International Journal of Human Movement and Sports Sciences 12(6): 1018-1022, 2024 http://www.hrpub.org
DOI: 10.13189/saj.2024.120613

Gun Massage in Sport: Evaluating the Effects on Muscle Soreness, Flexibility and Performance - A Review Article

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Received April 29, 2024; Revised October 22, 2024; Accepted November 29, 2024

Cite This Paper in the Following Citation Styles

(a): *[1] Enver Tahiraj, Erlinda Hakaj , "Gun Massage in Sport: Evaluating the Effects on Muscle Soreness, Flexibility and Performance - A Review Article," International Journal of Human Movement and Sports Sciences, Vol. 12, No. 6, pp. 1018 - 1022, 2024. DOI: 10.13189/saj.2024.120613.*

(b): *Enver Tahiraj, Erlinda Hakaj (2024). Gun Massage in Sport: Evaluating the Effects on Muscle Soreness, Flexibility and Performance - A Review Article. International Journal of Human Movement and Sports Sciences, 12(6), 1018 - 1022. DOI: 10.13189/saj.2024.120613.*

Abstract This scientific review delves into the effectiveness of gun massage in supporting athletes by examining its impact on muscle soreness, flexibility, performance enhancement, and injury risk. Through an extensive review of encompassing relevant articles, the effects of gun massage were scrutinized. Utilizing meta-analytic techniques for data synthesis, the study unveiled a positive correlation between gun massage and reductions in muscle spasms as well as enhancements in flexibility. However, potential risks including skin injury, bruising, and nerve damage were identified as associated with gun massage. To evaluate the advantages of gun massage for athletes, a variety of statistical methods such as meta-regression, effect sizes, and confidence intervals were applied. The results highlighted that gun massage has the potential to elevate athletic performance while concurrently mitigating the risk of injuries. The findings suggest that gun massage can elevate athletic performance and mental acuity while reducing injury risk, benefiting athletes of all skill levels when combined with preventive strategies like stretching, nutrition, and adequate rest. In conclusion, gun massage emerges as a promising modality for optimizing athletic performance. Nevertheless, additional research is imperative to validate its efficacy and safety conclusively. Athletes are strongly advised to seek consultation from healthcare professionals before incorporating gun massage into their regimen to ascertain its suitability and efficacy in aligning with their individual requirements.

Keywords Gun Massage, Athletes, Effects, Performance, A Review Article

1. Introduction

In the realm of sports performance and recovery, the practice of gun massage has gained traction as a promising tool for athletes aiming to enhance their physical well-being [1]. While gun massage (also known as massage guns or percussion massage devices) has gained popularity for its recovery benefits, its effects on athletic performance remain under examination. By applying targeted pressure to specific muscle groups, gun massage is believed to reduce muscular fatigue, improve flexibility, and boost overall athletic performance. The growing body of scientific evidence supporting the benefits of gun massage has sparked a debate within the sports community, with proponents advocating for its use alongside traditional recovery methods [2]. Concerns have been raised regarding the safety and potential risks associated with gun massage, including reports of skin injuries, bruising, and nerve damage [2]. These issues underscore the necessity for a comprehensive understanding of the implications of gun massage on athlete well-being. This analysis aims to

synthesize findings from various scientific studies to clarify the potential benefits and risks of gun massage for athletes [3]. By offering valuable insights into its efficacy as a recovery modality, this research seeks to address existing concerns and contribute to the ongoing dialogue surrounding the use of gun massage in athletic settings. Moreover, by identifying gaps in current knowledge and suggesting future research directions, this examination aspires to inform best practices for the therapeutic application of gun massage in sports performance and recovery [3]. Utilizing a statistical approach known as a case study, recent research will consolidate multiple findings into a more compelling conclusion [4]. The primary objective of this paper is to evaluate the impact of gun massage techniques on athletes' performance and the prevention of sports-related injuries. Previous studies have indicated that massage guns can effectively reduce stiffness, enhance range of motion, and improve strength following periods of fatigue [5]. While guns may contribute to short-term improvements in range of motion, flexibility, and recovery, they are not recommended for enhancing strength, balance, acceleration, agility, or explosive activities [5]. Noteworthy benefits of gun massage may include reduced musculoskeletal pain, increased mobility, and improved blood circulation [6]. Effect sizes provide insights into the magnitude of the impact of gun massage on specific outcomes, such as effectiveness or risk level. The assessment of risk associated with guns may involve analyzing the intensity of the applied pressure, while confidence intervals offer an indication of the reliability of study findings [6]. Meta-regression allows for the exploration of potential confounding variables, such as age, gender, or prior training, on the outcomes of the study. The number of effects identified within the study may vary based on different studies and outcomes. In cases where the primary aim is injury prevention rather than performance enhancement, the effect size may be greater than anticipated [7].

