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REVIEW

Physical Activity and Structured Exercise Programs as Tools for Mental Health Promotion: A Systematic Review

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ABSTRACT: Background: Mental health disorders are a major global burden, highlighting the need for effective non-pharmacological interventions. Physical activity has emerged as a promising strategy for improving mental health outcomes. This systematic review examined the effects of structured physical activity and exercise interventions on mental health outcomes, addressing the growing need for effective non-pharmacological strategies for mental health promotion. **Methods:** The review followed PRISMA 2020 guidelines. Searches were conducted in PubMed, Web of Science, Scopus, and PsycINFO for studies published between 2017 and December 2025. Study selection was based on the PICOS framework. Thirteen studies met the inclusion criteria and were included in the qualitative synthesis. Methodological quality was assessed using the PEDro scale. **Results:** Included studies involved clinical and non-clinical populations across various age groups. Structured exercise interventions (aerobic, resistance, or combined) were associated with reductions in depressive and anxiety symptoms, as well the improvements in psychological well-being and stress-related outcomes. Across the included studies, interventions of moderate-to-vigorous intensity performed two to five times per week over periods ranging from 6 to 24 weeks appeared to demonstrate the most consistent benefits. However, this observation is based on qualitative comparison of the included studies rather than a formal meta-analytic dose–response analysis. PEDro scores ranged from 4 to 8, indicating moderate to high methodological quality. **Conclusions:** Structured exercise interventions appear to be a promising and feasible approach for improving mental health outcomes across diverse populations. However, due to heterogeneity in study designs and outcome measures, the findings should be interpreted with caution, and further high-quality research is needed.

KEYWORDS: Psychological outcomes; exercise interventions; preventive health strategies; evidence synthesis; PEDro scale; PICOS

1 Introduction

Mental health disorders constitute one of the leading causes of disability worldwide and represent a substantial public health challenge across the lifespan. According to the recent global estimates, mental disorders account for a significant proportion of years lived with disability, with depressive and anxiety disorders being among the most prevalent conditions globally [1]. The World Health Organization (WHO)

has highlighted that poor mental health is associated with impaired social functioning, reduced productivity, and increased healthcare costs, emphasizing the need for effective, accessible, and scalable strategies for mental health promotion and prevention [2]. Although pharmacological and psychotherapeutic interventions remain central to mental health care, their limited reach, variable effectiveness, and high relapse rates highlight the importance of complementary, population-based approaches that address modifiable lifestyle factors [3].

In this context, physical activity has emerged as a promising and increasingly recognized determinant of mental health. Physical activity, defined as any bodily movement produced by skeletal muscles resulting in energy expenditure, and structured exercise programs, characterized by planned, repetitive, and goal-oriented activity, have been consistently associated with improved mental health outcomes [4]. Epidemiological evidence indicates that individuals who engage in higher levels of physical activity report lower prevalence of depressive and anxiety symptoms, as well as higher levels of psychological well-being, across diverse demographic groups [5,6]. Importantly, prospective cohort studies suggest that regular physical activity is associated with a reduced risk of developing depression, supporting a potential protective and preventive role [7].

Evidence from randomized controlled trials and meta-analyses further substantiates the mental health benefits of physical activity and exercise-based interventions. Exercise interventions have been shown to produce clinically meaningful reductions in depressive symptoms and modest but significant improvements in anxiety and psychological distress in both clinical and non-clinical populations [8,9]. In some cases, the magnitude of these effects is comparable to that of established first-line treatments, particularly for individuals with mild to moderate symptomatology [10]. These findings have contributed to the growing interest in incorporating physical activity into mental health promotion frameworks and clinical guidelines.

The beneficial effects of physical activity on mental health are supported by a range of interrelated biological, psychological, and social mechanisms. From a biological perspective, regular physical activity influences neurobiological pathways implicated in mental health, including increased expression of brain-derived neurotrophic factor, enhanced neurogenesis, modulation of inflammatory processes, and improved regulation of the hypothalamic–pituitary–adrenal axis [11,12]. Psychological mechanisms include improvements in self-efficacy, mood regulation, cognitive functioning, and perceived competence, alongside reductions in stress reactivity and rumination [13]. Additionally, social mechanisms, particularly relevant in group-based or supervised exercise contexts, include enhanced social interaction, social support, and sense of belonging, which are recognized protective factors for mental well-being [14].

While general physical activity is associated with mental health benefits, increasing attention has been directed toward the role of structured exercise programs. Such programs typically specify parameters such as intensity, frequency, duration, and type of activity, which may enhance adherence, facilitate reproducibility, and allow for clearer dose–response relationships compared with unstructured physical activity [15]. Systematic evidence suggests that structured aerobic, resistance, and combined exercise interventions can improve mental health outcomes across age groups, including children and adolescents, adults, and older populations [13,16]. However, the relative contribution of specific program characteristics and the extent to which structured interventions offer advantages over general physical activity for mental health promotion remain insufficiently synthesized.

