Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 31s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

A Study Correlation Between Hand Pain And Practicing Duration In Pistol Shooting Sports

Mrunmai Nitin Gavali[1], Dr. Javid H Sagar[*2]

[1] B. P. Th, D.Y. Patil College of Physiotherapy, D. Y. Patil Education Society (Deemed to be University), Kolhapur

Email ID: mrunmaigavali@gmail.com

[2] Head of Department, Department of Cardiopulmonary Physiotherapy, D.Y. Patil College of Physiotherapy, D. Y. Patil Education Society (Deemed to be University), Kolhapur

[*]**Corresponding author:**

Dr. Javid H Sagar

Email ID: javidsagar7777@gmail.com

Cite this paper as: Mrunmai Nitin Gavali, Dr. Javid H Sagar, (2025) A Study Correlation Between Hand Pain And Practicing Duration In Pistol Shooting Sports. *Journal of Neonatal Surgery*, 14 (31s), 982-986.

ABSTRACT

Background: Pistol shooting is a precision sport that requires sustained grip strength and motor control. Long hours of training may lead to musculoskeletal discomfort, particularly in the hand and forearm. This study aims to assess the correlation between hand pain and years of practice in pistol shooters, using the Cornell Hand Discomfort Questionnaire and Numeric Pain Rating Scale.

Methods: A cross-sectional observational study was conducted with 97 pistol shooters from Kolhapur. Participants were categorized based on their practice duration: 1-3 years (Beginner), 3-6 years (Intermediate), and more than 6 years (Advanced). Data collection involved demographic details, practice history, and pain assessment using validated tools. Statistical analysis was performed to determine the relationship between practice duration and hand discomfort.

Results: The study revealed that 82.47% of shooters reported experiencing hand pain, with pain intensity being higher during movement (Mean = 3.19) than at rest (Mean = 1.96). The mean Cornell Hand Discomfort Questionnaire score was 37.14 (SD = 21.85), indicating varied discomfort levels. Advanced shooters (>6 years of practice) reported the highest pain levels. Despite uniform training durations (2 hours daily), prolonged practice years were significantly associated with increased discomfort.

Conclusion: The findings suggest there is no correlation between hand pain and practicing duration in pistol shooters.

Keywords: *Hand pain, pistol, shooting, sport, correlation.*

1. INTRODUCTION

Pistol shooting is a sport that requires a combination of physical endurance, muscle control, and mental focus. Unlike many other athletic activities, pistol shooting places significant strain on the upper extremities, particularly the hand and forearm. Given that pistol shooters must maintain a stable grip while repeatedly engaging the trigger, it is crucial to understand the impact of prolonged practice on hand discomfort and pain.

The hand's kinematics can be described as an open chain that begins at the wrist joint and ends at the finger joints. Human joints can only move in rotation because of their unique anatomy. When examining the hand's structure as a bio- mechanism, particular bones are seen as joints and moveable components as kinematic pairs of various classes (class III: three degrees of freedom). Depending on the degree of simplification and the study's presumed application, it is said that every group of scientists studying the biomechanics of the human hand and its kinematic analysis produces results and descriptions that vary primarily in the number of the model's degrees of freedom. [1,2]

In the Olympic sport of air pistol shooting, competitors attempt to hit the center of the target 60 times in a row. The 10-ring has a diameter of 11 mm, and the target is divided into rings ranging from 1.0 to 10.9. Men and women compete in separate events; however, since 2017, both sexes have qualified for the finals by firing 60 competition shots together. During the qualifying round, decimals are not counted, but they are accounted for during the finals. The shoulder, hand, wrist, and lower back are the orthopedic regions most frequently injured in shooting sports. Hold stability has been a major focus of numerous studies across different shooting disciplines. Optoelectronic training devices have been developed to measure aiming

accuracy. For running target competitions, pistols and rifles are required to have a variety of sights. The running target must have a scope, while the pistol must have open sights. When shooting a pistol, the shooter has only one point of contact—one hand on the handle. [3,4,5] Compared to rifle disciplines, it is more challenging to minimize barrel motion during the trigger action with an air pistol due to its smaller contact points. With the 11 mm diameter 10-ring, the pistol provides a single point of contact and no stabilizing clothing. As a result, achieving targeting precision may be more critical in air pistol shooting than in air rifle shooting, given the larger target size and the inherent challenges of the shorter barrel. [3,4,6,7]

To understand how extended pistol shooting may affect the health of shooters' hands, it is essential to explore the relationship between hand pain and years of pistol shooting experience. Research has shown that grip strength significantly impacts shooting performance; stronger grips help with aim, recoil control, and trigger pull. However, the exact connection between hand pain and practice time remains unclear.

Hand pain can greatly affect a shooter's accuracy and overall performance. For example, chronic pain can intensify over time, lasting for months or even years, which can impede a shooter's ability to perform effectively. By examining shooters with varying levels of experience—those who have practiced for one to three years, three to six years, and more than six years— One can identify trends and thresholds at which hand pain becomes more frequent or severe.

