

# Acute Effects of Self-Myofascial Release Through Foam Roller and Static Stretching Methods on Vertical Jump Performance of Taekwondo Players

Mehmet Akarsu<sup>1</sup>, Cihad Onur Kurhan<sup>2</sup>, İsmail İlbak<sup>3</sup>, Recep Altuntop<sup>4</sup>, Mesut Günç<sup>5</sup>, Stefan Stojanović<sup>6</sup>, Tijana Purenovic-Ivanović<sup>7</sup>

<sup>1</sup>Mehmet Akarsu, Faculty of Sports Sciences, İnönü University, Malatya, Türkiye.

<sup>2</sup>Cihad Onur Kurhan, Institute of Health Sciences, Department of Physical Education and Sports, İnönü University, Malatya, Türkiye

<sup>3</sup>İsmail İlbak, Institute of Health Sciences, Department of Physical Education and Sports, İnönü University, Malatya, Türkiye

<sup>4</sup>Recep Altuntop, Şehit Zekeriya Bitmez Anatolian High School, Malatya, Türkiye

<sup>5</sup>Mesut Günç, Akşemseddin Hearing Impaired Secondary School, Malatya, Türkiye

<sup>6</sup>Stefan Stojanovic, Faculty of Sports and Physical Education, University of Niš, Niš, Serbia.

<sup>7</sup>Tijana Purenovic-Ivanović, Faculty of Sports and Physical Education, University of Niš, Niš, Serbia.

Email: mehmet\_akarsu@inonu.edu.tr

DOI: 10.47750/pnr.2022.13.S06.215

## Abstract

The objective of this research is to examine the acute effects of self-myofascial release through foam roller and static stretching methods on the vertical jump performance of taekwondo players. In this cross-sectional study, a randomized controlled experimental method, one of the quantitative research models, was used. 21 taekwondo players participated in this research voluntarily. The mean age of the participants was  $15.95 \pm 0.865$ ; the mean height was  $172.90 \pm 3.846$  and the mean body weight was  $61.86 \pm 5.379$ . On the first day of the study, low-paced jogging was performed for 5 minutes at a heart rate of 120 (RS V800) and then their vertical jump performance was measured. On the second day of the research, low-paced jogging was performed for 5 minutes, and then a static stretching protocol was applied to taekwondo players, and then their vertical jump performance was measured. On the third day of the research, low-paced jogging was performed for 5 minutes and then self-myofascial release through foam roller protocol was applied to taekwondo players and then their vertical jump performances were measured. As a result of the research, it was determined that there was no statistical difference between 5 minutes of jogging at a slow pace and static stretching. However, it was determined that there were statistically significant differences both between 5 minutes of jogging at a slow pace and self-myofascial release and between static stretching and self-myofascial release ( $p < 0.05$ ). In conclusion, it can be said that self-myofascial release through foam roller exercises can affect vertical jump performance positively and at an acute level.

**Keywords:** Warm-Up, Foam Roller, Stretching, Vertical Jump, Taekwondo.

## INTRODUCTION

Explosive power in sports is one of the important factors of physical strength. The vertical jump performance level, which is one of the most important indicators of the explosive power, can provide information about the lower extremity explosive power of the athletes (Kil, 2006). In many studies examining the physical fitness profiles of taekwondo athletes, it has been stated that explosive power is one of the performance, as well as success, determinants (Ball et al., 2011; Chiudoet al., 2011). Vertical jump performance, which is one of the explosive power indicators, has an important place in taekwondo.

Athletes with advanced features such as explosive power, quickness and strength in Taekwondo can perform Taekwondo elements more successfully (Kil, 2006). Lower extremity neuromuscular units are required for explosive kicking, jumping, and stance positioning (Balsomet al., 1994). The gluteal, adductor and vastus muscle groups make the greatest contributions to explosive vertical jumps, both in terms of power generation and muscle activation (Naganoet al., 2005). Taekwondo athletes with well-developed lower extremity explosive strength can provide more power output during kicking and this can give them an advantage during competition (Norjaliet al., 2019; Ball et al., 2011). Lower extremity strength is an important factor for the proper application of techniques when kicking or stepping during competition (Ball et al., 2011; Azi et al., 2002).