Despite the growing body of literature, existing reviews often focus on specific mental disorders, populations, or intervention modalities, limiting their applicability to broader mental health promotion perspectives. Furthermore, heterogeneity in study designs, outcome measures, and intervention characteristics complicates the interpretation and translation of findings into public health and clinical practice [10]. Several

reviews also predate recent large-scale trials and updated reporting standards, highlighting the need for a comprehensive and methodologically rigorous synthesis of current evidence [7]. Unlike previous reviews that primarily focused on specific populations or clinical diagnoses, the present review aims to provide a broader synthesis of structured exercise interventions across diverse populations and settings. Additionally, particular attention is given to intervention characteristics that may influence practical implementation and reproducibility.

Therefore, in line with the PRISMA 2020 guidelines, the aim of this systematic review is to synthesize and critically evaluate the available evidence on the role of physical activity and structured exercise programs in promoting mental health. Specifically, this review seeks to examine the effects of physical activity and exercise interventions on mental health outcomes, identify key characteristics of effective programs, and highlight gaps in the literature to inform future research and evidence-based mental health promotion strategies. Based on the applied methodology, the hypothesis was formulated that structured physical activity and exercise programs significantly improve mental health indicators, including reductions in depressive and anxiety symptoms and increases in psychological well-being. These effects are expected to be present across different populations compared with inactive or usual-care approaches.

2 Materials and Methods

A systematic and transparent approach to data collection, analysis, and selection was applied to ensure validity, minimize bias, and maintain reliability of findings. The present study adhered to the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) [17]. All included studies were cross-checked against the reference list and full-text articles to ensure consistency and correct classification. Any discrepancies were resolved through consensus among the authors.

2.1 Search Strategy

Electronic searches were conducted across multiple databases, including PubMed, Web of Science, Scopus and PsycINFO. The search included studies published up to December 2025, without applying a strict lower publication year limit. This approach allowed the inclusion of earlier high-quality randomized controlled trials that remain methodologically relevant. The databases were searched between 08 January and 10 January 2026. A combination of keywords related to physical activity, structured exercise, and mental health was applied to refine the search strategy. The search strategy included combinations of keywords using Boolean operators: (“physical activity” OR “exercise”) AND (“mental health” OR “depression” OR “anxiety”).

The full search strategy was adapted for each database and included combinations of controlled vocabulary (e.g., MeSH terms) and free-text terms. The detailed search strings for each database are provided in the Supplementary Materials.

The inclusion was restricted to original empirical studies reporting structured exercise interventions with clear mental health outcomes. Conference abstracts, preprints, gray literature, and review articles were excluded to ensure that only peer-reviewed and methodologically sound studies were analyzed. In order to ensure accurate data extraction and interpretation only studies published in English were included in the search.

2.2 Inclusion and Exclusion Criteria

To ensure an objective selection process, three authors (B. B., M. L., and M. L.) independently assessed studies on the basic of the predefined inclusion and exclusion criteria. The PICOS framework (Population, Intervention, Comparators, Outcomes, and Study Design) was applied to identify eligible studies.

The inclusion and exclusion criteria, along with a descriptive overview of study characteristics, are summarized in Table 1.

Table 1: The PICOS framework was applied to define inclusion and exclusion criteria.

PICOS Category	Inclusion Criteria	Exclusion Criteria
P (Population)	Men and women of all ages; healthy and clinical populations	Participants with severe health problems preventing physical activity
I (Intervention)	Structured exercise programs (aerobic, resistance, or concurrent); interventions applied in controlled experimental settings	Studies relying solely on self-reported activity without objective monitoring; interventions not structured
C (Comparators)	Experimental vs. control groups; different exercise intensity or modalities compared	Comparisons between unrelated sports or activities not focused on mental health outcomes
O (Outcomes)	Objective and subjective measures of mental health (e.g., depressive/anxiety symptoms, psychological distress)	Incomplete or missing results; only qualitative impressions without standardized measurement
S (Study Design)	Randomized and non-randomized controlled trials; longitudinal intervention studies	Duplicates; case reports (<5 participants per group); review articles; conference abstracts; preprints; studies not in English

Titles and abstracts were initially screened for relevance. Only studies that met all inclusion criteria were selected for full-text review. For studies with missing essential data, authors were contacted for clarification. Non-critical missing data were excluded from the analysis and tables to avoid misinterpretation.

To ensure full consistency with the predefined eligibility criteria, all included studies were re-evaluated at the full-text level during the final stage of the review process. Each study was independently verified to confirm that it: (1) represented an original empirical investigation rather than a review, protocol, or secondary analysis; (2) included a clearly defined structured physical activity or exercise intervention; (3) reported at least one relevant mental health outcome using standardized or validated measures; (4) met the population criteria defined by the PICOS framework; and (5) was correctly classified according to its study design.

