

Eat less or exercise more? Either way leads to more youthful hearts

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Overweight people who lose a moderate amount of weight get an immediate benefit in the form of better heart health, according to a study conducted at Washington University School of Medicine in St. Louis. And the heart improvements happen whether that weight is shed by eating less or exercising more.

"If individuals want to do something that's good for their heart, then my message to them is lose weight by the method they find most tolerable," says the study's senior author Sándor J. Kovács, Ph.D, M.D., director of the Cardiovascular Biophysics Laboratory and professor of medicine. "They're virtually guaranteed that it will have a salutary effect on their cardiovascular system."

Studying a group of healthy, overweight but not obese, middle-aged men and women, the researchers found that a yearlong regimen of either calorie restriction or exercise increase had positive effects on heart function. Their analysis revealed that heart function was restored to a more youthful state so that during the heart's filling phase (called diastole) it took less time for participants' hearts to relax and fill with blood. The findings will appear in an upcoming issue of the *American Journal of Physiology* and are now available online.

"As we get older, our tissues become more fibrotic as collagen fibers accumulate," says study co-author John O. Holloszy, M.D., professor of medicine in the Division of Geriatrics and Nutritional Science. "So the arteries and heart muscle stiffen, and the heart doesn't relax as well after

contracting. Similar studies that we've conducted with members of the Caloric Restriction with Optimal Nutrition Society (CRONies) show they have heart function resembling much younger people." CRONies voluntarily consume about 25 percent fewer calories than the average American while still maintaining good nutrition.

The scientists used ultrasound imaging (echocardiography) to measure the diastolic or filling phase of the cardiac cycle because it is a crucial indicator of heart health. "During filling, the left ventricle is a suction pump," Kovács explains. "Think of the rubber bulb of an old-fashioned bicycle horn — you squeeze it (the analog of the ejection phase of the cardiac cycle), then let go (the analog of the filling or diastolic phase) and the rubber bulb springs back to its original shape, sucking air back in. Similarly, the heart's muscle and connective tissue are elastic, and after ejecting blood to the body during contraction (systole), the left ventricle springs back to draw in new blood (diastole). It's during this filling phase of the cardiac cycle that subtle changes in heart health can be most readily detected."

By the end of the yearlong study, both the calorie restriction and exercise groups of volunteers lost 12 percent of their weight and 12 percent of their body mass index (BMI), a measurement considered to be a fairly reliable indicator of the amount of body fat. In both groups, participants' hearts responded to this weight loss by gaining the ability to relax more quickly, recovering some of the elasticity characteristic of younger heart tissue. Those in the calorie restriction group achieved slightly more reduction of heart stiffness.

Cardiologists can measure delicate alterations in diastolic function because of the work of Kovács, also professor of cell biology and physiology and adjunct professor of physics and of biomedical engineering, who developed a methodology called parameterized diastolic filling (PDF) formalism, which analyzes the filling of the heart

according to physical laws and determines the chamber's elasticity and stiffness. Previous studies in humans using the PDF formalism have shown that it's a more sensitive and specific predictor of cardiovascular health than conventional indexes of heart function determined by echocardiography.

Although previous studies also have indicated that the heart benefits from weight loss, those studies were performed on morbidly obese people, few focused on diastolic function and none used the sophisticated PDF formalism. By looking at filling function in healthy, non-obese people using PDF formalism, the researchers in the current study were able to understand in more detail how normal hearts react to moderate weight loss.

The detailed analysis showed that in both groups, the left ventricle gained an increased capacity to expand to accommodate blood entering during diastole. In the calorie restriction group, the global stiffness of the left ventricle decreased, suggesting that the muscle and connective tissue of the heart more readily sprang back after the contraction phase. This group also experienced a decrease in the internal pressure gradient, indicating that their left ventricles had better suction ability.

The study participants were nonsmokers between ages 50 and 60 and had BMIs between 23.5 and 30, making them high normal to overweight. None of the participants had diabetes, coronary artery disease, stroke, hypertension, cancer or lung disease. Before enrolling in the study, all were relatively sedentary — they exercised less than 20 minutes a day or twice a week.

Twelve participants (four men and eight women) were in the calorie restriction group, in which volunteers reduced the amount of calories they ate between 12 percent and 15 percent. Their physical activity did not change. Thirteen participants (six men and seven women) were in the

exercise group and increased their exercise to burn the caloric equivalent of the other group's caloric reduction. The exercise group exercised about six days a week for an hour each session walking, running, cycling or doing elliptical training. Their caloric intake did not change.

Kovács said he feels the study offers encouragement for those who are overweight. "One reason that it's hard to get people to change their behavior and lose weight is that we warn them about consequences of being overweight that might occur sometime in the future — we say if your BMI is too high, eventually you'll develop heart disease, diabetes or hypertension," Kovács says. "But now we can tell them, lose weight and right away you can have better cardiovascular health."

This study was part of a larger trial, CALERIE (Comprehensive Assessment of Long-term Effects of Reducing Intake of Energy), designed to investigate the feasibility of long-term calorie restriction in humans. CALERIE investigators have begun a second phase of their study in which they will determine the effect of calorie restriction in younger people, age 25 to 45.

Source: Washington University

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