HHS Public Access

Author manuscript

JAMA Netw Open. Author manuscript; available in PMC 2022 November 03.

Published in final edited form as:

JAMA Netw Open. ; 5(5): e2211631. doi:10.1001/jamanetworkopen.2022.11631.

Powering Through Daily Activities in Older Age—Will Power Training Replace Strength Training in Later Life?

On-Yee Lo, PhD,

Melike Kahya, PhD,

Brad Manor, PhD

Marcus Institute for Aging Research, Hebrew SeniorLife, Boston, Massachusetts; Beth Israel Deaconess Medical Center, Department of Medicine, Harvard Medical School, Boston, Massachusetts.

Balachandran et al[1] conducted a rigorous systematic review and meta-analysis of power vs strength training in community-dwelling older adults. The investigators focused on published randomized clinical trials that compared traditional resistance training protocols (eg, 3 sets of 10 repetitions of several exercises performed against a resistance equal to a specific percentage of 1-repetition maximum strength for 8 weeks) in which participants were randomized to perform the muscle-shortening contraction at comfortable speed (traditional strength training) or as fast as possible (power training). They excluded trials that combined this type of power training with other interventions, as well as other forms of power training, such as plyometric exercise. Primary outcomes included both clinical tests and self-reports of physical function. Secondary outcomes included measures of muscle power, strength, and mass. Twenty clinical trials comprising 566 community-dwelling older adults met all review criteria and were included in the analysis. Results suggested, albeit with low certainty, that power training has a small to moderate advantage over strength training for improving both subjective and objective measures of physical function in older adults. Power training also proved superior for outcomes related to muscle power, as expected, yet it was comparable to strength training with respect to gains in muscle strength and mass.

In 1990, Fiatarone and colleagues[2] published a small but highly influential study reporting that an 8-week high-intensity strength training program led to impressive increases in muscle strength and size in frail adults aged in their 90s. Since that time, regimens designed to augment muscular strength, or the amount of force that a muscle can exert against some form of resistance, have been proven to be a safe and effective strategy to delay age-related decreases in mobility and physical function across the entire lifespan.

Corresponding Author: Brad Manor, PhD, Marcus Institute for Aging Research, 1200 Centre St, Roslindale, MA 02026 (bradmanor@hsl.harvard.edu).

Conflict of Interest Disclosures: Dr Lo reported receiving a grant from the National Institutes of Health National Institute on Aging during the conduct of the study. No other disclosures were reported.

It is unclear whether targeting muscular strength is the optimal approach to improving physical function. It is true that all physical activities of daily living require a certain amount of muscle strength to move the body. However, safe performance of most daily activities also requires movements to be executed at specific—and often very rapid—speeds; for example, walking quickly to cross the street, moving one's foot from an automobile's accelerator to the brake pedal, shifting one's body weight to one leg and moving the other to modify one's base of support, and resisting the pull of gravity in the event of a fall. Each of these activities requires power—the product of both muscle strength and speed of contraction.

As we age from adulthood into senescence, our muscle power fades sooner and more rapidly than strength.[3] Moreover, insufficient power, compared with strength, is often a better indicator of current physical function[3] and the possibility of future falls.[4] It logically follows that strategies designed to augment muscle power may be more beneficial for older adults. However, even though power training is a mainstay of athletics in younger adults, its uptake by the gerontologic research community, geriatric clinical practice, and older individuals themselves has been relatively slow. As of 2021, for example, only 25% of physical therapists were found to document the speed that they instructed their patients to perform in muscle strengthening exercises.[5]

The results of this meta-analysis suggest that muscle power can be enhanced and that focusing on power training may better translate into improved physical function in relatively healthy older adults. These promising results warrant larger and more definitive trials of this type of power training—especially since the added benefit over traditional strength training comes from a simple change in focus to the speed of muscle shortening. At the same time, the work by Balachandran and colleagues[1] either directly or indirectly generates several important questions, such as whether power training is safe for healthy older adults. The meta-analysis concluded that data on adverse events were insufficiently collected and reported across the included trials. Did participants assigned to power training complete the exercise with an appropriate form at their maximal speed? Is this important? What is the optimal dose and progression of training? How long are observed benefits retained? Do older adults prefer this type of power training over traditional resistance training? Answering these questions will no doubt result in optimization of the benefits of power training and, importantly, the likelihood of adoption into both clinical practice and the daily exercise routines of older adults.