Studies that did not meet these criteria upon re-evaluation were excluded and replaced with eligible primary intervention studies. This additional verification step was implemented to ensure the internal validity and methodological consistency of the final included-study pool.

A total of 13 primary studies were included in this systematic review and presented in the main table (Table 2).

Data extracted included authorship, country, sample size, population characteristics, study design, type and intensity of intervention, duration, and mental health outcomes. Additional data included session duration, frequency, supervision format, and adherence rates when available. Disagreements between reviewers were resolved through discussion.

Table 2: Original empirical studies on the impact of physical activity on mental health.

No.	Authors (Year)	Country	Sample	Study Design	Intervention	Comparator/Control	Duration	Outcome Measure	Main Findings
1.	Philippot et al. (2022) [18]	Belgium	Hospitalized adolescents with depression (n = 40)	RCT	Structured aerobic exercise + TAU	TAU	8 weeks	HADS	↓ depressive and anxiety symptoms (HADS)
2.	Welford et al. (2022) [19]	United Kingdom	Adults with affective disorders (n = 90)	RCT	Aerobic exercise vs. yoga vs. usual care	YG + UC	12 weeks	Std. dep./anx.	Exercise and yoga ↓ depression and anxiety vs. usual care
3.	O'Sullivan et al. (2023) [20]	Ireland	Young adults (n = 60)	RCT	Resistance training	CG (NI)	8 weeks	Std. dep.	↓ depressive symptoms (moderate but significant)
4.	Shavaisi et al. (2024) [21]	Iran	Female university students with PMS (n = 72)	Single-blind RCT	Physical activity + positive psychology	CG	8 weeks	DASS-21	↓ depression, anxiety, and perceived stress
5.	Chin et al. (2022) [22]	USA	Older adults with insomnia (n = 120)	RCT	Walking (moderate vs. vigorous)	Mod. vs. Vig.	16 weeks	Std. dep.	↓ depressive symptoms (clinically meaningful)
6.	Higham et al. (2025) [23]	Australia	Inactive university staff (n = 50)	RCT	Concurrent aerobic + resistance training	CG (NI)	14 weeks	Std. str./anx./dep.	↓ stress, anxiety, and depressive symptoms
7.	Langoni et al. (2019) [24]	Brazil	Older adults with mild cognitive impairment (n = 60)	RCT	Group exercise program (aerobic + resistance + balance training)	UC/CG	12 weeks	Geriatric Depression Scale (GDS	↓ depressive symptoms and improved functional status in exercise group
8.	Chalder et al. (2012) [25]	United Kingdom	Adults with depression (n = 361)	RCT	Facilitated physical activity program vs. usual care	UC	32 weeks	BDI	↓ depressive symptoms
9	Helgadóttir et al. (2017) [26]	Sweden	Adults with mild-to-moderate depression (n = 620)	RCT	Light vs. Moderate vs. Vigorous Exercise (+TAU)	IC/CG	12 weeks	Depression severity	↓ depressive symptoms; long-term benefits maintained, particularly in light-intensity exercise

Table 2: *Cont.*

No.	Authors (Year)	Country	Sample	Study Design	Intervention	Comparator/Control	Duration	Outcome Measure	Main Findings
10.	Rahman et al. (2018) [27]	Sweden	Adults with mild–moderate depression (n = 946)	RCT	Aerobic exercise vs. resistance training vs. usual care	UC (+ ex. mod.)	12 weeks	Clin./self-rep. dep.	↓ depression symptom severity
11.	Helgadóttir et al. (2016) [28]	Sweden	Adults with depression (n = 120)	RCT	Supervised aerobic exercise (light vs. vigorous intensity)	Light vs. Vig.	12 weeks	Dep. + psych. WB	↓ depressive symptoms; ↑ psychological well-being
12.	Awick et al. (2017) [29]	USA	Older adults (n = 300)	RCT	MVPA behavioral intervention	CG	24 weeks	Std. psych. dist. + WB	↓ psychological distress; ↑ well-being
13.	Liu et al. (2026, ip) [30]	China	University students with pre-obesity (China) (n = 216)	RCT	Digital peer-support with daily micro-tasks (PPAW)	CG	24 weeks	Std. anx. + dep.	↓ anxiety/depression; ↑ well-being vs. controls

Legend: RCT = Randomized Controlled Trial; TAU = Treatment as Usual; MVPA = Moderate-to-Vigorous Physical Activity; PMS = Premenstrual Syndrome; n = Number of Participants; USA = United States of America; UK = United Kingdom; Comp./Ctrl. = Comparator/Control; TAU = Treatment as Usual; YG = Yoga Group; UC = Usual Care; CG = Control Group; NI = No Intervention; Mod. = Moderate Intensity; Vig. = Vigorous Intensity; ex. mod. = Exercise Modalities; Std. = Standardized; Dep. = Depression; anx. = Anxiety; str. = Stress; psych. dist. = Psychological Distress; WB = Well-Being; Clin./self-rep. = Clinician- or Self-Reported; HADS = Hospital Anxiety and Depression Scale; DASS-21 = Depression Anxiety Stress Scales (21 items); BDI = Beck Depression Inventory; PPAW = Promote Physical Activity and Wellbeing; ip = In Press; ↑ = Statistically Significant Improve $p < 0.05$; $p < 0.01$; ↓ = Statistically Significant Reduction $p < 0.05$; $p < 0.01$.

