

Exercise could be the heart's fountain of youth

July 23 2008

Absence may make the heart grow fonder, but endurance exercise seems to make it younger. According to a study conducted at Washington University School of Medicine in St. Louis, older people who did endurance exercise training for about a year ended up with metabolically much younger hearts. The researchers also showed that by one metabolic measure, women benefited more than men from the training.

"We know that the heart deteriorates as people get older, and that's largely because they don't stay as active as they used to," says first author Pablo F. Soto, M.D., instructor in medicine in the Cardiovascular Division. "Past research has suggested that exercise can reverse some effects of aging, and we wanted to see what effect it would have specifically on the heart."

The researchers measured heart metabolism in sedentary older people both at rest and during administration of dobutamine, a drug that makes the heart race as if a person were exercising vigorously. At the start of the study, they found that in response to the increased energy demands produced by dobutamine, the hearts of the study subjects didn't increase their uptake of energy in the form of glucose (blood sugar).

But after endurance exercise training — which involved walking, running or cycling exercises three to five days a week for about an hour per session — the participants' hearts doubled their glucose uptake during high-energy demand, just as younger hearts do.

Soto explains that if heart muscle doesn't take in glucose in response to increased energy needs, it goes into an energy-deprived state, which may raise the risk of heart attack. But if it can increase glucose uptake, the heart is better protected against ischemia (low oxygen) and heart attack.

Based on heart glucose metabolism, both the men and women in the study had the same rejuvenating benefit from their exercise programs. But the heart uses both glucose and fatty acids for energy. And when the researchers looked at fatty acid metabolism, they found a striking difference in the results of exercise training between women and men. In the men, the heart's fatty acid metabolism dropped in response to increased energy demand, but it went up in women.

"By that gauge, the women had a better response to exercise training than the men," Soto says. "At this point, the significance of that isn't clear. We know that in animal studies low fatty acid oxidation leads to heart muscle thickening and that when men train their heart muscle often gets thicker than women's. It could be that the increase in fatty acid oxidation in women's hearts with training is a reason why their hearts don't thicken as much."

The study is described in an article that appeared in advance online publication on June 20, 2008 in the American Journal of Physiology. The participants were six men and six women, ages 60 to 75, who were not obese but who had been living an inactive lifestyle. They were put on an eleven-month program of endurance exercise under the careful guidance of a trainer.

For the first three months, they were required to exercise to about 65 percent of their maximum capacity. After that, the program was stepped up so participants reached about 75 percent of maximum. Soto says the volunteers enjoyed the experience and told him they felt in the best shape they had been in years.

The researchers tested the volunteers' heart metabolism before and at the end of their exercise programs by using PET scanning techniques. "Here at the School of Medicine, we are uniquely able to look at the metabolism of the heart because we have the right combination of technology and expertise in cardiology, radiology and radiochemistry," Soto says. "We are one of the few places that can do this kind of study."

Next, the research team will investigate exercise training in individuals with heart failure. "In the past heart failure patients were told to limit their activity," Soto says. "Now more and more we're seeing there is potentially a benefit to getting them as active as possible. We want to know if heart failure patients will experience the same benefit in heart metabolism with exercise that we saw for older people."

Citation: Soto PF, Herrero P, Schechtman KB, Waggoner AD, Baumstark JM, Ehsani AA, Gropler RJ. Exercise training impacts myocardial metabolism of older individuals in a gender-specific manner. *American Journal of Physiology. Heart and Circulatory Physiology*. June 20, 2008 (advance online publication).

Source: Washington University

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