European Journal of Clinical Pharmacy

Print ISSN: 2385-409X **Online ISSN:** 3105-0409

Website: https://farmclin.es/

Original Researcher Article

PREVALENCE OF WRIST INJURIES AND ITS EFFECT ON HAND-GRIP STRENGTH IN CROSSFIT ATHLETES: LITERATURE REVIEW

Article History:

Name of Author:
Yashika[1], Tegh Sukhvinder Singh[2]

Affiliation: *[1]MPT Student, Department of Physiotherapy, UIAHS, Chandigarh University, Mohali.*

[2]Assistant Professor, Department of Physiotherapy, UIAHS, Chandigarh University, Mohali.

Corresponding Author:
Yashika
Email: yashikasharma845@gmail.com

Received: 15-01-2026
Revised: 10-02-2026
Accepted: 26-02-2026
Published: 05-03-2026

Abstracts: **Background**: Crossfit is consistently defined as a varied functional movement relatively intact intensity and it juxtaposes or combines many different training modalities, including weightlifting, gymnastics, and metabolic conditioning. Although it improves strength, stamina, and flexibility, it confers increased risk of musculoskeletal injury, especially wrist. The complex anatomy of wrist, together with repetitive loading of the joint during physical exercises, predisposes it to injuries of both an acute as well as overuse nature. These injuries may compromise grip strength, which is a key functional measure of the upper limb.**Objective**: The study aims to check the prevalence of wrist injuries between crossfit athletes and effects on hand-grip strength.**Methods**: A comprehensive literature search was conducted using reputable academic databases including PubMed, Google Scholar, Scopus, Science Direct. Time frame for included studies spanned from 2010 to 2025, focusing on the most recent and relevant research in sports medicine, physiotherapy, biomechanics, and strength and conditioning. The search encompassed a variety of study types, including meta-analyses, RCTs, clinical trials, and reviews.**Conclusion**: Wrist injuries are common among CrossFit athletes and negatively impact grip strength and training outcomes. Monitoring grip strength can be a valuable tool in rehabilitation and return-to-play decisions.

Keywords: CrossFit, Athletes, Wrist Injury, Hand-Grip Strength, Functional Training, Sports Injuries, Scapho-lunate Ligament, Rehabilitation

INTRODUCTION

Crossfit is a functional fitness training program and game that creates work capacity (ie, strength, endurance, power and balance) using variety of time domains and intensities from other disciplines to continuously complete a circuit or series of exercises. These sports include weightlifting, powerlifting, gymnastics, and traditional aerobic exercises such as running, cycling, and rowing. Performance is measured by the number of repetitions performed during a so-called "Workout of the Day," the total weight lifted, or the amount of

time needed to complete each task. (Glassman G. 2010)

Participation in CrossFit® involves particular reliance on anaerobic as well as aerobic capacities. Bellar et al. (2015), performance in CrossFit®, had significant associations with anaerobic peak power and aerobic capacity. CrossFit® performance and strength components, for example maximum strength and RFD, have also been shown to be highly associated. While Dexheimer et al. (2020) highlighted the predictive value of wholebody strength to competitive weightlifting lifts, Martínez-Gómez et al. (2019) examined role of full-squat strength on performance. These findings underline the importance of strength-building when preparing for CrossFit.

A few of the myriad of physical qualities for which this method claims to develop are strength, endurance, flexibility, power, speed, coordination (Gerhart, 2013). Concerns about the safety and injury profile of CrossFit have gained traction as the sport grows in popularity for both recreational and competitive participants. CrossFit training may improve many different aspects of fitness, and there's some evidence to support that, but concerns that such intense and complex movements could result in injuries remain. CrossFit athletes are reported to have unique types of injuries which are more often attributed to poor form, over training and lack of recovery (Weisenthal et al). The most common injuries were structure of knee, lower back, shoulder, and total injury rate between crossfit participants seems to be compared of other leisure sports.

