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Effect of a structured exercise programme on physical fitness and mental health among university students: A narrative review

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Abstract
Background: University students often combine declining physical activity with elevated psychological distress, yet campus exercise provision is frequently unstructured.
Purpose: This narrative review synthesised recent evidence (2023–2026) on the effects of structured exercise programmes on physical fitness and mental health among university students.
Approach: Six evidence syntheses, including one umbrella review, were identified through targeted searches and appraised narratively.
Findings: Exercise was consistently associated with lower anxiety, depression and stress, and high-intensity interval training (HIIT) improved body composition, cardiorespiratory fitness and muscle strength.
Gaps: However, certainty of evidence was often low to very low, heterogeneity was substantial, and primary trials were frequently small and incompletely reported. No single exercise mode could be declared superior, and long-term maintenance and sex-specific responses remain poorly studied.
Implications: Progressive, multicomponent programmes of around eight weeks or longer appear reasonable to embed in physical education and student support services, provided adherence, fidelity and safety are monitored.
Conclusion: Structured exercise is a promising adjunct for student fitness and mental health, but optimal dosage and mechanisms remain provisional pending theory-informed, longer-term trials.

Keywords: Structured exercise, university students, physical fitness, mental health, high-intensity interval training, anxiety and depression, physical education

Introduction

The university years form a transition in which health behaviours may be established and carried into later life. Students are described as susceptible to weight gain, higher body fat and reduced cardiorespiratory fitness, partly because academic and social pressures promote sedentary time, irregular eating and disrupted sleep (Yin *et al*., 2025) [6]. Psychological vulnerability is a parallel concern: students face heightened stress and an elevated risk of mental disorders (H. Huang *et al*., 2024) [2], and the incidence of adverse mental health symptoms among them has reportedly been rising (Liu *et al*., 2025) [5].

Exercise is attractive because it may address both domains at once. An umbrella review of 74 meta-analyses found that, among the intervention types examined, exercise showed the largest effect sizes for depression and anxiety in university students (H. Huang *et al*., 2024) [2]. Important disagreements nevertheless persist. Recent syntheses differ on which exercise mode works best (Lin & Gao, 2023; Liu *et al*., 2025) [4, 5], and the underlying trials are often judged to be at high risk of bias (K. Huang *et al*., 2024) [2]. Evidence on HIIT in students has also been described as limited, because most research has focused on children, general adults or athletes (Yin *et al*., 2025) [6].

The aim of this review is to critically synthesise recent evidence on the effects of structured exercise programmes on physical fitness and mental health in university students. The objectives are to (a) summarise findings on fitness and body composition, (b) summarise findings on anxiety, depression and stress, (c) judge the certainty of the evidence, and (d) derive cautious implications for practice and research. A structured exercise programme is defined here as planned, repeated sessions with specified type, intensity, frequency and duration.

Review Approach

This is a focused narrative review, not a systematic review. No protocol was registered, and no formal risk-of-bias tool was applied by the reviewer. Literature was identified in October 2026 through targeted web-based searches of publisher, repository and abstract-indexing pages (including Frontiers, BioMed Central, PubMed Central, ScienceDirect and Oxford Academic). Search terms combined “exercise”, “physical activity”, “high-intensity interval training”, “university students”, “college students”, “mental health”, “anxiety”, “depression”, “meta-analysis” and “umbrella review”.

Eligible sources were peer-reviewed systematic reviews, meta-analyses or umbrella reviews, published in English between 2023 and 2026, that examined exercise or physical activity interventions in university or college students and reported fitness, body composition or mental health outcomes. Observational reviews, syntheses of non-student populations and sources whose bibliographic details could not be verified were excluded. Primary trials were considered only as reported within these syntheses. Six sources met the criteria and were synthesised narratively, with attention to design, population, dose and certainty of evidence. Because the search was limited, the review is an evidence overview rather than an exhaustive account.