During competition, a muscle contraction-shortening cycle occurs to provide and maintain power output in the lower extremity. This cycle consists of the first eccentric contraction of the muscle during kicking and the concentric contraction immediately following it. Taekwondo athletes with good lower extremity jump performance generate more power during kicking, which gives them an advantage during competition. (Bridge et al., 2014). However, frequent use of vertical jumps in sports activities increases the risk of injury to the anterior cruciate ligament due to excessive increases in stretching and flexion movements in the knee region (Mayer et al., 2006). Therefore, determining the optimal exercise practices to improve lower extremity strength and jump performance in taekwondo athletes is very important in terms of preventing injuries. Within this frame of reference, the aim of this research is to examine the acute effects of self-myofascial release through foam roller and static stretching methods on the vertical jump performance of taekwondo players.

## Materials and Methods

In this cross-sectional study, the randomized controlled experimental method, one of the quantitative research models, was used. The study was carried out in accordance with the Declaration of Helsinki. All participants were informed about the purpose and content of the study and signed the Informed Consent Form.

### Participants

The descriptive statistics of the participants are given in Table 1 below.

Table 1. Descriptive Statistics of Participants

	N	Minimum	Maximum	Mean	Std. Deviation
Age	21	15	17	15,95	,865
Height	21	168	180	172,90	3,846
Body Weight	21	53	75	61,86	5,379

Twenty-one competitive taekwondo athletes with mean a age of  $15,95 \pm ,865$  years, mean height of  $172,90 \pm 3,846$  and mean body weight of  $61,86 \pm 5,379$ , who have been doing taekwondo for at least three years, voluntarily participated in the study (Table 1).

### Exercises Protocols

On the first day of the study low-paced jogging was performed for 5 minutes at a heart rate of 120 (RS V800). After 5 minutes of low-paced jogging, vertical jump performance was measured in a 3-minute rest period without any other exercise.

Self-myofascial release and static stretching exercises were applied using the protocols created by Kyranoudis et al. (2019). In both protocols, exercises were applied to the quadriceps, hamstrings, adductors and gastrocnemius muscle groups (Kyranoudis et al., 2019). Self-myofascial release and static stretching exercises protocols are shown in the Table 2.

Table 2. Self-Myofascial release and static stretching exercises protocols

Muscle groups	Self-Myofascial release exercises	Static stretching exercises
Quadriceps	“Participants laid face down with the foam roller under their thighs and put their forearms on the ground in a planking position. They rolled the foam roller distally and proximally from the bottom of the hip to the top of the knee.”	Participants from the upright position, touching with one hand on the wall for balance, grasped the ankle with the ipsilateral hand and attempted to touch it in the gluteus muscle.”
	“Participants sat on the foam roller under the top of the hamstrings muscle and had their hands placed behind their back. Limbs were	“Participants from the upright position stepped one foot forward while bending the other leg. From

Hamstrings	extended in front of the body and participants started to roll from the ischial tuberosity to the popliteal fossa.”	this position they tried to touch the toes with both hands.”
Adductors	"Participants laid face down with the foam roller at a 45-degree angle against their inner thigh and put their forearms on the ground in a planking position. They started at their groin area, rolling back and forth slowly from the very top of their inner thigh to right above their knee."	“Participants stood with their feet spread apart. They leaned one knee on one side and held the opposite leg straightened without moving their feet.”
Gastrocnemius	“Participants sat on the foam roller under their proximal calves and their hands were placed on the ground with their fingers pointing toward their body. Limbs were extended in front of the body and participants started to roll distally and proximally from distal to the knee to proximal to the ankle.”	“Participants touched the wall with their hands and elbows extended and extend one leg backward with the heel on the ground. They pressed the wall so they feel the stretch in their calf.”

On the second day of the study, low-paced jogging was performed for 5 minutes and then a static stretching protocol was applied to taekwondo players. Vertical jump performance was measured in a 3-minute rest period after static exercises protocol. On the third day of the research, low-paced jogging was performed for 5 minutes and then self-myofascial release through foam roller protocol was applied to taekwondo players. Vertical jump performance was measured in a 3-minute rest period after self-myofascial release protocol. Measurements were taken on three different days, 72 hours apart.

#### Vertical Jump Performance Measurement

The vertical jump performances of the athletes were measured with the electronic smart speed lite system. When the athletes felt ready, they jumped as high as they could and landed on the mat again. The jump distances of the athletes were measured electronically in cm and the best of 3 trials was recorded (Serin and Taşkın, 2016).

#### Analysis of Data

The research data were analyzed using the IBM Statistics package program (SPSS version 26.0, Armonk, NY). In the analysis of the research data, the repeated measures ANOVA test was applied. A Bonferroni multiple comparison test was used to determine which exercise protocols differed significantly.

## Results

The findings obtained from the research data are given below.