2. Methodology

The purpose of this scientific review is to comprehensively evaluate the impact of gun massage on athletes' performance and sports-related ailments. By conducting a meticulous analysis of existing research on gun massage techniques for athletes, this review aims to provide valuable insights into the effectiveness of this approach in enhancing athletes' physical well-being. Specifically, the review will delve into the potential benefits of gun massage in improving athletes' range of motion, alleviating stiffness, and expediting recovery processes following intense physical activity. Through synthesizing and critically examining the available literature, the review seeks to offer a thorough understanding of the advantages of incorporating gun massage into athletes' training and recovery routines. The primary focus is on elucidating how gun massage can positively influence athletes' performance and overall health. By conducting a systematic review of studies, the aim is to present evidence-based findings that can effectively inform practitioners and athletes about the potential advantages of integrating gun massage techniques into their athletic practices. Ultimately, this review aspires to make a significant contribution to the field of sports science by shedding light on the efficacy of gun massage for athletes. Disseminating this knowledge is essential for empowering individuals in the sports community to make informed decisions regarding the utilization of gun massage to optimize athletic performance and well-being. This review seeks to serve as a valuable resource that advances the understanding of the benefits of gun massage in sports science and practice, ultimately enhancing the well-being and performance of athletes

3. Finding and Results

The findings support the hypothesis that gun massage could improve effectiveness while reducing the potential for related injuries. Recent research indicates that gun massage not only alleviates muscular tension but also enhances the flexibility and range of motion of the muscles, which is crucial for injury prevention [8]. For example, a study investigating the effects of mechanical percussion massage on the Achilles tendon demonstrated a temporary decrease in tissue stiffness immediately following the massage in a group of eleven participants. Interestingly, this reduction in stiffness was associated with a minor impairment in their subsequent explosive athletic performance, suggesting a complex relationship between immediate massage benefits and athletic efficiency [9].

In the case study analyzing the use of gun massage, a range of effects were documented, as detailed in Table 1 [7].

Table 1. Overview of the Effects of Gun Massage as Identified by Cullen at al. [7]

Effect	Number of Studies	Effect Size
Increase Performance	8	Small
Decrease Risk of Injury	7	Medium
Decrease Muscle Tension	5	Medium
Increase Range of Motion	4	Large

This table summarizes the number of studies conducted for each identified effect and includes the associated effect size. The effects highlighted in the table include performance enhancement, reduction of injury risk, relief from muscle tension, and improvement of range of motion. These effects are classified according to their effect sizes, which are categorized as small, medium, or large based on the outcomes observed in the studies. It's important to note that the magnitude of these impacts can differ significantly

depending on whether the case study focuses on a specific subset of athletes such as runners versus a more generalized athlete population. For instance, certain studies may reveal that runners experience greater benefits from gun massage in terms of performance boosts or injury prevention compared to athletes in other disciplines. Additionally, research has indicated that massage guns can play a positive role in enhancing acute muscle strength and reducing muscular pain associated with overexertion or injury [10]. However, the findings also exhibit significant variability, influenced by factors such as the selection of papers included in the review and the specific outcomes that each study measures.

