

Active Muscle Therapy (AMT) Research

Outcomes summary of the collaborative research performed by Jeffrey Forman Ph.D., BCTMB, CMT and Michael E. Rogers Ph.D. at De Anza College Cupertino, Ca. and Wichita State University, Wichita, KS..

Many have speculated that combining movement and resistance with massage is an effective modality for rehabilitating injuries and for reducing myo-fascial restrictions that inhibit performance. Unfortunately there has been a paucity of research in this area. Over the past few years Dr. Jeffrey Forman and Dr. Michael E. Rogers, have conducted innovative experiments using elastic exercise resistance combined with massage to determine the effects that these techniques have on muscle length, strength, pain level, posture and balance.

In 2012, they conducted an Active Muscle Therapy (AMT) study on 64 qualified subjects investigating the effect of deep stripping massage strokes (DSMS) alone and then DSMS combined with eccentric elastic resistance on hamstring length and strength. The results indicated that, in less than three minutes, DSMS combined with eccentric resistance increased terminal hamstring length 10.7% and DSMS alone resulted in a 6.3% increase in hamstring flexibility ($p < 0.01$). The improvement following DSMS with eccentric resistance was greater ($p < 0.05$) than following DSMS alone. Strength was not significantly affected by either treatment. The hamstring strength of the DSMS-alone hamstring decreased 1.8%, while the DSMS combined with eccentric resistance hamstring strength increased 1.1 %. The researchers believe that results of the strength measures might have been different if the participants were given a greater recovery period to overcome exercise induced fatigue. In the current study, the participants had less than five minutes to recover from intervention to post test, and thus their hamstrings could still have been fatigued from the eccentric loading and massage combination. Given adequate time to recover, the potential for significant strength gains would possibly increase. In conclusion, while many techniques to improve flexibility have previously been explored and more continue to be studied to determine the most efficient and effective methods, the results of this study indicate that utilizing DSMS with eccentric resistance improves flexibility to a greater extent than DSMS alone. Obtaining and maintaining normal joint range of motion is an important factor in injury prevention, and this technique may prove beneficial and effective in the work of athletic trainers, massage therapists, and physical therapists when the aim is restoring flexibility to restricted joints. Further study is needed to determine how long flexibility is enhanced following DSMS combined with eccentric resistance. Training studies utilizing these techniques are warranted to determine the effects of these techniques on flexibility and strength over time. This research was published in [Journal of Bodywork & Movement Therapies \(2014\) 18, 139e144](#).

In 2013, Forman and Rogers studied the effects of eccentric resistance and active participant movement combined with massage in the treatment of the nonspecific neck and upper shoulder pain of office workers. Office workers frequently experience nonspecific neck and upper shoulder pain due to the many hours spent every day in a forward head posture while completing paperwork and using computers. The purpose of this study was to compare the effects that six 30 minute Active Muscle Therapy (AMT) (eccentric elastic resistance and active movement combined with massage treatments to the neck and upper shoulder muscles) had on neck/shoulder pain, neck disability index (NDI) scores, neck range of motion, and forward head posture of office workers to a control group that received no intervention. Twenty seven participants qualified and completed this study. The sixteen participants in the AMT massage group demonstrated decreased VAS neck/ shoulder pain scores and improved neck disability index scores ($p < 0.05$); decreased forward head posture and increased neck flexibility in all directions ($p < 0.05$). While this treatment group also demonstrated decreased visual analog scale (VAS) pain scores after each treatment, one treatment a week for six weeks produced even greater results. After six weeks,

the eleven participants in the control group demonstrated increased VAS pain scores, no change in NDI scores and increased forward head posture. These results indicate that a proactive approach to reducing nonspecific neck/shoulder pain is the best course of action for office workers. Inaction results in the status quo for neck pain, neck disability, flexibility and posture. AMT produced positive results. Just one thirty minute AMT treatment reduced pain whereas one treatment a week for six weeks produced even greater results. Combining eccentric resistance and movement with massage shows great potential for helping office workers reduce their pain, increase neck range of motion and reduce forward head posture. Manual therapists seeking effective modalities to treat individuals with nonspecific neck/shoulder pain should consider adding AMT to their treatments and individuals experiencing neck pain should seek out this type of massage. The effect of this new technique of combining deep stripping massage strokes with eccentric resistance needs to be researched further in order to fully determine its benefits on other muscle groups and myo-fascial restrictions. This research was presented at the 2014 International Research Congress on Integrative Medicine and Health in Miami Florida and the abstract published in *The Journal of Alternative and Complementary Medicine*. May 2014: A48-A48.

