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Healthy lifestyle patterns and mental health among university students: a systematic literature review

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ABSTRACT

Mental health problems among university students have become a critical global public health concern. Unhealthy lifestyle behaviors are strongly associated with elevated psychological distress in this population. However, comprehensive synthesis examining the multidimensional relationship between healthy lifestyle patterns and student mental health remains limited. This systematic literature review aimed to (1) identify the most frequently studied components of healthy lifestyle in relation to university student mental health, and (2) synthesize evidence on the relationship between healthy lifestyle patterns and mental health outcomes, including psychological well-being, stress, anxiety, depression, and emotional well-being. A systematic search was conducted across PubMed, Scopus, Web of Science, and PsycINFO databases. Studies published between 2022 and 2025 were included. Inclusion criteria required empirical studies focusing on college or university students, healthy lifestyle components, and mental health outcomes. The PRISMA 2020 framework guided the review process, and thematic narrative synthesis was applied to analyze extracted data. Quality appraisal was conducted using JBI Critical Appraisal tools. Twenty peer-reviewed studies were included in the final synthesis. Six dominant lifestyle themes emerged: physical activity, sleep quality, diet and nutrition, social support, general health behaviors, and sedentary/screen time behavior. Physical activity and sleep quality were the most consistently studied components. Across RQ2, healthy lifestyle patterns demonstrated protective associations with psychological well-being, and significant inverse relationships with stress, anxiety, depression, and negative emotional states. Sleep quality emerged as the single most consistently influential factor across all mental health outcomes. Healthy lifestyle patterns, particularly regular physical activity, adequate sleep, balanced nutrition, and strong social support, are positively and consistently associated with better mental health outcomes among university students. Universities should integrate holistic health promotion programs addressing multiple lifestyle dimensions simultaneously.

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Introduction

The mental health of university students has emerged as one of the most urgent concerns in contemporary global public health discourse. Higher education institutions across the world are confronting an unprecedented rise in psychological distress, mental illness, and functional impairment among their student populations. This phenomenon transcends geographic boundaries, affecting students in high-income, middle-income, and low-income countries alike, and has been amplified considerably by the disruptive effects of the COVID-19 pandemic on educational structures, social connectivity, and daily life routines (Wang et al., 2022; Ali et al., 2024). The transition into university lifemarked by academic pressure, financial stress, separation from family networks, and exposure to novel social environmentscreates a constellation of risk factors that render students uniquely vulnerable to a broad spectrum of mental health challenges (Hammoudi Halat et al., 2023). This vulnerability, if unaddressed, carries long-term implications not only for individual well-being and academic success but also for broader societal productivity and public health systems.

Epidemiological evidence consistently points to alarmingly high prevalence rates of mental health disorders among university student populations globally. Studies indicate that depression affects approximately 30–35% of students, anxiety disorders are present in 20–30%, and psychological distressencompassing subclinical levels of stress, emotional dysregulation, and burnoutis reported by up to 60% in some institutional contexts (Spagert et al., 2022; Melnyk et al., 2023). The COVID-19 pandemic served as a natural experiment revealing the fragility of student mental health infrastructure: lockdown measures, academic disruptions, social isolation, and digital exhaustion compounded pre-existing vulnerabilities, generating steep increases in depression, anxiety, and emotional burnout (Ghali et al., 2022; Melnyk et al., 2022). Beyond clinical thresholds, subclinical psychological distress has been documented to impair academic performance, reduce social engagement, and diminish life satisfaction, underscoring the need for preventive rather than reactive approaches to student mental health (Chu et al., 2023; Hammoudi Halat et al., 2023).

In response to these escalating challenges, the concept of healthy lifestyle has attracted growing scholarly and clinical attention as a modifiable determinant of mental health. A healthy lifestyle is broadly conceptualized as a constellation of behavioral practices that promote physical, psychological, and social well-being. Core components include regular physical activity, adequate and restorative sleep, balanced dietary intake, abstinence or moderation in substance use, robust social relationships, and effective management of sedentary behavior (Wang et al., 2025; Budnick et al., 2025). Health promotion frameworks such as Pender's Health Promotion Model and the Biopsychosocial Model of health and illness propose that lifestyle behaviors operate through interconnected biological, psychological, and social pathways to influence health outcomes, suggesting that multicomponent lifestyle interventions may be particularly effective in addressing mental health at the population level (Herbert, 2022; Ostermiller et al., 2025).

Emerging research has begun to document significant associations between specific healthy lifestyle components and improved mental health outcomes among university students. Physical activity has been linked to reductions in depressive and anxiety symptoms through neurobiological mechanisms including modulation of serotonergic and dopaminergic systems, elevation of brain-derived neurotrophic factor, and reduction of hypothalamic-pituitary-adrenal (HPA) axis reactivity (Herbert, 2022; Fukuie et al., 2024). Sleep quality has been identified as a particularly potent mediator of emotional regulation and psychological resilience, with disrupted sleep independently predicting higher rates of anxiety, depression, and poor academic functioning (Fukuie et al., 2024; Rahimi et al., 2024). Nutritional factors, including dietary quality, meal regularity, and micronutrient adequacy, have been associated with mood regulation and reduced psychological distress (Budnick et al., 2025). Social supportencompassing perceived peer support, family connection, and institutional belongingmoderates the effects of academic stress and functions as a key buffer against psychological breakdown (Sotaquirá et al., 2022; Zhang et al., 2024).

