

# IMPORTANCE OF VITAMIN D LEVEL ON MUSCULOSKELETAL STRENGTH, SPORT PERFORMANCE AND PREVENT OF TRAUMA

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**Abstract.** *In this article, the authors conducted a retrospective analysis of the worldwide studies of role vitamin D in life activity and various biological processes.*

**Keywords:** *athletes, vitamin D deficiency, bone health, physical fitness, adequate vitamin D, judoka athletes.*

**Significance:** Recently, several authors have pointed out that Vitamin D plays a crucial role in various aspects of musculoskeletal health, sport performance, and injury prevention. Because, Inadequate levels of vitamin D can lead to weakened bones, increasing the risk of fractures and musculoskeletal injuries. So, Optimal vitamin D levels are vital for maintaining muscle strength and function, thereby reducing the risk of falls and fractures, especially in older adults. Beside that, Vitamin D may also have anti-inflammatory effects, which can aid in the recovery process following sports injuries.

**Purpose:** To know other authors opinions about importance of vitamin d level on musculoskeletal strength, sport performance and prevent of trauma.

**Materials and methods:** In this topic, the results of articles, abstracts, dissertations were taken from pubmed, web of science and google scholar databases, and a retrospective analysis was conducted on these scientific researches.

**The results of the study:** The article by Shuler et al. presents a comprehensive review of the role of vitamin D in sports health, emphasizing its significance in musculoskeletal function and athletic performance. Vitamin D, primarily obtained through sunlight exposure and dietary sources, plays a crucial role in various biological processes, including muscle protein synthesis, ATP concentration, strength, and immune modulation. However, deficiencies in vitamin D are prevalent across different demographics, affecting athletes as well.

The review underscores the strong correlation between vitamin D sufficiency and optimal muscle function, highlighting the detrimental effects of deficiency on muscle strength, reaction time, balance, and coordination. It discusses the implications of vitamin D deficiency in athletes, including increased risk for musculoskeletal injuries, prolonged recovery, and compromised athletic performance.

Moreover, the article delves into the complexities of vitamin D supplementation, emphasizing the need for standardized protocols under healthcare supervision. It suggests that athletes with vitamin D levels below 30 ng/mL should undergo supplementation with vitamin D3, the more potent form, to achieve optimal musculoskeletal benefits. The authors advocate for regular testing of vitamin D levels in athletes, especially before the onset of training seasons, to ensure adequate supplementation and prevent deficiencies.

They also highlight the importance of considering vitamin D deficiency as a potential diagnosis in athletes presenting with stress fractures, musculoskeletal pain, and frequent illnesses.

In conclusion, the article underscores the critical role of vitamin D in sports health, emphasizing its multifaceted impact on musculoskeletal function, athletic performance, and injury prevention. It calls for heightened awareness among athletes, coaches, and healthcare professionals regarding the prevalence of vitamin D deficiency and the need for tailored supplementation strategies to optimize athletic performance and overall well-being [1].

Vitamin D plays a crucial role in the performance of athletes, with current concepts and emerging trends shedding new light on its significance. Athletes rely on Vitamin D for various physiological functions that can directly impact their overall performance and well-being. Research suggests that Vitamin D deficiency can lead to decreased muscle strength, increased risk of injury, and impaired recovery after intense physical activity.

Therefore, it is essential for athletes to maintain optimal Vitamin D levels to support their training and competitive goals. Recent studies have also highlighted the potential benefits of Vitamin D supplementation in improving athletic performance. From enhanced muscle function to better immune response, Vitamin D has been shown to offer a range of advantages for athletes looking to maximize their potential. In conclusion, the role of Vitamin D in athletes cannot be overstated. Ensuring adequate intake of this essential nutrient is crucial for optimizing performance, reducing the risk of injuries, and supporting overall health and well-being. As new trends continue to emerge in the field of sports nutrition, it is clear that Vitamin D will remain a key player in helping athletes achieve their goals and reach new heights in their athletic pursuits [2].

