THE ACUTE EFFECTS OF SELF-MYOFASCIAL RELEASE (SMR) USING ROLLING BAR ON INCREASING MUSCULOSKELETAL FLEXIBILITY

Kalam Azad Isa[1*], Wan Mohd Norsyam Wan Norman[1], Muhammad Aizudin Ismail[1], Ahmad Firdaos Syauqi bin Ahmad Sidiki[2]

[1]Faculty of Sports Science & Recreation
Universiti Teknologi Mara UiTM Pahang, 26400 Bandar Jengka

[2]Academy of Language Studies
Universiti Teknologi Mara UiTM Pahang, 27600 Raub

[*]Corresponding author: kalam_azad@uitm.edu.my

Abstract

Flexibility is one of the six health-related components which is paramount in athlete's performance by increasing the range of musculoskeletal movement. Additionally, prevention of musculoskeletal injury is highly associated with great flexibility during unimpeded sporting execution. Traditionally, techniques such as static, dynamic, ballistic and Proprioceptive Neuromuscular Facilitation stretching has proven being able to lengthen and increase the musculoskeletal flexibility. In recent studies, Self-Myofascial Release (SMR) technique is proclaimed to also increase person's musculoskeletal flexibility by increasing the range of motion with the prolonged application. However, limited empirical evidence showed the onset application of SMR in increasing the musculoskeletal flexibility. Therefore, N=24 healthy adolescent aged 13.46(.509) was recruited purposely to test the acute effect of SMR on lower extremities flexibility by using a pre-post experimental design. This result of this study indicated that there is an acute effect of SMR application of musculoskeletal flexibility with $t(23) = 7.402$, $p < 0.05$. It is suggested for future study that a comparison between prolonged and onset application of SMR on the musculoskeletal range of motion is carried out and established.

Keyword: Musculoskeletal, flexibility, Self-Myofascial Release

Introduction

Musculoskeletal flexibility is one of the six health-related fitness in which good flexibility will contribute significantly to a person's body posture, reducing the overall injury in daily activities and improving overall physical fitness even among kids (Behm & Chaouachi, 2011). Throughout the growth of puberty, the male adolescent will temporarily become less flexible than they used to be before. Stricker (2009) has explained this nature was caused by the majority of male adolescents who tend to lose some body fats and will grow more muscles, which will result in musculoskeletal flexibility decrease. Therefore, a good flexibility routine in their daily physical activity is essential throughout the growth process. To date, various techniques can be found to increase the person's musculoskeletal flexibility such as dynamic and static stretching, ballistic stretching, and Proprioceptive Neuromuscular Facilitation (PNF), that are proven to extend muscles, increase the range of movement and bring other physiological benefits to a person (Yuktasir & Kaya, 2009). In more recent years, researchers have started to acknowledge Self-Myofascial Release (SMR) technique as an alternative technique to increase musculoskeletal flexibility (Clark, Lucett, & Rodney, 2008) with the

usage of roller foam to enhance musculoskeletal flexibility. The SMR technique initially was used as therapeutic purposes by increasing the mitochondria biogenesis, altering a muscle's viscoelastic properties and improving the blood flow. This is possibly through cumulative angiogenesis and the growth factor of vascular endothelial which will lead to the increase of the person's mobility, speeding the muscle tissue's recovery and to assist athletic performance (Richman, Tyo & Nick, 2019. Healey et al., 2014). Even previous results have shown that SMR was able to stretch muscles and improve the range of motion of a joint among experienced male adolescent users. Škarabot, Beardsley, & Štirn (2015) have argued limited empirical evidence were found in regard effect of SMR among inexperienced users especially using a handheld roller-bar. Therefore, this study is designed to study the acute effect of self-myofascial release using rolling bar on lower limb flexibility among adolescent in order to justify the handheld rolling bar as a tool to improve musculoskeletal flexibility.

Materials and Methods

Subjects

A total number of N=24 male adolescent in the age range of 13.46(.509) was recruited purposely in this present study. These subjects were healthy athletes who are currently in the Hockey Sport Project from Seberang Temerloh Sports School (STSS).

Instrumentation

Musculoskeletal flexibility: This study has to utilize Sit and Reach Test adapted from Davis et al, (2000) to measure the lower back and hamstring flexibility by using Baseline 12-1085 Sit and Reach Trunk flexibility box as the testing instrument. This instrument has been adopted widely in previous literature as the most popular lower-back musculoskeletal flexibility due to the testing being cheaper and easier to conduct. The validity and reliability of this test are also reported to have a moderate validity for estimating hamstring extensibility with r = 0.46-0.67 (Mayorga-Vega, Merino-Marban & Viciana, 2014).

