Age-Related Muscle Loss and Strength

The Importance of Exercise to Preserve Both

"Use it or lose it" is a common expression when it comes to aging—especially with regard to muscle mass. As individuals age, they lose both muscle mass and strength, which can lead to loss of function and independence. Everyone loses some muscle mass and strength as they age, but "the rate of decline is within our control," says Sharon Collison, MS, RDN, LDN, CSSD, clinical instructor of nutrition in the department of behavioral health and nutrition at the University of Delaware.

It's difficult to say exactly when adults start to lose muscle mass because it's highly dependent on their activity level. For some, loss can begin in the fourth decade, and it's estimated that healthy adults lose about 24% of muscle mass between the ages of 40 and 70, which can rapidly increase after 70.[1,2]

Bob Murray, PhD, FACSM, an exercise scientist; president of Sports Science Insights in Crystal Lake, Illinois; and coauthor of *Food and Fitness After 50*, says, "We lose muscle mass as we age, but we also lose strength; 70-year-olds are about 30% weaker than they were at age 50 … a large drop in strength over just 20 years." The average strength of those in their 80s is about 40% less than those in their 20s.[3]

Loss of muscle mass and strength can lead to sarcopenia, defined as an age-related decline in muscle mass, setting the stage for poor balance, increased fall risk, lack of independence, and disability.[1,4] The good news is that with modest changes in physical activity and dietary patterns, it's never too late to reverse the loss of muscle mass and strength as individuals age. This article will explore ways dietitians can help clients "use it and not lose it" as the years go by.

Why Muscle Loss Occurs

The reasons for loss of muscle mass and strength related to age, lifestyle, and disease are hard to untangle. Researchers have identified several contributors, including the decline in the signaling pathways that regulate muscle size, decreased capacity of mitochondria, increased oxidative stress, and impaired satellite cell function.[5] Satellite cells are a muscle's resident stem cells, crucial for regenerating muscle, especially when muscle is injured or stressed. Older muscles have a reduced number of these important cells, decreasing the ability to regenerate muscle.[5,6] Satellite cells can be further reduced by an individual's disuse, critical illness, and continued aging.

Sedentary behavior is a major contributor to muscle and strength loss, and older adults are the least active of any age group.[4] In fact, researchers have coined a new term, "active couch potatoes," for those who do some exercise each day but then spend the rest of the day sitting. Research shows that spending greater than 10 hours per day sitting (not counting sleep) is associated with poorer health outcomes.[7]

Retaining Strength

Skeletal muscle is important for the ability to move, walk, climb stairs, get in and out of a chair, bend and lift, and other physical functions necessary for activities of daily living. Declining muscle mass is a strong predictor of several detrimental outcomes, such as slower walking speed, increased risk of falls, higher risk of hospitalization and greater length of stay, larger risk of postoperative complications, and mortality.[1]

Muscle strength also is a predictor of all-cause mortality. "The strong live long," Murray says. "It's estimated that about one-quarter to one-third of those over age 70 are sarcopenic and it's likely that even more are dynapenic, which is muscular weakness with or without sarcopenia."[8]

Muscle also affects our whole-body metabolism. Muscle mass contributes to our resting metabolic rate and is a reservoir for glucose and lipids and, as such, modulates blood sugar by insulin-mediated glucose uptake.[5,9] When glucose metabolism is impaired, the stage is set for type 2 diabetes. Lower resting metabolic rate is associated with fewer calories burned throughout the day, leading to accumulating fat mass, which in turn contributes to hypertension and cardiometabolic disorders.[10]

Exercise Solutions

"Resistance training is the most potent intervention for increasing and maintaining skeletal muscle mass, strength, and function," says Stuart Phillips, PhD, research chair in skeletal muscle health in aging and a professor of kinesiology at McMaster University in Ontario, Canada. "Muscle is 'plastic' or adaptable and progressive. Resistance exercise training is the most powerful stimulus for muscles to adapt." Progressive refers to the principle of overloading muscles for an anabolic stimulus or, in other words, lifting a weight until the muscle says, "no more," and making that weight heavier as an individual gets stronger.

Physical activity guidelines from all major health organizations recommend adults and older adults follow the Physical Activity Guidelines from the US Department of Health and Human Services, which say muscle-strengthening activities of moderate or greater intensity should be performed two or more days per week. Muscle-strengthening activities can include weight training with machines or free weights, working with resistance bands, performing exercises that use body weight for resistance (such as push-ups, pull-ups, and planks), climbing stairs, or the lifting and pulling that accompanies heavy gardening.[4]

There's no specific amount of time suggested for muscle strengthening, but clients and patients should use the principle of progressive training. They should perform the exercises to the point at which

it's challenging to do another repetition. Most exercise experts suggest one set of eight to 12 repetitions of each exercise is effective, but performing two or three sets (with rest between sets) is recommended to be most effective.[4]