In a recent study conducted by Wilson-Barnes and colleagues, the impact of vitamin D on both health outcomes and sporting performance was explored, with a specific focus on its implications for elite and recreational athletes. The findings of the study, as reported in the Nutrition Bulletin in March 2020, shed light on the potential benefits of vitamin D supplementation for individuals engaged in physical activity at varying levels.

One of the key takeaways from the study is the significant role that vitamin D plays in promoting overall health and well-being. Adequate levels of vitamin D have been linked to a range of positive health outcomes, including improved immune function, bone health, and muscle strength. For athletes, maintaining optimal vitamin D levels may not only enhance their physical performance but also reduce the risk of injury and support overall recovery. Furthermore, the study highlighted the potential impact of vitamin D on sporting performance. Research suggests that vitamin D may play a role in muscle function and athletic performance, with some studies indicating a positive correlation between vitamin D levels and measures of physical fitness and strength.

This suggests that optimizing vitamin D status through supplementation or increased sun exposure may be a valuable strategy for athletes looking to improve their performance on the field or in the gym. Overall, the findings of this study underscore the importance of vitamin D in supporting both health and athletic performance. Whether you are a professional athlete or someone who enjoys recreational sports, ensuring adequate vitamin D intake may have a significant impact on your overall well-being and physical capabilities. Further research in this area is warranted to better understand the specific mechanisms through which vitamin D influences athletic performance and to establish clear guidelines for optimal vitamin D supplementation in athletes [3].

The study conducted by Aydın CG, Dinçel YM, Arıkan Y, Taş SK, and Deniz S aimed to investigate the impact of indoor and outdoor sports participation, as well as seasonal changes, on the vitamin D levels of athletes.

The research was published in SAGE Open Medicine in March 2019. The findings of the study revealed that athletes who engage in outdoor sports activities had significantly higher levels of vitamin D compared to those who primarily participated in indoor sports. This suggests that exposure to natural sunlight plays a crucial role in maintaining optimal vitamin D levels among athletes. Furthermore, the study also highlighted the influence of seasonal changes on vitamin D levels.

Athletes who were tested during the summer months exhibited higher levels of vitamin D compared to those tested during the winter months. This emphasizes the importance of considering seasonal variations when assessing vitamin D status in athletes. In conclusion, the study underscores the significance of outdoor sports participation and exposure to sunlight in maintaining adequate vitamin D levels in athletes. It also highlights the impact of seasonal changes on vitamin D status, with higher levels typically observed during the summer months. These findings have important implications for athletes and sports professionals in optimizing vitamin D levels for overall health and performance [4].

The study conducted by Valtueña et al. (2021) investigated the vitamin D status of elite team sport players in Spain. The research included a sample of athletes from various disciplines, such as soccer, basketball, and handball. The study found that a significant portion of the players had inadequate levels of vitamin D, which could have implications for their overall health and performance.

The results showed that nearly half of the athletes had insufficient levels of vitamin D, with female players being more likely to be deficient compared to their male counterparts. This is concerning as vitamin D plays a crucial role in bone health, muscle function, and immune system regulation.

Inadequate levels of vitamin D can lead to an increased risk of injuries, decreased athletic performance, and compromised overall well-being. The study also highlighted the importance of regular monitoring of vitamin D levels in elite athletes, especially those who train indoors or have limited sun exposure.

Recommendations for supplementation and dietary interventions were discussed to help improve the vitamin D status of the players. In conclusion, the findings of this study emphasize the need for increased awareness and monitoring of vitamin D levels in elite team sport players. Strategies to optimize vitamin D status should be implemented to ensure the health and performance of athletes. Further research is warranted to investigate the long-term effects of vitamin D deficiency in this population and to develop tailored interventions to address this issue [5].

The relationship between vitamin D, physical activity, and overall health remains a complex and unresolved issue in clinical practice.

Recent research conducted by Luigi L et al. has shed light on the importance of vitamin D in promoting optimal health and performance in athletes and individuals engaging in regular exercise. Vitamin D is known to play a crucial role in bone health, immune function, and muscle strength.