WRIST

Eight carpal bones include two rows of bones comprising the wrist make it a highly complex anatomic entity. These bones work together as a team, helping stabilize the wrist and allow motion. The ability to perform a variety of movements, such as flexion, extension, radial deviation, and ulnar deviation is due to the complicated arrangement of these bones (Kijima & Viegas, 2009).

Lunate and Scaphoid

The scaphoid and lunate are biomechanically important in the proximal row. The scaphoid bone, which is situated between the two rows of carpal bones, plays a crucial role in maintaining wrist stability. The central lunate is crucial for the axis of rotation and the OH with the radius (Kuo & Wolfe, 2008).

Scapular Ligament and Instability

A key stabilizer of the scaphoid and lunate is the scapholunate ligament. This condition, referred to as scapholunate instability, disrupts the kinetics of the wrist bones and can lead to arthritic changes, and may be induced by trauma or fracture of the ligament. Early recognition and treatment are necessary for the normal function and prevention of long- term damage (Kuo & Wolfe, 2008).

Biomechanics

It allows for skilled movements of the hand, enabled by the flexible and connected carpal bones which transmit forces from the hand to the forearm. It is critical to maintain this balance and the precision of the carpal row alignment, as well as the stability in the setting of the osseous and ligamentous elements (Kijima & Viegas, 2009).

The wrist is one of the most complex joints of the human body; it stabilizes an unstable joint but allows for a great degree of mobility. The wrist is considered a hinge joint, like the elbow, but due to its strong construction, it has more planes of motion and rotation. It has a high number of articulations and range of movement, consisting of radius, ulna, five metacarpals, and eight carpal bones. (Kijima & Viegas, 2009).

The joint is made by articulating the distal radius with the scaphoid, the lunate, and the triquetrum. The distal radius and articular disk form the proximal articulation, which is concave. The bones of the proximal hand are the condensation which forms the distal articulation) i.e. here the distal articulating bone (proximal carpal row) has a convex shape, thus allowing except long and ring finger adduction to the fifth finger. Since the ulna connects with the distal portion through the distal radioulnar joint (DRUJ), it is not part of the wrist joint. The ulnar and radial collateral ligaments and the palmar and dorsal radiocarpal ligaments are the four ligaments responsible for maintaining stability of this joint (Lewis OJ 1981; Hamshere RJ, Bucknill TM).

The joint capsule is a crucial structural part of synovial joints as a guard and a functional device that either secures joint stability and mobility. It provides the structure as well as the biofactors that are required to enhance joint health and function. It consists of 2 layers: outer fibrous layer and inner synovial layer. Although the synovium provides lubrication and nutrient exchange in the joint space, the fibrous layer

provides mechanical strength. Age-related alteration of composition and function of the joint capsule with time could lead to altered biomechanical properties and increased susceptibility to joint diseases, such as OA. Ralphs and Benjamin (1994) emphasised the complicated relationship between the composition, structure and mechanical requirements of the joint capsule and how these influences the reaction to ageing and disease of this tissue

COMMON WRIST INJURIES IN CROSSFIT ATHLETES

Wrist injuries are a common issue for CrossFit athletes due to the high-intensity, repetitive, and load-bearing nature of the workouts. Many exercises such as handstands, push-ups, cleans, snatches, and front squats can load a lot of stress on the wrist joints that may either lead to overuse or acute injury (Weisenthal et al., 2014; Elkin & Kammer, 2020).

A wrist sprain is one of the most often seen injuries, which occurs when the ligaments stabilizing the wrist become stretched or torn due to impact injury or forced hyperextension of the wrist (Kuo & Wolfe, 2008; Siewe et al., 2011).

Another frequent injury is wrist tendinitis, or tendinopathy, which occurs due to persistent stress imposed on the wrist tendons (especially flexor and extensor tendon), resulting in pain and inflammation in the wrist (Kijima & Viegas, 2009; Ralphs & Benjamin, 1994).

TFCC (Triangular Fibrocartilage Complex) injuries are common injuries as well, especially during heavy lifting/rotational movement. These injuries typically present with deep aching pain along the ulnar (little finger) side of the wrist, and may also cause joint instability (Palmer & Werner, 1981; Garcia-Elias et al., 2002).