Despite this growing body of evidence, critical gaps remain in the systematic understanding of how healthy lifestyle patterns, as an integrated whole, relate to mental health outcomes in university students. Existing studies have largely examined individual lifestyle components in isolation, producing fragmented evidence that is difficult to synthesize or translate into coherent public health policy. There is also notable heterogeneity in outcome measurement, with studies employing diverse instruments to assess mental health, making cross-study comparison methodologically challenging. Furthermore, the literature has inadequately addressed the intersectional effects of multiple lifestyle behaviors operating simultaneously, as well as the potential moderating roles of gender, academic discipline, cultural context, and socioeconomic status (Valentim et al., 2023; Omidvar et al., 2024). A rigorous systematic synthesis is needed to consolidate existing knowledge, identify areas of consensus and divergence, and provide a evidence base for targeted interventions.

Systematic Literature Reviews (SLR) represent the methodological gold standard for synthesizing empirical evidence, enabling researchers to transcend the limitations of individual studies and generate robust, generalizable conclusions. Despite their recognized utility, no comprehensive SLR has to date integrated the full spectrum of healthy lifestyle components in relation to the full range of mental health outcomes among university students in the post-pandemic period. Prior narrative reviews have either focused narrowly on physical activity or sleep, or have not applied rigorous quality appraisal protocols, limiting the reliability of their conclusions. The present review addresses this gap by applying PRISMA 2020 guidelines, PICO framework, JBI Critical Appraisal tools, and narrative thematic synthesis to produce an integrated, methodologically rigorous synthesis of the current evidence.

This systematic literature review addresses two primary research questions (RQs): RQ1: What are the most frequently studied components of a healthy lifestyle in relation to mental health among university students? RQ2: How do healthy lifestyle patterns relate to mental health outcomesincluding psychological well-being, stress, anxiety, depression, and emotional well-beingamong university students? By answering these questions, this review aims to synthesize empirical evidence on the association between healthy lifestyle and mental health in higher education populations, identify the lifestyle components receiving the greatest research attention, and generate evidence-informed recommendations for university-based health promotion programming and future research directions.

Method

Study Design

This review employed a Systematic Literature Review (SLR) design guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 framework. The Population, Interest, Comparison, and Outcome (PICO) framework was used to define the scope of the review. Narrative thematic synthesis was applied to integrate findings across included studies. Quality appraisal was conducted using Joanna Briggs Institute (JBI) Critical Appraisal tools appropriate for cross-sectional studies, cohort studies, and quasi-experimental designs.

PICO Framework

The PICO components were defined as follows: Population (P): college and university students, including undergraduate, postgraduate, and professional degree students enrolled at higher education institutions; Interest (I): healthy lifestyle behaviors, including physical activity, sleep quality, dietary patterns, social support, substance use, and sedentary behavior; Comparison (C): differences in the level or degree of adoption of healthy lifestyle practices; and Outcome (O): mental health outcomes including psychological well-being, stress, anxiety, depression, and emotional well-being.

Search Strategy

A systematic search was conducted in four major academic databases: PubMed/MEDLINE, Scopus, Web of Science, and PsycINFO. The search was limited to studies published between January 2022 and December 2025 to capture recent evidence, particularly post-pandemic data. Search terms were organized into three conceptual clusters combined using Boolean operators: (1) Population: "university students" OR "college students" OR "undergraduate students" OR "higher education students"; (2) Intervention/Interest: "healthy lifestyle" OR "physical activity" OR "sleep quality" OR "dietary habits" OR "nutrition" OR "social support" OR "health behaviors"; and (3) Outcome: "mental health" OR "psychological well-being" OR "depression" OR "anxiety" OR "stress" OR "emotional well-being". Reference lists of included studies were also manually screened to identify additional relevant publications.

Eligibility Criteria

Studies were included if they: (1) focused on college or university student populations; (2) examined at least one component of healthy lifestyle as an exposure or independent variable; (3) reported at least one standardized mental health outcome; (4) were published in peer-reviewed journals in English; and (5) employed quantitative, mixed-methods, or systematic review designs. Studies were excluded if they: (1) focused solely on clinical populations with diagnosed mental illness; (2) were conducted among school-age children or working adults without a student sample; (3) were published only as conference abstracts, theses, or gray literature; or (4) did not report extractable quantitative data.

Study Selection

Following database searches, all identified records were imported into a reference management system and duplicates removed. Two reviewers independently screened titles and abstracts against eligibility criteria. Full texts of potentially eligible studies were then retrieved and assessed for inclusion. Disagreements were resolved through discussion and consensus. The PRISMA 2020 flow diagram guided documentation of the selection process. After screening, 20 primary studies met all inclusion criteria and were retained for synthesis.

Data Extraction

A standardized data extraction form was developed and piloted. For each included study, the following information was extracted: author(s) and year of publication, country/setting, study design, sample size and characteristics, lifestyle component(s) assessed, mental health outcomes measured, instruments used, key findings, and quality appraisal score. Data were extracted independently by two reviewers and cross-checked for accuracy.

Quality Appraisal

Methodological quality of included studies was assessed using the JBI Critical Appraisal Checklist for Analytical Cross-Sectional Studies, the JBI Checklist for Cohort Studies, and the JBI Checklist for Quasi-Experimental Studies, as appropriate. Each study was rated on criteria including representativeness of the sample, validity of measurement instruments, adequacy of statistical analysis, control for confounding, and clarity of reporting. Studies rated as high quality (≥70% of criteria met) were given greater interpretive weight in the synthesis. All 20 included studies met minimum quality thresholds.

Synthesis Approach

Narrative thematic synthesis was employed to integrate findings across included studies. Consistent with the approach proposed by Thomas and Harden (2008), this involved three analytical steps: (1) line-by-line coding of key findings from each study; (2) development of descriptive themes organized by lifestyle component (RQ1) and mental health outcome (RQ2); and (3) generation of analytical themes reflecting patterns, explanations, and higher-order interpretations across the literature. Findings were organized into thematic tables to facilitate transparency and comparability.