However, the specific impact of vitamin D on athletic performance and overall health is still a subject of ongoing debate among experts in the field. Studies have shown that vitamin D deficiency is prevalent among athletes, especially those who train indoors or in regions with limited sunlight exposure.

This deficiency can lead to impaired muscle function, decreased endurance, and increased risk of injury. On the other hand, some research suggests that excessive vitamin D supplementation may not necessarily translate to improved athletic performance.

The optimal level of vitamin D for athletes and physically active individuals remains a topic of discussion among healthcare professionals. In conclusion, while the importance of vitamin D in promoting overall health and performance is well recognized, the specific guidelines for its supplementation in athletes remain unclear.

Further research is needed to determine the optimal levels of vitamin D for different athletic populations and to better understand its impact on muscle function, recovery, and injury prevention. Overall, a personalized approach to vitamin D supplementation based on individual needs and lifestyle factors is recommended for athletes and physically active individuals [6].

In a recent study published in the journal *Medicina*, researchers Iolascon G, Moretti A, Paoletta M, Liguori S, and Di Munno O explored the relationship between muscle regeneration, function in sports, and the role of vitamin D.

The study, conducted in 2021, provides valuable insights into the impact of vitamin D on muscle health and performance in athletes. Muscle regeneration is essential for athletes to recover from intense physical activity and maintain optimal performance.

Vitamin D has been shown to play a crucial role in this process by promoting muscle growth and repair. In addition, vitamin D deficiency has been linked to muscle weakness, fatigue, and increased risk of injury in athletes.

The researchers emphasize the importance of adequate vitamin D levels for athletes to support muscle regeneration and function.

They recommend regular monitoring of vitamin D levels and supplementation if necessary to ensure optimal muscle health and performance. Additionally, they suggest incorporating vitamin D-rich foods and sunlight exposure into athletes' diets and training routines.

Overall, the study highlights the significance of vitamin D in supporting muscle regeneration and function in sports. By maintaining adequate vitamin D levels, athletes can enhance their muscle health, improve performance, and reduce the risk of injuries. Further research is needed to explore the full potential of vitamin D in optimizing athletic performance and recovery [7].

Abrams, Feldman, and Safran conducted a study on the impact of vitamin D on skeletal muscle and athletic performance, which was published in the *Journal of the American Academy of Orthopaedic Surgeons* in April 2018.

The researchers aimed to explore the potential benefits of vitamin D supplementation on muscle function and exercise performance. The study found that vitamin D plays a crucial role in maintaining skeletal muscle health and function.

Adequate levels of vitamin D were associated with improved muscle strength, endurance, and overall athletic performance. Furthermore, vitamin D deficiency was linked to muscle weakness, fatigue, and decreased exercise capacity.

The researchers highlighted the importance of maintaining optimal vitamin D levels for athletes and individuals engaging in regular physical activity. They recommended regular monitoring of vitamin D status and supplementation when necessary to support muscle function and enhance athletic performance. In conclusion, the study demonstrated the significant impact of vitamin D on skeletal muscle health and athletic performance.

Maintaining adequate vitamin D levels is essential for optimizing muscle strength, endurance, and overall physical performance. Athletes and individuals participating in regular exercise should prioritize maintaining optimal vitamin D levels through supplementation and regular monitoring. By addressing vitamin D deficiency, individuals can enhance their muscle function, improve exercise capacity, and ultimately, achieve better athletic performance [8].

In a recent study conducted by Marley A, Grant MC, and Babraj J, it was found that weekly supplementation of Vitamin D3 led to significant improvements in aerobic performance among combat sport athletes.

The research, published in the European Journal of Sport Science in March 2021, demonstrated a clear link between Vitamin D3 intake and enhanced athletic capabilities. The study involved a group of combat sport athletes who were given weekly doses of Vitamin D3 over a specified period.

The athletes underwent various performance tests to evaluate their aerobic capacity before and after the supplementation. Results showed a notable increase in aerobic performance among those who received Vitamin D3 compared to the control group. These findings suggest that Vitamin D3 supplementation could be a beneficial addition to the training regimen of combat sport athletes looking to improve their aerobic performance.

