

University of Maryland School of Medicine Study Shows Laughter Helps Blood Vessels Function Better

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Volunteers were shown funny and disturbing movies to test the effect of emotions on blood vessels

Using laughter-provoking movies to gauge the effect of emotions on cardiovascular health, researchers at the University of Maryland School of Medicine in Baltimore have shown for the first time that laughter is linked to healthy function of blood vessels. Laughter appears to cause the tissue that forms the inner lining of blood vessels, the endothelium, to dilate or expand in order to increase blood flow.

When the same group of study volunteers was shown a movie that produced mental stress, their blood vessel lining developed a potentially unhealthy response called vasoconstriction, reducing blood flow. That finding confirms previous studies, which suggested there was a link between mental stress and the narrowing of blood vessels.

The results of the study, conducted at the University of Maryland Medical Center, will be presented at the Scientific Session of the American College of Cardiology on March 7, 2005, in Orlando, Florida.

The endothelium has a powerful effect on blood vessel tone and regulates blood flow, adjusts coagulation and blood thickening, and secretes chemicals and other substances in response to wounds, infections or irritation. It also plays an important role in the development of cardiovascular disease.

“The endothelium is the first line in the development of atherosclerosis or hardening of the arteries, so, given the results of our study, it is conceivable that laughing may be important to maintain a healthy endothelium, and reduce the risk of cardiovascular disease,” says principal investigator Michael Miller, M.D., director of preventive cardiology at the University of Maryland Medical Center and associate professor of medicine at the University of Maryland School of Medicine. “At the very least, laughter offsets the impact of mental stress, which is harmful to the endothelium.”

The study included a group of 20 non-smoking, healthy volunteers, equally divided between men and women, whose average age was 33. The participants had normal blood pressure, cholesterol and blood glucose levels. Each volunteer was shown

part of two movies at the extreme ends of the emotional spectrum. They were randomized to first watch either a movie that would cause mental stress, such as the opening scene of “Saving Private Ryan” (DreamWorks, 1998), or a segment of a movie that would cause laughter, such as “King Pin” (MGM, 1996). A minimum of 48 hours later, they were shown a movie intended to produce the opposite emotional extreme.

Prior to seeing a movie, the volunteers fasted overnight and were given a baseline blood vessel reactivity test to measure what is known as flow-mediated vasodilation. For that test, blood flow in the brachial artery in the arm was restricted by a blood pressure cuff and released. An ultrasound device then measured how well the blood vessel responded to the sudden increase in flow.

Volunteers watched a 15-minute segment of the movie while lying down in a temperature-controlled room. After the movie was shown, the brachial artery was constricted for five minutes and then released. Again, ultrasound images were acquired. Changes in blood vessel reactivity after the volunteers watched a movie lasted for at least 30 to 45 minutes. A total of 160 blood vessel measurements were performed before and after the laughter and mental stress phases of the study.

There were no differences in the baseline measurements of blood vessel dilation in either the mental stress or laughter phases. But there were striking contrasts after the movies were seen. Brachial artery flow was reduced in 14 of the 20 volunteers following the movie clips that caused mental stress. In contrast, beneficial blood vessel relaxation or vasodilation was increased in 19 of the 20 volunteers after they watched the movie segments that generated laughter. Overall, average blood flow increased 22 percent during laughter, and decreased 35 percent during mental stress.

Several volunteers had already seen “Saving Private Ryan,” says Dr. Miller, but even so, some of them were among the 14 with reduced blood flow.

“The magnitude of change we saw in the endothelium is similar to the benefit we might see with aerobic activity, but without the aches, pains and muscle tension associated with exercise,” says Dr. Miller. “We don’t recommend that you laugh and not exercise, but we do recommend that you try to laugh on a regular basis. Thirty minutes of exercise three times a week, and 15 minutes of laughter on a daily basis is probably good for the vascular system.”

Dr. Miller says this study was not able to determine the source of laughter’s benefit. “Does it come from the movement of the diaphragm muscles as you chuckle or guffaw, or does it come from a chemical release triggered by laughter, such as endorphins?” he asks. Dr. Miller says a compound called nitric oxide is known to play a role in the dilation of the endothelium. “Perhaps mental stress leads to a breakdown in nitric oxide or inhibits a stimulus to produce nitric oxide that results in vasoconstriction,” says Dr. Miller.

The current study builds on earlier research Dr. Miller conducted on the potential benefits of laughter, reported in 2000, which suggested that laughter may be good for the heart. In that study, answers to questionnaires helped determine whether people were prone to laughter and ascertain their levels of hostility and anger. Three hundred volunteers participated in the study. Half of them had suffered a heart attack or had undergone coronary artery bypass surgery; the other half did not have heart disease. People with heart disease responded with less humor to everyday life situations than those with a normal cardiovascular system.

Dr. Miller says certain factors in the earlier study may have affected the results. For example, he says it may be that people who have already had a coronary event are not as laughter-prone as those who do not have heart disease.

He says the current study sought to eliminate that uncertainty by using volunteers whose cardiovascular system was healthy. The results of the brachial artery blood flow measurements, which are precise and objective, appear to make the connection between laughter and cardiovascular health even stronger, according to Dr. Miller.

Other researchers in the study included Charles Mangano, R.D.M.S; Young Park, M.D.; Radha Goel, M.D.; Gary Plotnick, M.D. and Robert A. Vogel, M.D., all from the University of Maryland School of Medicine. The study was supported by a grant from the National Institutes of Health and a Veterans Affairs Merit award to Dr. Miller.