Results and Discussions

Study Selection

The initial database search yielded 1,842 records. After removal of 423 duplicates, 1,419 records underwent title and abstract screening, of which 1,287 were excluded as irrelevant. Full-text assessment was conducted for 132 potentially eligible records; 112 were excluded for reasons including non-student populations (n=34), absence of mental health outcomes (n=28), inappropriate study design (n=21), insufficient data reporting (n=17), and non-English language (n=12). Twenty studies met all eligibility criteria and were included in the final synthesis. The PRISMA 2020 flow diagram captures this selection process.

Characteristics of Included Studies

The 20 included studies were published between 2022 and 2025 and originated from diverse geographic contexts including China, Lebanon, the United States, Portugal, Colombia, Germany, Japan, Australia, Afghanistan, and multinational settings. Sample sizes ranged from 124 to 6,247 participants (median ≈ 950). The majority (n=16) used cross-sectional designs; two were longitudinal cohort studies; one was a mixed-methods evaluation; and one was a quasi-experimental intervention study. Populations included undergraduate students (n=14), graduate and professional students (n=3), and mixed undergraduate/graduate cohorts (n=3). Table 1 summarizes the characteristics of included studies.

Table 1. <Characteristics of Included Studies>

Author (Year)	Country	Design	N	Lifestyle Component	Mental Health Outcome	Key Finding
Wang et al. (2025)	China	Cross-sectional	3,702	Multiple lifestyle behaviors	Mental health (composite)	Healthy lifestyle positively associated with

						mental health
Omidvar et al. (2024)	Iran	Cross-sectional	642	Health-promoting lifestyle	Mental health (GHQ)	Health-promoting behavior manages mental health outcomes
Valentim et al. (2023)	Portugal	Cross-sectional	1,527	Multiple lifestyle factors	Positive mental health	Lifestyle components predict positive mental health
Ghali et al. (2022)	Tunisia	Cross-sectional	1,003	Lifestyle during COVID-19	Depression, anxiety, stress	Poor lifestyle → higher depression/anxiety
Spagert et al. (2022)	Germany	Cross-sectional	2,418	Multiple lifestyle behaviors	Mental health indicators (gender-stratified)	Lifestyle significantly associated with mental health; gender differences noted
Wang et al. (2022)	China	Cross-sectional	6,247	Lifestyle + social support	Mental health outcomes	Lifestyle and social support independently predict mental health
Rahimi et al. (2024)	Afghanistan	Cross-sectional	485	Lifestyle factors	Anxiety, depression, stress	Sleep and physical activity most protective
Fukuie et al. (2024)	Japan	Cross-sectional	760	Sleep, physical activity, diet	Mental and physical health	Sleep quality central to all health outcomes
Herbert (2022)	Germany	Review/program	N/A	Physical activity & exercise	Mental health, well-being	Exercise programs improve mental health in students
Budnick et al. (2025)	USA	Cross-sectional	502	Diet, nutrition barriers	Mental health outcomes	Diet quality associated with mental health; barriers identified
Chu et al. (2023)	Japan	Cross-sectional	1,204	Lifestyle behaviors	Mental health & academic performance	Lifestyle mediates mental health → academic performance pathway
Hammoudi Halat et al. (2023)	Lebanon	Cross-sectional	1,040	Health behaviors	Mental health, academic achievement	Mental health and health behaviors predict academic outcomes
Sotaquirá et al. (2022)	Colombia	Cross-sectional	783	Social capital, lifestyle	Mental health	Social capital + lifestyle jointly predict mental health

Zhang et al. (2024)	Malaysia	Cross-sectional	921	Health awareness, lifestyle	Self-esteem, social support	Self-esteem + social support mediate health awareness → lifestyle
Mei et al. (2023)	China	Cross-sectional	1,368	Healthy lifestyle (mediator)	Life satisfaction	Healthy lifestyle mediates locus of control → life satisfaction
Ostermiller et al. (2025)	USA	Cross-sectional	338	Lifestyle behaviors	Mental health (SGM students)	Lifestyle protective even among minority-stress populations
Melnyk et al. (2022)	USA	Quasi-experimental	124	Cognitive-behavioral + lifestyle	Mental health, healthy behaviors	CBT + lifestyle intervention improves mental health outcomes
Melnyk et al. (2023)	USA	Cross-sectional	2,603	Healthy behaviors	Mental health during COVID-19	Healthy behaviors buffer against COVID-related mental health decline
Cantisano et al. (2022)	Spain	Mixed-methods	296	Lifestyle (e-health program)	Emotional health	Digital lifestyle intervention improves emotional health
Peuters et al. (2024)	Belgium	Mixed-methods	412	Mobile lifestyle intervention	Mental health (adolescents)	Mobile intervention promotes mental health through lifestyle change

RQ1: Most Studied Components of Healthy Lifestyle

Thematic analysis of the 20 included studies revealed six major lifestyle components consistently addressed in the literature. These are presented below as thematic clusters with supporting synthesis.

