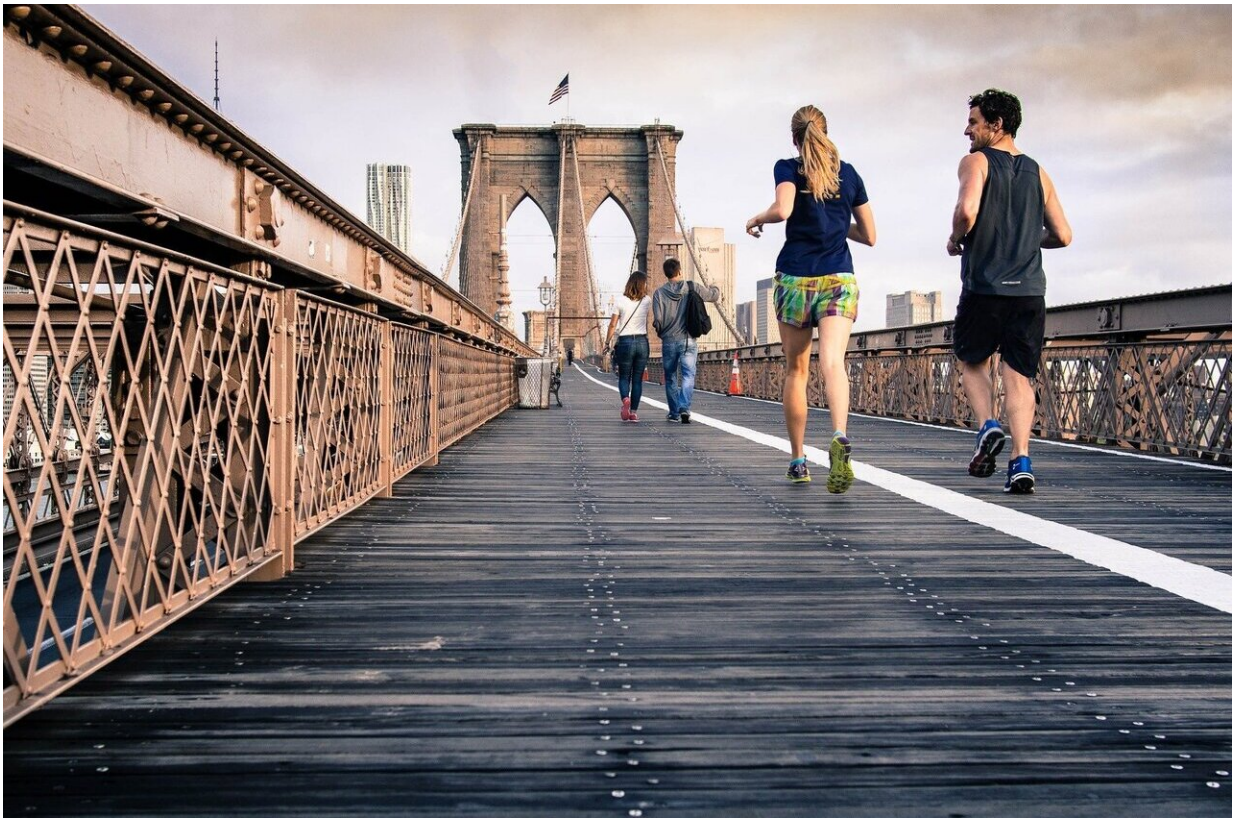
MedicalXpress

Blood vessel growth in muscle is reduced in women after menopause

September 22 2020



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A new study from the University of Copenhagen's Department of Nutrition, Exercise and Sports demonstrates that formation of small blood vessels is impaired in the muscle tissue of postmenopausal women.

The study's findings highlight the importance of physical activity for women prior to and during menopause, as a means to prevent the development of disease later in life.

The risk of developing cardiovascular disease generally increases with age. For most of their lives, women have a lower risk of cardiovascular disease than men, but the picture changes as menopause sets in. The exact reason has yet to be fully understood.

Spinning failed to stimulate blood vessel growth

A new study has demonstrated that postmenopausal women have a significantly reduced ability to form tiny blood vessels, called capillaries, in their muscles—compared to younger women. The study showed that older women were unable to increase the number of capillaries in skeletal muscle tissue after an eight-week period of spinning on stationary bikes, in contrast with what has previously been demonstrated in both younger and older men.

Capillaries are important for health as they are needed for absorbing sugar and fat into muscles. The loss of capillaries can also have an effect on insulin resistance and contribute to the development of type 2 diabetes.

Despite the absence of capillary growth, the women's health improved in a number of other ways after the eight weeks of spinning, including overall fitness.

Line Nørregaard Olsen, a Ph.D. student at the University of Copenhagen's Department of Nutrition, Exercise and Sports explains that the lack of improvement with regards to new capillary growth is most likely due to the permanent loss of estrogen after menopause:

"The study supports the idea that women benefit from being physically active prior to menopause, while their estrogen levels are high. It provides them with a better physical starting point as they enter menopause—which is important. Even though eight weeks of training of the post-menopausal women has a noteworthy effect on some parameters, it had no effect on capillary formation in muscle. A sufficient number of capillaries in muscle is important for muscle function and reduces the risk of developing type 2 diabetes."

Professor Ylva Hellsten, also of UCPH's Department of Nutrition, Exercise and Sports, and the principal investigator, elaborates on the study's potential implications: "It is important to emphasize that both men and women are greatly served by being physically active throughout life, regardless of their age. But the current study suggests that there are some crucial differences between men and women in the way that the cardiovascular system is affected by aging and physical activity. As a result, this study should lead to an adjustment of the training recommendations for women in this age group."

In future studies, the researchers will evaluate which training is most effective to develop the health of the postmenopausal women.

About the study

- Two groups of women participated in the study: 12 women 59-70 years of age (postmenopausal) and five women 21-28 years of age (premenopausal). Both groups had a biopsy taken from their thigh muscle. Furthermore, the older group was trained over an eight-week period, three times weekly, on spin bikes at moderate to high intensity.
- The postmenopausal women took part in tests of their physical fitness and on a range of other parameters both before and after training. Both before and after the training, this group of

participants had tissue samples taken from their thigh muscles, which were used to analyze the number of capillaries in their muscles, as well as to analyze several muscle-specific proteins.

- After 8 weeks of aerobic exercise, in the form of spinning, the fitness of the postmenopausal women improved by 15%.
- The process by which new capillaries are formed is called 'angiogenesis'. Capillaries are essential for the transport of oxygen and nutrients to the body's cells.
- In the project, cells in capillaries called 'endothelial cells' were studied in the laboratory by isolating them from muscle samples obtained from the participating women. This has never been done before.
- The study has ben published in the article "Angiogenic Potential is Reduced in Skeletal Muscle of Aged Women" in the renowned scientific journal *Journal of Physiology*.

More information: *Journal of Physiology* (2020). DOI: 10.1113/JP280189

Provided by University of Copenhagen