

Mori, H., Ohsawa, H., Tanaka, T. H., Taniwaki, E., Leisman, G., & Nishijo, K. (2004). Effect of massage on blood flow and muscle fatigue following isometric lumbar exercise. *Medical Science Monitor*, 10(5).

Background

Fatigue is one factor that limits muscle function and may lead to various pain and injury conditions. It is most commonly caused either by repetitive motion or by sustained muscular contractions. The authors note "One cause of fatigue is restriction of blood flow to actively contracting muscles. Insufficient delivery of oxygen and inadequate removal of metabolic waste products can occur without adequate blood flow to muscles."

Massage is widely believed to have a beneficial effect on treating muscle fatigue and has been used in clinical and sports settings for that purpose. Various efforts have been made to investigate the effects of massage on the circulatory system. However, the results have been contradictory, making it difficult to draw adequate conclusions about the true benefits of massage to the circulatory system.

To date the majority of studies have recorded only blood flow to the skin, overall blood flow volume in surrounding tissues, or other indirect indicators such as skin temperature. The authors note that "...if increased blood flow only occurs in the skin, then there is little for muscle tissue to gain from it." This study attempted to measure the effects of massage on factors leading to muscle fatigue using improved technological procedures so a more accurate picture of the benefits of massage might be possible.

In this study the authors measured skin and intramuscular blood flow using a techniques called near infrared spectroscopy and infrared thermography. In addition to using these high-tech non-invasive measurement methods, a visual analog scale (VAS) was used for each of the subjects to report their perception of back fatigue. A VAS lets the subject rate their degree of fatigue on a visual sliding scale so it can be observed and compared with other participants. By combining these different measurement procedures the authors attempted to evaluate the effects of massage on circulation in the skin and within the muscles. By evaluating the local circulatory effects, especially within the muscle, it is assumed that a more accurate picture can be produced about the benefits of massage in addressing muscle fatigue.

There were 29 subjects who participated in the study and they were divided into two groups. Both groups participated in two different experimental sessions that were one week apart so to avoid any carry-over effects. Since there were two groups and two different experimental sessions each group did a different experimental session each week. Therefore, by the end of the experiment all subjects had participated in both experimental conditions.

Each participant was asked to lie prone on the treatment table in a resting position with hands behind their heads while the measurement electrodes were attached and initial readings on muscle blood volume, skin temperature, and skin blood flow were collected. They were then instructed to slowly extend their trunks and hold this position for 90 seconds (Load 1). Immediately afterward, they received

either massage for 5 minutes (first condition) or rest for 5 minutes (second condition). In the "rest" condition subjects rested prone on the treatment table for the 5 minutes. In the "massage" condition subjects received effleurage, as well as kneading and compression techniques to the lumbar and sacral region for 5 minutes. Massage treatment was performed by a licensed massage therapist in Japan. Following the rest or massage each subject did the trunk extension again just as before (Load 2). Measurements were taken before and after each instance of the trunk extension activity.

Findings and Discussion

Several interesting findings were evident from the analysis of results. There was an increase in muscle blood volume after the Load 2 period for those receiving massage. Skin temperature was higher in the massage group than in the rest group at each one of the measurement intervals. There was also a decrease in perceived fatigue as measured on the VAS with massage when compared with rest. In the rest group, perceptions of fatigue actually increased.

Previous studies have attempted to correlate the benefits of massage with some of these factors such as increased circulation or removal of lactic acid from muscles after activity. The authors note several studies which have suggested that exercise and movement is more helpful than massage at removing lactic acid from muscles immediately after exercise. However, they note that the means of evaluating the lactic acid change was through blood samples taken from the subject's fingers, when massage was performed to other distant muscle groups. The suggestion made here is that the increase in muscle blood volume may be a specifically local benefit, and that it may, in fact, have a beneficial effect on reducing lactic acid concentrations locally in the muscle. The methods for investigating muscle blood volume changes used in this study were not previously available, so new light may be shed on this concept of lactic acid removal.

It is likely that this debate about lactic acid, circulation, and the exact physiological effects of massage will continue for some time. However, there are still beneficial concepts to be derived from this study. Regardless of the physiological rationale behind the effect, it is of note that massage was helpful in reducing lumbar muscle fatigue after exercise. This is the clinically important and relevant factor to grasp from this study. Now we should also attempt to replicate these results and study the same effects of massage on muscle fatigue on other areas of the body as well.