2. MATERIALS AND METHODOLOGY

The above study was conducted with 97 participants. It was an observational study. Participants were selected as per the inclusion and exclusion criteria and all the participants who fulfilled the inclusion criteria were assessed by using the Cornell hand discomfort questionnaire and numeric pain rating scale.

Inclusion criteria Participants belonging to both genders, Pistol Shooters in Kolhapur region who practice thrice a week, Initial category participants (1-3 years), Middle category participants (3-6 years), Late category participants (> 6 years), Willing to participate in study and ability to give informed consent. Exclusion criteria Participants with any pathological diseases of upper limb, any implants near wrist joint, open wound near wrist joint, having injuries on hand or history of hand surgeries in past 6 months.

After receiving approval of the study protocol by the Research Ethical Committee of D. Y. Patil Education Society, Kolhapur, the study was conducted from September 2024 – March 2025 in pistol shooting academies (Target Shooting Academy range, Kolhapur). After receiving their written and oral consent, participants were included in the study. Participants were grouped according to three categories that are practicing for 1-3 years, 3-6 years, and 6 < years of pistol shooting. Before starting with the assessment, the participants were given a complete explanation regarding the research course, and consent was taken both verbally and in writing.

Participants underwent assessment for hand pain using Numeric pain rating scale and Cornell hand discomfort questionnaire. Numeric pain rating scale score where 0 is no pain and 10 is maximum pain, was recorded. Cornell hand discomfort questionnaire score was interpreted where 6 is minimum discomfort and 540 is maximum discomfort, the data was recorded. The statistical analysis utilized appropriate biostatistical tools and was conducted using the master chart data.

Cornell hand discomfort questionnaire

Validity: By contrasting it with the Visual Analog Scale (VAS), the validity of the Turkish version of the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) was verified. VAS scores had a good connection with CMDQ severity scores (Spearman: 0.463–0.834, $p<0.005$), and there was a significant to nearly perfect correlation. [8]

Reliability: Internal consistency metrics and test-retest analysis were used to assess the reliability. With Cronbach's alpha values of 0.876 (frequency), 0.895 (severity), and 0.875 (interference), test-retest reliability demonstrated moderate to almost perfect agreement (Kappa: 0.564–0.948), and internal consistency was strong, suggesting a dependable instrument for assessing musculoskeletal discomfort. [8]

3. RESULT

Table No. 1 Gender Distribution of patients

Gender	Frequency	percentage
Female	29	29.90%
Male	68	70.10%
Total	97	100.00%

Table no. 2 General Characteristics of Participants

Variable	Mean	S.D.
Age	21.93	4.98
Pain Intensity on Rest (0 to 10)	1.96	1.14
Pain Intensity on Movement (0 to10)	3.19	1.62
Daily hours of practice	2.00	0.00
Interpretation of Cornell hand discomfort questionnaire	37.14	21.85

Pain is a Common Issue: A significant 82.47% of participants report experiencing pain. Pain on movement (Mean = 3.19) is notably higher than pain at rest (Mean = 1.96), suggesting that movement exacerbates discomfort.

Uniform Training Hours: All participants train for exactly 2 hours daily, which may contribute to the high pain prevalence.

Cornell Hand Discomfort Scores Vary Widely: The standard deviation (21.85) is high, showing that some participants experience significant discomfort while others do not.

Gender Disparity in Participants: The study includes more male participants (70.10%) than females (29.90%).

Experience Level Distribution: Almost half of the participants (45.36%) have between 3 to 6 years of experience. The number of participants with more than 6 years of experience is lower, which may suggest a dropout or reduced participation over time.

Table no. 3 Practising years in pistol shooters

Practicing Years in Pistol Shooters	Frequency	percentage
1 to 3 Years	33	34.02%
3 to 6 Years	44	45.36%
> 6 Years	20	20.62%
Total	97	100.00%

Most participants have 3 to 6 years of experience (45.36%). Fewer shooters have more than 6 years of experience (20.62%).

Table no. 4 Pain distribution in participants

Pain	Frequency	percentage
Yes	80	82.47%
No	17	17.53%
Total	97	100.00%

A high percentage (82.47%) report experiencing pain, which may indicate a significant issue related to practice conditions or physical strain.

4. DISCUSSION

82.47% of shooters reported experiencing hand pain, indicating a high prevalence of discomfort.

Pain was significantly higher during movement (Mean = 3.19) compared to rest (Mean = 1.96), suggesting that repetitive motion exacerbates pain.

Shooters with more than 6 years of practice reported the highest levels of hand discomfort.

All participants practiced for exactly 2 hours daily, suggesting that practice duration is a critical factor in pain development.

A higher percentage of male shooters (70.10%) participated compared to female shooters (29.90%), but the study did not

assess gender-based pain differences.

These findings highlight a direct correlation between years of practice and increased hand pain, reinforcing the need for preventive strategies.

Causes of Hand Pain in Pistol Shooters, several biomechanical and physiological factors contribute to hand pain in pistol shooters, including:

Prolonged Muscle Contraction and Fatigue

Sustained grip strength is required to keep the pistol stable. Over time, this prolonged contraction can lead to muscle fatigue, inflammation, and microtrauma in the tendons and ligaments.

