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Aging: Its Effects on Strength, Power, Flexibility, and Bone Density

Adams, O'Shea, and O'Shea. NSCA XXI, 2, 65-77.

When people reach 50, they begin to pay the price of a sedentary lifestyle.

The detrimental changes are in body composition, including loss of lean body mass, strength, flexibility, and bone density, along with an increase in body weight and body fat. Inactivity with aging is the primary factor in these changes.

Age-related changes in body composition can be retarded and even reversed through resistance training.

As life expectancy grows, the decline in muscle strength with aging becomes a matter of increasing importance…from ages 30-80 years, back, leg, and arm strength decrease 30-40%.

Fat moves inward with age.

Strength increases into the 4^{th} decade but decreases thereafter at an accelerated rate.

Type I and II muscle fiber area are reduced with age in men and women 20-70 years. More evident after age 60. Disuse is a reversible factor that is responsible for the muscle atrophy and strength loss.

To maintain muscle efficiency people should resistance train as they get older.

Active women over 60 were comparable to college-age women on the ability to remain muscle and adapt.

Physical activity counteracts age-related strength decline. Resistance training is critical to maintain fat-free weight with age.

After age 74%, 28% of men and 66% of women in the U.S. cannot lift things heavier than 10 lbs.

69-70 year old swimmers, runners, and weightlifters were compared to age-matched controls and 28 year olds. Maximum isometric and cross-sectional area for the swimmers and runners were the same as the controls but the weightlifters were identical to the 28 year olds. The swimmers and runners had atrophy of Type II muscles that were maintained in weightlifters.

Neurological factors combined with muscle hypertrophy significantly improve strength. The elderly can obtain a significant and rapid gain in functional strength with resistance exercise.
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Resistance training is essential for individuals 50 and older who are wanting to maintain an independent lifestyle and are wanting to avoid the possibility of ending up in a nursing home.

The aging human body is highly resilient in its capacity to cope and adapt to high-intensity resistance training.

The ability of the neuromuscular system to develop high action velocities, or power, depends on the recruitment and firing frequencies of the motor units and contractile characteristics of the respective muscle fibers.

Increased neural adaption as a result of resistance training may increase recruitment of higher threshold, higher force motor units, thereby increasing muscular power. Type II muscle fibers are associated with high-velocity, power movements. And Type II fibers have been shown to decrease with age. This age-related decline of Type II fibers is reversible through resistance training. Resistance training also increase neuromuscular coordination, which leads to increased power.

Power endurance is the ability of muscles to contract and produce force for extended periods of time without fatigue. Important in long-distance walking, hiking, cross-country skiing, and biking. Muscular strength plus aerobic endurance equals power endurance. Most effectively gained through cross-training of circuit weight training and aerobics.

Flexibility declines with age 20-30% between ages 30-70 years. Stiffness mainly found in joint capsules, muscles, and fascia. With age, collagen increases insolubility, becomes more cross-linked, and increases in content in muscle. This decreases ROM. Immobilization or lack of activity increases collagen turnover and deposits in ligaments, shortens muscle fibers, and decreases muscle mass. This results in less flexibility.

As people get older, the ROM of the lower extremity joints gets progressively smaller. Gait patterns of older men shows shorter strides, decreases ROM of hip flexion and extension, and reduced ankle flexibility. Squats and shoe typing require the greatest ROM of daily activities.

Disuse due to lack of physical activity produces contractures and shortening of connective tissue, while increased flexibility of the entire musculotendinous unit results from repetitive, active contractions that increase circulation to a muscle and gradually increase the strength of the tendon. Active women in their 60s were more similar to young women in their 20s than inactive women their own age. Weight training for increased muscle strength and size appears to increase flexibility. Properly employed resistance-training exercises are more effective than traditional flexibility exercises at improving range of motion. Flexibility as a safety factor in preventing falls is often overlooked. Flexibility and strength allow someone to perform household activities with lower rise of injury. Frequently lower back pain is associated with stiffness in hips and back, and is corrected with stretching.

Free-weight training combined with stretching and swimming develops and maintains good joint flexibility. Areas of major focus: hips, lower back, thighs, and hamstrings contribute most to functional living.

After age 50 there is a significant decline in bone mineral density (BMD). Lower BMD and a decline in strength greatly increases risk of injury and fractures due to falls. Long-term resistance training has been proven to significantly improve BMD. Stronger individuals possess greater BMD compared to weaker ones.

Summary

Resistance training can improve the physical qualities of life for the aging adult. Major goal: maintain sufficient muscle function to last one's lifetime.
The older adult can derive health benefits from resistance training is no longer theory but confirmed fact. A broad-based strength fitness program is a must for individuals 50 and over to build and maintain strength, coordination, flexibility, and strong bones. This provides an overall feeling of physical and mental well-being.