Theme 1: Physical Activity

Physical activity emerged as the most frequently studied lifestyle component, appearing in 16 of 20 included studies. This broad category encompassed aerobic exercise, structured sports participation, leisure-time physical activity, and general movement patterns. The relationship between physical activity and mental health outcomes was consistently positive across studies, though the intensity, frequency, and type of activity varied considerably across studies. Herbert (2022) specifically argued for university-based physical activity programs as a primary vehicle for mental health promotion, citing robust neurobiological evidence supporting the antidepressant and anxiolytic effects of regular aerobic exercise. Chu et al. (2023) demonstrated that physical activity not only predicted better mental health directly but also functioned as a mediating variable in the relationship between mental health and academic performance, suggesting that physical activity may operate through multiple pathways. Rahimi et al. (2024), studying Afghan university students, found that physical activity was one of the two most protective lifestyle factors against anxiety and depression, alongside sleep quality. Spagert et al. (2022) reported significant gender differences in the association between physical activity and mental health in German students, with male students showing stronger mental health benefits from exercise, potentially reflecting differential patterns of sports participation and exercise motivation. Findings across studies were highly consistent in direction, with only minor heterogeneity in effect size.

Theme 2: Sleep Quality

Sleep quality was identified as a consistent and powerful predictor of mental health outcomes, appearing in 14 included studies and emerging as the most universally robust lifestyle predictor across all mental health domains. Fukuie et al. (2024) conducted a particularly detailed examination in a Japanese student sample and concluded that subjective sleep quality was the single most important lifestyle element connecting mental and physical health, outperforming physical activity and diet in predictive power. Their findings suggested that sleep problems mediated the relationship between academic stress and psychological distress. Rahimi et al. (2024) corroborated this centrality of sleep, finding that poor sleep was the strongest predictor of anxiety and depression in their Afghan student sample. Wang et al. (2025) reported that students with consistent, adequate sleep patterns demonstrated significantly higher composite mental health scores, and this association persisted after adjusting for multiple covariates including socioeconomic status and academic load. Notably, Ghali et al. (2022) found that during the COVID-19 pandemic, disrupted sleep schedules were among the most prevalent lifestyle changes associated with increased psychological distress, highlighting that sleep is particularly sensitive to environmental disruptions. There was strong and highly consistent evidence across diverse geographic and cultural contexts that poor sleep quality is a major modifiable risk factor for mental health problems in university students.

Theme 3: Diet and Nutrition

Dietary habits and nutritional patterns appeared as an independent or co-examined lifestyle component in 11 included studies. Budnick et al. (2025) provided the most in-depth examination of this relationship in a U.S. college student sample, finding that diet quality was significantly associated with mental health outcomes, with students reporting lower diet quality also reporting higher rates of depression, anxiety, and emotional difficulties. Critically, this study also identified structural barriersincluding food insecurity, time constraints, limited cooking skills, and financial limitationsthat disproportionately affect college students' nutritional choices, suggesting that individual dietary behavior cannot be understood in isolation from socioeconomic context. Fukuie et al. (2024) included dietary regularity in their multivariate model and found that while diet contributed to overall health, its independent effect was weaker than sleep quality. Chu et al. (2023) documented that irregular meal patterns and poor nutritional quality were associated with higher rates of psychological distress and reduced academic functioning. Hammoudi Halat et al. (2023) found that dietary behaviors were among the health behaviors most strongly correlated with mental health and academic performance in Lebanese students. Overall, the evidence pointed to a modest-to-moderate protective association between healthy dietary patterns and better mental health, with the strongest effects seen for diet diversity, meal regularity, and reduced ultra-processed food consumption.

Theme 4: Social Support

Social supportencompassing perceived peer support, family connection, and institutional belongingwas examined as a distinct or co-occurring lifestyle component in 13 included studies, reflecting its recognized position within health promotion models as a fundamental determinant of well-being. Sotaquirá et al. (2022) demonstrated in a Colombian student sample that social capital and lifestyle behaviors were jointly and independently associated with mental health outcomes, with strong social support networks buffering against the negative mental health effects of poor lifestyle habits. Wang et al. (2022) similarly documented in a large Chinese sample (n=6,247) that perceived social support quality independently predicted mental health scores, even after controlling for demographic and lifestyle variables, indicating that social support operates through mechanisms that are distinct from other lifestyle components. Zhang et al. (2024) proposed a theoretical pathway through which health awareness promotes healthy lifestyles via self-esteem and social support as sequential mediators, suggesting that social support functions both as a direct determinant of mental health and as a facilitating mechanism through which other lifestyle behaviors are adopted and maintained. Valentim et al. (2023) found that social connectedness was among the strongest predictors of positive mental health in Portuguese students, while Ostermiller et al. (2025) reported that social support was particularly critical for sexual and gender minority students who face additional minority stressors that undermine psychological resilience.

Theme 5: General Health Behaviors

Beyond the more specific categories above, 15 included studies employed composite measures of general health-promoting behaviors, using validated instruments such as the Health-Promoting Lifestyle Profile II (HPLP-II), the Healthy Lifestyle Scale, or bespoke composite indices. These studies examined clusters of behaviors including substance avoidance (alcohol, tobacco, illicit drugs), personal hygiene, stress management practices, health responsibility, and spiritual growth. Omidvar et al. (2024) specifically evaluated health-promoting lifestyle approaches in a cohort of Iranian college students and found that higher HPLP-II scores

were significantly associated with better mental health outcomes as measured by the General Health Questionnaire (GHQ). Melnyk et al. (2022; 2023) conducted both an intervention study and a large cross-sectional survey demonstrating that students reporting engagement in a broader repertoire of healthy behaviors showed lower rates of depression and anxiety, and that a cognitive-behavioral skills program designed to increase healthy behaviors produced significant improvements in mental health over a 7-week period. The composite behavioral approach captured synergistic effects among multiple lifestyle dimensions that single-component studies may underestimate, suggesting that the cumulative adoption of healthy behaviors may generate greater mental health benefits than any single behavior in isolation.

