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Effects of Physical Exercise Interventions on Depression, Anxiety, and Psychological Distress in Adult Women: A Systematic Review and Meta-analysis

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Lebrón-Roldán, J; Valle-Muñoz, VM; Rodriguez-Sanchez, D; Zurita-Corvalán, N; Ávila-García, M; Atencia-Rodriguez, M; Segura-Díaz, JM; Saucedo-Araujo, RG; Arcediano-Consuegra, LM; Villa-González, E; Barranco-Ruiz, Y.

Corresponding author:
Víctor Manuel Valle-Muñoz

victor_96@ugr.es

Author Affiliation:
Department of Physical Education and Sports, Faculty of Sport Sciences, Sport and Health University Research Institute (iMUDS), University of Granada, Granada, Spain.

ADMINISTRATIVE INFORMATION

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Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 5 May 2026 and was last updated on 5 May 2026.

INTRODUCTION

Review question / Objective The objective of this review is to synthesize the evidence on the effects of physical exercise interventions on depressive, anxiety, and psychological distress symptoms in adult women, and to determine which specific intervention characteristics are associated with greater reductions in these mental health symptoms in this population.

Rationale Depression, anxiety, and psychological distress are consistently more prevalent in adult women than in men, ranking among the leading causes of disability worldwide (GBD 2021 Mental Disorders Collaborators, 2024; World Health Organization [WHO], 2022). The Global Burden of Disease (GBD) 2021 study highlights this disparity, showing that mental disorders remain among the top leading causes of disability-adjusted life years (DALYs) globally, with females consistently bearing a significantly heavier burden of depressive and anxiety disorders than males (GBD 2021 Mental Disorders Collaborators, 2024). This heightened vulnerability stems from a complex interplay of biological factors, including sex-specific stress regulation via the hypothalamic-pituitary-adrenal (HPA) axis (Heck & Handa, 2019), and distinct neurobiological profiles in emotion-regulating brain regions (Kovács et al., 2023).

In this context, physical exercise is a widely recognized non-pharmacological strategy to mitigate these issues. A recent umbrella review reported substantial mental health improvements following exercise interventions (Singh et al., 2023). However, while that review demonstrated clear efficacy in specific female cohorts, such as postpartum women, it did not provide sex-stratified data for the general adult population. This oversight leaves a critical gap in understanding the precise effect sizes and optimal exercise protocols

specifically tailored to the broader demographic of adult women.

This gap in targeted evidence is particularly concerning given the persistent gender disparity in physical activity, with women consistently reporting higher rates of inactivity than men (Strain et al., 2024). Sedentary behavior is a well-established risk factor for mental health disorders, exhibiting a dose-response relationship with depressive symptoms (Nasir et al., 2025; Wang et al., 2025), while also being intrinsically linked to deleterious effects on cardiorespiratory fitness (Prince et al., 2024).

A major barrier to reversing these trends is the "gender-neutral" design of many exercise programs, which often fail to consider women's unique life contexts and psychological constraints (Guo & Huang, 2025). When interventions ignore female-specific preferences and the critical role of enjoyment, adherence drops, leading to higher attrition rates and blunted clinical effectiveness (Jones et al., 2025; Zhang et al., 2024).

Therefore, the objective of this review is to synthesize the current evidence on the effects of physical exercise interventions on depressive, anxiety, and psychological distress symptoms in adult women, and to determine which specific intervention characteristics are associated with the greatest reductions in these symptoms.

Condition being studied This review focuses on the clinical and subclinical manifestations of depression, anxiety, and psychological distress in adult women. Depression is characterized by persistent sadness and loss of interest, while anxiety involves excessive worry and fear. Psychological distress encompasses a broader range of non-specific symptoms of stress, emotional turmoil, and negative affect. The relationship between physical exercise interventions and these mental health symptoms will be evaluated to understand how exercise can serve as a non-pharmacological strategy to foster resilience and improve mental well-being in women.