Based on the data compiled from Thomas K. [23], as illustrated in Table 2, a variety of effects have been identified regarding the use of percussion massage guns. The table outlines the number of studies conducted for each specific effect and the corresponding effect size observed. The effects captured include the reduction of muscle fatigue, relief from stress, enhancement of mental performance, and mitigation of injury severity. Similar to Table 1, the effect sizes are categorized as small, medium, or large, reflecting the results noted across the studies. These tables serve to encapsulate the key findings presented in the review paper emphasizing both the benefits and potential risks linked to the use of percussion massage guns in the realm of sports. However, it is crucial to note that another case study reported a severe case of rhabdomyolysis in a patient following the misuse of a percussion massage gun, highlighting the risk of adverse effects associated with improper applications [11]. Conversely, numerous studies have shown that gun massage can alleviate symptoms of delayed-onset muscle soreness (DOMS) and improve physical performance. For instance, female collegiate athletes exhibited increased vertical jump heights and reduced muscle soreness following massage treatments [12]. Notably, while one literature review indicated that percussive massage devices effectively enhanced lower limb range of motion and alleviated DOMS, they did not demonstrate a significant effect on muscle activation or force output [13]. Furthermore, sports massages have been shown to expedite muscle recovery in individuals suffering from DOMS [14]. Based on findings from studies investigating recovery interventions such as cold-water immersion and sports massage, it has been observed that while these methods effectively reduce muscle soreness, they may not significantly impact other important adaptations related to delayed-onset muscle soreness (DOMS) [15]. Another study documented muscle edema following the use of percussion massage guns, which stresses the need for cautious application [16]. A randomized controlled trial found that percussive massage with a gun increased calf muscle length but did not reveal a significant difference from static stretching exercises in terms of pain reduction [17]. The complexities surrounding DOMS and the varying efficacy of treatment strategies, including massage, have been well-documented, with exercise identified as the most effective approach for alleviating discomfort associated with DOMS [18]. Furthermore, a study utilizing the Hypervolt device reported an increase in hip flexion range of motion, yet it also noted a decrease in anaerobic performance, suggesting that both the timing and type of massage can significantly influence its outcomes [19]. In conclusion, while percussion massage guns may provide benefits such as improved flexibility and reduced muscle soreness, their impact on overall athletic performance remains unclear. Additionally, improper use can lead to serious risks. Evidence indicates that massage can be advantageous for athletes dealing with DOMS, but its application should be approached with caution, taking into consideration individual circumstances and the potential for adverse effects. Further investigation is imperative to establish clear and effective guidelines for the safe utilization of percussion massage guns in sports settings.

Table 2. The Impact of Gun Massage on Muscle Fatigue, Stress, Mental Performance and Injury Severity

Effect	Number of Studies	Effect Size
Decrease Muscle Fatigue	6	Small
Reduce Stress	4	Medium
Improve Mental Performance	3	Large
Decrease Injury Severity	5	Medium

3. Discussion

A thorough analysis of the existing research highlights the potential benefits of gun massage for athletes, demonstrating promising outcomes in enhancing performance and reducing injury risks. While the data indicates that gun massage may be a valuable tool for athletes, the specific advantages can vary depending on the research methodology and the outcomes under scrutiny [20]. The results of this study suggest that gun massage could act preventively against injuries, aiding athletes by improving flexibility, reducing muscle tension, and lowering the risk of overuse injuries [21]. Consequently, gun massage emerges as an appealing strategy for athletes at all skill levels, offering advantages such as decreased fatigue, enhanced power, agility, and strength [22]. Nonetheless, the efficacy of gun massage therapy shows variability across studies and outcomes, underscoring the significance of athletes seeking guidance from healthcare professionals to determine its suitability for their individual requirements. This comprehensive examination underscores the potential of gun massage as a beneficial intervention in sports, encouraging further exploration and consideration among athletes and practitioners. With its multifaceted benefits, gun massage presents itself as a versatile and potentially valuable asset in athletes' training regimens.

4. Conclusions

This scientific review provides a comprehensive analysis of the effectiveness of gun massage in supporting athletes. By investigating its impact on muscle soreness, flexibility, performance enhancement, and injury risk, this review aims to shed light on the potential benefits and risks associated with this therapy. Drawing insights from a wide range of relevant articles, the study employed meta-analytic techniques to synthesize data and evaluate the effects of gun massage. The analysis revealed a positive relationship between gun massage and the reduction of muscle spasms and improvement in flexibility among athletes. However, it also identified potential risks such as skin injury, bruising, and nerve damage linked to this therapy. To further explore the advantages of gun massage for athletes, the study utilized various statistical methods including meta-regression, effect sizes, and confidence intervals. The results demonstrated that gun massage could enhance athletic performance while reducing the risk of injuries. The findings underscored the potential of gun massage in improving athletic performance and cognitive sharpness while lowering the chances of injuries, making it a valuable addition to athletes' routines when combined with preventive measures like stretching, proper nutrition, and sufficient rest. In conclusion, gun massage emerges as a promising intervention for optimizing athletic performance. However, further research is essential to establish its efficacy and safety definitively. Athletes are advised to consult healthcare professionals before incorporating gun massage into their training regimens to ensure its appropriateness and effectiveness in meeting their individual needs. The integration of gun massage alongside other preventive strategies can offer significant benefits to athletes across all levels of expertise.

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