2.3 Study Selection and Methodological Quality

Duplicate records were identified using Mendeley software based on title, author names, and DOI matching. Automatic detection was followed by manual verification to ensure accuracy and to remove any remaining duplicates or multiple reports from the same study. Data screening and extraction were conducted independently by three authors (B. B., S. B., and M. L.) using the previously described search protocol. EndNote (v. 21) was used for citation management, and Mendeley (v. 2.111.0, Copyright © 2024 Elsevier Ltd., Barcelona, Spain) was used for duplicate detection.

The study critically evaluated the quality of the included research and systematically identified potential limitations, such as sample variability, differences in exercise interventions, and inconsistencies in mental health outcome assessment, which are discussed in detail in the Discussion section.

To ensure accurate classification, all included studies were categorized according to their actual study design based on full-text evaluation. Only randomized and controlled intervention studies were retained, and their classification was verified to avoid misinterpretation of evidence hierarchy. All included studies were confirmed to be randomized controlled trials based on full-text assessment.

The methodological quality of the selected studies was independently assessed using the Physiotherapy Evidence Database (PEDro) scale, comprising 11 criteria (Table 2). Each criterion was scored using a binary system (+ or −). Studies scoring 6 or more points were categorized as high quality, those scoring 4–5 points as moderate quality, and those scoring below 4 points as low quality. The first item of the PEDro scale is not included in the total score, resulting in a maximum score of 10.

3 Results

To enhance the clarity and consistency of the findings, numerical values were reported wherever possible. However, some outcomes were described qualitatively due to variations in study methodologies, intervention types, and mental health measurement tools. While certain outcomes, such as depressive symptom scores or anxiety levels, are explicitly quantified, others, including motivation, psychological well-being, or cognitive improvements, are described descriptively in the reviewed studies. Standardization of reporting metrics in future research would facilitate more direct comparisons across studies.

3.1 Literature Characteristics

The study selection process is illustrated in Fig. 1 using the PRISMA 2020 flow diagram. In total, 842 records were identified through database searching. In addition, additional records identified through other sources were included in the initial pool of studies. After removal of duplicates, records marked as ineligible by automation tools, and other non-relevant records, a total of 635 unique records remained for screening.

These records were screened based on titles and abstracts, resulting in the exclusion of 433 records that did not meet the predefined inclusion criteria. Subsequently, 202 reports were sought for retrieval, of which 93 could not be obtained despite efforts to access full texts through institutional and database resources. A total of 109 full-text articles were assessed for eligibility.

Of these, 96 studies were excluded due to not meeting the inclusion criteria, including lack of intervention design, absence of relevant mental health outcomes, inappropriate study populations, or non-eligible publication types. During the final stage of selection, three previously included studies were replaced with three newly identified eligible studies following refinement of eligibility assessment and updated screening checks. Ultimately, 13 studies met all inclusion criteria and were included in the qualitative synthesis.