Theme 6: Sedentary Behavior and Screen Time

Sedentary behavior and screen time were examined as independent risk factors for poor mental health in 8 included studies. This theme received comparatively less focused attention than physical activity or sleep, but represented a consistently emerging area of concern. Spagert et al. (2022) found that in their German student sample, high sedentary time was independently associated with poorer mental health indicators, even after controlling for physical activity, suggesting that sitting time and exercise are not simply inverse ends of the same spectrum but represent distinct behavioral domains with separate health implications. Ghali et al. (2022) noted that during COVID-19, increased screen time associated with remote learning contributed to psychological distress through multiple pathways including digital fatigue, disrupted sleep, and reduced physical movement. Wang et al. (2022) documented associations between high leisure-time screen use and elevated anxiety and depression symptoms in Chinese students. Melnyk et al. (2023) similarly found that screen time was among the behaviors most strongly correlated with poor mental health in their national survey. While the evidence base for this theme was somewhat less extensive than for physical activity or sleep, findings were directionally consistent: high sedentary behavior and excessive screen time are independently associated with poorer mental health outcomes in university students.

Table 2. <Thematic Synthesis of Lifestyle Components (RQ1)>

Lifestyle Component	Studies (n)	Key Supporting Studies	Consistency	Notable Differences
Physical Activity	16	Herbert (2022); Chu et al. (2023); Rahimi et al. (2024); Spagert et al. (2022)	High	Gender differences in effect magnitude (Spagert et al., 2022)
Sleep Quality	14	Fukuie et al. (2024); Rahimi et al. (2024); Wang et al. (2025); Ghali et al. (2022)	Very High	COVID-19 disruption amplified effects (Ghali et al., 2022)
Diet and Nutrition	11	Budnick et al. (2025); Fukuie et al. (2024); Chu et al. (2023); Hammoudi Halat et al. (2023)	Moderate	Structural barriers (food insecurity) moderate effects (Budnick et al., 2025)
Social Support	13	Sotaquirá et al. (2022); Wang et al. (2022); Zhang et al. (2024); Valentim et al. (2023)	High	Stronger effect in minority populations (Ostermiller et al., 2025)
General Health Behaviors	15	Omidvar et al. (2024); Melnyk et al. (2022; 2023); Wang et al. (2025)	High	Composite effects exceed single-component interventions
Sedentary/Screen Time	8	Spagert et al. (2022); Ghali et al. (2022); Wang et al. (2022); Melnyk et al. (2023)	Moderate	Independent of physical activity (Spagert et al., 2022)

RQ2: Healthy Lifestyle and Mental Health Outcomes

Healthy Lifestyle and Psychological Well-Being

Across the included studies, healthy lifestyle patterns demonstrated robust positive associations with psychological well-being, encompassing dimensions such as life satisfaction, positive affect, sense of meaning, and flourishing. Valentim et al. (2023) conducted a comprehensive analysis in a Portuguese higher education sample and found that multiple lifestyle dimensionsincluding physical activity, social connection, and behavioral regularitycollectively predicted positive mental health scores at a level that was statistically and practically significant. Students who maintained lifestyle diversity, engaging in a range of health-promoting behaviors simultaneously, reported substantially higher well-being scores than those whose lifestyle profiles were narrow or dominated by sedentary behaviors. Mei et al. (2023) provided important mechanistic insight by demonstrating that healthy lifestyle acted as a mediating variable in the pathway between health locus of control and life satisfaction in a large Chinese student sample, suggesting that lifestyle functions not only as a direct predictor of well-being but also as a transmitter through which psychological attributes such as sense of control translate into experiential well-being. Zhang et al. (2024) further elaborated this model, showing that health awareness promoted well-being through a sequential chain involving enhanced self-esteem, expanded social support, and subsequently more consistent healthy lifestyle behavior. These findings collectively suggest that psychological well-being among university students is best understood as an emergent property of multiple, interacting lifestyle inputs rather than the product of any single behavioral practice.

Healthy Lifestyle and Stress

The evidence consistently indicated that healthy lifestyle patterns are significantly protective against perceived stress and academic burnout in university students. Wang et al. (2022) found in a large Chinese sample that lifestyle behaviors, combined with high-quality social support, were among the strongest predictors of lower perceived stress scores. Students who exercised regularly, maintained consistent sleep schedules, and reported strong peer relationships showed markedly lower stress levels than those who did not, even when controlling for academic workload and socioeconomic status. Melnyk et al. (2023) documented, in a national sample of nursing and health sciences students during COVID-19, that engagement in healthy behaviors was the most powerful buffer against pandemic-related stress escalation. Students maintaining pre-pandemic lifestyle habitsincluding regular exercise, adequate sleep, and social connectionshowed significantly smaller increases in stress compared to those who discontinued these behaviors during lockdown. Spagert et al. (2022) conducted gender-stratified analyses revealing that for female German students in particular, a combination of high physical activity and adequate sleep was most predictive of low stress scores, while social support played an additional moderating role. Omidvar et al. (2024) found that students with higher HPLP-II scores showed better stress management competencies as measured by standardized self-report scales, suggesting that health-promoting behavior may partly buffer stress through the acquisition of coping skills and emotional regulation capacities embedded within the health-promoting lifestyle model.

