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ORIGINAL ARTICLE

Comparison of the effects of massage gun and foam roller applications on jump performance in female basketball players

Kadın basketbolcularda masaj tabancası ve foam roller uygulamalarının sıçrama performansına etkilerinin karşılaştırılması

Mironshokhbek URİNOV[1], Veysel ULUDAĞ[2], Fatma ÜNVER[1]

Abstract

Purpose: The purpose of this study is to compare the effects of massage gun (MG) and foam roller (FR) applications on vertical and horizontal jump performance in female basketball players.

Methods: This study included 15 female basketball players with an average age of 18. Participants completed a demographic information form in the first week, followed by measurements of vertical and horizontal jump distances after a 5-minute warm-up. In the second week, FR application was performed and final test measurements were taken. In the third week, MG application was conducted and final test measurements were repeated. Each application was followed by a 48-hour rest period to minimize residual effects. Measurements were scheduled to align with participants' regular training routines and were taken at the same time of day.

Results: Both MG and FR applications significantly increased vertical and horizontal jump distances compared to baseline measurements (FR: p=0.028 for horizontal, p=0.001 for vertical; MG: p=0.004 for horizontal, p=0.002 for vertical). The MG application appeared to be more effective in improving jump performance compared to the FR application.

Conclusion: Massage gun and foam roller applications are effective methods for enhancing jump performance in female basketball players. However, the MG application appears to provide superior results. MG application may be preferred in training and rehabilitation processes, but further studies are needed to confirm its efficacy.

Keywords: Basketball, Foam roller, Jump, Massage gun.

Öz

Amaç: *Bu çalışmanın amacı, kadın basketbolcularda masaj tabancası (MT) ve foam roller (FR) uygulamalarının dikey ve yatay sıçrama performansına etkilerini karşılaştırmaktı.*

Yöntem: *Çalışmaya yaş ortalaması 18 olan 15 kadın basketbolcu katıldı. Katılımcılara, ilk hafta demografik bilgi formu doldurtuldu ve 5 dakikalık ısınma sonrası dikey ve yatay sıçrama değerleri ölçüldü. İkinci hafta FR uygulaması yapıldı ve son test ölçümleri alındı. Üçüncü hafta ise MT uygulaması gerçekleştirildi ve son test ölçümleri tekrar edildi. Her uygulama arasında, uygulamanın etkilerinin kaybolmasını önlemek için 48 saatlik bir ara verildi. Ölçümler, katılımcıların düzenli antrenman programıyla uyumlu şekilde ve günün aynı saatinde gerçekleştirildi.*

Bulgular: *Hem MT hem de FR uygulamaları, başlangıç ölçümleri ile karşılaştırıldığında dikey ve yatay sıçrama mesafelerinde anlamlı artış sağladı (FR: yatay için p=0,028, dikey için p=0,001; MT: yatay için p=0,004, dikey için p=0,002). MT uygulamasının, FR uygulamasına kıyasla sıçrama performansını iyileştirmede daha etkili olduğu görüldü.*

Sonuç: *Masaj tabancası ve foam roller uygulamaları, kadın basketbolcularda sıçrama performansını artırmada etkili yöntemlerdir. Ancak MT uygulamasının daha üstün olduğu görülmektedir. MT uygulaması, antrenman ve rehabilitasyon süreçlerinde tercih edilebilir ancak etkinliğini doğrulamak için daha fazla çalışmaya ihtiyaç vardır.*

Anahtar kelimeler: *Basketbol, Foam roller, Sıçrama, Masaj tabancası.*

1: Pamukkale University, Faculty of Physical Therapy and Rehabilitation Denizli, Türkiye.
2: Düzce University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation Düzce, Türkiye.
Corresponding Author: Fatma Ünver : fatmakunver@hotmail.com
ORCID IDs (order of authors): 0009-0008-8021-6608; 0000-0002-9911-5961; 0000-0002-3100-0818.
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INTRODUCTION

Vertical and horizontal jumping are critical components of success in power sports such as soccer, volleyball, and basketball. Among these, basketball heavily relies on explosive movements like jumping for scoring, rebounding, and defensive actions. The vertical jump test is a widely used, simple, and reliable method for assessing power output in athletic populations. Accurate evaluation of jump performance is essential for tailoring training and rehabilitation protocols in athletes.[1, 2]

Massage gun (MG) and foam rolling (FR) are two commonly used methods in athletic training and rehabilitation routines, aimed at enhancing power output and improving performance. Fascia, a major component of connective tissue, plays a pivotal role in muscle function. Stress, tension, or trauma-induced imbalances in fascial tissue can lead to reduced joint range of motion, muscle pain, and neuromuscular hypertonicity. When fascia loses its gel-like properties and becomes stiff, it negatively impacts movement and performance.[3,4]