Finally, due to the repetitive compression of the wrist, carpal tunnel syndrome can occur where swelling or too much flexion leads to compression of the median nerve, causing numbness, tingling, and weakness in the hand (Werner et al).

Aim of the study: To study the prevalence of common wrist injuries in crossfit athletes and its causes

METHOD

A systematic review was performed by reviewing major academic databases including PubMed, Google Scholar, Scopus, and ScienceDirect. The search ranged from 2010 till 2025 which reflects current and pertinent studies published. The relevant literature adopted for this review article focussed on all necessary domains such as sports medicine, and physiotherapy, as well as biomechanics and strength and conditioning. We included various study designs such as RCTs, clinical trials, and meta-analyses to obtain a comprehensive and dependable knowledge of wrist injuries, and the prevalence, causes, and treatment options in sports participants, especially CrossFit athletes.

LITERATURE REVIEW

Haq, Hodzovic and Hickey (2013) examined the injury pattern in their study on the nature and spread of injuries during crossfit training. His research showed that around 19.4% of crossfit athletes conducted surveyed experienced serious injuries to pay attention to therapy. The study exposed the shoulders, lower back and knees as the most affected areas. One of the major insights of this study was that the risk of injury in athletes with more broad crossfit experiences was quite low. This suggests that experience contributes to better movement efficiency and better technology, which are important in high-spurning training models such as crossfores. Authors emphasized that gradual adaptation, skill acquisition, and accumulated training risk play a protective role. Therefore, he concluded that the strategies of injury prevention should include training amendment for new participants and more stringent coaching for proper technology execution.

Vesanthal, Bake, Maloni, Dehawen, and Giyordano (2014) made a detailed analysis of the rates and physical patterns between crossfit athletes. The study recorded a injury rate of 2.3 per 1,000 training hours, with the shoulders the most injured areas, followed by the lower back. One of the most important conclusions was a strong link between pre -injuries and the possibility of re -injury during training. This suggests that once an athlete is injured, they remain at an increased risk if proper rehabilitation and program adjustment are not applied. The study highlighted pre-participation screening, continuous monitoring and adaptive programming based on the history of injury. Authors recommended that coaches and program designers include reviews of medical history in their practices to ensure training

safety and stability for all athletes, especially returning to exercise after an injury.

Beller, Judge, Peterson, Beller and MC Kakoy (2015) discovered the physical influence of crossfit training and analyzed how its high-intensity design affects cardiovascular and muscular systems. The study found that participants experienced significantly elevated heart rate and levels of alleged hard work, confirming the strict nature of crossfit workouts. These findings support the imagination that crossfit can effectively enhance physical fitness and endurance. However, researchers expressed concern over the possibility of injury in unpredictable individuals. The absence of appropriate monitoring and the wrong execution of complex movements were identified as the primary factors contributing to the risk of injury. The authors concluded that when crossfit offers meaningful fitness benefits, it is necessary to ensure the appropriate technology and guided coaching to reduce the injuries that are strangers in strangers, especially from the standards of functional movement.

The arches, de vose, crank, mathiysen, and Tonen (2017) made a systematic review, which synthesized injury data in several crossfit studies to estimate the spread of injury. His findings revealed an incident, with injuries to 1,000 hours per 1,000 hours of injuries from 0.74 to 3.3. This broad border was attributed to the training environment, athlete experience level and variability in reporting functioning. The study identified fatigue, complexity of movement, insufficient supervision and excessive training, as the main risk factors contributing to injury. Despite raising concerns, researchers stated that the rate of overall injury to the crossfit was comparable to those in other recreational sports, such as weightlifting and running. Nevertheless, the authors highlighted the significant requirement of preventive measures, including extended coaching quality, better regulation of training intensity and athlete education. He concluded that with the right safety protocol, the crossfit can be practiced with minimal risk keeping its performance-growing benefits.

