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Exercise As a Core Treatment for Depression: An Umbrella Review Synthesizing Evidence on Efficacy, Modality, Dose–Response, and Sustainability

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I. INTRODUCTION

Depression remains a leading contributor to global disability, with high relapse rates and limitations associated with pharmacotherapy, including adverse effects and partial remission. Exercise has emerged as a promising non-pharmacological treatment; however, existing evidence remains fragmented across modalities, dosage parameters, and methodological quality. Most meta-analyses aggregate heterogeneous exercise interventions, limiting clarity regarding optimal modality, dose–response patterns, and long-term sustainability. Furthermore, few umbrella reviews systematically appraise methodological quality using standardised tools. This study aims to synthesize systematic reviews and meta-analyses to evaluate the overall efficacy of exercise for depression, compare modalities, examine dose–response relationships, and assess sustainability of effects.

II. METHODS

An umbrella review was conducted, including systematic reviews and meta-analyses published between 2010 and 2025 that examined exercise-only interventions for unipolar depression. Eligible reviews reported outcomes using validated depression scales. Three primary modalities were analysed: aerobic, resistance, and mind-body exercise. Searches were performed across PubMed, Scopus, Web of Science, Ovid MEDLINE, and ProQuest. Extracted data included pooled effect sizes, heterogeneity, follow-up duration, and exercise dosage parameters, including frequency, intensity, duration, and MET-minutes. Methodological quality was assessed using AMSTAR 2, and evidence certainty was evaluated using GRADE.

III. RESULTS AND DISCUSSION

Across included reviews, exercise demonstrated consistent moderate-to-large reductions in depressive symptoms, with effect sizes comparable to first-line antidepressant treatments for mild-to-moderate depression. All modalities produced significant improvements. Aerobic exercise was most extensively studied, while resistance training showed strong effects in populations with comorbid physical conditions. Mind-body modalities demonstrated

competitive efficacy and high adherence rates in several network meta-analyses. Dose–response analyses suggest optimal outcomes with 3–5 sessions per week, 45–60 minutes per session at moderate-to-vigorous intensity. Evidence indicates a curvilinear relationship, with diminishing returns at excessively high volumes. Long-term follow-up data remain limited; while benefits persist up to 6–12 months in several studies, attenuation occurs without sustained participation. Adherence, social engagement, and intrinsic motivation appear central to relapse prevention. Methodological appraisal revealed variability in review quality, though higher-quality syntheses consistently support exercise as an effective intervention.

IV. CONCLUSIONS

Exercise demonstrates robust antidepressant efficacy across modalities and populations, supporting its integration as a core component of depression treatment. Moderate, structured programmes yield optimal outcomes, with flexibility in modality selection based on individual preference and context. Future research should prioritise direct modality comparisons, standardised dose reporting, and long-term follow-up beyond one year to strengthen clinical translation.

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