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Effects of Physical Activity on Loneliness in Older Adults: A Systematic Review of Randomized Controlled Trials

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ADMINISTRATIVE INFORMATION

Support - The authors did not receive support from any organization for the submitted work.

Review Stage at time of this submission - Piloting of the study selection process.

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 25 May 2026 and was last updated on 25 May 2026.

INTRODUCTION

Review question / Objective This systematic review aims to evaluate the effects of physical activity interventions on loneliness among older adults. Specifically, it will synthesize evidence from randomized controlled trials to examine whether physical activity interventions reduce loneliness in adults aged 60 years and older. Using the PICOS framework, the population will be older adults aged 60 years and above; the intervention will be physical activity interventions; the comparison will include no intervention, wait-list control, usual care, inactive control, or other active comparison conditions; the primary outcome will be loneliness; and the study design will be randomized controlled trials. The review will also summarize intervention characteristics, comparison conditions, loneliness measurement instruments, and loneliness-related outcomes when reported.

Rationale Loneliness is a common and important public health concern among older adults and is associated with a range of adverse psychological, social, and physical outcomes. As population aging accelerates, loneliness in later life has become increasingly important, making it necessary to identify feasible and evidence-based approaches to reduce loneliness among older adults. Physical activity interventions may offer an accessible and practical strategy because they can support regular participation, social contact, group interaction, physical function, and confidence in social engagement. However, existing evidence remains scattered across different physical activity types, settings, delivery modes, comparison conditions, and outcome measures. Previous reviews on loneliness interventions among older adults have examined a broad range of approaches, but reviews focusing specifically on physical activity interventions remain very limited, and the existing evidence has not been recently

synthesized. Therefore, a focused systematic review of randomized controlled trials is needed to provide a clearer and more rigorous synthesis of the current evidence.

Condition being studied The condition being studied is loneliness among older adults. Loneliness refers to the subjective experience of perceived inadequacy in the quantity or quality of social relationships. It differs from social isolation, which refers to the objective lack of social contact, social participation, or social network size. Older adults may be more vulnerable to loneliness because of retirement, bereavement, living alone, reduced mobility, declining physical function, health changes, and fewer opportunities for social engagement. Loneliness in later life is an important public health concern because it is associated with poorer psychological well-being, lower quality of life, reduced social participation, functional decline, and increased health risks. In this review, loneliness will be treated as the primary outcome.
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METHODS

Search strategy A systematic search will be conducted in Web of Science, Scopus, PubMed, Cochrane Library, CINAHL, PsycINFO, and CNKI. The search strategy will combine three core concepts: loneliness, older adults, and randomized controlled trials. The main English search terms will include "loneliness," "lonely," "loner," and "solitude" for loneliness; "older adult*," "aged," "old age," "elderly," "octogenarian," and "senior citizens" for older adults; and "RCT" or "randomized controlled trial*" for study design. Equivalent Chinese search terms will be used in CNKI based on the same conceptual framework. Database-specific search syntax will be applied as appropriate to each database. The planned final search date is February 26, 2026.

Participant or population This review will address older adults aged 60 years and above. Studies describing participants as older adults or elderly people will also be considered eligible when the reported mean age is 60 years or above. Participants may include community-dwelling older adults, nursing home residents, or older adults living in long-term care or similar care settings. The review will include healthy older adults as well as older adults with chronic conditions or mild to very mild dementia, provided that the study is not primarily focused on severe clinical or psychiatric conditions. Studies involving non-older populations, severe mental illness, marked cognitive impairment, or other severe clinical conditions that substantially alter the health profile of the sample will be excluded.

Intervention The review will evaluate physical activity or exercise-based interventions for alleviating loneliness among older adults. These interventions may include structured exercise programs, walking programs, aerobic exercise, resistance training, balance training, flexibility exercise, tai chi, qigong, yoga, dance or other movement-based activities, online or home-based exercise programs, and multicomponent interventions that include a clear physical activity component. Interventions may be delivered individually or in groups and may take place in face-to-face, online, home-based, community-based, or institution-based settings. To be eligible, the intervention must include a clear and identifiable physical activity or exercise component.

Comparator Eligible comparators will include no intervention, wait-list control, usual or standard care, routine activities, and other non-physical

activity comparison conditions. Studies comparing a physical activity or exercise-based intervention with another active comparison condition will also be considered eligible, provided that loneliness is reported as an outcome.

Study designs to be included Only randomized controlled trials will be included.