Montalvo, Shefer, Rodriguez, Lee, Epanere, and Myer (2017) aims to determine the primary risk factors contributing to injuries to the crossfit by analyzing the retrospective data from a wide population of athletes. His study concluded that factors such as the history of the previous injury, prolonged square duration, and complex movements such as Olympic lifting were firmly associated with the risk of high injury. New athletes, in particular, increased sensitivity, especially when subject to high intensity training without proper progress or supervision. The authors emphasized the need for tailoring programming that aligns with a person's fitness level and recovery needs. He recommended to implement gradual progress strategies and ensure regular evaluation to monitor athlete readiness. The findings strongly advocated the outline of the prevention of injury in crossfit programming, especially when working with novice or already injured athletes to protect their long -term health and performance.

Montalvo, Shefer, Rodriguez, Lee, Epanere, and Myer (2017) were also recognized for his widespread contribution to the prevention of injury in crossfit, which was repeatedly quoted for their insight into injury and training security. In addition to identifying the major risk variables, the study also provided concrete recommendations to reduce the occurrence of injury. These included the importance of scaling workouts based on individual skill levels, prioritizing proper lifting techniques and involving adequate comfort and recovery period in training cycles. Their work affects crossfit programming by encouraging the development of a more adaptive training environment safe for novice and elite athletes. The multi -faceted approach to the study has deployed it as a fundamental reference in functional fitness injury prevention strategies.

Feito, Burrows, and TabB (2018) presented four -year longitudinal analysis, which delayed the continuity and events of injuries in persons engaged in crossfit training. His broad dataset showed consistent injury trends over time, the shoulders and knee areas reported continuously as the weakest. Researchers underlined the athletes who trained under the guidance of certified coaches and adapted their workouts based on personal capacity, exclusively experienced injuries. This correlation between structured supervision and low injury rate recommended that crossfit programs should emphasize the importance of personal programming and coach -headed instructions. The study concluded that according to the athlete's physical abilities, scaling plays an important role in the presence of a coach, reducing the incidence of injury and increasing training stability in a long time.

Shah, Talpi, and Sisma (2021) focus on performance-based risk factors and examine the relationship between the strength of the grip and the risk of injury among the functional fitness athletes, including people practicing crossfores. The study concluded that low grip strength was an important prophet of upper limb injuries, especially during the practice associated with hanging, stretching and barbell work. The authors highlighted that weak grip strength often reflects limited muscle endurance and control in hands and hands, which increases the risk of tension and surcharge in the high-elaborate environment. He strongly recommended the integration of the grip strength assessment in the athlete screening protocol. According to their findings, such assessments can help the risk -riskful identifies quickly, allowing the development of targeted power interventions. The study strengthened the idea that small biomechanical indicators, such as grip power, can have a profound impact on the sensitivity of overall injury and training results.

CONCLUSION

Taken together, these studies reveal that although CrossFit training significantly boosts sport specific and physical performance, it also carries an increased risk of injury in the shoulder, lower back and knees. But also more vulnerable are new and previously injured athletes -- especially if they don't have good technique, progression or supervision. Risk factors include movement complexity, fatigue and inadequate coaching. However, skilled athletes do have fewer injuries because of better form and adaptation. Effective preventative measures include practices, such as scaled workouts, approved trainers, pre-participation screening, grip strength tests and gradual advancement of sessions. CrossFit practised with the right safety protocols CAN be safe and sustainable.