Most trials included in the meta-analysis by Balachandran and colleagues[1] used common, wellvalidated tests of physical function; for example, the Get Up & Go test. On one hand, improvements on these performance-based outcomes suggest that power training likely induced meaningful changes in physical function. On the other hand, these tests may not fully capture the extent to which improvements in both lower and upper body power output transfer out of the clinical setting and into activities that require different amounts and/or types of power. The present results[1] may encourage future research into how this type of power training translates into improved safety in daily life movements, as well as the quantity and quality of habitual physical activity.

The 566 participants included in this meta-analysis were relatively healthy and relatively young older adults: the mean age of 18 of the 20 study cohorts was 75 years or younger.[1] Thus, it remains to be seen whether power training is feasible, safe, and effective in very old and/or more vulnerable populations of older adults, such as those who are frail, present with high risk of falling, or are cognitively impaired. Reid et al[6] reported that, although the primary contributor to low power output in the healthy group was a diminished rate of neuromuscular activation, the primary contributor in the mobility-limited group was muscle weakness. Therefore, it is important to keep in mind that power generation is a multifactorial phenomenon and older adults with mobility limitations or sedentary lifestyles may not necessarily respond to power training the same as their healthier counterparts who were represented in the meta-analysis.

Many activities of daily living that are essential to independent physical function—especially those that include standing, walking, and transferring—require numerous abilities beyond muscle power, such as sensorimotor integration, muscle coordination, postural control, numerous cognitive functions. The type of power training analyzed in this meta-analysis focused primarily on machine-based exercises (eg, seated leg press) that limit multiplane movement, as well as the need to control ones' center of mass with respect to its base of support.[1] On one hand, this type of power training may be advantageous in terms of safety and ease of implementation, especially because most community fitness centers have this type of equipment available. On the other hand, efforts to design power training programs that also include task-oriented exercises that mimic real-life activities are expected to provide the added benefit of ensuring that gains in muscular power are integrated into the complex and dynamic control systems that give rise to physical functioning in older adults.[7] More studies are therefore needed to directly compare the benefits of different types of power training in older adults both with and without functional limitations.

REFERENCES

1. Balachandran AT, Steele J, Angielczyk D, et al. Power training vs. traditional strength training on physical function in older adults: a systematic review and meta-analysis. JAMA Netw Open. 2022;5(5):e2211623. doi:10.1001/jamanetworkopen.2022.11623 [PubMed: 35544136]
2. Fiatarone MA, Marks EC, Ryan ND, Meredith CN, Lipsitz LA, Evans WJ. High-intensity strength training in nonagenarians: effects on skeletal muscle. JAMA. 1990;263(22):3029–3034. doi:10.1001/jama.1990.03440220053029 [PubMed: 2342214]
3. Reid KF, Fielding RA. Skeletal muscle power: a critical determinant of physical functioning in older adults. Exerc Sport Sci Rev. 2012;40(1):4–12. doi:10.1097/JES.0b013e31823b5f13 [PubMed: 22016147]
4. Simpkins C, Yang F. Muscle power is more important than strength in preventing falls in community-dwelling older adults. J Biomech. 2022;134:111018. doi:10.1016/j.jbiomech.2022.111018 [PubMed: 35228153]
5. Handlery R, Shover E, Chhoun T, et al. We don't know our own strength: a survey of strength training attitudes, behaviors, and knowledge in physical therapists and physical therapist students. Phys Ther. 2021;101(12): pzab204. doi:10.1093/ptj/pzab204 [PubMed: 34473297]
6. Reid KF, Pasha E, Doros G, et al. Longitudinal decline of lower extremity muscle power in healthy and mobility-limited older adults: influence of muscle mass, strength, composition, neuromuscular activation and single fiber contractile properties. Eur J Appl Physiol. 2014;114(1):29–39. doi:10.1007/s00421-013-2728-2 [PubMed: 24122149]

7. Bean JF, Herman S, Kiely DK, et al. Increased Velocity Exercise Specific to Task (InVEST) training: a pilot study exploring effects on leg power, balance, and mobility in community-dwelling older women. J Am Geriatr Soc. 2004;52(5):799–804. doi:10.1111/j.1532-5415.2004.52222.x [PubMed: 15086665]