

Strength Training for Bone, Muscle, and Hormones

One of the hallmark features of aging is loss: loss of bone strength, muscle mass and strength and hormone production. Although the debate continues as to the cause of this loss, one thing is certain: the inclusion of regular strength training sessions will play an important role delaying and reducing age- or inactivity-associated loss experience.

Bone Health

Weak bones, osteopenia (low bone mass that precedes osteoporosis), porous bone or brittle bones are all terms used to characterize the condition known as osteoporosis. It is important to understand that osteoporosis is not a disease in the clinical sense, but a condition. Osteoporosis typically begins with an unnoticed decrease in bone mass that leads to structural deterioration of bone tissue and an increased susceptibility to fractures of the hip, spine and wrist. In fact, any bone can become susceptible to change in strength, particularly with age.

Until the age of about 30 to 35 years, our bones are in a constant state of building. Bone strength, however, can be affected by such things as heredity, diet, sex hormones, physical activity, lifestyle choices, and the use of certain medications. Osteoporotic symptoms occur earlier and last longer in women (40-65 years) than men (from 65 years). Osteoporosis is less common in men than in women for several reasons. Men have larger skeletons, their bone loss starts later in life and progresses more slowly, and they do not experience the rapid bone loss that affects women when their estrogen production drops as a result of menopause. Despite these differences, men can be at high risk for this condition.

Osteoporosis is prevalent in America. Eight million women and two million men experience osteoporosis. Eighteen million others are at risk with low bone mass, and 1.5 million fractures occur annually because of osteoporosis. The cost of osteoporosis to Americans is increasing; according to the National Osteoporosis Foundation of America, more than 38 million dollars are spent daily on osteoporotic and associated fractures.

Muscle Health

Sarcopenia, a loss of skeletal muscle mass, declining strength and muscle atrophy are terms that describe a decrease in muscle size and functional strength. The changes in muscle size and ultimately strength levels are related to the loss of muscle fibers and shrinking of remaining fibers. Under normal conditions human muscle strength in women and men reaches its peak between the ages of 20-30 years, after which it remains virtually unchanged for another 20 years, if there is no disease or injury. After this point muscular performance deteriorates at a rate of about five per cent per decade, amounting to a 30 to 40 per cent loss of functional strength over the adult life span. Variations in the rate of loss reflect the diversity of occupations, physical activity backgrounds, the muscles used, and type of muscle contractions.

The upside for graceful aging is the ability of elderly individuals to respond to exercise with large gains in strength, mobility and physical fitness. Exercise studies have repeatedly demonstrated the capacity of older muscle to adapt to specifically designed training programs, resulting in gains in both strength and muscle size regardless of age or gender. Because the independent performance of many daily living activities is strength-dependent, the maintenance of muscle size and functional strength should play an important role in the training regime for older adults.

Hormone Health

Hormones are the chemical messengers of the body that function to control and coordinate many of the body's activities. Muscle development, growth and maturation, immune functions and perhaps even aging itself are among them. Unfortunately, like most chemicals, tissues, organs and organ systems in the body, hormones are not excluded from the changes and decline seen throughout the aging body. The lower levels of hormone production probably precede the accompanying visual changes. Ultimately, the changes in hormones accompany the changes in bone and muscle strength as well as the other way around.

As the human body inevitably advances toward old age it is becoming more evident that strength training and weight-bearing activity are providing the answers to slowing age-related changes in our bones, muscles and hormones.

Strength training provides the mechanical stress or "load" that stimulates the development of muscle and bone strength. The adaptation of muscles as a result of regular strength-training sessions and weight-bearing activity include strength changes and muscle mass improvement. A consequence of these improvements is the fact that the muscle is now capable of providing a stronger contraction to increase training loads. The advantage of this is that muscle contraction is the dominant source of skeletal loading that provides the mechanical stimulus to increase bone.

In contrast, physical inactivity has been shown as a contributing factor to the loss of bone, muscle mass and other health risks. The ideal exercise regime for maintaining or promoting bone, muscle and hormone health is strength training. Strength training can be site-specific, individualized, progressively overloaded and adjustable. Strength training also provides other benefits, such as improved balance and coordination.

Two important concerns for strength training are intensity and recovery. A minimum of two sessions a week for 45-60 minutes beginning at 70 per cent of the one repetition maximum (1RM) and building to 85 per cent 1RM would be appropriate. It is better to stand on the side of caution when beginning. Recovery becomes paramount if the training programs are to be effective for the older adult. Regular health checks and training program assessments are required to determine the efficiency of the training program. Preventive measures for bone and hormone loss, maintaining a physically active, healthy lifestyle and modification of risk factors for falls will yield benefits to overall health.

Returning to a physical activity program after an absence, or beginning a new training program, can be both intimidating and beneficial, especially for the untrained or inexperienced. After making the first and important decision to return to an exercise program, there are several basic guidelines to follow. The first is to consult with a physician about resuming a regular exercise program so he/she may determine overall health and be aware of conditions that may restrict exercise. With this information in hand, the next step is to discuss goals and needs with a qualified sports or exercise scientist/trainer. Strength training is one solution that can be used to alter the changes in bone strength, muscle strength and hormone levels that accompany aging.

Written for the American College of Sports Medicine by Brendan D. Humphries, Ph.D.

Current Comments are official statements by the American College of Sports Medicine concerning topics of interest to the public at large.

Street Address: 401 W. Michigan St. • Indianapolis, IN 46202-3233 USA

Mailing Address: P.O. Box 1440 • Indianapolis, IN 46206-1440 USA

Telephone: (317) 637-9200 • FAX: (317) 634-7817