Healthy Lifestyle and Anxiety

Anxiety outcomesincluding generalized anxiety, social anxiety, test anxiety, and anxiety sensitivitywere examined in 14 of 20 included studies, and the findings were directionally consistent: higher engagement in healthy lifestyle behaviors was associated with lower anxiety symptoms. Rahimi et al. (2024), in an Afghan student sample, found that physical activity and sleep quality were the two lifestyle factors most strongly inversely associated with anxiety scores, with students engaging in moderate-to-vigorous physical activity at least three times per week showing significantly lower anxiety compared to sedentary peers. Ghali et al. (2022) documented in Tunisian medical students during COVID-19 that lifestyle disruptionsincluding reduced physical activity, irregular sleep, social isolation, and increased screen timewere jointly associated with elevated anxiety, with the combination of multiple disrupted behaviors showing additive effects on anxiety symptom severity. Herbert (2022) reviewed experimental evidence supporting the role of exercise programs in reducing clinically significant anxiety in university populations, citing mechanisms including regulation of the HPA axis, reduction of cortisol reactivity, and promotion of gamma-aminobutyric acid (GABA) activity. Valentim et al. (2023) found that social support quality was a particularly robust predictor of lower anxiety among Portuguese students, even after adjusting for physical activity and sleep, suggesting that interpersonal connection may have anxiety-buffering effects that are independent of other lifestyle components. Chu et al. (2023) demonstrated that lifestyle behaviors mediated the relationship between anxiety symptoms and academic outcomes, indicating that the anxiety-attenuating effects of healthy lifestyle have downstream consequences for educational success.

Healthy Lifestyle and Depression

The relationship between healthy lifestyle and depressive symptoms was examined in 17 of 20 included studies, making depression the most extensively investigated mental health outcome in the reviewed literature. Across diverse geographic, cultural, and methodological contexts, the evidence was highly consistent: students with healthier lifestyle profiles reported significantly lower rates of depressive symptoms, lower depression severity scores, and lower rates of probable major depressive disorder. Wang et al. (2025) analyzed a large cross-sectional sample in China and found that a composite index of healthy lifestyle choicesencompassing physical activity, sleep, diet, and social engagementwas negatively and significantly associated with depression scores, with dose-response patterns suggesting that each additional healthy behavior was incrementally protective. Melnyk et al. (2022) demonstrated in a quasi-experimental design that a cognitive-behavioral intervention that explicitly targeted healthy lifestyle behaviors produced significant reductions in depressive symptom scores over a 7-week period in veterinary medicine students, providing causal support for the lifestyle-depression relationship that cross-sectional studies cannot confirm. Ostermiller et al. (2025) explored the protective potential of lifestyle behaviors among sexual and gender minority graduate studentsa population facing elevated depression risk due to minority stressand found that lifestyle behaviors remained significantly protective even in this high-risk context, though the magnitude of protection was attenuated relative to non-minority populations. Sotaquirá et al. (2022) found in a Colombian sample that social capital and positive lifestyle behaviors jointly predicted lower depression rates, with their interaction suggesting that lifestyle is particularly protective when embedded within a supportive social environment. Hammoudi Halat et al. (2023) demonstrated in Lebanese university students that health behaviors were among the strongest predictors of lower depression levels, contributing independently to both mental health and academic outcomes.

Healthy Lifestyle and Emotional Well-Being

Emotional well-beingencompassing emotional regulation, positive affect, resilience, and emotional intelligencewas addressed explicitly in six included studies and implicitly in several others. Cantisano et al. (2022) evaluated a digital health program (ePSICONUT) designed to improve emotional health through lifestyle modification in Spanish university students and found significant improvements in emotional health scores among program participants, suggesting that structured lifestyle intervention can generate measurable improvements in emotional functioning within a short timeframe. Peuters et al. (2024) conducted a mixed-methods evaluation of a mobile healthy lifestyle intervention targeting adolescents and found that improvements in lifestyle behaviorsparticularly physical activity and sleepwere associated with enhanced emotional well-being and emotional regulation capacity. Mei et al. (2023) found that healthy lifestyle mediated the positive relationship between internal locus of control and life satisfaction, implying that lifestyle behaviors serve as a channel through which psychological resources are converted into positive emotional experience. Valentim et al. (2023) specifically measured positive mental healthincluding emotional, social, and psychological well-beingand found that lifestyle components were significant predictors of all three dimensions. These findings suggest that healthy lifestyle not only reduces negative mental health states (depression, anxiety, stress) but also actively cultivates positive emotional functioning, consistent with the dual-continua model of mental health proposed by Keyes (2002) and with health promotion frameworks emphasizing flourishing as a distinct goal beyond symptom reduction.

Table 3. <Relationship Between Healthy Lifestyle and Mental Health Outcomes (RQ2)>

Mental Health Outcome	Studies (n)	Key Studies	Nature of Relationship	Consistency
Psychological Well-Being	14	Valentim et al. (2023); Mei et al. (2023); Zhang et al. (2024)	Healthy lifestyle → higher well-being; mediation via self-esteem & social support	High
Stress	13	Wang et al. (2022); Melnyk et al. (2023); Omidvar et al. (2024)	Healthy lifestyle inversely associated with perceived stress; physical activity and sleep most protective	High
Anxiety	14	Rahimi et al. (2024); Ghali et al. (2022); Herbert	Physical activity and sleep most strongly	High

		(2022); Valentim et al. (2023)	protective; social support buffers anxiety independently	
Depression	17	Wang et al. (2025); Melnyk et al. (2022); Ostermiller et al. (2025); Sotaquirá et al. (2022)	Healthy lifestyle (composite + individual components) consistently inversely related to depression; dose-response pattern	Very High
Emotional Well-Being	6	Cantisano et al. (2022); Peuters et al. (2024); Mei et al. (2023)	Lifestyle intervention improves emotional regulation and positive affect; dual-continua effects (reduces negatives, promotes positives)	Moderate-High

RQ1: Why These Components Dominate the Literature

The thematic analysis of the included studies revealed a clearly stratified landscape of lifestyle research in relation to student mental health. Physical activity and sleep quality emerged as the most extensively studied and most consistently associated components, followed by social support, general health behaviors, diet and nutrition, and sedentary behavior. This hierarchy is not accidental; it reflects both the maturity of the scientific evidence base and the theoretical frameworks that have most influenced research in this domain.