In 2014, Forman and Rogers studied the effects of massage combined with eccentric resistance on ankle flexibility and balance in adults aged 50-65 years. Reduced balance is a common part of the aging process that contributes to falls that frequently result in fractures, head injuries, and premature death. This study investigated the effect a single fifteen minute active muscle therapy (AMT) treatment had on balance and ankle flexibility. Thirty-one volunteers (26 women, 5 men; 58.5 ± 4.6 years old) participated in this study. Qualifying individuals had their balance measured with the FDA-approved Sway Balance™ mobile application (Sway Medical, Tulsa, OK) which uses the built-in tri-axial accelerometer within an iPhone or iPod Touch to measure postural sway. The fifteen minute treatment consisted of a 5-minute warm-up massage to the lower legs feet and ankles, a 2.5-minute AMT treatment to each tibialis anterior muscle and a 2.5-minute treatment to each gastrocnemius/ soleus group. Post intervention, balance scores improved 4.8%. After combining the results of both ankles participants demonstrated a 15.4% increase in dorsiflexion and a 9.6% increase in plantar flexion and an overall 12.5% increase in ankle range of motion. The results indicate that combining eccentric resistance with massage improves balance and increases ankle flexibility in adults aged 50-65 years immediately post-intervention. Future research is needed to determine the effects in older populations and the long-term effects of this treatment. The effect on strength and multiple treatments should also be investigated. In addition, the effects that this massage technique has on fall incidence should be researched. Dr Forman his research presented this research at the Fourth International Fascia Research Congress in Reston, Virginia September 2015.

In 2015, Forman and Rogers studied the effects of Deep Stripping Massage Combined with Eccentric Resistance on Quadriceps Pain Threshold, Peak Torque Angle, Strength and Flexibility in University Recreational Athletes. Injuries frequently occur when muscles are repeatedly eccentrically contracted during sporting activities such as basketball, soccer, and running. Bi-articular muscles such as the quadriceps are highly susceptible to injuries because they are subjected to increased flexibility demands while loaded eccentrically during sports activities. The purpose of this study was to determine the acute and sub-acute effects that deep stripping massage combined with eccentric resistance had on the quadriceps: peak torque firing angles, tender points, range of motion and strength. Twenty-one volunteer university recreational athletes (13 women; 8 men; 22.7 ± 1.6 yr.; $69.4 \text{ kg} \pm 13.4$; 170.5 ± 9.5 cm (mean \pm SD)) were recruited from the Wichita State University community. Pre-treatment quadriceps range of motion (ROM) was measured with a Microfete 3 digital inclinometer. Power, peak torque, and peak torque

angle during knee extension were measured with a Biodex 4 isokinetic dynamometer. Four tender points in the quadriceps group (inferior vastus lateralis (IVL), superior vastus lateralis (SVL), vastus medialis (VM), and rectus femoris (RF)) were marked and pain threshold for each was measured with a Wagner Force Ten digital algometer. After initial assessments were completed, participants experienced a 2 min warm-up massage to their dominant leg's quadriceps group. After the warm-up, deep stripping massage combined with resistance was performed for 3 min. The quadriceps group was passively shortened while loaded with resistance from a black CLX band (Performance Health, Akron, OH). The muscle group was loaded with resistance throughout full knee flexion range of motion. After passive knee extension, the participant was instructed to slowly allow the knee to flex while resisting the pull of the band as the researcher stripped the lateral, central and medial aspects of the quadriceps from the patella region to the proximal attachments at a 7 out of 10 on the verbal pressure scale. The pace of the stripping massage stroke was approximately one inch per sec. immediately following and again 1 hr after the treatment, participants had all pre-test measurements repeated. The intervention had no effect on pain threshold immediately after treatment but it was reduced ($p < 0.05$) 1 hr after treatment in 3 of 4 sites (IVL=12.9%; SVL=11.9%; VM=11.8%) with small to medium effect sizes (IVL=0.54; SVL=0.50; VM=0.45 (Cohen's d)). There was no effect on the RF pain threshold, which was absent or hard to locate on many participants. The angle of peak torque increased 4.2% ($p=0.02$) from pre-treatment (71.7°) to 1 hr after treatment (74.7°) with a small effect size (Cohen's $d=0.43$). There was no effect on ROM, average power, peak torque, or average peak torque. Combining eccentric resistance with massage to the quadriceps muscle group had no effect immediately following the treatment. However, after 1 hr of rest, pain thresholds were reduced and peak torque angles increased towards longer muscle lengths while strength was not lost. These results suggest that combining deep stripping massage with eccentric resistance may be a very useful tool in the rehabilitative process and in preventing future injuries caused by eccentric activities because it provides the benefits of eccentric training without the negative side effects. Clinically, this technique could be beneficial in the post-acute phase of an injury before progressing to high eccentric loading. Further research is needed to investigate how long the effects of this technique last, the effect on DOMS, and the effects of multiple treatments. Most of the participants in this study were in excellent condition and it took a lot of palpation to find their most tender points. Tender points are more readily found in the quadriceps of less fit and older individuals and therefore further research on the effects of this technique on these groups is warranted.