Eligibility criteria Additional eligibility criteria will be as follows. Eligible records will be limited to full-text articles published in peer-reviewed journals and to studies published in English or Chinese. Studies published outside the predefined 10-year search period will be excluded. Studies in which loneliness is mentioned only in the introduction, discussion, or recommendations for future research, but is not actually measured and reported as an outcome, will be excluded. Books, conference papers, theses, reviews, and study protocols will also be excluded.

Information sources The information sources for this review will primarily consist of major international and Chinese electronic databases, including Web of Science, Scopus, PubMed, Cochrane Library, CINAHL, PsycINFO, and CNKI. The planned final search date will be February 26, 2026. These sources were selected to ensure broad coverage across medicine, nursing, psychology, public health, sports science, and Chinese-language literature relevant to older adults, loneliness, and physical activity intervention research.

Main outcome(s) The main outcome of this review is loneliness, as measured by validated or clearly described loneliness assessment tools reported in the included randomized controlled trials. The review will primarily examine loneliness outcomes at post-intervention. Intervention effects will be interpreted mainly on the basis of reported between-group differences. In trials using active comparator conditions, within-group changes in the physical activity intervention group will also be considered, where appropriate, as supplementary evidence of improvement, but will be interpreted separately from evidence of superiority over the comparator.

Data management All records retrieved from the database searches will be imported into EndNote 20 for reference management and duplicate removal. After de-duplication, the remaining records will be screened in stages according to the predefined eligibility criteria. Screening decisions and extracted data will be recorded in Excel spreadsheets using a structured and standardized format. Two reviewers will independently conduct the screening and data extraction, and the results will be cross-checked for consistency. Any disagreements will be resolved through discussion with a third reviewer until consensus is reached. This process is intended to support transparent documentation and consistent handling of screening and extraction decisions.

Quality assessment / Risk of bias analysis The methodological quality of studies meeting the screening criteria will be assessed using the Cochrane Risk of Bias 2 tool. RoB 2 evaluates five domains: the randomization process, deviations from intended interventions, missing outcome data, measurement of the outcome, and selection of the reported result. Each domain will be judged as low risk, some concerns, or high risk of bias, followed by an overall risk-of-bias judgment for each study. Two reviewers will independently and blindly complete the risk-of-bias assessment using the RoB 2 Excel tool. Any disagreements will be resolved through discussion with a third reviewer until consensus is reached. Studies judged to be at overall high risk of bias will be excluded from the review.

Strategy of data synthesis A structured synthesis will be undertaken to integrate the findings of the included studies. Meta-analysis will not be conducted if substantial heterogeneity is identified across studies in terms of intervention type, participant characteristics, settings, comparator conditions, loneliness measures, and outcome reporting. The included studies will be systematically compared and integrated according to study characteristics, types of physical activity or exercise-based interventions, implementation features, comparator conditions, loneliness assessment methods, and reported effects on loneliness. Where appropriate, studies will be grouped by intervention category, study characteristics, and direction of effect to identify patterns of consistency and difference across the evidence base. Methodological quality and risk of bias will also be considered when interpreting the overall strength and consistency of the findings.

Subgroup analysis If the included studies are sufficiently comparable in terms of intervention type, comparator conditions, outcome measurement, and reporting format, subgroup analyses will be considered to explore potential differences in intervention effects across study characteristics. Prespecified subgrouping factors will include type of physical activity or exercise-based intervention, implementation setting, comparator type, intervention duration and

frequency, and participant characteristics. If the number of included studies is insufficient or heterogeneity is too substantial, formal subgroup analyses will not be conducted; instead, stratified comparison and integrated interpretation will be undertaken.

Sensitivity analysis If the included studies are suitable for quantitative synthesis, sensitivity analyses will be conducted to examine the robustness of the overall findings by excluding studies at high risk of bias, excluding studies with small sample sizes, or comparing results under different statistical approaches where appropriate. If quantitative synthesis is ultimately not undertaken, formal sensitivity analyses in the traditional sense will not be performed. Instead, the robustness of the review conclusions will be evaluated through comparison of study characteristics, risk of bias assessments, and consistency of the overall evidence.

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

Country(ies) involved China; Malaysia.

Keywords Older Adults; Loneliness; Physical Activity; Randomized Controlled Trials; Systematic Review.

Contributions of each author

Author 1 - Peiyu Zhu - ZPY conceptualized the review, developed the methodology, designed the study protocol, conducted the literature search, screened the studies, performed the data extraction and analysis, and drafted the manuscript.
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Author 2 - Kim Geok Soh - KGS contributed to the study design, provided methodological oversight, supervised the research process, and critically revised the manuscript.
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