The dominance of physical activity in the literature is explicable through multiple converging theoretical lenses. Within the framework of Pender's Health Promotion Model, physical activity represents a prototypical example of a health-promoting behavior that individuals are motivated to pursue when they perceive its benefits as exceeding its barriers, and when self-efficacy is sufficiently high (Herbert, 2022). From a neurobiological standpoint, the evidence for exercise as a natural antidepressant is substantial: aerobic exercise stimulates hippocampal neurogenesis, modulates serotonergic and dopaminergic neurotransmission, reduces cortisol reactivity, and upregulates brain-derived neurotrophic factor (BDNF), all of which contribute to improved mood regulation and stress resilience (Herbert, 2022; Fukuie et al., 2024). University environments, with their competitive academic cultures and sedentary study demands, are inherently prone to generating the physical inactivity that research consistently identifies as a psychological risk factor. This makes physical activity a natural intervention target, explaining its prevalence in both research and health promotion programming (Chu et al., 2023; Melnyk et al., 2022).

Sleep quality's emergence as the most consistently influential lifestyle factor across all mental health domains is theoretically coherent within the Biopsychosocial Model of health. Sleep is a fundamental biological process with wide-ranging effects on cognitive, emotional, and physiological regulation. Disrupted sleep impairs prefrontal cortical function, reduces emotional regulation capacity, elevates amygdala reactivity, and dysregulates cortisol and inflammatory pathways, generating a cascade of biological effects that directly undermine psychological resilience (Fukuie et al., 2024; Rahimi et al., 2024). From a psychological perspective, sleep deprivation reduces cognitive flexibility, increases catastrophizing and rumination, and undermines the capacity for effective copingall of which magnify the psychological impact of academic stressors. The university environment is particularly sleep-hostile: late-night studying, digital screen exposure, social activities, irregular schedules, and anxiety-related hyperarousal conspire to degrade sleep quality in ways that compound psychological vulnerability. The finding that sleep quality outperformed physical activity and diet in several studies (Fukuie et al., 2024) underscores the need for sleep to be prioritized in health promotion programming, not simply as an adjunct to physical activity but as a primary target in its own right.

The significant role of diet and nutrition in mental health is increasingly understood through the emerging field of nutritional psychiatry. Dietary quality influences mental health through multiple mechanisms including gut microbiome modulation, inflammatory pathway regulation, tryptophan availability for serotonin synthesis, and oxidative stress management (Budnick et al., 2025). The finding that structural barriersparticularly food insecurity and economic constraintsmoderated the diet-mental health relationship

(Budnick et al., 2025) is of particular policy relevance: it implies that interventions addressing dietary behavior without addressing the socioeconomic conditions that constrain healthy eating will have limited effectiveness. Universities seeking to promote student mental health through nutritional initiatives must therefore address structural determinants, including affordable healthy food options, food pantry programs, and financial literacy education, alongside behavioral interventions.

The prominent role of social support in the reviewed literature aligns closely with Social Support Theory and Social Cognitive Theory, both of which emphasize the centrality of interpersonal relationships to psychological well-being. Social support operates through multiple mechanisms: direct provision of practical assistance, emotional validation, information sharing, and belongingall of which reduce the subjective severity of stressors and promote adaptive coping (Sotaquirá et al., 2022; Wang et al., 2022). Zhang et al. (2024) contributed an important theoretical elaboration by demonstrating that social support also functions as a mediating mechanism through which health awareness is converted into lifestyle behavior, positioning social support not only as a direct protective factor but also as an enabling condition for other healthy lifestyle behaviors. This implies that social isolationincreasingly prevalent among university students in the digital agemay undermine mental health through dual pathways: directly, by depriving students of emotional resources, and indirectly, by removing the social scaffolding that sustains healthy behavior.

RQ2: Mechanisms of Lifestyle-Mental Health Association

The synthesis of evidence across the five mental health outcome domains revealed a consistent pattern: healthy lifestyle behaviors are protective across the full spectrum of mental health, from reducing negative states (depression, anxiety, stress) to promoting positive states (well-being, emotional flourishing). This dual-directional effect is consistent with the dual-continua model of mental health, which posits that mental illness and mental well-being are distinct but related dimensions, each requiring targeted attention (Valentim et al., 2023; Cantisano et al., 2022). The mechanisms underlying these relationships operate through three intersecting pathways.

Biological Pathway

Physical activity triggers neurochemical cascadesincluding serotonin, dopamine, norepinephrine, and endorphin releasethat directly elevate mood and reduce anxiety (Herbert, 2022). Sustained aerobic exercise promotes hippocampal volume and neuroplasticity, which may explain its longer-term antidepressant effects. Adequate sleep enables synaptic consolidation, glymphatic clearance of neural waste products, and hormonal resettingparticularly of the HPA axis all of which maintain the neurological substrate of emotional regulation (Fukuie et al., 2024). Nutritional adequacy particularly of omega-3 fatty acids, B vitamins, zinc, magnesium, and tryptophan supports neurotransmitter synthesis and anti-inflammatory processes, providing a biochemical foundation for stable mood (Budnick et al., 2025). Collectively, these biological mechanisms suggest that healthy lifestyle is not merely correlated with mental health but is constitutively involved in the biological processes that produce and maintain psychological equilibrium.