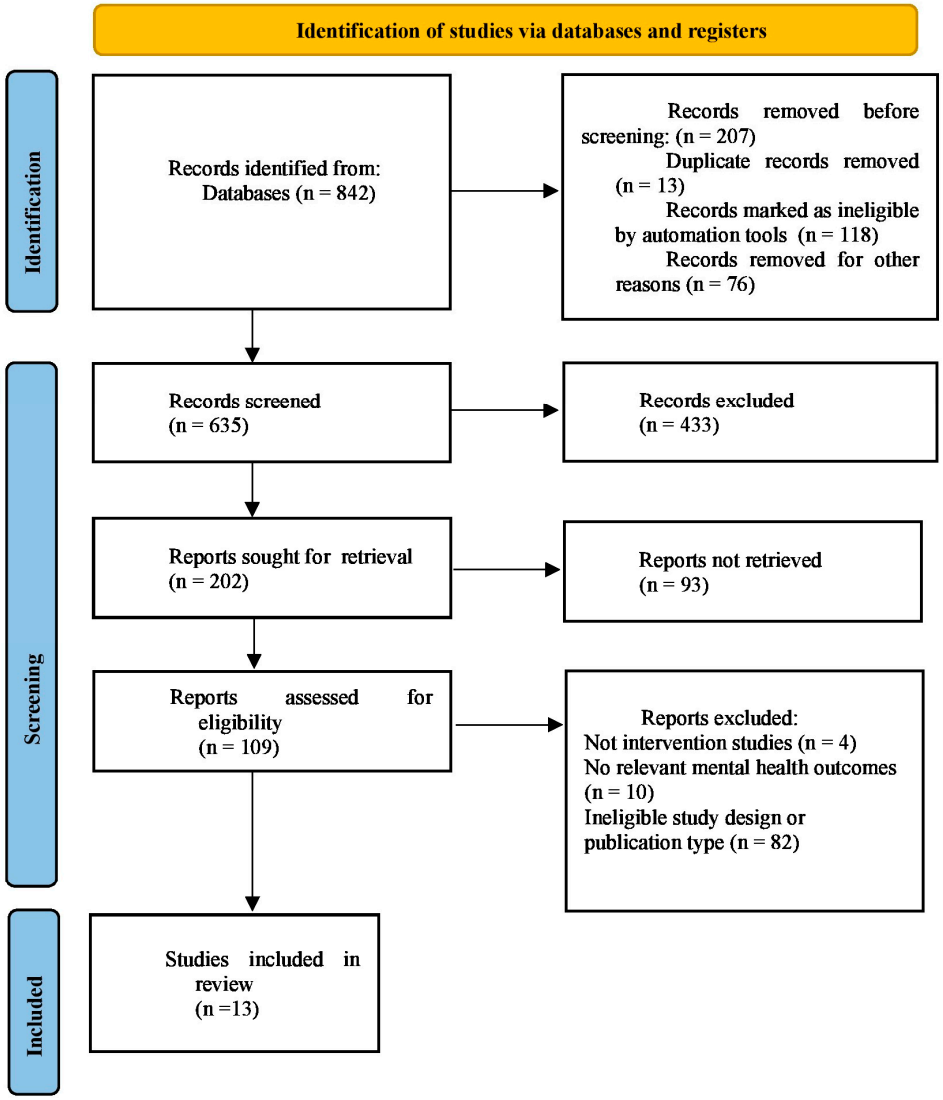

Figure 1: PRISMA Flowchart diagram of the study selection.

Although no lower year restriction was applied, the majority of included studies were published in recent years. All included studies were subsequently verified to ensure full compliance with the predefined eligibility criteria.

The distribution of studies by country, population characteristics, and intervention type is summarized in Table 1. The majority of studies were conducted in the USA (n = 2), UK (n = 2), Ireland (n = 1), Iran (n = 1), Australia (n = 1), Sweden (n = 3), Brazil (n = 1), Belgium (n = 1) and China (n = 1). Sample sizes ranged from 40 to 946 participants, encompassing both healthy adults and clinical populations with mild to moderate mental health concerns. Exercise interventions included aerobic training, resistance training, concurrent training, and structured group exercise programs, with durations ranging from 8 weeks to 32 weeks and frequencies from 2 to 5 sessions per week. Intensity was reported as moderate-to-vigorous physical activity (MVPA) in 8 studies and as low-to-moderate intensity in 5 studies. Control groups typically followed either treatment as usual (TAU) or no-intervention protocols. The database coverage of primary and supplementary studies is presented in Fig. 2.

