

Resistance Training to Mitigate Sarcopenia in Menopausal Women

Commentary

Joy Kagendo¹ Brenda Watson¹

¹ Department of Health and Exercise Studies, North Carolina State University, Raleigh, NC, USA

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Abstract

Introduction: Menopause is associated with hormonal changes that contribute to declines in skeletal muscle mass, strength, and functional capacity. Resistance training (RT) is a widely recommended non-pharmacological strategy to mitigate sarcopenia and support musculoskeletal health in peri- and postmenopausal women. This short narrative review summarizes recent evidence on resistance training interventions in peri- and postmenopausal women, with emphasis on muscle strength, body composition, and functional performance outcomes.

Methods: A narrative literature review was conducted using PubMed, Scopus, and SPORTDiscus to identify peer-reviewed studies published between 2019 and 2025 examining resistance training interventions in peri- and postmenopausal women. Due to heterogeneity in study designs, intervention protocols, and outcome measures, findings were synthesized qualitatively rather than quantitatively.

Results: Across the reviewed literature, resistance training was consistently associated with improvements in muscular strength, preservation or modest increases in lean mass, reductions in fat mass, and enhanced functional performance. Most studies reported moderate-to-large strength improvements and favorable neuromuscular adaptations when resistance training programs were progressive and sustained for at least eight weeks. Resistance training was well tolerated, with no serious adverse events reported.

Conclusions: Current evidence supports resistance training as a safe and effective intervention to counteract menopause-related declines in muscle strength and function. Structured and individualized resistance training programs should be prioritized to promote healthy aging and functional independence in peri- and postmenopausal women.

Key Words: menopause, neuromuscular performance, sarcopenia

Corresponding author: Joy Kagendo, jikagend@ncsu.edu

Introduction

Menopause represents a critical physiological transition in women's health, characterized by declining estrogen levels that contribute to accelerated losses in skeletal muscle mass, strength, and neuromuscular function.^{1,2} These changes increase the risk of sarcopenia, frailty, falls, and loss of functional independence. As life expectancy increases, identifying effective strategies to preserve musculoskeletal health during and after menopause is of growing clinical and public health importance.

Resistance training is widely recognized as a cornerstone intervention for maintaining muscle mass and strength in aging populations. In peri- and postmenopausal women, resistance training has been associated with improvements in muscular strength, lean mass, functional performance, and connective tissue integrity.³⁻⁵ Beyond musculoskeletal outcomes, resistance training may also positively influence metabolic health, adiposity, and bone density—factors that

are adversely affected by menopausal hormonal changes.⁶⁻⁸ The purpose of this short narrative review is to summarize recent evidence on resistance training interventions in peri- and postmenopausal women, with emphasis on trends in strength, body composition, and functional outcomes, and to provide evidence-informed recommendations for practice.

Methods

This review was conducted using a narrative synthesis approach. A targeted literature search of PubMed, Scopus, and SPORTDiscus was performed to identify peer-reviewed studies published between 2019 and 2025. Search terms included combinations of menopause, postmenopausal, resistance training, strength, lean mass, body composition, and neuromuscular performance. Studies were included if they involved peri- or postmenopausal women approximately 45–70 years of age, examined structured resistance training interventions lasting at least eight weeks, and reported outcomes related to muscle strength, lean mass, fat mass, or functional performance.

Participants

Included studies involved peri- or postmenopausal women aged 45–70 years. All studies reported that participants provided informed consent, and protocols were approved by the respective Institutional Review Boards of each study.

Protocol

Given the substantial variability in resistance training protocols, outcome measures, and assessment methodologies across the literature, this commentary does not attempt quantitative aggregation of findings. Instead, the discussion emphasizes overarching patterns, consistency in the direction of effects, and the practical implications for strength and performance outcomes. Where relevant, representative data are described using reported means \pm standard deviations, along with corresponding p -values and effect sizes as presented in the original investigations. Interpretations are grounded in commonly accepted statistical thresholds, including an alpha level of $p \leq 0.05$, while prioritizing practical relevance and applied significance over statistical aggregation.

Results

Across the 13 studies included in this review, resistance training interventions were consistently associated with improvements in muscular strength, body composition, and functional performance in peri- and postmenopausal women. Although study designs, training protocols, and outcome measures varied considerably, the direction of effects was largely uniform. Changes in vastus intermedius thickness were assessed using B-mode ultrasound imaging in studies reporting this outcome; however, probe placement, imaging protocols, and analytic approaches varied across investigations, limiting direct quantitative comparison.

Most studies reported moderate-to-large improvements in maximal and functional strength following resistance training interventions lasting eight weeks or longer. Strength gains were most observed in the lower extremities and were reported across a range of training intensities and modalities, including traditional machine-based resistance training, free-weight programs, and low-impact functional resistance exercise. Studies employing progressive overload and moderate-to-high training intensities generally reported greater strength improvements, although lower-intensity programs were also effective, particularly among previously untrained participants.^{3, 4, 7, 13}

Majority of the studies on body composition reported preservation or modest increases in lean mass following resistance training, with several also noting reductions in fat mass or favorable shifts in body composition. These effects were more consistently observed in studies of longer duration or higher training volume. Importantly, resistance training appeared effective in attenuating menopause-related muscle loss even when large increases in lean mass were not observed.^{1, 2, 5, 10, 14}

Several investigations reported improvements in neuromuscular and functional outcomes, including muscle thickness, balance, and performance on functional tasks. In studies assessing vastus intermedius thickness, ultrasound imaging was used; however, measurement protocols varied, limiting direct comparison across studies. Functional improvements, such as enhanced lower-body performance and mobility, suggest that resistance training benefits extend beyond isolated strength gains to outcomes with direct relevance to daily activities and independence.^{3, 7, 12, 13}

Resistance training was well tolerated across studies, with no serious adverse events reported. Programs were successfully implemented in peri- and postmenopausal women with varying baseline fitness levels, supporting the safety and feasibility of resistance training when appropriately prescribed and supervised.

Discussion

Limitations include heterogeneity in training protocols, small sample sizes in some studies, and limited long-term follow-up. Resistance training is an effective intervention for peri- and postmenopausal women, consistently improving muscular strength, preserving lean mass, and enhancing functional and neuromuscular performance. Despite variability in study designs and protocols, the direction of effects across 13 included studies was largely uniform, supporting resistance training as a cornerstone strategy for mitigating menopause-related declines in musculoskeletal health.¹⁻³

Strength gains were most pronounced in studies employing progressive overload and moderate-to-high intensities, although lower-intensity and low-impact programs were also beneficial, particularly in untrained participants. Several studies reported favorable adaptations in muscle structure, including increases in muscle thickness assessed via ultrasound, as well as improvements in functional performance, highlighting benefits that extend beyond isolated strength outcomes.⁴⁻⁷

Resistance training is a safe, feasible, and effective strategy to counteract menopause-related declines in muscle strength, lean mass, and functional performance. Across diverse study designs and training protocols, consistent qualitative trends demonstrate that progressive resistance exercise supports musculoskeletal health and functional independence in peri- and postmenopausal women. This narrative review is limited by heterogeneity in training protocols, outcome measures, and follow-up durations, as well as small sample sizes in some studies. While quantitative effect magnitudes cannot be directly compared, the consistent qualitative trends underscore the clinical relevance of resistance training for maintaining strength, functional capacity, and independence in peri- and postmenopausal women.

Conflict of Interest. The authors declare no conflicts of interest.

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