Table 3. Descriptive Statistics of Participants' Vertical Jump Performance After Exercises Protocols

Exercises Protocols	Mean	Std. Deviation	N
5 Min Jog At Slow Pace	38,43	3,155	21
Static Stretching	38,24	3,448	21
Self-Myofascial Release	41,2857	4,10052	21

As stated in Table 3, the mean value of jump performance after 5 min jog at the slow pace of the participants was  $38,43 \pm 3,155$ , the mean jump performance after static stretching was  $38,24 \pm 3,448$  and the mean jump performance following self-myofascial release was  $41,2857 \pm 4,10052$ .

Table 4. Repeated Measures ANOVA Results

Performance Levels	Sum of Squares	df	Mean Square	F	p	Partial Squared	Eta
Vertical Jump	122,413	1,509	81,132	48,718	,000	,709	
Error	50,254	30,176	1,665				

$p < .05$ .

According to the results of the Table 4, it was determined that there was a statistically significant difference between the vertical jump performances of the participants ( $p < .05$ ). In this context Bonferroni multiple comparison test was used to determine which exercise protocols differed significantly.

Table 5. Bonferroni Multiple Comparison Test Results

Exercises Protocols		Mean Difference	Std. Error	p
5 Min Jog At Slow Pace	Static Stretching	,190	,255	1,000
	Self-Myofascial Release	-2,857*	,427	,000
Static Stretching	5 Min Jog At Slow Pace	-,190	,255	1,000
	Self-Myofascial Release	-3,048*	,334	,000
Self-Myofascial Release	5 Min Jog At Slow Pace	2,857*	,427	,000
	Static Stretching	3,048*	,334	,000

$p < .05$ .

According to Table 5, it was determined that there was no statistical difference between 5 min jog at slow pace and static stretching. However, it was determined that there was a statistical difference both between 5 min jog at slow pace and self-myofascial release and between static stretching and self-myofascial release.

## Discussion and Conclusion

The aim of this research was to examine the acute effects of self-myofascial release through foam roller and static stretching methods on the vertical jump performance of taekwondo players.

Inspecting the studies examining how self-myofascial release affects athletic performance reveals that the approach has a significant impact on enhancing athletic performance (Torun et al., 2022; Bradbury-Squires et al., 2015; Sağıroğlu, 2017; Peacock, et al, 2014). In contrast, it has been reported, as well, by some authors that the self-myofascial release technique did not enhance athletic performance (Behara, Jacobson, 2017; Healey, et al, 2014; Zhang, et al, 2020). Looking at those results, it can be said that there is no consensus among researchers and that this topic, in terms of researching the effects of self-myofascial release on sports performance, is still under debate.

According to Sağıroğlu (2017), self-myofascial relaxing techniques applied to the lower extremities using a foam roller can improve athletes' performance in terms of vertical jump. Similar results were observed by Pak (2020) on a sample of taekwondo athletes, concluding that foam roller self-myofascial relaxation exercises (10 minutes of posterior and 5 minutes of anterior self-myofascial relaxation exercises) enhanced vertical jump performance and kicking performance as well.

The mean value of jump performance after 5 a min jog at the slow pace of the participants was  $38,43 \pm 3,155$  (Table 3). After using the model of exercise created by Kyranoudis et al. (2019) the mean jump performance after static stretching was  $38,24 \pm 3,448$  compared to  $41,28 \pm 4,10$  following self-myofascial release, showing that this stretching program had a beneficial effect on athletic performance.

Observing the presented results, it was concluded that there was no statistical difference between 5 minutes of jogging at a slow pace and static stretching. However, it was determined that there were statistically significant differences both between 5 minutes of jogging at a slow pace and self-myofascial release and between static stretching and self-myofascial release ( $p < 0.05$ ). It can be said that self-myofascial release through foam roller exercises can affect vertical jump performance positively and at an acute level (Table 4, Table 5).

Although the positive and negative effects of the self-myofascial release technique are discussed in the scientific literature, as shown, and although inconsistent results are obtained, the results of this study showed that the self-myofascial release technique excises through the foam roller had statistically significant differences in benefit within vertical jump performance among taekwondo players.

Finally, it should be said that different durations as well as the use of different types of foam rollers during stretching can be a decisive factor in determining whether a stretching program will be effective or not, and also to what extent it will be effective. Future research should be conducted using alternative methods.