Foam rollers provide a self-myofascial release technique that enhances recovery, flexibility, and performance by applying pressure to soft tissues and fascia. This method is widely used due to its simplicity and cost-effectiveness. Similarly, massage gun devices utilize percussive therapy, combining vibration and mechanical stimulation to alleviate muscle stiffness, improve blood flow, and enhance range of motion. However, despite the growing popularity of MG in sports applications, its effects on performance remain underexplored.[5,6]

Although both FR and MG are known to positively affect flexibility and recovery, there is a lack of comparative studies investigating their specific impacts on vertical and horizontal jump performance. Understanding the differences between these methods can provide athletes, coaches, and clinicians with evidence-based recommendations for optimizing performance outcomes.[7-10]

The purpose of this study is to compare the acute effects of 2-minute massage gun and foam roller applications on the hip, upper leg, and lower leg muscles in junior female basketball players. By focusing on functional anaerobic power output, this research aims to identify the more effective method for enhancing athletic performance, thereby contributing valuable insights to the existing literature.

METHODS

Participants

This study was conducted in accordance with ethical guidelines and approved by the Non-Invasive Clinical Research Ethics Committee of Pamukkale University (approval date: 17.08.2021, number: 15). Informed consent was obtained from all participants prior to the study.

The study included 15 junior female basketball players from a professional team in Turkey, with a mean age of 18 years. Inclusion criteria included being 18 years old, actively participating in competitive basketball, and having no medical conditions affecting performance. Exclusion criteria were a history of musculoskeletal injuries, lower extremity surgeries, or any condition that could interfere with participation in the study within the last 3 months.

Procedures

The study spanned three weeks, during which participants underwent vertical and horizontal jump performance tests under different conditions. Before each testing session, participants completed a 5-minute standardized warm-up routine consisting of dynamic stretching exercises.

In the first week, baseline measurements of jump performance were taken following the warm-up. In the second week, the FR intervention was applied to targeted muscle groups, followed by post-intervention performance measurements. In the third week, the MG intervention was applied, and performance measurements were repeated. To minimize residual effects and ensure recovery, a 48-hour interval was maintained between each application. All measurements were conducted at the same time of day (between 11:00 am and 2:00 pm) and aligned with participants' regular training schedules. Height and body weight measurements were among the data collection methods. Height was measured with a Seca 700 device with a precision of ± 0.1 cm, with participants standing barefoot, feet together,

and their heads, backs, and heels touching the measuring instrument. Body weight was measured with a Seca 700 scale with a precision of ±0.1 kg, while participants wore shorts and t-shirts and were barefoot.

Interventions

Foam Roller (FR): A medium-density EVA foam roller (33 cm x 14 cm) was used. The FR intervention targeted the gluteal muscles, hamstrings, quadriceps, tibialis anterior, and gastro-soleus muscle complex. Participants performed rolling motions by transferring their body weight onto the foam roller for 120 seconds per muscle group. Rolling was conducted bilaterally, with each direction lasting approximately 4 seconds. Examples of foam roller application are given in Figure 1.

Massage Gun (MG): The MG intervention was performed using a Theragun Pro massage gun with a large round head attachment. The application targeted the same muscle groups as the FR intervention and utilized a frequency of 40 Hz. Each muscle group was treated for 120 seconds bilaterally. The MG intervention was performed by a trained physiotherapist to ensure standardization.[10]

Outcome Measures

Vertical Jump Performance: Vertical jump height was assessed using the My Jump mobile application, a validated tool for measuring jump height in athletic populations. Participants performed the test with hands on hips to isolate lower body power. The test was repeated three times with a 1-minute rest between attempts, and the highest value was recorded.[11]

Horizontal Jump Performance: Horizontal jump distance was measured using a tape measure. Participants were instructed to jump forward with both feet, maintaining balance upon landing. The distance between the starting line and the heel closest to the starting line was measured. The test was repeated three times, and the best value was recorded.[11]

Visuals of the vertical and horizontal jumping application are given in Figure 2.

Statistical analysis

Data were analyzed using the SPSS 25.0 software package. Continuous variables were presented as mean ± standard deviation, and categorical variables were presented as numbers. When parametric test assumptions were met, the significance of the difference between two means was tested with the Independent Samples T-Test; when parametric test assumptions were not met, the Mann-Whitney U test was used to compare differences between independent groups. For dependent group comparisons, the Paired Samples T-Test was used when parametric test assumptions were met, and the Wilcoxon Test was used when parametric test assumptions were not met.

