

# Study: Massaging muscles facilitates recovery after exercise

August 12 2008

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Researchers testing the long-held theory that therapeutic massage can speed recovery after a sports injury have found early scientific evidence of the healing effects of massage. The scientists have determined that immediate cyclic compression of muscles after intense exercise reduced swelling and muscle damage in a study using animals.

Though they say it's too soon to apply the results directly to humans in a clinical environment, the researchers consider the findings a strong start toward scientific confirmation of massage's benefits to athletes after intense eccentric exercise, when muscles contract and lengthen at the same time.

"There is potential that this continuing research will have huge clinical implications," said Thomas Best, a professor of family medicine at Ohio State University and senior author of the study. "If we can define the mechanism for recovery, the translation of these findings to the clinic will dictate how much massage is needed, for how long, and when it should be performed after exercise."

Anecdotal evidence suggests massage offers many health benefits, but actual testing of its effects at the cellular level is more difficult than one might think. In this study with rabbits, the researchers used one mechanical device to mimic movements associated with a specific kind of exercise, and a second device to follow the exercise with a simulated consistent massaging motion on the affected muscles. They compared these animals to other animals that performed the exercise movements

but did not receive simulated massage. All animals were sedated during the experiments.

"We tried to mimic Swedish massage because anecdotally, it's the most popular technique used by athletes," said Best, who is also co-medical director of the OSU Sports Medicine Center and a team physician for the Department of Athletics. "A review of the research in this area shows that despite the existing anecdotal evidence – we know athletes use massage all the time – researchers don't know the mechanism of how massage improves recovery after exercise and injury."

Swedish massage combines long strokes, kneading and friction techniques on muscles and various movements of joints, according to the American Massage Therapy Association.

After the experimental exercise and massage were performed in the study, the researchers compared the muscle tissues of all of the animals, finding that the muscles in animals receiving simulated massage had improved function, less swelling and fewer signs of inflammation than did muscles in the animals that received no massage treatment after exercise.

The research is published in a recent issue of the journal *Medicine & Science in Sports & Exercise*.

The research focused on eccentric exercise, which creates a motion similar to the way in which quadriceps in human thighs are exercised during a downhill run. In the study, the scientists focused on the tibialis anterior muscle, located on the front of the shin in humans. The simulated exercise involved continuous flexing and pointing of the toes to exert the muscle during seven sets of 10 cycles, with two minutes of rest between each set.

"It's hard to describe exactly how the exercise intensity would be matched in a human, but this was considered a significant amount of exercise that would likely cause muscle soreness and possible damage," Best said.

Immediately following the exercise, the affected muscle was subjected to 30 minutes of simulated massage, called compressive loading. The researchers used mathematical equations to determine the appropriate amount of force to apply to the animal muscle, which was intended to match the force Swedish massage typically places on a patient's spine. The device used to simulate the stroking motion for the research was designed by Yi Zhao, assistant professor of biomedical engineering at Ohio State and a co-author of the study.

"We know biological tissues are sensitive to the magnitude of frequency, duration and load, so we controlled the force, frequency and time spent on massage," Best said.

The exercise-massage cycle was repeated for four days, after which the animals' muscle strength and tissue were examined.

The massaged muscles recovered an estimated 60 percent of the strength after the four-day trial, compared to restoration of about 14 percent of strength in muscles that were exercised and then rested.

Similarly, the massaged muscles had fewer damaged muscle fibers and virtually no sign of white blood cells, the presence of which would indicate that the body was working to repair muscle damage, when compared with the rested muscles. The massaged muscles weighed about 8 percent less than the rested muscles, suggesting that the massage helped prevent swelling, Best said.

"One fundamental question is how much of a role does inflammation

play in repair to a muscle? Are we preventing inflammation and therefore improving recovery? We haven't proven that yet," Best said.

He is collaborating with a variety of experts across the university to continue this line of research, and hopes to cooperate with Ohio State's Center for Integrative Medicine on future clinic-based work.

"Our goal is to use this model to understand the biological mechanisms of massage as a guide to preclinical trials to test the effects of massage on muscle recovery after exercise," he said. "A trial in humans could look at optimal indications for massage.

"Ultimately, we could also find out how massage helps not just exercise-induced muscle injury, but swelling and pain associated with other medical conditions, as well."

Source: Ohio State University

Citation: Study: Massaging muscles facilitates recovery after exercise (2008, August 12)  
retrieved 6 May 2024 from

<https://medicalxpress.com/news/2008-08-massaging-muscles-recovery.html>

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