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Review Article

Effectiveness of nutritional and exercise interventions to improve body composition and muscle strength or function in sarcopenic obese older adults: A systematic review



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ABSTRACT

Although sarcopenic obesity (SO) poses a major public health concern, a robust approach for the optimization of body composition and strength/function in SO has not yet been established. The purpose of this systematic review was to assess the effectiveness of nutritional (focusing on energy and protein modulation) and exercise interventions, either individually or combined, on body composition and strength/function in older adults with SO. MEDLINE, the Cochrane Central Register of Controlled Trials, CINAHL and SPORTDiscus were searched. Main inclusion criteria comprised sarcopenia as defined by the European Working Group on Sarcopenia in Older People (EWGSOP) and obesity defined as % body fat $\geq 40\%$ (women) and $\geq 28\%$ (men). Randomized controlled trials (RCTs), randomized controlled crossover trials and controlled clinical trials with older adults (mean age ≥ 65 years) following a nutritional regimen and/or an exercise training program were considered. Out of 109 full text articles identified, only two RCTs (61 participants) met the inclusion criteria. One study was a nutritional intervention adding 15 g protein-day⁻¹ (via cheese consumption) to the participants' habitual diet. The second study was a high-speed circuit resistance training intervention. Body composition did not change significantly in either of the studies. However,

Abbreviations: % BF, Percent Body Fat; ACSM, American College of Sports Medicine; AHA, American Heart Association; BIA, Bioelectrical Impedance Analysis; BMI, Body Mass Index; CT, Computerized Tomography; DXA, Dual-energy X-ray Absorptiometry; EPIDOS, EPIDemiologie de l'OSteoporose; EWGSOP, European Working Group on Sarcopenia in Older People; FM, fat mass; GFR, Glomerular Filtration Rate; HD, Habitual Diet; HG, Handgrip; HSC, High Speed Circuit; IGF-1, Insulin-like Growth Factor 1; IADL, Instrumental Activities of Daily Living; LM, Lean Mass; MRI, Magnetic Resonance Imaging; MPS, muscle protein synthesis; mTOR, mechanistic Target of Rapamycin; PRISMA, Preferred Reporting for Systematic Reviews and Meta-analyses; PROSPERO, International prospective register of systematic reviews; RCH+HD, Ricotta Cheese plus Habitual Diet; RCTs, Randomized controlled trials; RPE, Rates of Perceived Exertion; RM, Repetition Maximum; SD, Standard Deviation; SGOT, Serum Glutamic Oxaloacetic Transaminase; SGPT, Serum Glutamic-Pyruvic Transaminase; SPPB, Short Physical Performance Battery test; SMI, Skeletal muscle index; SO, Sarcopenic Obesity; SH, Strength Hypertrophy; TASM, Total appendicular skeletal muscle.

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the exercise intervention improved significantly muscle strength and physical function. Although this review was limited by the small number of eligible studies, it provides evidence for the potential benefits of exercise and highlights the necessity for future research to develop effective interventions including dietary and exercise regimens to combat sarcopenic obesity.

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1. Introduction

Sarcopenia is defined by the European Working Group on Sarcopenia in Older People (EWGSOP) as the age-related decline of muscle mass and strength or function [1]. Low strength and muscle mass are associated with poor functional status, physical impairments, frailty, increased risk of falls, loss of independence and higher mortality risk [1,2]. It has been suggested that in older people, strength is a stronger predictor of functional impairment and mortality rates than absolute changes in muscle mass or lean mass alone [3–6]. Secondary to functional impairments, muscle atrophy may also contribute to insulin resistance as muscle tissue plays the main role in glucose uptake and utilization [7]. According to a recent systematic review, the prevalence of sarcopenia may vary from 1% to 29% in community-dwellers and 14% to 33% in long-term care populations [8].

Another condition that can promote poor health is obesity, which is defined as ‘abnormal or excess body fat accumulation’ [9], and is a growing concern due to its progressively rising prevalence rates in older populations [10]. In 2010, 35% and 28% of adults 65 years of age and older were reported to be obese in the US and the UK, respectively [11,12]. Similar to sarcopenia, obesity can increase the risk of falls and mobility limitations in older age [13,14], and when used in conjunction with indices of body composition and fat distribution (waist circumference or waist to hip ratio) it may be associated with adverse health effects, such as cardiovascular disease, metabolic syndrome, diabetes mellitus and several cancers [15]. Furthermore, adipose tissue can infiltrate the muscle tissue [16] and mediate an inflammatory response [17], which can result in muscle atrophy, lower muscle quality and strength, and mobility losses [16,18,19].

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