METHODS

Search strategy A comprehensive search strategy including gender-specific, exercise-related, and mental health-related terms will be applied.
The following full search string was developed and optimized for PubMed:
Population:
("women" OR "woman" OR "female" OR "females")

Intervention:
AND ("exercise" OR "physical activity" OR "aerobic" OR "resistance training" OR "strength training" OR "HIIT" OR "high intensity interval training" OR "yoga" OR "pilates" OR "tai chi" OR "mind-body" OR "dance" OR "zumba" OR "combined exercise" OR "concurrent training" OR "multicomponent exercise" OR "group exercise" OR "supervised exercise" OR "exercise therapy")

Outcomes:
AND ("mental health" OR "psychological distress" OR "depression" OR "depressive" OR "anxiety" OR "affect" OR "affective disorders" OR "mood" OR "mood disorders" OR "well-being" OR "wellbeing" OR "emotional wellbeing" OR "psychological wellbeing").

Participant or population Adult women aged 18 years or older, including young adults, middle-aged women, perimenopausal women, and postmenopausal women[vm5.1]. Eligible populations may include healthy women or women with non-severe comorbidities. Women with severe psychiatric disorders (e.g., psychotic disorders), active cancer, severe cardiovascular disease, or conditions that prevent participation in physical exercise will be excluded.

Intervention Eligible interventions will comprise structured physical exercise programs with a minimum duration of four weeks. To ensure replicability, clinical transparency, and rigorous comparability across trials, interventions must be comprehensively described according to the FITT principles, explicitly detailing the Frequency, Intensity, Time (duration), and Type of exercise (American College of Sports Medicine [ACSM], 2022). Furthermore, the reporting of the exercise protocols must align with the essential criteria outlined in the Consensus on Exercise Reporting Template (CERT) framework (Slade et al., 2016). Eligible modalities encompass a broad spectrum of conditioning, including aerobic training, resistance/strength training, high-intensity interval training (HIIT), mind–body practices (e.g., yoga, tai chi, qigong, Pilates), dance-based exercise (e.g., Zumba, aerobic dance), concurrent or multicomponent training, and supervised or group-based exercise therapy programs. Multimodal interventions (e.g., exercise combined with caloric restriction diets, structured psychotherapy, or pharmacological treatments) will be excluded unless the isolated effect of the physical exercise component can be independently analyzed.

Comparator
– Inactive controls (e.g., waitlist, no intervention, treatment-as-usual/standard care) or active non-exercise controls.
– Active controls must be limited to low-intensity activities (e.g., basic stretching, relaxation techniques, health education sessions) that do not constitute a structured conditioning regimen capable of inducing significant cardiovascular or neuromuscular adaptations.

Study designs to be included Experimental and quasi-experimental designs, including randomized controlled trials (RCTs), cluster-randomized trials, and non-randomized controlled trials. Observational designs (e.g., cross-sectional, longitudinal cohorts, case-control), case reports, qualitative studies, and narrative reviews will be strictly excluded.

Eligibility criteria – P (Participants): Adult women (>18 years)).
with primary psychological distress or affective symptoms, excluding those with severe somatic/physical pathologies.
-I (Intervention): Structured physical exercise program lasting a minimum of 4 weeks, a temporal threshold established to capture physiologically and psychologically meaningful adaptations in depressive and anxiety symptoms (Singh et al., 2023).
– C (Comparator): Inactive controls (waitlist, usual care) or active non-conditioning controls (stretching, health education).
– O (Outcomes): Quantitative changes in depressive symptoms, anxiety symptoms, and psychological distress.
-S (Study Design): Randomized controlled trials (RCTs) and quasi-experimental studies