## REFERENCES

1. Aziz, AR, Tan, B, Teh, KC. (2002). Physiological Responses During Matches And Profile of Elite Pencak Silat Exponents. *Journal of Sports Science & Medicine*; 1(4), 147-155.
2. Ball, N, Nolan, E, Wheeler, K. (2011). Anthropometrical, Physiological, and Tracked Power Profiles of Elite Taekwondo Athletes 9 Weeks Before the Olympic Competition Phase. *The Journal of Strength & Conditioning Research*; 25(10), 2752-2763.
3. Balsom, PD, Ekblom, B, Sjodin, B. (1994). Enhanced Oxygen Availability During High Intensity Intermittent Exercise Decreases Anaerobic Metabolite Concentrations in Blood. *Acta Physiologica Scandinavica*; 150(4), 455-456.
4. Behara, B, Jacobson, B. (2017). Acute Effects of Deep Tissue Foam Rolling and Dynamic Stretching on Muscular Strength, Power, and Flexibility in Division I Linemen. *The Journal of Strength and Conditioning Research*; 31, 888-892.
5. Bradbury-Squires, DJ, Nofall, JC, Sullivan, KM, Behm, DG, Power KE, Button, DC. (2015). Roller-Massager Application to The Quadriceps and Kneejoint Range of Motion and Neuromuscular Efficiency During a Lunge. *Journal of Athletic Training*; 50(2), 133-140.
6. Bridge, CA, Ferreira da Silva Santos, J, Chaabene, H, Pieter, W, Franchini, E. (2014). Physical and Physiological Profiles of Taekwondo Athletes. *Sports Medicine*; 44(6), 713-733.
7. Chiodo, S, Tessitore, A, Cortis, C, Cibelli, G, Lupo, C, Ammendolia, A, De Rosas, M, Capranica, L. (2011). Stress-Related Hormonal and Psychological Changes to Official Youth Taekwondo Competitions. *Scandinavian Journal of Medicine & Science in Sports*; 21(1), 111-119.
8. Healey, KC, Hatfield, DL, Blanpied, P, Dorfman, LR, Riebe, D. (2014). The effects of myofascial release with foam rolling on performance. *The Journal of Strength & Conditioning Research*; 28:61-68.
9. Kil, Y. (2006). Competitive Taekwondo. *Human Kinetics*.
10. Kyranoudis, A, Arsenis, S, Ispyrilidis, I, Chatziniakolaou, A, Gourgoulis, V, Kyranoudis, E, Metaxas, T. (2019). The Acute Effects of Combined Foam Rolling and Static Stretching Program on Hip Flexion and Jumping Ability in Soccer Players. *Journal of Physical Education and Sport*; 19(2), 1164-1172.
11. Myer, GD, Ford, KR, McLean, SG, Hewett, TE. (2006). The Effects of Plyometric Versus Dynamic Stabilization and Balance Training on Lower Extremity Biomechanics. *The American Journal of Sports Medicine*; 34 (3), 445-455.
12. Nagano, A, Komura, T, Fukashiro, S, Himeno, R. (2005). Force, Work and Power Output of Lower Limb Muscles During Human Maximal-Effort Countermovement Jumping. *Journal of Electromyography and Kinesiology*; 15(4), 367-376.
13. Norjali Wazir, MRW, Van Hiel, M, Mostaert, M, Deconinck, FJ, Pion, J, Lenoir, M. (2019). Identification of Elite Performance Characteristics in A Small Sample of Taekwondo Athletes. *Plos One*; 14(5), e0217358.
14. Peacock, CA, Krein, DD, Silver, TA, Sanders, GJ, von Carlowitz, KA. (2014). An acute bout of self-myofascial release in the form of foam rolling improves performance testing. *International Journal of Exercise Science*; 7, 202-211.
15. Sađirođlu, İ. (2017). Acute Effects of Applied Local Vibration During Foam Roller Exercises on Lower Extremity Explosive Strength and Flexibility Performance. *European Journal of Physical Education and Sport Science*; 3(11), 20-31.
16. Serin, E, Taşkın, H. (2016). The Relationship Between Anaerobic Endurance and Vertical Jumping. *Journal of Sport and Performance Research*; 7(1), 37-43.
17. Torun, S, Torun, MC, Kaya, M. (2022). Investigation of the Effect of Self-Myofascial Release Techniques on the Flexibility of Hamstring in Young Soccer Players. *National Journal of Kinesiology*; 2(2), 49-54.
18. Zhang, Q, Trama, R, Fouré, A, Hautier, CA. (2020) The Immediate Effects of Self-Myofascial Release on Flexibility, Jump Performance and Dynamic Balance Ability. *Journal of Human Kinetics*; 31(75), 139-148.