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Literature Review: Effects of Myofascial Release on
Range of Motion and Athletic Performance

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Introduction

Myofascial release is a manual therapy technique that uses applied pressure and stretching to muscles and fascia with the intent to improve movement of the muscles and the surrounding fascia (Sefton, 2004). Fascia is a thick, connective tissue that surrounds all muscles and organs. It aids muscle in attaching to bones and gives the muscles structure and flexibility. Fascia becomes fluid and soft when warmed and moved, but if it sits without movement, it can become rigid (Sefton, 2004). Fascia may limit range of motion of the muscles it surrounds along with muscles above and below itself on the chain of surround muscles when it becomes tight or more solid due to inactivity or injury (Sefton, 2004). If the fascia is more solid, it will not maneuver along with movements of the body as well, cause immobility. With overuse, illness, trauma, or other events, adhesions may form between the fascia and muscle tissue causing pain and immobility. Myofascial release is one of many techniques used to increase mobility in a joint or series of joints and also improve athletic performance (Peacock, Krein, Silver, Sanders & von Carlowitz, 2014). Performing myofascial release may be done through massages or through tools, usually done by a therapist, but more commonly, self-myofascial release (SMR) is performed. This is by using body weight or force onto an object such as a foam roller or lacrosse ball to place pressure along a muscle with the intent to target the adhesions in fascia to improve movement (Macdonald, et al., 2013). According to Sefton (2004), indications for myofascial release include structural imbalances, acute and chronic pain, muscle spasms, muscle guarding, and lack of soft tissue mobility. Trigger points, tight areas in muscle or fascia that cause pain or discomfort, are also a reason to incorporate myofascial release. Many studies have supported or refuted the fact that

myofascial release is able to improve pain levels or improve mobility and athletic performance on a joint or series of joints. This literature review will look at various studies and scholarly works to provide a concise and thorough look at the studies both pro and con of myofascial release. This literature review will investigate a select few of the studies investigating the effectiveness of myofascial release on healthy, pain and injury free adults. From examining a variety of studies, conclusions may be reached, bringing closer the final answer of whether or not myofascial release is worth performing on patients.

Review of Literature

There is no debate that having impaired range of motion leads to a higher prevalence of injury. Increasing range of motion is desirable for all, as well as non-athletes, because it will decrease the chance of injury. Impaired range of motion results in some muscles not being activated since the joint is not utilizing all planes of motion. If some muscles are not activating properly, muscle atrophy may occur. Having one additional means of improving range of motion will only decrease the chance of injury. Myofascial release is believed by many in the exercise field to improve range of motion along with improving athletic performance. Improving athletic performance is important not only for maximal efforts and for improving chances of success in competition, but it is important for training. Being able to consistently train at a higher level will ensure greater performance in a future race, game, competition, etc. Foam rolling was shown to dilate the arterial system, restore soft-tissue, and improve vascular plasticity (Okamoto, Masuhara, & Ikuta, 2014). Dilation of the arterial system means an increase in blood flow to the muscles, which will increase how much O₂ is available to the muscles along with other key nutrients. Wastes may also be taken away from muscles much more quickly, allowing for continued increased athletic performance. This data suggests that foam rolling and other myofascial release techniques will improve athletic performance.

The possibility of self-myofascial techniques leading to improved acute and chronic range of motion would be critical in itself for improving athletic performance. In many recent studies, static stretching has been discredited as being as effective as previously thought. Static stretching is the act of extending or flexing a series of joints to elongate a particular muscle or muscle group. Static stretching is done with the muscles

at rest, they are elongated to discomfort, not pain, and held in a stretched position typically for thirty seconds. This position held is at the end limit of natural range of motion and is known to improve end range of motion of that particular movement and the end range of those muscles. Static stretching is commonly performed before sporting activities and bouts of physical fitness, however recent studies have shown it to decrease performance, particularly power output (Marchetti, et al. 2013).