Exclusion criteria:
– Studies will be excluded if they meet any of the following criteria:
– Publication date: Published prior to January 2013, to ensure diagnostic consistency and clinical homogeneity in accordance with modern DSM-5 guidelines.
– Duration: Exercise interventions lasting less than 4 weeks.
– Population: Mixed-sex samples where data are not explicitly sex-stratified for independent female analysis.
– Comorbidities: Clinical somatic populations (e.g., oncology, neurology) where mental health symptoms are secondary to severe physical disease.
– Confounded interventions: Exercise combined with other primary therapies where the exercise effect cannot be isolated.
– Study design: Observational, non-original research, or conference abstracts lacking full peer-reviewed data.
– Language: Articles published in languages other than English or Spanish.
– Outcome measurement: Studies assessing primary mental health outcomes using non-validated, ad-hoc, or purely qualitative questionnaires.

Information sources Searches will be conducted in PubMed, Embase, PsycINFO, Scopus, Web of Science, SPORT Discus, Google Scholar (Winn et al., 2026), and Cochrane CENTRAL. Additional records will be identified from grey literature and reference lists. To ensure clinical homogeneity and the contemporary relevance of the findings, the search strategy will be restricted to articles published from January 2013 to the present. This specific temporal threshold was selected to align with the publication of the Fifth Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) in May 2013 (APA, 2013). Applying this restriction ensures that all included trials evaluating depressive and anxiety symptoms utilize modern, standardized psychometric and diagnostic criteria, thereby minimizing the clinical heterogeneity that would be introduced by legacy classifications (e.g., DSM-III or DSM-IV).

Due to the vast volume of literature retrieved in initial scoping searches, and to ensure strict clinical homogeneity, the search strategy is restricted to articles published from January 1, 2013, to the present. This specific temporal threshold aligns with the publication of the Fifth Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). Applying this restriction ensures that all included trials evaluating depressive and anxiety symptoms utilize modern, standardized psychometric and diagnostic criteria, thereby minimizing clinical heterogeneity. Furthermore, automated database filters will be applied to strictly capture primary intervention data: Study Type (Clinical Trial, Randomized Controlled Trial), Species (Humans), Sex (Female), and Age (Adult: 19+ years, Aged: 65+ years).

Please note that while the electronic search will capture a broad sample, studies explicitly targeting clinical populations where psychological distress or depression is secondary to severe somatic or organic comorbidities (e.g., oncology populations, neurodegenerative disorders, cardiovascular diseases) will be systematically excluded during

the manual Title/Abstract screening phase. Additional relevant studies will be identified through manual backward and forward citation tracking of included trials and relevant prior systematic reviews.

Main outcome(s) Quantitative changes in depressive symptoms, anxiety symptoms, and overarching psychological distress, assessed exclusively using standardized and validated psychometric instruments (e.g., BDI, HAM-D, STAI, BAI, DASS-21).

Additional outcome(s) Changes in affect (positive/negative), mood states, emotional well-being, psychological well-being, subjective well-being, and health-related quality of life (HRQoL). For HRQoL assessments, data extraction will specifically focus on the mental health and emotional role dimensions of validated global scales (e.g., PANAS, SF-36, SF-12, WHOQOL-BREF).

Data management Two reviewers will independently extract data on study design, participant demographics, intervention details (including frequency, intensity, time, and type of exercise), comparators, follow-up, and numerical outcomes. A standardized and piloted data extraction form will be used to ensure consistency across reviewers, and references will be managed using EndNote software. To provide a comprehensive description of the study samples, data extraction will also document whether trials reported or controlled for for specific physiological and lifestyle variables relevant to female populations (ie: menstrual cycle phase, menopausal status, sleep quality, etc..). Additionally, information on adherence rates and dropout will be extracted when available. Discrepancies will be resolved through discussion or by involving a third reviewer,. and inter-reviewer agreement will be assessed (e.g., using Cohen's kappa coefficient).

Quality assessment / Risk of bias analysis Risk of bias for randomized trials will be assessed using RoB 2. Non-randomized trials will be assessed using ROBINS-I. The assessment will be conducted independently by two reviewers, with any disagreements resolved through discussion or consultation with a third reviewer.

