

Build Muscle, Improve Health

Most people know the beneficial effects of aerobic activity with respect to heart health, cardiorespiratory function, endurance fitness, and physical well-being. Certainly, increased aerobic capacity is a major objective of a comprehensive conditioning program. However, it is important to realize that muscles are the engines of our bodies. Muscles are where combustion occurs, where energy is released, where power is produced, and where movement originates. Muscles have long been recognized as key factors in physical performance and athletic achievement. Essentially all serious sports participants include regular resistance exercise in their training programs. However, recent research has shown that strength training has much greater application than improved sports performance or even enhanced physical fitness. Clearly, our muscular condition has a major influence on both our physical and mental health.

It is likely that age-related muscle loss is a starting point for a cascade of physiological problems, including bone loss, metabolic rate reduction, fat gain, diabetes, metabolic syndrome, heart disease, and all-cause mortality. Adults who do not perform resistance exercise lose almost 5 lbs. of muscle every decade before age 50 years and up to 10 lbs. of muscle every decade after age 50 years. With this in mind, let's examine the evidence-based benefits of resistance training for generally healthy individuals as well as for adults who have common risk factors.

MUSCLE MASS

Numerous studies have shown that muscle mass may be increased in adults of all ages, including individuals in their 90's. A recent research study revealed a 3-lb increase in lean weight (muscle) after 10 weeks of standard strength training, and a follow-up study showed approximately twice as much lean weight gain after 9 months of resistance exercise. Similar increases in lean weight were attained for strength training frequencies of 2 and 3 days per week and among all of the age groups.

BONE DENSITY

Muscle loss (sarcopenia) is associated with bone loss (osteopenia), which explains partly why approximately 45 million Americans suffer from insufficient bone mass. Women who do not engage in resistance exercise may experience a 1% to 3% per year reduction in bone mineral density (BMD) which may lead to osteopenia and osteoporosis. Fortunately, several longitudinal studies have shown significant increases in BMD after participation in progressive strength training programs. Resistance exercise has been shown to increase BMD between 1% and 3% in both premenopausal and postmenopausal women.

RESTING METABOLISM

At rest, every pound of untrained muscle uses between 5 and 6 calories per day for protein breakdown and synthesis. However, every pound of resistance-trained muscle uses approximately 9 calories per day for more extensive protein breakdown and repair processes. Resistance exercise produces tissue microtrauma that requires relatively large energy supplies for muscle remodeling. Research reveals that a single strength training session can increase resting energy expenditure by 5% to 9% for 3 days after the workout.

BODY FAT

Most strength training studies that have shown significant increases in lean weight also have demonstrated concurrent decreases in fat weight. Resistance exercise also has been effective for reducing intra-abdominal fat in older men and women. Some people have questioned how three relatively brief (20-minute) circuit strength training sessions a week can result in a 1.5-lb/month fat loss. So let's take a look. Assuming approximately 200 calories used during a 20-minute resistance training circuit, the total monthly energy expenditure directly caused by resistance exercise is only 2,400 calories (12 workouts x 200 calories per session). However, assuming the lowest reported increase in resting metabolism associated with strength training (100 calories/day), the total monthly energy expenditure indirectly caused by resistance exercise is 3,000 calories (30 days x 100 calories/day), for a total calorie use of 5,400 calories (2,400 calories plus 3,000 calories), which is equivalent to 1.5 lbs. of fat.

GLYCEMIC CONTROL

Muscle loss and fat gain increase the risk of Type 2 diabetes, a disease that is predicted to affect one in three adults by the middle of this century. Numerous studies have demonstrated significant improvements in insulin sensitivity and glycemic control as a result of resistance exercise. Research has concluded that strength training should be recommended for both the prevention and management of Type 2 diabetes. There is also evidence that resistance exercise may be preferable to aerobic activity for improving insulin sensitivity. The American Diabetes Association recommends resistance exercise for all of the major muscle groups, 3 days/week, progressing to 3 sets of 8 to 10 repetitions each, performed at a higher level of training intensity.

BLOOD PRESSURE

Several studies have shown significant reductions in resting blood pressure (systolic and diastolic) after two or more months of regular resistance exercise (circuit and standard strength training). Combined resistance and endurance exercise also has demonstrated favorable blood pressure responses. Considering that about 35% of Americans have hypertension, the blood pressure benefits associated with strength training should not be overlooked.

BLOOD LIPIDS

An even larger number of Americans (~45%) have undesirable blood lipid profiles. Research in this area has revealed improved blood lipid profiles after participation in strength training programs. Resistance training has been effective for improving triglyceride levels, low-density lipoprotein (LDL) cholesterol, and high-density lipoprotein (HDL) cholesterol in older women. Recent research indicates that combined strength training and aerobic activity may have a more favorable impact on blood lipid profiles than either exercise performed independently.

PHYSICAL FUNCTION

Research clearly demonstrates that resistance exercise can reverse some of the degenerative processes associated with inactive aging, including muscle loss, movement control, functional abilities, physical performance, and walking speed. In a study of nursing home results showed nearly a 4-lb increase in lean weight, a 3-lb decrease in fat weight, a 60% increase in overall muscle strength, and a 14% improvement in functional independence.

MENTAL HEALTH

Research has demonstrated that programs of resistance training and aerobic exercise were more effective than aerobic exercise alone for improving cognitive function in inactive older adults. However, studies restricted to only resistance training interventions also have shown significant improvements in various cognitive abilities. It has been found that combined strength and endurance training significantly improved physical self-concept, total mood disturbance, depression, fatigue, positive engagement, revitalization, tranquility, and tension in adults and older adults.

AGING FACTORS

One aspect of aging is a reduction in muscle mitochondrial content and function. Circuit strength training has been shown to increase both muscle tissue mitochondrial content and oxidative capacity. After the strength training program, older adults' mitochondrial gene expression was similar to that of moderately active young adults. This shows that specific aging factors in skeletal muscle may be reversed through progressive resistance exercise.

RECOMMENDATIONS FOR BEGINNING A STRENGTH PROGRAM

Regardless of age, sex, or apparent physical condition, people who wish to begin a resistance training program should complete a health-screening questionnaire. The most recent ACSM resistance training recommendations call for relatively brief workouts that provide two to four sets of 8 to 12 repetitions each for the major muscle groups by performing 8 to 10 multi-joint exercises two or three nonconsecutive days per week with sensible progression.

Various modes of resistance are effective for increasing muscle mass and strength. For example, free-weight training offers many multiple joint exercises performed from a standing position that concurrently activate muscles of the legs, core, upper body, and arms while incorporating balance, coordination, and movement control, while older individuals, people with orthopedic limitations, and those who have issues with balance, coordination, or flexibility may be advised to begin strength training with resistance machines.

SUMMARY

Muscle loss may initiate a cascade of health issues including bone loss, metabolic rate reduction, fat gain, diabetes, metabolic syndrome, heart disease, and all-cause mortality. Resistance training has been shown to add muscle mass, increase bone mineral density, raise resting metabolic rate, decrease body fat, improve glycemic control, reduce resting blood pressure, improve blood lipid profiles, enhance physical function, improve mental health, and reverse specific aging factors in skeletal muscle. Beginning participants should be assessed for cardiovascular disease risk factors and should be trained in accordance with the ACSM recommendations for performing safe and effective resistance exercise.

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