

Muscle changes with aging – which factors are avoidable/reversible?

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Muscle wastage/loss in older adults is known as "Sarcopenia"

This is the first in a series of articles on recommended training principles for 40+ year olds.

Recent research indicates that the observed loss of force production in older people is primarily due to the result of muscle atrophy and alterations in the percentage of contractile tissue within muscle⁽¹⁻⁴⁾ rather than deficits in muscle activation (motor unit recruitment and firing rates). ⁽⁵⁻⁷⁾

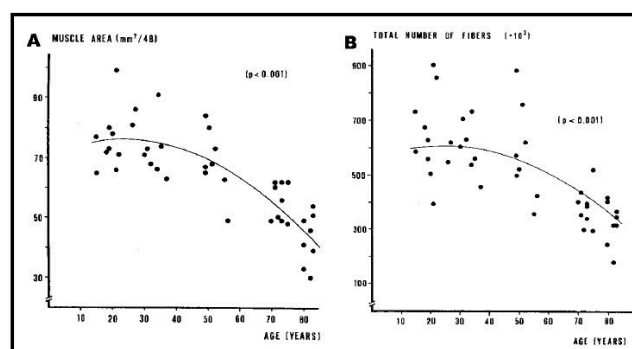


Figure 1 - Muscle Area/Fibre No. loss with age.

There have been conflicting views as to how this loss occurs, is it a decrease in fibre size or fibre number?

Recent whole muscle sampling techniques have shown that the reduction in Cross Sectional Area (CSA) is mainly due to a loss in total fibre number not a significant reduction in the size of each muscle fibre (as per figure 1).

Researchers have also demonstrated that, in addition to the decrease in skeletal muscle CSA, the muscles of older people (65–83 years of age) contain less contractile tissue and more non-contractile tissue when compared with the skeletal muscle of younger people (26–44 years of age).⁽⁴⁾ A greater percentage of non-contractile tissue (fat and connective tissue) results in a decreased force production capability.

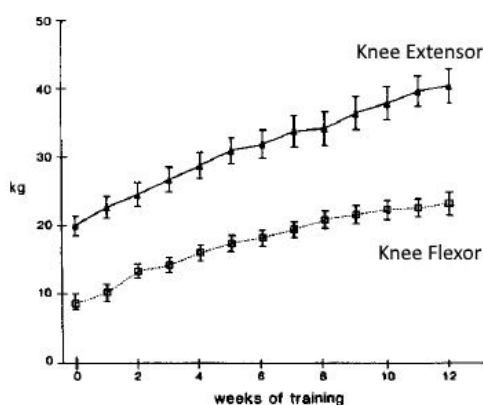
Some researchers ^(8,9) have concluded that the size of type I (slow) fibers does not change substantially with age, but that type II (fast) fibers undergo selective atrophy

We know that Type II fibres are the most important fibre type for strength and muscle size so having a reduction in these fibre types will have a direct influence upon both total muscle size and potential strength capacity.

To add to the reduction in size/number of Type II muscles fibres, there is also a reduction in cortical motor output to these fibre types with age ^(5, 10, 11). This results in a reduction in the Central Nervous System's capacity to stimulate these fibres to the levels once attained at a younger age. This directly affects the strength and power output capacity of these fibres within any muscle group. Also the less capable the CNS stimulation, the harder it is to mechanically load these fibres (necessary for hypertrophy) leading to a further reduction in fibre size (and number).

TRAINING CONCEPTS

Training-induced adaptations in skeletal muscle depend on the intensity, frequency, duration, and mode of exercise.^(12–14) Appropriate exercise can alter, slow, or even partially reverse some of the age-related physiological changes that occur in skeletal muscle, including sarcopenia & decreased force production through loss in CNS activation ^(8, 15-18).



Strength adaptations in the elderly performing knee strengthening exercises.

There is a common misconception that the older population need to “take it easy” with gym/strength training – when starting, yes, like any beginner, but there is no reason for this cohort not to train as hard as they are capable of once they have been training for a while. Research

clearly shows gains in strength, power & CSA all occurring when undertaking an appropriate strength training routine (8, 19, 20).

PRACTICAL APPLICATION/COMMENTS:

As someone myself in this older category (>50) I would make the following observations with regarding to training and adaptation.



1. Neural strength gains are typically larger than muscle CSA gains as you get older.
2. Joint/tendon over-loading can result from this increase in neural gain over CSA increase if not well managed. (shoulders, back & knees being three areas of particular concern).
3. Physiological recovery rates are typically much slower than when you were younger (partly due to changes in hormonal levels, also a reason for the low increase in CSA – a future post), so you have to be more considerate with your program planning/periodization (future post).
4. Core stability is key to ensure your spine is protected (as joint flexibility decreases with age resulting in the lumbar spine being less able to tolerate excessive forces placed upon it during any lifting activity).
5. The adage “Use it or Lose It” applies well to physical conditioning with older adults. It is far easier to maintain a given strength level/muscle size when you are older than it is to try to increase strength/muscle size – so the goal should be not to lose these physical attributes in the first place – and this can be achieved by undertaking regular conditioning training starting as early as possible and continuing these routines into your old age.

Future articles will look at many aspects of strength and conditioning with the older population to try to debunk many incorrectly held beliefs about what can be achieved if you have the will to get yourself into shape.

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