Strategy of data synthesis A random-effects meta-analysis will be conducted to estimate pooled effect sizes using standardized mean differences (Hedges' g) with 95% confidence intervals. When necessary, effect sizes will be calculated or converted from other reported statistics (e.g., means and standard deviations, change scores, or other effect size measures) into a common metric. Statistical heterogeneity will be assessed using the I^2 statistic and the chi-square (Q) test, and interpreted as low (75%).

Publication bias will be evaluated using funnel plots and Egger's regression test when at least 10 studies are available, and, when appropriate, the trim-and-fill method will be applied to estimate the potential impact of missing studies. All statistical analyses will be conducted using appropriate software (e.g., R using the metafor package).
The overall certainty of the evidence will be assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach. This framework will be applied to evaluate the quality of the evidence across key domains, including risk of bias, inconsistency, indirectness, imprecision, and publication bias. The use of GRADE will allow for a transparent and structured interpretation of the strength of the evidence, facilitating the translation of findings into practical recommendations. This approach is consistent with current best practices in systematic reviews and meta-analyses and aligns with methodological standards observed in similar studies.

Subgroup analysis If sufficient data are available (typically >2 studies per stratum), subgroup analyses will be conducted to explore potential sources of statistical heterogeneity and clinical variation. We plan to stratify the pooled results based on exercise modality (e.g., aerobic, resistance, mind-body, concurrent training), participant life stage (premenopausal, perimenopausal, postmenopausal), and intervention characteristics such as duration and supervision level. To further dissect the quality of the evidence, we will also explore whether effect sizes differ significantly between trials that rigorously reported or controlled for key lifestyle and physiological variables, such as the menstrual cycle phase, sleep quality,.....and those that failed to account for these female-specific contexts.

Sensitivity analysis Sensitivity analyses will be performed to rigorously test the robustness and reliability of our primary findings. We will apply a leave-one-out method to verify that the overall meta-analytic effect is not disproportionately driven by the weight or extreme variance of any single trial. To ascertain the impact of methodological quality on the results, we will repeat the primary analyses after systematically excluding studies assessed as having a high risk of

bias. Finally, we will restrict the analysis exclusively to randomized controlled trials, filtering out quasi-experimental designs to ensure that our definitive conclusions regarding exercise and mental health are grounded entirely in the highest tier of available evidence. Additional sensitivity analyses will be conducted excluding studies with imputed or converted data, as well as those with small sample sizes.

Language restriction Studies published in English or Spanish will be included.

Country(ies) involved Spain and Chile.

References: American College of Sports Medicine. (2022). ACSM's guidelines for exercise testing and prescription (11th ed.). Wolters Kluwer. ISBN-13: 978-1975150181

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

GBD 2021 Mental Disorders Collaborators. (2024). Global, regional, and national burden of 12 mental disorders in 204 countries and territories, 1990–2021: A systematic analysis for the Global Burden of Disease Study 2021. The Lancet Psychiatry, 11(5), 321–344. https://doi.org/10.1016/S2214-108X(24)00063-4

Guo, Y., & Huang, L. (2025). Gender stereotypes and female exercise behavior: Mediating roles of psychological needs and negative emotions. Frontiers in Psychology, 16, 1569009. https://doi.org/10.3389/fpsyg.2025.1569009

Heck, A. L., & Handa, R. J. (2019). Sex differences in the hypothalamic–pituitary–adrenal axis' response to stress: An important role for gonadal steroid hormones. Neuropsychopharmacology, 44(1), 45–58. https://doi.org/10.1038/s41386-018-0167-9

Jones, C. S., Spring, K. E., & Wadsworth, D. D. (2025). Factors influencing regular exercise in young women: A survey study assessing the preferences and motivators for aerobic and muscle-strengthening exercise. Health Psychology and Behavioral Medicine, 13(1). https://doi.org/10.1080/21642850.2025.2465613