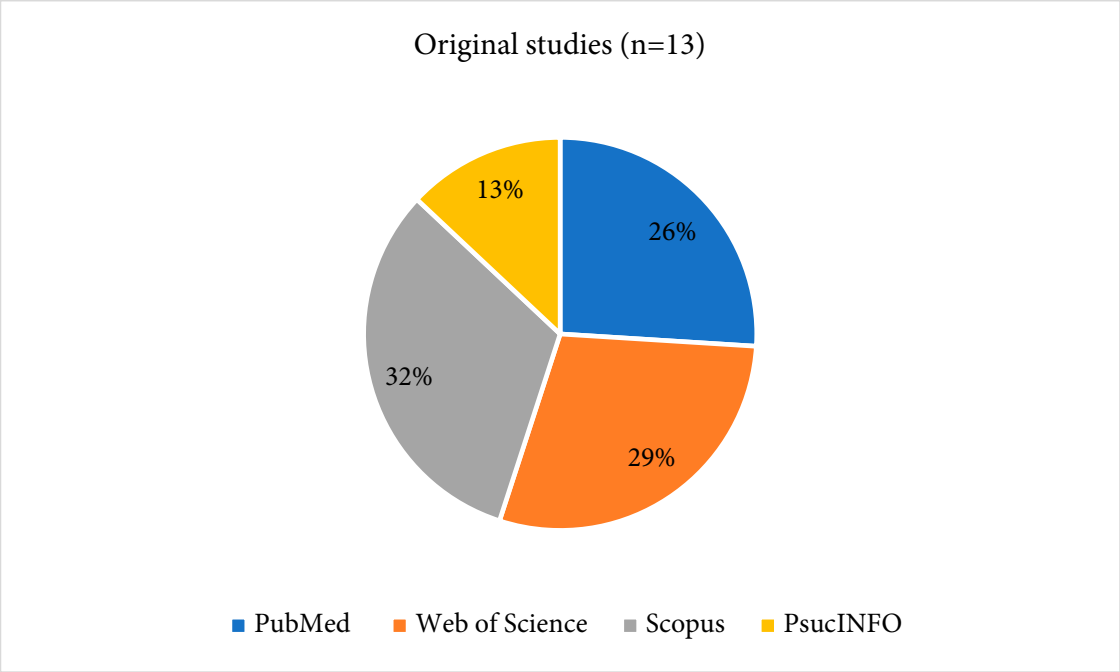

Figure 2: Database coverage of primary and supplementary studies.

3.2 The Methodological Quality Assessment of the Included Studies

The methodological quality of the included studies, assessed using the PEDro scale, ranged from 4 to 8 points, indicating overall moderate to high quality. Specifically, four studies were classified as high quality (≥6 points), while the majority demonstrated moderate methodological rigor. Lower scores were primarily associated with the lack of blinding of participants, therapists, and assessors, which is common in exercise-based interventions. However, most studies reported adequate randomization procedures and between-group statistical comparisons. As shown in Table 3, the methodological quality of the included studies was assessed using the PEDro scale.

Table 3: Evidence Database (PEDro) score of the included studies.

Reference	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	Total
Philippot et al. (2022) [18]	+	+	+	+	–	–	+	–	–	+	+	7
Welford et al. (2022) [19]	+	+	+	–	–	–	+	+	–	+	+	7
O'Sullivan et al. (2023) [20]	+	+	+	+	–	–	–	–	–	+	+	6
Shavaisi et al. (2024) [21]	+	–	–	+	–	–	–	–	+	+	+	5
Chin et al. (2022) [22]	+	+	+	–	–	–	–	–	+	+	+	6
Higham et al. (2025) [23]	–	+	–	+	–	–	+	–	+	+	+	6
Lagoni (2019) [24]	+	–	+	–	–	+	+	–	+	+	+	7
Chalder et al. (2012) [25]	+	+	+	+	–	–	–	+	+	+	+	7
Helgadóttir et al. (2017) [26]	+	–	+	–	–	+	+	–	+	+	+	7
Rahman et al. (2018) [27]	+	+	+	+	-	-	-	+	+	+	+	7
Helgadóttir et al. (2016) [28]	+	+	–	+	–	–	–	+	+	+	+	6
Awick et al. (2017) [29]	+	+	+	–	+	–	–	–	+	+	+	7
Liu et al. (2026, ip) [30]	+	–	–	–	–	–	+	+	+	+	+	6

Legend: + indicates one point; – indicates no point; ip-in press. PEDro criteria: (1) Eligibility criteria; (2) Random allocation; (3) Concealed allocation; (4) Baseline comparability; (5) Blinding of subjects; (6) Blinding of therapists; (7) Blinding of assessors; (8) Adequate follow-up (<15% dropouts); (9) Intention-to-treat analysis; (10) Between-group statistical comparisons; (11) Point estimates and variability. **Note:** The first item (eligibility criteria) is not included in the total PEDro score; maximum score = 10.

4 Discussion

The primary purpose of this study was to evaluate the effects of structured physical activity and exercise interventions on mental health outcomes across diverse populations. The main findings indicate that aerobic, resistance, and combined training programs were generally associated with reductions in depressive and anxiety symptoms. Group-based and supervised interventions additionally enhanced motivation, self-efficacy, and cognitive functioning.

These results confirm the hypothesis formulated in the Introduction, which posited that structured exercise would significantly improve mental health indicators across clinical and non-clinical populations. Overall, the observed outcomes align with expectations and support previous evidence indicating that moderate-to-vigorous exercise performed multiple times per week yields the most robust benefits.

4.1 Effects of Exercise on Mental Health

Across the included studies, structured physical activity was generally associated with the positive effects on mental health outcomes across diverse populations. Interventions incorporating aerobic, resistance, or combined training modalities were associated with reductions in depressive and anxiety symptoms, with longer duration and higher frequency programs generally producing stronger and more stable benefits. Improvements in psychological wellbeing, mood, and life satisfaction were reported across both clinical and non-clinical populations, highlighting the broad applicability of exercise as a mental health promotion strategy [31,32].

In addition to reductions in core symptoms of depression and anxiety, several studies reported improvements in secondary psychological outcomes, including motivation, self-efficacy, and perceived competence. Enhancements in cognitive functioning, particularly in domains such as attention and executive function, were also observed, especially in interventions that combined aerobic and resistance training. These findings suggest that structured exercise may influence both affective and cognitive dimensions of mental health, contributing to more comprehensive psychological benefits [9,33].