Roller bar: This study has to utilize handheld IDSON muscle roller-bar as the SMR method. The dimension of the rolling bar is 25'' in length and 1.5'' in diameter. Subjects were required and need to hold the bar firmly with both hands on the bar-end handle and they need to roll the bar back and forth on the superficial of the both left and right gluteal, hamstrings, quadriceps, and calf. Subjects were instructed to perform 30 seconds of rolling with little pressure applied for each muscle group both left and right and 30 seconds break time were given between sets. A total number of three sets of rolling were performed by all subjects.

Procedure

Before this study started, the researcher has to obtained official permission from the Temerloh District Education Office and STSS to perform this study. One week before the study, all subjects were briefly explained on the purpose of the present study and all procedures involved throughout the study. Testing protocol and the usage of the roller bar as the SMR treatment were demonstrated by trained research assistants. During the testing day, 15 minutes of general warm-up was given to the subjects. Then, the subjects were tested individually to determine the flexibility level with sit and reach test before the acute application of handheld muscle roller-bar. Three trials were given in this pre-test and the only best score was recorded by the research assistants. After the subjects completed the pre-test, the subjects were instructed to perform SMR using the handheld muscle roller-bar. The subjects were closely observed by research assistance and guidance was given if improper technique detected. The post-test took part after the SMR session ended. Same testing protocol as the pre-test whereby all subjects were tested again with sit and reach test to measure the differences. Three trials were given and only the best score recorded by the research assistants.

Result and Discussion

Results

Paired sample t-test was used to determine the differences of musculoskeletal flexibility for both before and after the application of SMR technique using the handheld muscle roller-bar. From the analysis, it is found that there is significant of mean differences of 2.25 sd=1.489 cm (**Table 1**) before and after the application of SMR on musculoskeletal flexibility (Figure 1) with $t(23) = 7.402$, $p < 0.05$. Hence, the null hypothesis was rejected to confirmed there is an acute effect of self-myofascial release (SMR) using a rolling bar on increasing musculoskeletal flexibility.

Table 1

	Mean	sd	t	df	Sig. (2-tailed)
Flexibility	2.25	.304	7.402	23	.000**
Pretest-posttest					

Sig. **p = <.05 (two tailed)

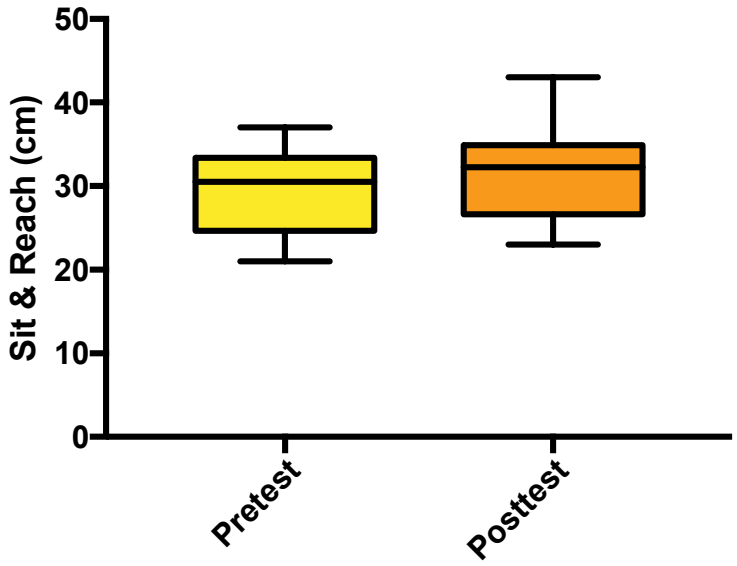

Figure 1 Mean score between before (pre-test) and after (post-test) the application of Self-Myofascial Release (SMR) using handheld roller-bar

Discussion

This study determines the acute effect of Self-Myofascial Release (SMR) using handheld rolling bar on increasing musculoskeletal flexibility. The past studies have shown that the SMR treatment can stretch muscles and help to improve overall flexibility (Clark, Lucett, & Rodney, 2008). Yet, most studies have only used a traditional instrument such as foam rolling to determine the effect. Furthermore, the previous studies only focused on the SMR treatment effect towards experienced population where there is a gap in knowledge among the inexperienced population regarding the acute effect in musculoskeletal flexibility after the SMR technique. (Škarabot, Beardsley & Štirn, 2015). Therefore, this study was designed to fill in the gap by using inexperienced healthy adolescent to test its effects. From the experiment conducted, it is be found that the SMR technique which used the handheld rolling bar has also

produced an acute effect in increasing the lower limb musculoskeletal flexibility. Physiologically, Healey et al. (2014) has explained the benefits of SMR, which can occur with the increasing of the mitochondria biogenesis, altering a muscle's viscoelastic properties, and improving the blood flow possibly through cumulative angiogenesis and the growth factor of vascular endothelial. When there is a pressure in the muscle fibres, it will offer a sensation of deep-tissue massage and will replicate a myofascial release effect and allow the fascia to become smooth and lengthen, thus allowing for greater elasticity of the muscle (Sullivan et al, 2013). From this study, it is also found that 30 seconds of SMR using handheld rolling in each muscle group especially in large muscle group seems to produce a significant effect on the range of motion as suggested by Roylance et. al. (2013), Healey (2014). Any application of SMR shorter than 30 seconds is suggested to have no significant effects on flexibility increments (Healey, 2014).

