative synthesis reflects a selection of non-overlapping meta-analyses, as overlapping evidence was managed by retaining the largest meta-analysis for each PICO question. While this approach reduces redundancy and dependence across estimates, it may have led to the exclusion of alternative meta-analytic evidence addressing similar questions, limiting the comprehensiveness of the quantitative synthesis. Some reviews mixed universal and indicated student samples, limiting clarity regarding prevention level and baseline severity. When meta-analyses included a mixture of active and inactive comparators without reporting subgroup-specific estimates, we applied a ≥50% rule to classify comparator type. Although this ensured consistency across analyses, this approach may have introduced some degree of misclassification and attenuated differences between comparator categories. An additional limitation concerns the absence of quantitative evidence for QoL and PTSD outcomes. Although these outcomes were part of our eligibility criteria, no SRs with meta-analyses on these outcomes were identified.

At the service level, mindfulness and cognitive-based interventions appear the most promising. However, given the low certainty of the evidence, implementation should be cautious, supported by routine outcome monitoring, and preferably delivered within structured, scalable stepped-care systems.

From a research perspective, future trials should be preregistered, adequately powered and use active controls and standardised outcomes. Comparative, multisite designs would improve generalisability, while SRs should adopt protocol-driven methods with bias assessment.

This umbrella review synthesised psychosocial interventions for university students within a unified, evidence-grading framework. Across outcomes, mindfulness and cognitive-based interventions showed the most robust and consistent evidence, with benefits for depression, anxiety and distress. However, the overall evidence base remains limited and of low certainty, with stronger effects typically observed against inactive comparators. These findings suggest that psychosocial interventions may improve student mental health, but further methodological refinement is needed to identify the most effective strategies, particularly against active controls.

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