Group-based and supervised interventions appeared to provide additional psychosocial advantages. Beyond the physiological effects of exercise, these programs facilitated social interaction, peer support, and increased adherence, which are recognized as important determinants of sustained engagement in physical activity. Such findings support the notion that the context in which exercise is performed may play a significant role in shaping mental health outcomes. While intervention characteristics varied across studies, programs characterized by moderate-to-vigorous intensity performed multiple times per week over several weeks appeared to yield the most consistent improvements in mental health outcomes across the included studies. However, these observations should be interpreted cautiously, as no formal dose–response meta-analysis was conducted [34]. Interventions lasting between 8 and 24 weeks, with a frequency of two to five sessions per week, were particularly effective [32]. Comparisons with control conditions, including no-intervention or treatment-as-usual groups, generally suggested that observed improvements may be attributable to the structured exercise rather than general participation or placebo effects.

Overall, the analysis of the 13 included studies indicates that structured exercise appears to have a generally positive effect on key mental health outcomes, particularly depression and anxiety. Although effect sizes were not consistently reported across studies, the convergence of both quantitative and qualitative findings strengthens the robustness of the overall evidence base. The consistency of these results across different populations and intervention types further supports the generalizability of exercise as an effective mental health promotion strategy. Overall, structured exercise demonstrated consistent positive effects on key mental health outcomes, particularly depression and anxiety (Fig. 3). These findings were observed

across different populations and intervention types, supporting the generalizability of exercise as an effective mental health promotion strategy.

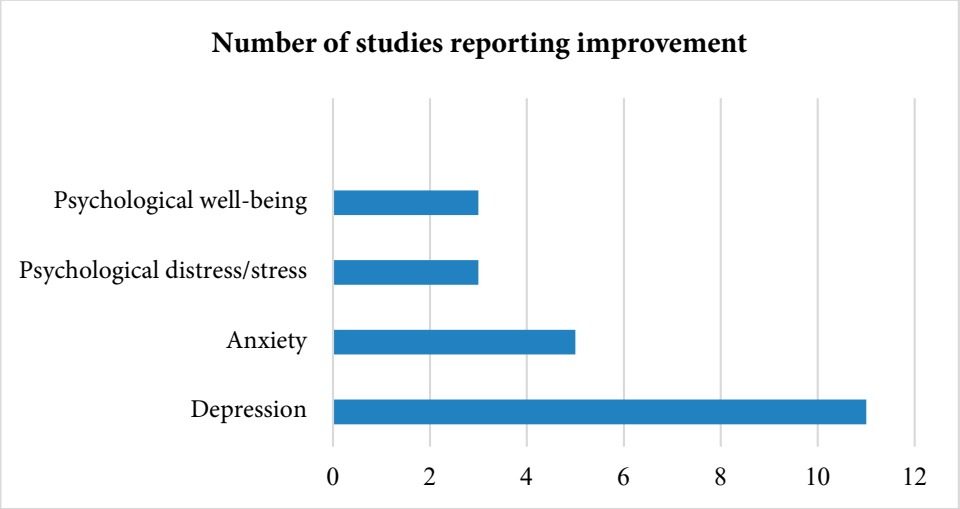

Figure 3: Effects of Structured Exercise on Mental Health Outcomes (Number of Studies Reporting Improvement).

The findings of this systematic review are in line with previous randomized controlled trials and meta-analyses that have demonstrated the beneficial effects of physical activity on mental health. The observed reductions in depressive and anxiety symptoms are consistent with the meta-analysis by Schuch et al. [9] which identified exercise as an effective intervention, particularly among individuals with mild to moderate depressive symptoms. Similarly, epidemiological evidence reported by Chekroud et al. [5] suggests that higher levels of physical activity are associated with fewer days of poor mental health in the general population.

Evidence from studies focusing on aerobic exercise supports earlier findings that moderate-to-vigorous aerobic activity contributes to improvements in mood and reductions in psychological distress. At the same time, findings from resistance training interventions extend the current literature by suggesting that strength-based exercise may exert an independent antidepressant effect, as previously reported by Gordon et al. [33]. Although resistance training has been less frequently examined in isolation, evidence from systematic reviews and meta-analyses suggests that it is associated with reductions in depressive symptoms, supporting its inclusion as a component of comprehensive exercise programs [16]. Furthermore, the additional benefits observed in group-based interventions support earlier conclusions emphasizing the importance of social interaction and support as key mechanisms underlying the relationship between physical activity and mental health [14]. These psychosocial components may be particularly relevant for populations at risk of social isolation or reduced engagement in health-promoting behaviors.