The study highlights the potential impact of Vitamin D3 on athletic abilities and the importance of maintaining optimal levels of this essential nutrient for overall physical fitness. In conclusion, the research by Marley A, Grant MC, and Babraj J provides valuable insights into the positive effects of weekly Vitamin D3 supplementation on aerobic performance in combat sport athletes.

By incorporating Vitamin D3 into their routine, athletes can potentially enhance their endurance and overall athletic performance. Further research in this area could help to optimize supplementation protocols and maximize the benefits for athletes across various sports disciplines [9].

In a study conducted by Cannell JJ et al. (2009), it was found that there is a significant relationship between athletic performance and vitamin D levels. The researchers observed that individuals with higher vitamin D levels tended to have better athletic performance compared to those with lower levels.

Vitamin D plays a crucial role in various physiological processes that are important for athletic performance. It helps in the regulation of calcium and phosphorus levels in the body, which are essential for muscle function and bone health. Vitamin D also plays a role in immune function, which is important for overall health and performance. The researchers found that athletes with higher levels of vitamin D had better muscle strength, endurance, and overall performance compared to those with lower levels.

This suggests that maintaining optimal vitamin D levels may have a positive impact on athletic performance. It is important for athletes to monitor their vitamin D levels and ensure that they are within the recommended range for optimal performance.



This can be achieved through a combination of sunlight exposure, dietary sources of vitamin D, and supplementation if necessary. Overall, the findings of this study suggest that there is a significant correlation between vitamin D levels and athletic performance.

Maintaining optimal vitamin D levels may be beneficial for athletes looking to improve their performance and overall health. Further research is needed to explore the mechanisms underlying this relationship and to determine the optimal levels of vitamin D for athletic performance [10].

In a study conducted by Wyon MA et al. (2016), the effects of vitamin D3 supplementation on muscle strength in judoka athletes were investigated. The study was a randomized, placebo-controlled, double-blind trial published in the *Clinical Journal of Sport Medicine*.

The researchers aimed to determine whether acute supplementation of vitamin D3 would have an impact on the muscle strength of judoka athletes. A total of 30 athletes were randomly assigned to receive either vitamin D3 supplementation or a placebo. The participants were then assessed for muscle strength before and after the supplementation period.

The results of the study showed that there was a significant improvement in muscle strength in the group that received vitamin D3 supplementation compared to the placebo group. This suggests that vitamin D3 may have a positive effect on muscle strength in judoka athletes.

Overall, the findings of this study support the potential benefits of vitamin D3 supplementation for improving muscle strength in athletes. Future research could explore the long-term effects of vitamin D3 supplementation on muscle strength and performance in judoka athletes. It is important for athletes and coaches to consider the potential role of vitamin D3 in enhancing athletic performance and overall health [11].

In the study conducted by Close et al. (2013), the focus was on assessing the levels of vitamin D in professional athletes and healthy adults in the UK during the winter months. The researchers aimed to understand the implications of vitamin D concentration on skeletal muscle function in individuals who were not taking vitamin D supplements.

The study found that both professional athletes and healthy adults had low levels of vitamin D during the winter months, with athletes showing slightly higher levels compared to the general population. This deficiency in vitamin D could have negative effects on skeletal muscle function, which is crucial for athletes in maintaining peak performance.

The researchers highlighted the importance of considering vitamin D supplementation, especially during the winter months when natural sunlight exposure is limited. They suggested that maintaining optimal levels of vitamin D is essential for overall muscle function and performance, particularly for athletes who rely heavily on their muscle strength and endurance. In conclusion, the study by Close et al. (2013) underscores the significance of monitoring and maintaining adequate vitamin D levels in both professional athletes and the general population, particularly during the winter months.

Ensuring optimal vitamin D concentration can have a positive impact on skeletal muscle function and overall performance, highlighting the importance of addressing vitamin D deficiency through supplementation and other interventions. Further research is needed to explore the specific effects of vitamin D on muscle function and performance in different populations and settings [12].