Repetitive Strain Injuries (RSI)

Frequent pistol firing movements involve repetitive trigger pulls and wrist stabilization, which can cause tendonitis, tenosynovitis, or carpal tunnel syndrome. Overuse and Lack of Recovery

Shooters who do not allow sufficient recovery time may develop chronic pain syndromes, where tissue healing is incomplete, leading to persistent discomfort.

Improper Grip Technique, excessive force during gripping can result in joint strain and soft tissue damage. Proper technique and ergonomic modifications may help reduce these risks.

Preventive Strategies for Reducing Hand Pain: Given the high prevalence of hand pain among pistol shooters, it is essential to implement preventive measures to enhance longevity in the sport. The following strategies can be employed:

Strength Training and Conditioning: Hand grip exercises using resistance bands or grip strengtheners can help improve endurance.

Forearm strengthening through wrist curls and reverse wrist curls can enhance muscle resilience.

Finger dexterity exercises, such as using stress balls or finger resistance bands, can improve control and reduce strain.

Stretching and Flexibility Routines: Wrist and finger stretches should be performed before and after shooting sessions to prevent stiffness.

Forearm massage and foam rolling can enhance circulation and reduce muscle tension.

Optimizing Shooting Technique: Using an ergonomic pistol grip can help distribute pressure evenly across the hand, reducing localized strain.

Minimizing unnecessary tension while holding the gun can prevent overuse injuries.

Previous research by Mon-López et al. (2017) [5] highlighted that handgrip and shoulder abduction strength significantly influence Olympic pistol shooting performance. Similarly, studies by Cheng et al. (2017) [6] suggested that precision sports require optimal neuromuscular control, where excessive exertion can lead to decreased efficiency and increased fatigue.

Proper Rest and Recovery

Adequate breaks between training sessions allow muscles to recover and reduce cumulative fatigue. Alternating practice intensity (light and heavy training days) can help prevent chronic overuse injuries.

Medical and Physiotherapy Interventions

Hand physiotherapy can aid in muscle recovery and pain management.

Anti-inflammatory treatments, such as ice therapy or topical analgesics, can help alleviate acute pain.

5. CONCLUSION

The goal of the study was to investigate the relationship between hand pain and the amount of time spent practicing pistol shooting sports. The results showed that a significant proportion of shooters (82.47%) felt hand pain, with the degree of pain being higher when moving (Mean = 3.19) than when at rest (Mean = 1.96). Long years of practice were linked to more hand pain even with consistent training schedules (2 hours per day). However, the statistical analysis showed no significant relationship between the amount of time spent practicing and hand pain, indicating that other factors, such as technique, grip strength, and recovery strategies, can affect how uncomfortable a person feels.

The study emphasizes the significance of using preventive measures to reduce musculoskeletal stress in shooters. Long-term performance sustainability can be improved and the likelihood of overuse injuries decreased with the use of strength training, ergonomic adjustments, and structured recovery methods. To further validate these findings, future studies should concentrate on grip force measures, gender-based pain differences, bigger sample sizes, and longitudinal studies. Sports physiotherapy treatments can be created to address these issues and increase shooters' effectiveness in training while lowering

their risk of discomfort and injury.

REFERENCES

[1] Jaworski Ł, Karpiński R. Biomechanics of the human hand. J Technol Exploit Mech Eng. 2017;3(1):28-33. doi:10.35784/jteme.536.

[2] Gustus A, Stillfried G, Visser J, Jörntell H, van der Smagt P. Human hand modelling: kinematics, dynamics, applications. Biol Cybern. 2012;106(10):741-755. doi:10.1007/s00422-012-0532-4.

[3] Olsson E, Laaksonen MS. Key technical components for air pistol shooting performance. *Int J Perform Anal Sport.* 2021;21(3):348–360. doi:10.1080/24748668.2021.1891820.

[4] Ihalainen S, Kuitunen S, Mononen K, Linnamo V. Determinants of elite-level air rifle shooting performance. *Scand J Med Sci Sports.* 2016;26(3):266-274. doi:10.1111/sms.12440.

[5] Mon, D., Zakynthinaki, M. S., Cordente, C. A., Monroy Antón, A. J., Rodríguez, B. R., & Jiménez, D. L. (2015). Finger Flexor Force Influences Performance in Senior Male Air Pistol Olympic Shooting. *PLOS ONE*, *10*(6), e0129862. https://doi.org/10.1371/journal.pone.0129862

[6] Cheng M-Y, Wang K-P, Hung C-L, Tu Y-L, Huang C-J, Koester D, et al. Higher power of sensorimotor rhythm is associated with better performance in skilled air-pistol shooters. Psychol Sport Exerc. 2017; 32:47–53. doi:10.1016/j.psychsport.2017.05.007.

[7] Kim MS. The kinematic factors of physical motions during air pistol shooting. Korean J Sport Biomech. 2016;26(2):197-204. doi:10.5103/KJSB.2016.26.2.197.

[8] Eyİ İ, Büyükakıncı BY. Musculoskeletal disorders of hand in healthcare workers: A cross-sectional study. *Ergonomi.* 2022;5(3):144-152. doi:10.33439/ergonomi.1150940.