Foundations, Approaches and Recent Evidence

1. Theoretical and Conceptual Foundations

Structured programmes rest on the principles of progression and dose specification, in which type, intensity, frequency

and duration are manipulated to produce adaptation. Time efficiency is the rationale most often offered for HIIT in student settings (Yin *et al*., 2025) [6]. Behavioural theory matters because programmes must be adopted and sustained, yet only five of 59 studies in one review were informed by a behaviour change theory (K. Huang *et al*., 2024) [2]. Theoretical grounding therefore remains weak relative to the physiological rationale.

2. Major Approaches and Practices

The syntheses cover varied approaches. Lin and Gao (2023) [4] examined aerobic exercise and yoga, whereas Liu *et al*. (2025) [5] compared resistance training, HIIT and aerobic exercise. Yin *et al*. (2025) [6] reviewed running-based, Tabata, bodyweight or combined circuit and small-sided-game HIIT, with most trials delivering three sessions per week. Chen *et al*. (2026) [1] compared HIIT with moderate-intensity continuous training (MICT) in overweight or obese students.

3. Recent Empirical Evidence

Mental health. Lin and Gao (2023) [4] pooled nine randomised trials in college students and reported a moderate overall reduction in anxiety (SMD = −0.55, 95% CI [−0.76, −0.35]), with subgroup estimates of −0.39 for aerobic exercise and −0.76 for yoga. Liu *et al*. (2025) [5] synthesised 34 articles (80 individual studies, 8,020 participants) and found improvements in mental health outcomes, with resistance training and HIIT showing the strongest effects on anxiety, depression and stress and aerobic exercise the most effective for sleep quality. K. Huang *et al*. (2024) [2] meta-analysed 59 studies of undergraduates and reported reductions in anxiety (SMD = −0.88; 20 studies), depression (SMD = −0.73; 14 studies) and stress (SMD = −0.61; 10 studies). However, heterogeneity was very high for anxiety (I^2 = 90.29%) and stress (I^2 = 86.97%), the evidence was graded very low, and the narrative synthesis of remaining studies was mixed.

Physical fitness. Yin *et al*. (2025) [6] analysed 15 HIIT studies (13 randomised) in general university students, excluding physical education majors and student-athletes. HIIT reduced BMI (MD = −1.08, 95% CI [−1.87, −0.29]), body fat percentage, waist-to-hip ratio and heart rate, and improved VO2max and muscle strength (d = 0.64, 95% CI [0.18, 1.09]). Strength gains were larger in programmes longer than eight weeks, whereas work-rest ratio did not moderate outcomes. Heterogeneity was high for BMI (I^2 = 78%) and strength (I^2 = 67%), and only four of 15 studies m*et a*ll quality criteria. Chen *et al*. (2026) [1] restricted their review to 12 trials in overweight or obese students and concluded, with low-to-very-low certainty, that both HIIT and MICT may improve body weight, BMI, body fat percentage and fat mass. HIIT may offer additional benefit for cardiorespiratory fitness and some lipid markers, but head-to-head differences were not consistently significant. Across reviews the direction of effect is consistent, while magnitude and certainty are not.

4. Mechanisms and Explanatory Factors

Mechanisms are proposed rather than demonstrated. Yin *et al*. (2025) [6] attribute body composition changes to elevated post-exercise energy expenditure and fat oxidation, and larger strength gains in longer programmes to the time needed for neuromuscular adaptation; these are the authors' interpretations. None of the reviewed syntheses tested psychological mediators. Neurobiological, sleep-related and social or self-efficacy pathways are plausible hypotheses, and the sleep benefit of aerobic exercise reported by Liu *et al*. (2025) [5] could be one intermediate route, but this has not been tested. Group-based delivery may also act through social contact rather than exercise itself.

5. Population-Specific Considerations

Most evidence comes from general students, so it should not be extended to trained students or athletes, who were excluded by Yin *et al*. (2025). Chen *et al*. (2026) [1, 6] address only overweight or obese students. Trials in the HIIT review included mixed-sex, male-only and female-only samples, but no verified evidence from the reviewed syntheses supports sex-specific or baseline-fitness-specific prescriptions, and Yin *et al*. (2025) [6] call for such tailoring to be studied.

