

Changes in body composition with aging: results from longitudinal studies

Marjolein Visser, VU University, and VU University Medical Center, Amsterdam, Netherlands

The aim of this presentation is to review patterns of change in body composition over time in adults. It has long been thought that age-related loss of weight, along with loss of muscle mass, was largely responsible for muscle weakness in older people.² It is now clear that changes in muscle composition are also important, eg, adipose tissue infiltration in muscle can lower muscle quality and function). In this way, a weight-stable older person may still lose lean body mass and functionality. However, the recent worldwide increase in the prevalence of obesity complicates the relationship between weight change, muscle loss, and decreasing strength with aging.

The first step in understanding age-related changes in body composition is to determine how to measure such changes accurately and to repeat these measures over time in the same individuals. Both longitudinal and cross-sectional studies have been used to relate changes in Body Mass Index (BMI) to age; BMI increases with age (Figure 1).¹ Longitudinal data are more reliable than cross-sectional data because longitudinal data avoid cohort differences.

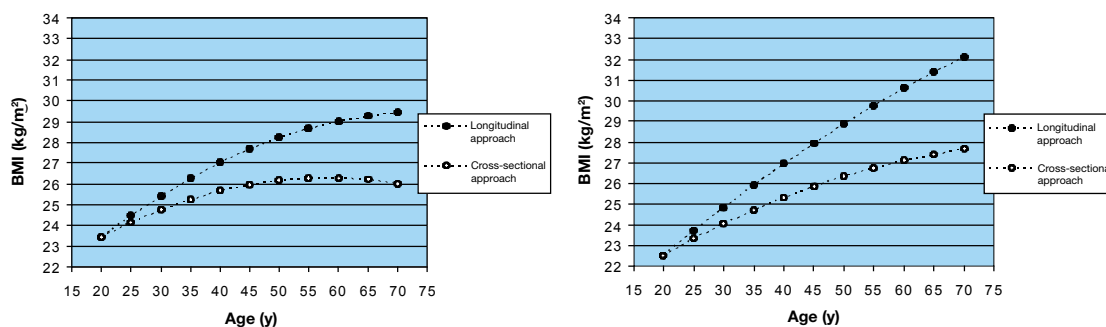


Figure 1. BMI versus age in men (left) and women (right), as determined in longitudinal and cross-sectional studies

BMI increases with age, but cross-sectional data under-estimated the increase because recent-born cohorts had higher BMI levels than did earlier-born cohorts. (Adapted from Nooyens¹)

But BMI determinations do not distinguish between fat and lean (nonfat) body mass. Further, BMI does not capture the distribution of fat over the body. Measurements of waist and various body circumferences can provide evidence of changes in visceral and peripheral fat. Measurements of skinfold thickness can be used to characterize changes in subcutaneous fat distribution. More sophisticated measures, such as dual X-ray absorptiometry (DEXA), magnetic resonance imaging (MRI), or computed tomography (CT), distinguish fat depots from nonfat body mass, but these imaging methods are more expensive than simple anthropometric measures.

Taken together, various techniques for assessing body composition have shown the following patterns of change:

- In aging men, the percentage of fat mass increases initially, then levels off or decreases. Such change has been attributed to accelerated decrease in lean mass, along with an initial increase and a later decrease in fat mass.³ Women show a generally similar pattern.³
- Intramuscular and visceral fat tend to increase with aging, while subcutaneous fat declines in other areas of the body.⁴⁻⁶
- Increased fat infiltration into muscle with aging is associated with lower muscle strength and reduced lower extremity performance.⁷
- In older individuals (70-79 years), skeletal muscle mass declines by about 1 percent per year (Figure 2).⁴
- While there are many individual weight patterns in old age, weight loss (and regain) accelerates muscle loss.

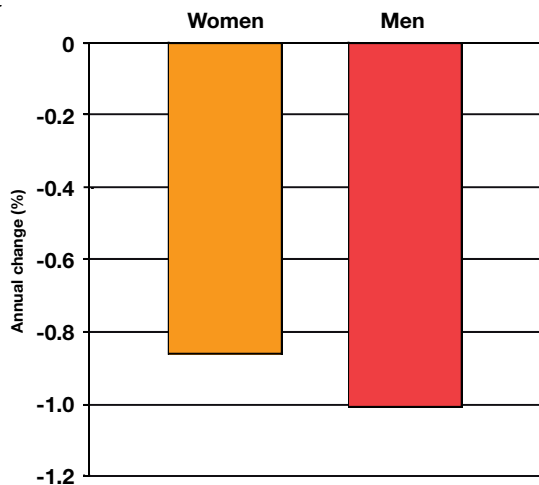


Figure 2. Loss of skeletal muscle over 3 years in older adults (Goodpaster, 2006)

In conclusion, the age-related changes in body composition may lead to a decline in physical function in older adults. Individual body composition measurements can be compared to an age-matched population as a way of assessing health status and estimating physical performance.

Take-home messages

- BMI tends to increase with aging in both men and women.
- With aging, skeletal muscle mass declines, especially in adults older than 70 years.
- There are many individual weight patterns in old age, but weight loss (with or without regain) accelerates muscle loss.

References

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Discussion

Irit Hermesh: What should we do about obese elderly people? Should we forbid them to diet because they will lose lean body weight? Is it better for them to be at an ideal BMI or to keep lean body mass? What is the balance?

Marjolein Visser: This question is a very important one, which we will address more today and again tomorrow. You don't want a person to lose lean tissue. Diet without doing anything else is the worst thing you can do both for bone and muscle. If ever you put a person on a diet, it has to go hand-in-hand with physical activity to avoid loss of lean body mass.

Abellan van Kan Gabor: I would like to comment on the data you are managing; it represents a really healthy, healthy American population. We don't have any data about loss of muscle mass and strength in aged, frail people. I think the population in health ABC is not the same population we are seeing in our consultations, in the hospital, hospitalized or in our rehabilitation units. It's a totally different population in terms of muscle mass and muscle strength—not our everyday patients.

Marielle Emmelot-Vonk: Can you explain to me why men lose more muscle mass than women?

Marjolein Visser: That's a good question, but we really don't know the answer yet. Of course men and women start off with different body compositions. But even when we adjust for body composition, men still lose more muscle mass than women. This is one of many questions yet to be answered.

Alfonso Cruz: Do we have enough data to say at what age peak muscle mass is achieved? Is there a difference between men and women?

Marjolein Visser: I don't know if we have a mixed longitudinal design with accurate measures of muscle to do that. The concept of peak muscle mass comes from cross-sectional studies; those studies show that around age 25 to 30 you start to decline. But I don't really know if we would see the same result in longitudinal studies.