Psychological Pathway

Beyond neurobiological mechanisms, healthy lifestyle exerts psychological effects through enhanced self-efficacy, improved self-esteem, and strengthened coping competencies. Students who successfully maintain health-promoting behaviors develop a generalized sense of behavioral self-regulation that transfers to academic and social domains, reducing helplessness and catastrophizing in response to stressors (Melnyk et al., 2022; Mei et al., 2023). Zhang et al. (2024) demonstrated that self-esteem served as a sequential mediator between health awareness and lifestyle adoption, suggesting that psychological variables are not merely outcomes of lifestyle change but active facilitating mechanisms. The cognitive-behavioral skills building approach employed by Melnyk et al. (2022) underscored the importance of psychological skill development including thought challenging, problem-solving, and behavioral activation as necessary complements to lifestyle behavior change, particularly in populations whose mental health problems have erected psychological barriers to health-promoting action.

Social Pathway

The social dimensions of lifestyle are equally consequential. Students embedded in supportive social networks whether through peer relationships, family connection, or institutional community benefit from buffering of stress appraisal, enhancement of positive affect through shared experience, and modeling of health-promoting behaviors through social norms. Sotaquirá et al. (2022) demonstrated that social capital and lifestyle behaviors operated through partially independent pathways to mental health, suggesting that university health promotion efforts should address social integration alongside individual behavior. Ostermiller et al. (2025) found that lifestyle behaviors remained protective even among sexual and gender minority students facing

minority stress, but that the magnitude of protection was partially attenuated, highlighting that the social pathway may be disrupted by structural exclusion and discrimination in ways that require targeted programmatic responses. Campus-based social programs, peer mentoring, group exercise, and community-building initiatives may therefore generate mental health benefits through the social pathway that complement and amplify the biological and psychological effects of other lifestyle interventions.

Practical Implications

The findings of this review carry substantial implications for university administrators, health practitioners, academic counselors, and policymakers. First and foremost, the evidence supports a multicomponent approach to mental health promotion that simultaneously addresses physical activity, sleep, nutrition, and social connection, rather than single-component interventions. Universities should develop integrated wellness programs modeled on evidence-based frameworks such as the MINDSTORMS program or the Healthy Campus Initiative that embed lifestyle promotion within existing academic and extracurricular structures (Melnyk et al., 2022; Cantisano et al., 2022).

Second, given the central importance of sleep quality across all mental health outcome domains, targeted sleep hygiene education should be a mandatory component of first-year student orientation and academic health services. Sleep clinics, app-based sleep monitoring tools, and evidence-based psychoeducation about sleep disorders should be made widely accessible across campus (Fukuie et al., 2024; Rahimi et al., 2024). Third, the role of structural barriers particularly food insecurity and economic constraints in limiting healthy dietary behaviors points to the need for institutional policy responses, including subsidized healthy food options, campus food banks, and nutritional counseling services, particularly for economically disadvantaged student populations (Budnick et al., 2025).

Fourth, digital and mobile health interventions represent a scalable and accessible platform for delivering lifestyle-based mental health promotion to university students. The positive outcomes reported by Cantisano et al. (2022) and Peuters et al. (2024) suggest that well-designed e-health and mHealth interventions can produce measurable improvements in lifestyle behavior and mental health outcomes, with the potential for widespread reach and low per-student cost.

This review identifies several important directions for future research. Longitudinal prospective studies are needed to establish the causal directionality of the lifestyle-mental health association and to examine how lifestyle patterns evolve across the university life course. Research employing objective lifestyle measures such as actigraphy for sleep and physical activity, biomarkers for nutritional status will strengthen the evidentiary base by reducing reliance on self-report data susceptible to social desirability bias. Intersectional research examining how gender, ethnicity, socioeconomic status, sexual orientation, and academic discipline moderate the lifestyle-mental health relationship is needed to produce more nuanced and targeted intervention recommendations. Finally, intervention research testing multicomponent lifestyle programs using randomized controlled trial designs is needed to establish effectiveness under controlled conditions and to identify active ingredients and optimal dosing for different student subpopulations.

Conclusions

This systematic literature review synthesizes evidence from 20 peer-reviewed studies to provide a comprehensive account of the relationship between healthy lifestyle patterns and mental health outcomes among university students. In addressing RQ1, six major lifestyle components emerged as consistently studied in this context: physical activity, sleep quality, diet and nutrition, social support, general health behaviors, and sedentary behavior/screen time. Physical activity and sleep quality received the greatest research attention and demonstrated the most consistent associations with mental health outcomes, while social support and composite health behaviors also featured prominently. In addressing RQ2, the evidence consistently demonstrated that healthy lifestyle patterns are significantly and meaningfully protective across the full range of mental health outcomes examined, including psychological well-being, stress, anxiety, depression, and emotional well-being. Sleep quality was the single most universally influential lifestyle factor, while physical activity, social support, and dietary quality each contributed independently and in synergy with other lifestyle dimensions. The protective effects of healthy lifestyle were observed across diverse geographic and cultural contexts, across gender groups, and even in high-risk populations such as sexual and gender minority students, though effect magnitudes varied by population and context. Theoretically, the lifestyle-mental health relationship is best understood through a biopsychosocial model incorporating biological, psychological, and social pathways operating simultaneously and interactively. Practically, these findings support a multicomponent, integrated approach to student health promotion that addresses physical, nutritional, social, and sleep-related dimensions of lifestyle within a coherent, evidence-based framework. Universities that invest

in holistic lifestyle promotion programs for their students are investing not only in mental health but also in academic performance, retention, and long-term graduate outcomes. The evidence reviewed here provides a compelling basis for making such investments a priority in higher education health policy.

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