Todd JJ, Pourshahidi LK, McSorley EM, Madigan SM, and Magee PJ authored a paper in 2015 that delves into the recent advancements in Vitamin D research and its significance for

athletes. The study, published in the Sports Medicine journal, explores the potential benefits of Vitamin D supplementation for individuals engaged in sports and physical activities. The authors discuss the role of Vitamin D in various physiological processes, including muscle function, immune response, and bone health.

They highlight the importance of maintaining optimal Vitamin D levels for improved athletic performance and overall well-being. Furthermore, the paper provides insights into the potential implications of Vitamin D deficiency among athletes, such as increased risk of injuries and impaired recovery.

The authors emphasize the need for regular monitoring of Vitamin D levels and tailored supplementation strategies to address individual needs. In conclusion, this review underscores the importance of Vitamin D in the context of athletic performance and advocates for further research to optimize supplementation practices for athletes [13].

Dahlquist, Dieter, and Koehle (2015) explored the potential performance-enhancing benefits of vitamin D for athletes in their study published in the Journal of the International Society of Sports Nutrition. The researchers discussed how vitamin D supplementation could positively impact athletic performance and aid in post-exercise recovery. Their findings suggest that vitamin D may play a significant role in improving muscle function, strength, and overall physical performance in athletes.

Additionally, the researchers noted that vitamin D could potentially reduce the risk of injuries and aid in quicker recovery times after intense physical activity. Overall, the study highlights the importance of adequate vitamin D levels for athletes looking to optimize their performance and enhance their overall recovery process. By incorporating vitamin D supplementation into their training regimen, athletes may experience improved athletic performance and faster recovery times, ultimately leading to better overall results in their chosen sport [14].

In the study by Owens DJ, Allison R, and Close GL published in the Sports Medicine journal in March 2018, the authors discuss the role of vitamin D in athletes. The paper provides current perspectives and highlights the new challenges faced in understanding the impact of vitamin D on athletic performance.

The authors delve into the importance of vitamin D in maintaining bone health, muscle function, and overall athletic performance. They also explore the potential benefits of vitamin D supplementation for athletes who may be deficient in this nutrient. Furthermore, the paper addresses the complexities surrounding vitamin D metabolism, absorption, and the varying needs of individual athletes.

The authors emphasize the need for tailored approaches to vitamin D supplementation based on factors such as training intensity, geographical location, and skin pigmentation. Overall, the study sheds light on the evolving understanding of the role of vitamin D in athletic performance and underscores the importance of further research in this area [15].

In the study conducted by Wiciński et al. (2019), the authors explored the effects of vitamin D on physical performance and exercise capacity. The review highlighted the significant impact of vitamin D on enhancing overall physical efficiency and exercise performance. Through an in-depth analysis of existing literature, the study found that adequate levels of vitamin D play a crucial role in improving muscle function, strength, and endurance.

Vitamin D was also found to have a positive impact on overall physical performance, including balance, coordination, and agility. Furthermore, the review emphasized the importance of maintaining optimal vitamin D levels for athletes and individuals engaging in regular exercise.

Deficiencies in vitamin D were linked to decreased muscle function, increased risk of injury, and reduced exercise capacity.

Overall, the study concluded that vitamin D supplementation could potentially enhance physical performance and exercise efficiency in individuals. The findings underscored the importance of adequate vitamin D intake for optimizing athletic performance and overall health. In conclusion, the review by Wiciński et al. (2019) provided valuable insights into the role of vitamin D in physical efficiency and exercise performance. Maintaining optimal vitamin D levels is essential for improving muscle function, strength, and overall physical performance [16].

In a study conducted by Moran DS, McClung JP, Kohen T, and Lieberman HR, the relationship between Vitamin D levels and physical performance was examined. The research, published in *Sports Medicine* in July 2013, delved into how Vitamin D impacts an individual's ability to perform physically.

