Skeletal muscle mass and cardiovascular health

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What is the connection between skeletal muscle mass and cardiovascular health? Three recent studies demonstrate that an increase in skeletal muscle mass could lead to improved cardiovascular health regardless of fat mass.

Cardiovascular disease is the leading cause of death and disability worldwide.1 To improve cardiovascular health, the American Heart Association (AHA) recommends monitoring of 7 risk factors and health behaviors (Life’s Simple 7) to improve cardiovascular health.2 This metric includes blood pressure, cholesterol control, improving blood glucose levels, increasing physical activity, eating a heart-healthy diet, weight loss, and smoking cessation. Two risk factors, adequate quantities of physical activity and weight are associated with ideal cardiovascular health.3-6

Other measures of body composition have emerged recently as significant predictors of cardiovascular health, in addition to modifying weight as a Life’s Simple 7 metric.7 The loss of skeletal muscle mass, which naturally occurs during aging but may be accelerated due to physical inactivity,8 may be associated with poor cardiovascular health. While it is not surprising that weight is associated with cardiovascular health, the outcomes from three studies present additional insights.
Studies Show an Increase in Skeletal Muscle Mass Improves Cardiovascular Health

The consensus amongst these studies demonstrated an increase in skeletal muscle mass would improve cardiovascular health. The role of body fat and cardioavascular health was variable, however, with differences among genders. In 2016, Srikanthan et al.\textsuperscript{3} evaluated the relationship between cardiovascular mortality and skeletal muscle mass and cardioavascular mortality and fat mass in 6,451 individuals by stratifying them into four groups according to body muscle mass and fat mass. The four groups included:

1. low muscle mass/low fat mass
2. low muscle mass/high fat mass
3. high muscle mass/low fat mass
4. high muscle mass/high fat mass

Increased skeletal muscle mass was associated with a lower incidence of cardiovascular mortality, so the lowest rates were observed in group 3: high muscle mass/low-fat mass.\textsuperscript{3} Of note, however, cardiovascular mortality was also low in group 4 with high muscle mass/high fat mass, suggesting increasing muscle mass, fat mass, and body mass index (BMI) was
significantly associated with improved survival. In fact, most individuals in group 4 had high muscle mass, and their BMI was high enough to categorize them as overweight, obese, or morbidly obese according to World Health Organization obesity categories.\(^9\)

The cardiovascular mortality risk was significantly lower in group 3, high muscle mass/low-fat mass, than group 1, low muscle mass/low-fat mass, demonstrating the importance of skeletal muscle mass for cardiovascular health. Furthermore, sex differences were observed in these associations. In women, group 4 had significant protection against cardiovascular disease, revealing a lower cardiovascular mortality risk (even with hormone and metabolic risk factors). Those in group 3 did not. Whereas in men, the high muscle mass/low fat mass group had a reduced cardiovascular mortality risk, and the high muscle mass/high fat mass group demonstrated a trend toward lower cardiovascular mortality risk.

Similar findings demonstrating the benefit of increased muscle mass with decreased cardiovascular disease risk were reported by Tyrovolas and colleagues (2020)\(^4\) in the large ongoing ATTICA study. This study initially enrolled men and women without cardiovascular disease. Ten years later, a second evaluation was performed with 1,019 men and women at least 45 years of age. Nearly 27% of these individuals presented with cardiovascular disease; 6 times more often in men than women. What was interesting in these outcomes was that those who had the most muscle mass at the study onset were least likely to have cardiovascular disease, demonstrating an 81% decreased risk for cardiovascular disease irrespective of quantity of physical activity, diet, or education. Muscle mass was not associated with cardiovascular disease incidence in women.

A more recent study by Knowles et al. (2021)\(^5\) analyzed similar variables of skeletal muscle mass, fat mass, and cardiovascular disease risk. After evaluating the association between skeletal muscle and fat mass with cardiovascular disease incidence, in contrast to Srikanthan et al.,\(^3\) body fat and skeletal muscle mass were not found to be superior to BMI for predicting nonfatal cardiovascular events. BMI did not distinguish between fat mass and skeletal muscle mass.\(^5\) While the researchers observed a strong positive association between fat mass and cardiovascular risk, the relationship between cardiovascular disease risk and skeletal muscle mass varied by sex. A positive log-linear association was found in men, whereas a curvilinear response relationship was observed in women. As skeletal muscle mass increased, cardiovascular risk increased to a point, but with additional increases, cardiovascular risk decreased.

In evaluating the risk of incident myocardial infarction and sex-specific differences from UK Biobank data, central adiposity, particularly waist-to-hip ratio, was more strongly associated with risk of myocardial infarction (MI) in women than men with no history of cardiovascular disease.\(^6\)

**Clinical Implications**

Despite the varied role of body fat in the outcomes of these studies, increasing skeletal muscle mass to improve cardiovascular health is consistent with the AHA’s Life’s Simple 7 and cannot be overstated.
First, while body composition is important for predicting cardiovascular mortality in patients with cardiovascular disease, it is also essential to emphasize the need to increase muscle mass through physical activity as a priority before weight loss. Weight loss is not always beneficial in women with cardiovascular disease.\(^\text{10}\) Download PCNA’s **Heart Healthy Toolkit** for tips on helping your patients make lifestyle changes and for patient handouts that extend the value of the clinical encounter.

Another reason to increase physical activity is that increased muscle mass is typically found in more active individuals, which protects heart health, and fitness is a major predictor of improved survival in the general population and those with cardiovascular.\(^\text{11}\)

Muscle mass begins to decrease at age 30-40, so reinforcing adequate quantities of physical activity engagement is consistent with guidelines\(^\text{12}\) on maintaining cardiovascular health as individuals age, is a priority. Moreover, skeletal muscle mass is also more likely to be modifiable by lifestyle interventions such as physical activity rather than whole body muscle or fat-free mass.

Increasing muscle mass may also influence the metabolic effect of cardiovascular disease risk. Furthermore, insulin resistance is associated with cardiovascular disease.\(^\text{13}\) Skeletal muscle mass accounts for 85% of the body’s glucose disposal; thus, increased muscle mass may improve metabolic health.\(^\text{3}\) Learn more about the connections between cardiovascular disease and diabetes in PCNA’s complimentary CE course, **Making the Link Between Diabetes and Cardiovascular Disease**.

Lastly, other indexes of body composition besides BMI may be beneficial when predicting cardiovascular mortality such as waist circumference and waist-to-hip ratio. While BMI is a simple measure for assessing cardiovascular disease risk, waist circumference is also simple to measure although it has not been established as a better anthropometric measure.\(^\text{14-15}\) Waist-to-hip and BMI provide different information,\(^\text{7}\) suggesting waist-to-hip ratio is a better indicator for MI risk than BMI, irrespective of sex, although more strongly in women.\(^\text{6}\)

References