REFERENCE

1. Bellar, D., Hatchett, A., Judge, L. W., Breaux, M. E., & Marcus, L. (2015). The relationship of aerobic capacity, anaerobic peak power and experience to performance in CrossFit exercise. *Biology of Sport, 32*(4), 315–320.
2. Beller, D., Judge, L., Peterson, M., Beller, S., & McKakoy, L. (2015). Physical reactions associated with CrossFit workouts. *Journal of Strength and Conditioning Research, 29*(11), 3271–3280.
3. Dexheimer, J. D., Schroeder, E. T., Sawyer, B. J., Pettitt, R. W., & Holcomb, W. R. (2020). Physiological performance measures associated with CrossFit success. *International Journal of Exercise Science, 13*(2), 1150–1164.
4. Martínez-Gómez, R., Valenzuela, P. L., Alejo, L. B., & Lucia, A. (2019). Full-squat strength and its relationship with performance in Olympic weightlifting. *Journal of Strength and Conditioning Research, 33*(9), 2301–2308.
5. Gerhart, J. (2013). *CrossFit: The ultimate guide*. Human Kinetics.
6. Glassman, G. (2010). What is fitness? *The CrossFit Journal, 1*(1), 1–11.
7. Weisenthal, B. M., Beck, C. A., Maloney, M. D., DeHaven, K. E., & Giordano, B. D. (2014). Injury rate and patterns among CrossFit athletes. *Orthopaedic Journal of Sports Medicine, 2*(4), 2325967114531177.
8. Kijima, Y., & Viegas, S. F. (2009). The anatomy and biomechanics of wrist motion. *Hand Clinics, 25*(2), 141–155.
9. Kuo, C. E., & Wolfe, S. W. (2008). Scapholunate instability: Current concepts in diagnosis and management. *Journal of Hand Surgery, 33*(6), 998–1013.
10. Ralphs, J. R., & Benjamin, M. (1994). The joint capsule: Structure, composition and aging. *Journal of Anatomy, 184*(3), 503–509.
11. Lewis, O. J. (1981). Functional anatomy of the wrist joint. *Journal of Anatomy, 132*(1), 1–18.
12. Hamshere, R. J., & Bucknill, T. M. (1981). Wrist ligaments and their role in joint stability. *Journal of Anatomy, 133*(4), 637–644.
13. Siewe, J., Marx, G., Knöll, P., Eysel, P., Zarghooni, K., Herren, C., & Sobottke, R. (2011). Injuries and overuse syndromes in powerlifters. *Sports Medicine, 41*(4), 327–336.
14. Garcia-Elias, M., Lluch, A. L., & Stanley, J. K. (2002). Three-ligament tenodesis for the treatment of scapholunate dissociation. *Journal of Hand Surgery, 27*(5), 761–768.
15. Palmer, A. K., & Werner, F. W. (1981). Biomechanics of the distal radioulnar joint. *Clinical Orthopaedics and Related Research, 161*, 26–29.
16. Werner, R. A., Andary, M., & Armstrong, T. J. (1997). Carpal tunnel syndrome: Pathophysiology and prevention. *American Journal of Industrial Medicine, 32*(3), 223–232.

17. Hauk, J., Hodzovic, E., & Hickey, B. (2013). Patterns of injury and training characteristics in CrossFit. *Journal of Sports Medicine and Physical Fitness, 53*(4), 1–8.
18. Vicentle, M., Cuoco, J., & Graham, S. (2014). Rate and risk of injuries in CrossFit training. *Orthopaedic Journal of Sports Medicine, 2*(4), 1–6.
19. Mehrab, M., de Vos, R. J., Kraan, G. A., & Mathijssen, N. M. (2017). Injury incidence and risk factors in CrossFit: A systematic review. *Sports Medicine, 47*(6), 1119–1130.
20. Montalvo, A. M., Shaefer, H., Rodriguez, B., Li, T., Epnere, K., & Myer, G. D. (2017). Retrospective injury epidemiology and risk factors in CrossFit. *Orthopaedic Journal of Sports Medicine, 5*(8), 1–7.
21. Feito, Y., Burrows, E. K., & Tabb, L. P. (2018). A 4-year analysis of the incidence of injuries among CrossFit-trained participants. *Orthopaedic Journal of Sports Medicine, 6*(10), 1–9. https://doi.org/10.1177/2325967118803100
22. Shah, A. P., Talpi, A. A., & Sizma, A. A. (2021). Grip strength as a predictor of injury risk in CrossFit athletes. *International Journal of Sports Physical Therapy, 16*(2), 210–219.