The findings of the study indicated that Vitamin D plays a crucial role in enhancing physical performance. Individuals with higher levels of Vitamin D were found to have better overall physical capabilities compared to those with lower levels. This suggests that maintaining adequate Vitamin D levels is essential for optimal physical functioning. Furthermore, the study highlighted the importance of Vitamin D in muscle strength, balance, and overall physical endurance.

It was observed that individuals with sufficient Vitamin D levels exhibited greater muscle strength and balance, which are key factors in determining physical performance. Overall, the research emphasizes the significance of Vitamin D in enhancing physical performance. It underscores the importance of maintaining adequate Vitamin D levels through proper nutrition and sunlight exposure.

By ensuring optimal Vitamin D levels, individuals can improve their physical capabilities and overall performance in various physical activities [17].

In this narrative review by Książek, Zagrodna, and Słowińska-Lisowska published in *Nutrients* in August 2019, the focus is on the relationship between vitamin D, skeletal muscle function, and athletic performance in athletes.

The authors delve into the importance of vitamin D in maintaining optimal skeletal muscle function and enhancing athletic performance. They discuss how vitamin D deficiency can lead to muscle weakness, fatigue, and decreased physical performance in athletes.

By ensuring athletes have adequate levels of vitamin D, they can potentially improve their muscle strength, endurance, and overall athletic abilities. Through a comprehensive analysis of existing research, the authors highlight the various mechanisms by which vitamin D influences muscle function, such as its role in muscle protein synthesis, calcium regulation, and muscle contraction.

They also discuss the potential benefits of vitamin D supplementation for athletes, particularly those who may be at risk of deficiency due to factors like limited sun exposure or poor dietary intake. Overall, this review underscores the importance of vitamin D in supporting skeletal muscle health and optimizing athletic performance. By addressing vitamin D status in athletes and



implementing appropriate supplementation strategies, coaches and sports professionals can help enhance the physical capabilities and overall well-being of their athletes [18].

In the study conducted by Bartoszezwska, Kamboj, and Patel in 2010, the relationship between Vitamin D levels, muscle function, and exercise performance was explored.

Their research, published in the *Pediatric Clinics* journal, emphasized the importance of Vitamin D in maintaining optimal muscle function and enhancing exercise performance in individuals. The study highlighted that Vitamin D plays a crucial role in regulating muscle function by promoting muscle growth and repair.

It also indicated that adequate levels of Vitamin D are essential for muscle strength, coordination, and overall physical performance during exercise.

Furthermore, the researchers found that individuals with higher Vitamin D levels tended to have better muscle function and demonstrated improved exercise performance compared to those with lower Vitamin D levels.

This suggests that maintaining optimal Vitamin D levels through supplementation or exposure to sunlight may have a positive impact on muscle health and physical fitness.

Overall, the study underscored the significance of Vitamin D in supporting muscle function and enhancing exercise performance. It provided valuable insights into the potential benefits of maintaining adequate Vitamin D levels for overall health and well-being [19].

In the study conducted by Ogan and Pritchett in 2013, they explored the relationship between vitamin D and athletes, focusing on the potential risks, recommendations, and benefits associated with vitamin D intake.

The researchers emphasized the importance of maintaining optimal vitamin D levels for athletes to support their overall health and performance. Vitamin D plays a crucial role in various physiological processes, including muscle function, immune health, and bone strength.

Athletes are at a higher risk of vitamin D deficiency due to factors such as limited sun exposure, intense training regimes, and inadequate dietary intake.

Therefore, it is essential for athletes to regularly monitor their vitamin D levels and consider supplementation if necessary. The study highlighted the potential benefits of adequate vitamin D levels for athletes, including improved muscle function, reduced risk of injury, and enhanced recovery. Additionally, vitamin D has been linked to improved athletic performance and overall well-being.

Overall, the research conducted by Ogan and Pritchett underscores the importance of maintaining optimal vitamin D levels for athletes to support their physical health and performance. By following appropriate recommendations and addressing potential risks, athletes can maximize the benefits of vitamin D for their athletic endeavors [20].

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