For more detail on resistance exercise for older adults, the National Strength and Conditioning Association published a position statement in 2019, suggesting that beginners should aim for one set of exercises per muscle group, progressing to two to three sets. The recommendation for intensity of exercise is 70% to 80% of one repetition maximum, starting with lighter weights for beginners and progressing to greater intensity over time. The organization also recommends performing the exercises two to three times per week on nonconsecutive days to give muscles a chance to adapt.[11]

While strength training is the best way to build and maintain muscle mass and strength, aerobic or endurance exercises have more than cardiorespiratory benefits. Activities such as brisk walking, jogging, cycling, pickleball, tennis, basketball, and swimming increase blood flow to muscles, the number and function of mitochondria, and the number of glucose and fat transporters in muscles. These adaptations result in a positive net protein balance and contribute to decreasing cardiometabolic disorders.[12]

For optimal results, aerobic exercise of moderate intensity should be performed 150 minutes (two hours and 30 minutes) to 300 minutes (five hours) each week or 75 to 150 minutes of vigorous-intensity activity.[4]

Nutrition Recommendations

In addition to physical activity, diet and nutrition play an important role in maintaining muscle and strength. Dietary protein works synergistically with resistance training to promote muscle strengthening.[13] The quality, quantity, and timing of protein appear to be crucial to support muscle protein anabolism. Protein quality refers to proteins that supply all the essential amino acids necessary to stimulate muscle protein synthesis (MPS). Animal-sourced protein (dairy milk, eggs, meat, fish, poultry, and even the plant protein, soy) is the most well-studied for MPS, but other plant-based proteins can support muscle mass when consumed in higher quantities due to amino acid composition and lower digestibility. Leucine, the amino acid identified as the anabolic trigger for MPS, is found in higher amounts in animal-sourced foods than plant-sourced foods.[13,14]

Protein quantity also is important due to a condition called "anabolic resistance" observed in older muscles. It's a blunting of the normal stimulation of muscle in response to protein. When older adults consume protein at the same level as younger adults, muscle protein stimulus isn't at the level seen in younger adults.[6,13] Researchers suggest that to overcome anabolic resistance, 1.6 g protein/kg/body weight be consumed each day.[13,14]

To maximize MPS, protein intake should be distributed throughout the day, using 0.4 g protein/kg/meal as a guide.[13] While many older adults consume slightly more protein than the recommended dietary allowance of 0.8 g/kg/day, they do so in a skewed pattern. A typical pattern is 10 g protein at breakfast, 25 g protein at lunch, and 35 g at dinner.[14] Research suggests that a more evenly distributed pattern of protein intake is preferred for greater MPS.[1,15]

Phillips says, "Dietary protein works synergistically with resistance training to support muscle mass and strength," which is crucial for muscle health as we age. While we focus on the MPS effect of protein, sufficient energy, and other nutrients also are important. "Whole food protein provides not only amino acids but other nutrients needed for optimal aging," Phillips says.

Counseling Strategies

Almost 20 years ago, researchers demonstrated that strength training in frail nursing home residents wasn't only doable but also highly effective in counteracting muscle weakness and frailty in the very old.[16] It's never too late to build muscle mass and strength and extend the health span.

While it may be intimidating for some, the best motivation for an older person to start, or continue an exercise program, may be the emphasis on functional fitness. Ask clients what they like to do and what they hope to continue to do as they age. For some, it may be running after their grandchildren, tending the garden or other yard care tasks, walking the dog, or engaging in newly discovered activities such as pickleball. Muscle mass and strength are important for all the activities that make life enjoyable, so teaching clients ways to maintain their strength by engaging in activities they enjoy can help ensure a higher quality of life.

Dietitians also should encourage clients to explore community options for exercise, especially for those who have been sedentary and want to get started but don't know where to begin. Many Medicare and supplemental insurance programs offer free access to community exercise programs. For example, SilverSneakers® is a health and fitness program designed for adults aged 65 and older that's included with qualifying Medicare health plans.

Clients may want to consider hiring a qualified personal trainer who can help reduce the chances of injury during exercise by safely demonstrating correct form. Some trainers offer "buddy" sessions so a couple or two friends can take advantage of a reduced rate, with the added benefit of social support. Suggest they look for trainers who have a nationally recognized, education-based certification approved by the National Commission for Certifying Agencies, such as the American Council on Exercise, the American College of Sports Medicine, and the National Academy of Sports Medicine.

Don't let clients forget that home exercise can be effective, too. There are many exercise videos clients can follow at home. They also can use resistance bands as another effective option, as they're affordable and come with a set of exercises to follow, starting with low resistance and moving up to higher resistance over time. Easy exercise ideas can include getting up and down off the floor, up and down from a chair, or simply walking up and down stairs several times per day. Whatever it is, finding time to move throughout the day is the most important thing. ■

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For references, view this article on our website at www.TodaysDietitian.com.