Figure 1. Examples of the application of foam rollers.

Figure 2. Jump performance (A: Vertical jump, B: Horizontal jump).

RESULTS

The demographic characteristics of the participants are shown in Table 1. When the horizontal jump distances of the participants before and after the FR application were compared, a significant increase was observed ($p<0.05$) (Table 2). When the vertical jump distances of the participants before and after the FR and MT applications were compared, a significant increase was observed ($p<0.05$) (Table 2).

Table 1. Demographic characteristics of participants (N=15).

	Mean± SD
Height (cm)	178.86±6.37
Weight (kg)	71.13±8.14
Body mass index (kg/m^2)	22.17±1.49
Age	18±0

DISCUSSION

In this study, the effects of MG and foam FR applications on vertical and horizontal jump performance in female basketball players were compared. The results show that both MG and FR applications significantly increased jump distances compared to baseline measurements. However, MG application was found to be more effective than FR application in improving jump performance.

Although studies examining the individual effects of MG and FR are available, direct comparisons of their effects on jump performance are scarce. This study contributes to the literature by addressing this gap and providing comparative data on these two methods.[12,13]

Coaches and athletes often use warm-up techniques before competitions or physical activities to optimize performance. While traditional warm-up methods consist of submaximal aerobic exercises or static stretches, dynamic warm-up techniques are more effective in increasing range of motion and preparing the muscles for sport-specific movements. In this study, a standardized 5-minute warm-up consisting of dynamic stretching exercises was applied before each intervention. This protocol likely contributed to the observed improvements in jump performance by optimizing muscle flexibility and activation, as supported by previous research.[14-16]

MGs represent a relatively novel technology in sports applications, with limited evidence available on their effects on athletic performance. Previous studies have demonstrated that MG can increase local blood flow, modulate pain, and improve myofascial mobility. Similarly, our findings suggest that MG enhances performance by more effectively preparing the muscles and tissues, possibly through mechanical percussion and reduced passive stiffness of tendons. The significant improvement in jump performance observed in this study aligns with these proposed mechanisms, adding valuable insights to the growing body of evidence supporting MG's efficacy.[17-19]

FR, on the other hand, is a well-established method with extensive evidence supporting its role in enhancing flexibility, recovery, and athletic performance. Studies have shown that FR application improves hamstring flexibility, increases jump height, and enhances performance when combined with dynamic warm-up exercises. While our findings confirm the effectiveness of FR in improving jump performance, they also suggest that MG may provide superior results within a shorter timeframe, making it a more efficient option in certain scenarios.[20,21]

It is important to note that the improvements observed in this study are based on acute interventions. Future studies should investigate the long-term effects of repeated MG and FR applications on various performance parameters to better understand their potential in training and rehabilitation processes.

The interaction between participants' regular training schedules and intervention effects warrants consideration. Although 48-hour intervals were maintained between interventions to minimize residual effects, the potential overlap with training-induced adaptations may have influenced the outcomes. Future studies should control for such variables to isolate the effects of MG and FR more effectively.

This study has several limitations that should be considered when interpreting the results. First, the sample size was relatively small, with only 15 participants, and no power analysis was conducted to determine the optimal sample size. The limited availability of eligible participants from a single professional basketball team constrained the sample size. Second, the menstrual cycle phases of the participants were not recorded, which could have influenced the results due to hormonal fluctuations affecting performance. Future studies should control for this factor to ensure

Table 2. Comparison of horizontal jump and vertical jump distances before and after foam rolling (FR) and massage gun (MG) applications.

	Baseline	After	
	Mean± SD	Mean± SD	p
Horizontal Jump Distances			
Foam rolling (FR)	209.38±10.09	211.23±9.96	<0.001
Massage gun (MG)	209.38±10.09	213.43±9.81	<0.001
Vertical Jump Distances			
Foam rolling (FR)	32.91±3.47	33.96±3.51	<0.001
Massage gun (MG)	32.91±3.47	35.32±4.14	<0.001

more reliable outcomes. Third, the study focused exclusively on female basketball players, limiting the generalizability of the findings to other athletic populations or male athletes. Fourth, only vertical and horizontal jump performance parameters were assessed. Other performance metrics such as agility, speed, or strength were not evaluated, which could provide a more comprehensive understanding of the interventions' effects. Lastly, the interventions were assessed for their acute effects. The long-term impacts of repeated MG and FR applications remain unclear and warrant further investigation. Future research should explore these methods over extended periods and in more diverse populations to better understand their broader applications in training and rehabilitation.

