

synopsis of

## Physiological Changes During Aging

The human body experiences functional declines from the normal aging process.

Adults with a sedentary lifestyle experience quicker degradation of physiological functions and face a greater risk of premature death than adults who exercise regularly.

- Loss of hearing ability at certain frequencies,
- After age 30, strength losses 10% per decade,
- Increased risk of bone breaks,
- More limited extensibility and ROM due to collagen binding of fascia and connective tissue,
- 30% lower stroke volume for heart output. Maximum oxygen use declines 8-10% per decade after age 30,
- Loss of neural control decreases precision and coordination,
- Loss of Type II (fast twitch) muscles due to disuse. Decreased force production,

While aging is unavoidable, exercise can mitigate its effects and may actually promote healthier, more youthful physiological Functions.

The best program includes all three components of exercise: strength training, cardiorespiratory exercise, and stretching.

Per the NASM, strength training can improve strength and power for adults of all ages, given that the benefits of this type of exercise include preserving muscle mass and metabolic function, especially after age 55.

Older men do experience strength gains and other benefits similar to those of the younger men

Resistance training may be the secret to keeping aging muscles young and aging adults functional and independent.

Cardiovascular exercise for over-35 adults can

- Improve cardiorespiratory function (by increasing stroke volume and cardiac output, a combination of stroke volume and heart rate),
- Increase mitochondrial density and
- Enhance the ability to extract oxygen from blood in the working muscles.

These are all break down as people, who are not physically active, age.

Flexibility training ensures that aging muscle, fascia and connective tissue remain pliable and elastic. Joints can move through their full ranges of motion (ROM).

Use a variety of movement speeds to ensure that muscle and fascia maintain or improve the ability to rapidly lengthen and store mechanical energy. Use plyometric exercises to improve the function of fascia and connective tissues. High-velocity movements can induce a more youthful collagen architecture, which also produces a significant increase in elastic storage capacity.

### Young and Middle Adulthood

- Muscle mass peaks in women between 16 and 20 years of age; muscle mass in men peaks between 18 and 25 years of age.
- Decreases in muscle mass begin to occur as early as 25 years of age.
- Muscle mass constitutes approximately 40% of total body weight during early adulthood, with men having slightly more muscle mass than women.
  - Muscle continues to develop into the second decade, especially in men.
  - Muscle strength and endurance reach a peak during the second decade, earlier for women than men.
  - By sometime in the third decade, strength declines between 8% and 10% per decade through the fifth or sixth decade.
  - Strength and muscle endurance deteriorate less rapidly in physically active versus sedentary adults.
  - Improvements in strength and endurance are possible with only a modest increase in physical activity.

### Late Adulthood

- Rate of decline of muscle strength accelerates to 15% to 20% per decade during the sixth and seventh decades and increases to 30% per decade thereafter.
- By the eighth decade, as loss of muscle mass continues, skeletal muscle mass has decreased by 50% compared to peak muscle mass during young adulthood.
  - Muscle fiber size (cross-sectional area), type I and type II fiber numbers, and the number of alpha motoneurons all decrease. Preferential atrophy of type II muscle fibers occurs.
  - Decreases in the speed of muscle contractions and peak power occur.
  - Gradual but progressive decrease in endurance and maximum oxygen uptake.
  - Loss of flexibility reduces the force-producing capacity of muscle.
  - Minimal decline in performance of functional skills occurs during the sixth decade.
  - Significant deterioration in functional abilities by the eighth decade is associated with a decline in muscular endurance.
  - With a resistance training program, a significant improvement in muscle strength, power, and endurance is possible during late adulthood.
- Evidence of the impact of resistance training on the level of performance of functional motor skills is mixed but promising.