Conclusion

This study has confirmed that SMR technique using a handheld roller bar has the same properties with another SMR technique, for example, roller foam application to increase the musculoskeletal flexibility among male adolescents. Although the findings of the study have shown a positive result of a handheld roller bar in SMR, it is suggested that further investigation is needed to compare the different SMR tools on the acute effect on lower limb flexibility. This suggestion is derived due to the different SMR tools having a different response in musculoskeletal flexibility. In detail, the pressure distribution from the roller massager rather than the usual application by a person with their bodyweight with a foam roller may provide an advantage of consistent force application during the SMR session. Therefore, it is advisable to compare the different SMR tools to find out which ones have the ability to produce greater effects upon improving the range of motion, either by using a tool that needs pressure generated by the arms (e.g. roller massager) or a tool that uses the bodyweight to provide the pressure (e.g. foam roller) to the targeted muscles in comparing the best result for musculoskeletal flexibility.

Acknowledgement

We would like to thank our colleagues from UiTM Pahang who have provided insights and expertise that have made a significant contribution to this research. We would also like to thank the GADING Journal of Science and Technology for giving us the opportunity to share this research publicly.

Conflict of interests

This is a self-funded academic research and the authors declare that there is no conflict of interests.

References

Behm D. G, & Chaouachi, A. (2011). A review of the acute effects of static and dynamic stretching on performance. *111*(11):2633-51. doi: 10.1007/s00421-011-1879-2.

Clark, M. A., Lucett, S. & Corn, R. J. (2008). NASM essentials of personal fitness training (3rd ed.) Wolters Kluwer Health/ Lippincott Williams & Wilkins, Philadelphia

Davis, B. et al. (2000). *Physical Education and the study of sport (*4th ed.). London: Harcourt Publishers.

Roylance, D. S. George, J. D., Hammer, A. M., Rencher, N., Gellingham, G. W., Hager, R. L., & Myrer, W. (2013). Evaluating Acute Changes in Joint Range-of-Motion using Self-Myofascial Release, Postural Alignment Exercises, and Static Stretches. *International Journal of Exercise Science, 6*(4), 310-319.

Healey, K. C, Hatfield, D. L, Blanpied, P, Dorfman, L. R, and Riebe, D. (2014). The effects of myofascial release with foam rolling on performance. *J Strength Cond Res, 28*(1), 61–68.

Sullivan, K. M. Silvey, D. B. J., Button, D. C., & Behm, D. G. (2013). Roller Massager Application to The Hamstrings Increases Sit-And-Reach Range Of Motion Within Five To Ten Seconds Without Performance Impairments. *The International Journal of Sports Physical Therapy*, *8*(3), 228.

Leonid Kalichman, Chen Ben David (2017). Effect of self-myofascial release on myofascial pain, muscle flexibility, and strength: A narrative review, Journal of Bodywork & Movement Therapies. *21*, 446-451.

Mayorga-Vega, D., Merino-Marban, R., & Viciana, J. (2014). Criterion-Related Validity of Sit-and-Reach Tests for Estimating Hamstring and Lumbar Extensibility: A Meta-Analysis. *Journal of sports science & medicine*, *13*(1), 1–14.

Richman E. D., Tyo B. M. & Nicks, C. R. (2019). Combined Effects of Self-Myofascial Release and Dynamic Stretching on Range of Motion, Jump, Sprint, and Agility Performance. *J Strength Cond Res., 33*(7), 1795-1803. doi:10.1519/jsc.0000000000002676. PMID: 29912081.

Madoni, S. N., Costa, P. B. Coburn, J. W. & Galpin, A. J. (2018). Effects of foam rolling on range of motion, peak torque, muscle activation, and the hamstring-to-quadriceps strength ratios. *Journal of Strength Conditioning, 32*(7), 1821–1830.

Škarabot, J., Beardsley, C., & Štirn, I. (2015). Acute Effect of Foam Rolling and Dynamic Stretching on Flexibility and Jump Height. *The International Journal of Sports Physical Therapy*, *10*(2), 203.

Stricker, P. R. (2009). Sports Success Rx! Your Child's Prescription for the Best Experience. American Academy of Pediatric. https://www.healthychildren.org/English/healthy-living/fitness/Pages/Body-Composition-and-Flexibility.aspx

Yuktasir, B. & Kaya, F. (2009). Investigation into the long-term effects of static and PNF stretching exercises on range of motionand jump performance. *Journal of bodywork and movement therapies*. 13(1):11-21 DOI: 10.1016/j.jbmt.2007.10.001