Conclusion

In conclusion, while both MG and FR applications are effective in enhancing jump performance, MG demonstrates a potential advantage by delivering more pronounced improvements within a shorter timeframe. These findings provide valuable guidance for coaches and physiotherapists in selecting appropriate methods for training and rehabilitation.

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Conflicts of Interest: *None*

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REFERENCES

1. Konrad A, Glashüttner C, Reiner MM, et al. The acute effects of a percussive massage treatment with a hypervolt device on plantar flexor muscles' range of motion and performance. J Sports Sci Med. 2020;19:690-694.
2. Wiewelhove T, Döweling A, Schneider C, et al. A meta-analysis of the effects of foam rolling on performance and recovery. Front Physiol. 2019;10:376.
3. Martínez-Aranda LM, Sanz-Matesanz M, García-Mantilla ED, et al. effects of self-myofascial release on athletes' physical performance: A systematic review. J Funct Morphol Kinesiol. 2024;9.
4. Antohe BA, Alshana O, Uysal H, et al. Effects of myofascial release techniques on joint range of motion of athletes: A systematic review and meta-analysis of randomized controlled trials. Sports (Basel). 2024;12.
5. Davis HL, Alabed S, Chico TJA. Effect of sports massage on performance and recovery: a systematic review and meta-analysis. BMJ Open Sport Exerc Med. 2020;6.
6. Pagaduan JC, Chang SY, Chang NJ. Chronic effects of foam rolling on flexibility and performance: A systematic review of randomized controlled trials. Int J Environ Res Public Health. 2022;19.

7. Arbiza BCC, da Silva AMV, de Lima KS, et al. Effect of foam rolling recovery on pain and physical capacity after resistance exercises: A randomized crossover trial. J Bodyw Mov Ther. 2024;37:226-232.
8. Zhang X, Li X, Wu Z, et al. Deciphering recovery paradigms: Foam rolling's impact on DOMS and lactate dynamics in elite volleyball athletes. Heliyon. 2024;10.
9. Leabeater AJ, Clarke AC, James L, et al. Under the gun: Percussive massage therapy and physical and perceptual recovery in active adults. J Athl Train. 2024;59:310-316.
10. Ferreira RM, Silva R, Vigário P, et al. The effects of massage guns on performance and recovery: A systematic review. J Funct Morphol Kinesiol. 2023;8.
11. Stanton R, Kean CO, Scanlan AT. My Jump for vertical jump assessment. Br J Sports Med. 2015;49:1157-1158.
12. Aguilar AJ, DiStefano LJ, Brown CN, et al. A dynamic warm-up model increases quadriceps strength and hamstring flexibility. J Strength Cond Res. 2012;26:1130-1141.
13. Yu W, Feng D, Zhong Y, et al. Examining the ınfluence of warm-up static and dynamic stretching, as well as post-activation potentiation effects, on the acute enhancement of gymnastic performance: A systematic review with meta-analysis. J Sports Sci Med. 2024;23:156-176.
14. Cullen ML, Casazza GA, Davis BA. Passive recovery strategies after exercise: a narrative literature review of the current evidence. Curr Sports Med Rep. 2021;20:351-358.
15. Szymczyk P, Węgrzynowicz K, Trybulski R, et al. Acute effects of percussive massage treatment on drop jump performance and achilles tendon stiffness. Int J Environ Res Public Health. 2022;19.
16. Roberts TD, Costa PB, Lynn SK, et al. Effects of percussive massage treatments on symptoms associated with eccentric exercise-ınduced muscle damage. J Sports Sci Med. 2024;23:126-135.
17. Hendricks S, Hill H, Hollander SD, et al. Effects of foam rolling on performance and recovery: a systematic review of the literature to guide practitioners on the use of foam rolling. J Bodyw Mov Ther. 2020;24:151-174.
18. Konrad A, Nakamura M, Bernsteiner D, et al. The accumulated effects of foam rolling combined with stretching on range of motion and physical performance: A systematic review and meta-analysis. J Sports Sci Med. 2021;20:535-545.
19. Lim JH, Park CB. The immediate effects of foam roller with vibration on hamstring flexibility and jump performance in healthy adults. J Exerc Rehabil. 2019;15:50-54.
20. Tsai WC, Chen ZR. The acute effect of foam rolling and vibration foam rolling on drop jump performance. Int J Environ Res Public Health. 2021;18.
21. Richman ED, Tyo BM, Nicks CR. Combined effects of self-myofascial release and dynamic stretching on range of motion, jump, sprint, and agility performance. J Strength Cond Res. 2019;33:1795-1803.