Static stretching has been shown to decrease vertical jump height (Damasceno, et al., 2014), decrease the first 100 meter time in an endurance distance run (Damasceno, et al., 2014), and has been shown to decrease speed in a short sprint of 20 meters (Yıldız, Çilli, Gelen & Güzel, 2013). An inverse correlation was found in the amount of time spent static stretching versus the decrease in sprint times, that is the longer a participant held a static stretch, the slower their sprint time became (Yıldız, et al., 2013). Static stretching even has been shown to decrease performance in muscle groups other than the muscle that underwent static stretching prior to the testing. In one test, participants were put through static stretching of the shoulder and were then asked to perform a maximal concentric jump. There was no significant change in muscle activation, however, the propulsion duration and peak forces were affected, causing a decrease in the performance of the jump (Marchetti, et al., 2014). These results suggest that static stretching has neural affects along with the direct effects on the muscle structure. From recent research, it becomes clear that static stretching is outdated and new ways to improve range of motion and performance before activity need to be investigated and developed.

Currently, many studies show varied results on the effectiveness of myofascial release as a way to increase range of motion and improve athletic performance.

In a study titled *An Acute Bout of Self-Myofascial Release in the Form of Foam Rolling Improves Performance Testing*, researchers compared effectiveness of self-myofascial release in the form of using a foam roller in comparison to a dynamic warm up (Peacock, et al., 2014). The researchers used 11 healthy, athletic, and active males aged 22.18 ± 2.18 . Participants were put through a 5 minute warm up using a slow run followed by the dynamic warm up consisting of arm circles, body weight squats, squat jumps, high knees, butt kickers, alternating jump lunges, alternating log jumps, scapular pushups, thoracic rotations, and clapping pushups. Each movement was performed in two sets of ten. Following the dynamic warm up, participants conducted the performance tests. During the self-myofascial release testing sessions, the same warm up and dynamic warm up were used, but foam rolling was added. Foam rolling was used on the thoracic and lumbar regions, gluteal muscle group, hamstring region, calf region, quadriceps and hip flexor region, and the pectoral region. Each region was foam rolled bilaterally and for 5 strokes over 30 seconds. The performance testing measured differences in flexibility, power, agility and strength. Performance tests included a sit and reach test for testing hamstring and back flexibility, vertical jump and standing long jump for power, an agility test, an indirect one rep bench press for maximum strength testing, and a 37 meter sprint. The dynamic and self-myofascial release testing sessions were one week apart. The concluding results showed a significant difference between the dynamic warm up testing and dynamic warm up coupled with foam rolling. The vertical jump, standing long jump, agility test, indirect one rep max bench press, and 37 meter sprint all showed significant improvements for the myofascial sessions. There were no differences for the sit and reach test with no change in range of motion due to foam rolling.

This study has pros and cons that make it a valuable research effort but leaves room for further study. Foam rolling large muscle groups that allow for maximal power output ensures that the participants are getting proper results from the foam rolling. Having the dynamic warm up for both the control and test sessions is also beneficial in seeing the effects the additional myofascial release has on performance, however it leaves open the further research to evaluate the effectiveness myofascial release alone has on performance. A test with the same subjects with just the 5 minute warm up run followed by foam rolling may be more thorough for study because it would include less variables in the study by excluding the dynamic warm up.

From the results showing that SMR does not improve flexibility, more study needs to focus on effects of SMR on flexibility and mobility. In the research study titled *Self Myofascial Release: Effects on Hamstring Range of Motion and Torque*, the focus was to evaluate changes in hamstring range of motion (ROM) and isokinetic eccentric/concentric hamstring torque production (Evans, 2014). In this study, ten participants first had two days, separated by 24 hours, of familiarization with the format of the study. They then had two testing days, still separated by 24 hours. One day was a control test in which participants were tested in their hamstring torque production and ROM using a sit and reach following passive rest. The experimental day consisted of the same testing performed after a self-myofascial release protocol on a foam roller. For both sessions, a warm up was conducted consisting of a 5-minute cycling warm up at 60% of age predicted max heart rate. Time was carefully tracked for both the control and experimental tests. The first round of tests occurred 8 minutes after the completion of the warm up. During these 8 minutes, participants were either foam rolling for 5 minutes or

undergoing passive rest. Ten minutes after the first tests, the tests were performed again. The data collected from the control and experimental conditions demonstrated no significant differences in any of the measured variables.