Evidence on Effectiveness

Symptom reduction (anxiety, depression, stress): moderate at best. The direction of effect is consistent across Lin and Gao (2023), K. Huang *et al*. (2024), H. Huang *et al*. (2024) and Liu *et al*. (2025) [2, 4, 5]. Pooled estimates of −0.55 to −0.88 are large by conventional benchmarks, but very low certainty, high heterogeneity and high risk of bias mean they may be overestimated.

Body composition, cardiorespiratory fitness and strength with HIIT: moderate for general students (Yin *et al*., 2025) [6], but limited for the HIIT-versus-MICT question because certainty was low to very low (Chen *et al*., 2026) [1]. A mean BMI reduction of about one unit is modest, and its practical meaning depends on baseline status; the reviewed syntheses do not define meaningful change thresholds.

Optimal exercise mode: inconclusive. Lin and Gao (2023) [4] concluded that aerobic exercise was optimal, although their yoga estimate was numerically larger with overlapping intervals. Liu *et al*. (2025) [5] favoured resistance training and HIIT for symptoms and aerobic exercise for sleep. Differences in outcomes, comparators and study pools plausibly explain this divergence.

Programme duration (more than eight weeks for strength): limited, as it rests on one subgroup comparison. Long-term effects: inconclusive, because follow-up data were largely absent (Yin *et al*., 2025) [6].

Barriers and Challenges to Implementation

Time constraints and low adherence are described as defining challenges for student exercise (Yin *et al*., 2025) [6], yet many trials did not report adherence, and only 30 of 59 studies in one review reported intervention fidelity (K. Huang *et al*., 2024) [2]. Incomplete outcome-assessor blinding, small samples and heterogeneous measurement further limit interpretation (Yin *et al*., 2025) [6]. High-intensity formats may carry fatigue and injury risks for students with low baseline fitness or cardiovascular risk, which Yin *et al*. (2025) [6] recommend managing through tailored work and rest settings. Facilities, cost, accessibility, gender-related and cultural factors are plausible practical barriers but were not examined in the reviewed syntheses

and are therefore emerging considerations, not established findings.

Discussion and Implications

Taken together, the syntheses support a consistent but cautious conclusion: structured exercise is associated with better student fitness and lower symptoms of anxiety, depression and stress, while the size of these benefits is uncertain. Disagreement about the best mode appears to reflect methodological differences rather than clear physiological superiority. Evidence is also geographically concentrated; seven of the 15 HIIT studies came from China (Yin *et al*., 2025) [6], which limits generalisability to other educational and cultural settings. Causal interpretation is strongest where randomised trials underpin the pooled estimates, but weakened by risk of bias (K. Huang *et al*., 2024) [2].

The following recommendations are interpretations offered by this review, not direct findings. Physical education teachers and university programme designers may incorporate progressive, multicomponent sessions, including resistance and interval elements, with a duration of about eight weeks or longer where strength is a goal. Coaches and strength and conditioning professionals should individualise intensity and screen for baseline fitness and cardiovascular risk before introducing HIIT. Exercise practitioners should record attendance and fidelity, since the evidence base is weakened by their absence. Students may benefit from time-efficient options, but should not assume that one mode is best. Universities and policymakers could treat exercise as a complement to, not a replacement for, established mental health services.

Priority research gaps include adequately powered, pre-registered randomised trials with active comparators, theory-informed designs, transparent fidelity reporting, follow-up of six months or longer, testing of psychological mediators, and analyses by sex and baseline fitness.

Limitations of the Review

The search relied on targeted web-based retrieval rather than a documented multi-database strategy, and only six English-language syntheses were included, so other eligible reviews may have been missed. No independent screening or formal quality appraisal was performed. Overlap among primary studies in the included reviews was not assessed, which may inflate apparent consensus. Heterogeneity in measures, small trial samples, short interventions and risk of publication bias in the underlying literature further limit confidence.

Conclusion

Recent syntheses suggest that structured exercise programmes can improve fitness and body composition and reduce anxiety, depression and stress in university students, but the certainty of this evidence is generally low. Optimal mode, dose and long-term durability remain uncertain. The most important practical implication is that progressive, adequately monitored exercise programmes are reasonable to embed in student physical education and wellbeing provision. The most important research priority is high-quality, theory-informed trials with reported fidelity and extended follow-up.

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