Kovács, D., Gonda, X., Petschner, P., & Juhász, G. (2023). Sex differences in the neurobiology of depression. Journal of Neural Transmission, 130(4), 481–496. https://doi.org/10.1007/s00702-023-02613-2

Nasir, M., Duclos, M., Pereira, B., & Boirie, Y. (2025). Impact of occupational sedentary behavior on mental health: A systematic review and meta-analysis. PLOS One, 20(1), e0328678. https://doi.org/10.1371/journal.pone.0328678

Prince, S. A., Dempsey, P. C., & Roberts, C. K. (2024). The effect of sedentary behaviour on cardiorespiratory fitness: A systematic review and meta-analysis. Sports Medicine, 54(4), 843–864. https://doi.org/10.1007/s40279-023-01994-x

Singh, B., Olds, T., Curtis, R., Dumuid, D., Virgara, R., Watson, A., & Maher, C. (2023). Effectiveness of physical activity interventions for improving depression, anxiety and distress: An umbrella review of 97 systematic reviews and 1039 randomised controlled trials. British Journal of Sports Medicine, 57(18), 1203–1209. https://doi.org/10.1136/bjsports-2022-106195

Slade, S. C., Dionne, C. E., Underwood, M., & Buchbinder, R. (2016). Consensus on Exercise Reporting Template (CERT): Explanation and elaboration statement. British Journal of Sports Medicine, 50(23), 1428–1437. https://doi.org/10.1136/bjsports-2016-096651

Strain, T., Sharp, S. J., Panter, J., Wijndaele, K., Brage, S., & Woodcock, J. (2024). National, regional, and global trends in insufficient physical activity among adults from 2000 to 2022: A pooled analysis of 507 population-based surveys with 5.7 million participants. The Lancet Global Health, 12(8), e1232–e1241. https://doi.org/10.1016/S2214-109X(24)00150-5

Wang, Y., Zhang, Y., Guo, Y., & Lu, Y. (2025). Sedentary behavior and physical activity are associated with risk of depression among adult and older populations: A systematic review and dose-response meta-analysis. Frontiers in Psychology, 16, 1542340. https://doi.org/10.3389/fpsyg.2025.1542340

Winn, J. G., Hao, T., Hardaway, J. W., & Oh, H. (2026). Google Scholar in Systematic Reviews. Journal of Librarianship and Information Science. https://doi.org/10.1177/09610006261445270

World Health Organization. (2022). World mental health report: Transforming mental health for all. World Health Organization. https://iris.who.int/handle/10665/356119

Zhang, X., Huang, J., & Wang, L. (2024). Real-world effectiveness of community-based exercise programs on cardiorespiratory fitness and psychological distress in women. International Journal of Environmental Research and Public Health, 21(3), 342. https://doi.org/10.3390/ijerph21030342

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Contributions of each author

Author 1 - Jaime Lebrón-Roldán.
Email: jaimelebron@ugr.es

Author 2 - Victor Manuel Valle-Muñoz.
Email: victor_96@ugr.es
Author 3 - David Rodriguez-Sanchez.
Email: davidrs@ugr.es
Author 4 - Natalia Zurita-Corvalán.
Email: zuri.corvalan@gmail.com
Author 5 - Manuel Ávila-García.
Email: mavila@ugr.es
Author 6 - Maria Atencia-Rodriguez.
Author 7 - José Manuel Segura-Díaz.
Email: jsdiaz@ujaen.es
Author 8 - Romina Gisele Saucedo-Araujo.
Email: rsaucedo@ull.edu.es
Author 9 - Luis Mariano Arcediano-Consuegra.
Author 10 - Emilio Villa-González.
Email: evilla@ugr.es
Author 11 - Yaira Barranco-Ruiz.
Email: ybarranco@ugr.es