This study followed many of the same techniques as other studies that found significant differences for range of motion from myofascial release techniques. The study included a proper warm up and foam rolling key areas, however the results were insignificant. In the discussion section of this study, the researchers acknowledged the possibility of having inadequate pressure upon the foam roller causing insufficient myofascial release. It was suggested that for future studies, the foam rolling sessions be modified to allow for more force upon the foam roller. The study likely did not find significant differences for the torque measurement testing because a single joint, not an entire natural movement, such as a sprint or a jump, produced the movement. Incorporating a more explosive movement with a higher output may show a more significant difference in comparison to isolating one joint and one muscle group.

In a study conducted at the Human Performance Laboratory at the University of Rhode Island titled *The Effects of Myofascial Release with Foam Rolling on Performance*, researchers examined if myofascial release enhanced performance in athletic tests (Healey, Hatfield, Blanpied, Dorfman & Riebe, 2014). This study used 26 healthy college aged individuals who were recreationally healthy, participating in physical activity 3-4 times per week for at least the previous 6 months. Testing sessions were separated by 5 days and were asked to refrain from vigorous activity for 48 hours prior to testing. During both testing sessions, a dynamic warm up was performed consisting of 5 reps each leg of walking lunges, walking knee to chest, side squats,

walking butt kicks, frankensteins, and penny kickers. During the myofascial release testing session, participants foam rolled quadriceps, hamstrings, IT band, calves, latissimus dorsi, and the rhomboids, all for 30 seconds per muscle. On the control test day, participants performed light planking for a time and position equivalent to how long they would have supported their bodies during foam rolling. This was done because it stimulates the same isometric body weight hold that occurs during foam rolling. For both testing sessions, the athletic testing consisted of an isometric force test, vertical jump measurements and an agility test. The isometric force test consisted of participants standing on a force-plate while quarter squatting under a Smith Machine squat bar and maximally pushing against the bar for 10 seconds. The vertical jump test consisted of a maximum vertical jump height without a step and also measuring force production during a vertical jump using a force plate. The agility test consisted of a 5-10-5 yard shuttle run. During the testing, pre and post fatigue along with pre and post soreness were also evaluated using a perceived 0-10 point scale.

The results of the study showed no significant differences between any of the performance test measurements for the participants between their foam rolling session and static plank sessions. However, there was significantly less fatigue after foam rolling in comparison to the participants planking. This study contradicts the previous studies by finding no change in athletic performance between performing myofascial release techniques or not. This study was different in that the participants performed planking instead of passive rest, so further research needs to be done concerning this detail.

In a study conducted at the Memorial University of Newfoundland titled *An Acute Bout of Self Myofascial Release Increases Range of Motion Without a Subsequent*

Decrease in Muscle Activation or Force, investigators studied whether or not SMR using a foam roller would have effects on knee extensor force and activation and knee joint range of motion (MacDonald, Penney, Mullaley, Cuconato, Drake, Behm & Button, 2013). The study consisted of 11 healthy active male subjects. Subjects were tested on quadriceps maximum voluntary contraction force, evoked force and activation, and knee ROM prior to and two and ten minutes after the specific intervention per session. One test session consisted of two, one-minute trials of self-myofascial release using a foam roller and the other session, the control, consisted of no myofascial release techniques. The statistical test, two-way ANOVA with repeat measures, was performed. There were no significant differences between the two different sessions for neuromuscular dependent factors, the maximum voluntary contractions forces or evoked force and activation. However, a significant difference was found for the knee ROM measurements between the varying conditions. The average ROM was significantly different, increasing 12% at the two minute after measurement and 10% ten minutes after the self-myofascial release or control variation. There was also a significant negative correlation between the force exerted and the subjects' ROM prior to foam rolling, but it no longer existed with the changes post foam rolling. Overall, the study showed that self-myofascial release using a foam roller increased knee range of motion without decreasing muscle performance.

This study contradicts previous studies mentioned. The results claim that range of motion benefitted from myofascial release, however performance was left unchanged. The researches were more concerned with performance decreasing as range of motion increased, but performance neither decreased nor increased, so the negative correlation of range of motion to performance resulted in being neutral post myofascial release.