Despite heterogeneity in intervention protocols, outcome measures, and study designs, the consistency of positive findings across the included studies aligns with conclusions from previous systematic reviews [8,10,31] which identified physical activity as a safe, feasible, and broadly applicable strategy for improving mental health. However, the variability in reporting and methodological approaches highlights the need for greater standardization in future research, particularly with respect to outcome measurement and intervention characterization.

Taken together, these findings reinforce the role of structured exercise as a robust, scalable, and evidence-based strategy for improving mental health across diverse populations.

4.2 Methodological Considerations and Limitations

Despite the generally positive findings, the results of this systematic review should be interpreted with caution due to several important methodological limitations. Substantial heterogeneity was observed across studies in terms of design, participant characteristics, intervention protocols, and outcome measures, which limited comparability and precluded precise conclusions regarding the optimal exercise "dose" for mental health outcomes. The inclusion of earlier studies may have contributed to additional methodological heterogeneity.

Although several studies assessed depression and anxiety using comparable instruments (e.g., HADS, PHQ-9), effect sizes were not consistently reported, and the available data were insufficient to support a formal meta-analysis or moderator analysis. Consequently, the present review relies on a narrative synthesis, which may reduce the precision and clinical applicability of the findings. In particular, conclusions regarding the frequency, intensity, and duration of exercise interventions associated with greater mental health benefits were derived from qualitative comparisons across studies rather than from a formal meta-analytic dose–response approach. Therefore, these observations should not be interpreted as definitive evidence of an optimal exercise prescription.

Initial inconsistencies in study classification highlight the importance of rigorous verification procedures in systematic reviews.

In addition, inconsistencies in the reporting of key intervention characteristics—such as session duration, adherence rates, supervision format, and individualization of exercise protocols—limit the reproducibility and practical translation of the interventions. These gaps highlight the need for more standardized reporting in future studies. With regard to the methodological quality, the PEDro scale was used to assess study rigor; however, certain limitations remain. Criteria such as blinding of participants, therapists, and assessors were rarely fulfilled, representing a potential source of bias. Although this is common in exercise-based interventions, it should be considered when interpreting the findings.

Furthermore, most studies focused on short-term outcomes, with limited evidence regarding long-term follow-up and sustainability of mental health benefits. Small sample sizes in several studies may also reduce statistical power and generalizability.

Finally, while efforts were made to apply clearly defined inclusion criteria and standardized procedures, minor inconsistencies in reporting and study classification indicate the need for stricter methodological standardization in future systematic reviews. Addressing these issues would strengthen the reliability and clinical relevance of the evidence base.

4.3 Practical Applications

The findings of this review suggest that structured physical activity may represent a promising complementary strategy for supporting mental health. However, given the methodological limitations and heterogeneity of the included studies, these implications should be interpreted with caution.

Regular physical activity of moderate-to-vigorous intensity appears to be associated with improvements in depressive and anxiety symptoms. Nevertheless, due to inconsistencies in intervention reporting, it remains difficult to define precise exercise prescriptions in terms of frequency, duration, and intensity. Educational institutions, universities, and community settings may provide suitable environments for implementing structured exercise programs, particularly when interventions include both aerobic and resistance components and are delivered in supervised or group-based formats. These approaches may enhance adherence and psychosocial engagement, although further research is required to confirm their effectiveness under standardized conditions. From a clinical perspective, structured exercise may be

considered as an adjunct to standard psychological and pharmacological treatments. However, individualized program design, monitoring, and progression remain essential, and recommendations should be tailored to specific populations and health conditions.

Future research should prioritize standardized intervention protocols, detailed reporting of exercise characteristics, and consistent use of validated outcome measures to improve the translation of findings into practice.

5 Conclusions

This systematic review suggests that structured physical activity and exercise interventions appear to be associated with beneficial effects. Aerobic, resistance, and combined exercise modalities were linked to reductions in depressive and anxiety symptoms, as well as improvements in psychological well-being and stress-related outcomes. The most consistent findings were observed in interventions of moderate-to-vigorous intensity performed multiple times per week over sustained periods.

Benefits were reported in both clinical and non-clinical populations, suggesting the potential applicability. In addition, group-based and supervised interventions may provide additional psychosocial benefits, highlighting the role of social interaction in supporting mental health outcomes. However, substantial methodological heterogeneity, inconsistencies in outcome measurement, and limited reporting of effect sizes restrict the strength of the conclusions. Furthermore, the lack of long-term follow-up data limits insight into the sustainability of these effects.

Overall, structured physical activity appears to be a safe, accessible, and potentially effective complementary approach for supporting mental health. Future research should prioritize standardized intervention protocols, consistent reporting practices, and extended follow-up periods to strengthen the evidence base and improve clinical applicability. However, given the methodological variability and heterogeneity across studies, these findings should be interpreted with caution. Further high-quality and standardized research is needed to confirm these findings.

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