From these four studies, it becomes clear that many mixed results occur from investigating the effectiveness of myofascial release on range of motion and athletic performance. A general consensus seems to be that myofascial release improves athletic performance in short, powerful bouts of exercise that involve multiple joints and muscle groups, such as vertical jumps or sprints. The effect myofascial release has on range of motion still is uncertain. The studies using the standard sit and reach test showed no changes in range of motion, however the study by MacDonald et al. (2013) showed a significant difference in range of motion. MacDonald et al. (2013), however, measured the range of motion of the knee while the participant was in a forward lunged position. Perhaps using a different mode of measuring range of motion produces varied results. It seems that athletic performance was affected when it involved full body power movements and no single joint power movements. It also seems that range of motion was changed when the variable measured was a single joint such as knee ROM, but it had no effect on range of motion when measured as a full body movement, such as a sit and reach test. The type of motion, single joint versus full body, showed different results for athletic performance and range of motion, athletic performance only improving for full body motion and range of motion only improving for single joint mobility.

Overall, myofascial release techniques show an ability to improve range of motion and athletic performance depending on the type of range of motion and mode of athletic performance. Further research needs to be conducted to find which muscle groups and joints benefit the most from myofascial release. Also, the technique used when conducting myofascial release can be varied and researched for the most beneficial technique. Further studies utilizing multiple forms of warm up and athletic preparation

for before and after activity may be conducted to find a strong combination of stretching, warming up, dynamic warm ups, and myofascial release techniques.

From researching topics, reading articles, and compiling different thoughts into this literature review, I learned about properly conducting research and how to analyze studies. I learned to use a specific population, such as a narrow age range and a similar group such as elite athletic or recreationally active, to improve consistency with results. It is also important to analyze a variety of statistics. Many of the studies investigated different athletic tests to include flexibility, power, endurance, and agility to gain more variables to study. I have also learned how much work and preparation must go into a study to not only get the study started but how much effort is required to ensure it runs smoothly and holds validity.

I will be able to use much of this acquired knowledge in my future career because I now have a greater understanding of what is involved with research and what is expected of conducting a study. Reading and understanding research-based literature has become much easier to understand as well. An important part of studies is investigating all possibilities and changing variables to find changes in results that conclusions can be drawn from. Overall, this literature review has furthered my knowledge on how to implement knowledge acquired from my undergraduate studies.

References

- Damasceno M. V., Duarte M., Pasqua L.A., Lima-Silva A.E., MacIntosh B.R., et al. (2014). Static stretching alters neuromuscular function and pacing strategy, but not performance during a 3-km running time-trial. *PLoS ONE*, 9(6), 1-8.
- Evans D. F. (2014) Self myofascial release: effects on hamstring range of motion and torque. *Honors College at The Aquila Digital Community: Honors Theses*. Paper 238.
- Healey K. C., Hatfield D. L., Blanpied P., Dorfman L. R. & Riebe D. (2014). The Effects of myofascial release with foam rolling on performance. *Journal of Strength and Conditioning*, 28(1), 61-68.
- MacDonald G., Penney M., Mullaley M., Cuconato A., Drake C., Behm D. G. & Button D. C. (2013) An acute bout of self myofascial release increases range of motion without a subsequent decrease in muscle activation or force. *Journal of Strength and Conditioning*, 27(3), 812-821.
- Marchetti P. H., de Oliveira Silva F. H. D., Soares E. G., Serpa E. P., Nardi P. S. M., Vilela G. B. & Behm D. G. (2014). Upper limb static-stretching protocol decreases maximal concentric jump performance. *Journal of Sports Science and Medicine*, 13, 945-950.
- Okamoto T., Masuhara M., Ikuta K. (2014). Acute effects of self-myofascial release using a foam roller on arterial function. *Journal of Strength and Conditioning Research* 28(1), 69-73.
- Peacock C. A., Krein D. D., Silver T. A., Sanders G. J. & von Carlowitz K. A. (2014). An acute bout of self-myofascial release in the form of foam rolling improves performance testing. *International Journal of Exercise Science* 7(3), 202-211.
- Sefton J. (2004). Myofascial release for athletic trainers, Part 1: theory and session guidelines. *Human Kinetics* 9(1), 48-49.

Yıldız S., Çilli M., Gelen E., & Güzel E. (2013). Acute effects of differing duration of static stretching on speed performance. *International Journal of Human Sciences*, *10*(1), 1202-1213.