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Research Article

Importance of Vitamin D in Athletes and Exercise; A mini review

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Abstract

Vitamin D has an important role in the function of the cardiovascular, immune, and musculoskeletal systems. Regarding to this role there is a potential for vitamin D to affect the physical and athletic performance. To consider whether vitamin D is related to exercise, physical and athletic performance. We have examined a large number of literature related to the effect of vitamin D on exercise, physical and athletic performance. In elderly people with insufficient vitamin D levels, vitamin D supplementation improves muscle strength, balance and reduces falls. Furthermore, vitamin D supplementation to non-athletes and athletes with inadequate levels has helped to increase physical and athletic performance respectively. In contrast, in athletes or non-athletes where vitamin D levels are adequate, vitamin D supplementation is not correlated with improved athletic performance. Vitamin D levels have a very important role in physical and athletic performance. Increasing or decreasing levels of vitamin d is associated with levels of performance.

Keywords: Vitamin D, Athletes, Performance, Sports

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Vitamin D is a vitamin that is naturally present in very few foods and available as a dietary supplement. It is also produced endogenously when ultraviolet rays from sunlight strike the skin and trigger vitamin D synthesis [28]. Apart from its effect on cardiovascular function [39] the immune and skeletal system Vitamin D possibly associated with physical performance [4, 27, 36]. A study in the United States found a positive association between cardiovascular fitness and Vitamin D levels [22].

Vitamin D levels have been associated with muscle strength mainly of the lower limbs, bone fractures physical condition and balance. A recent study examined vitamin D profile in America National Football League players and concluded that professional football players deficient in vitamin D levels may be at greater risk of bone fractures

[35]. Two related studies showed that muscle weakness has been also associated with vitamin D low levels [8, 41].

However, results from another study do not associate vitamin D levels with lower limbs isokinetic function [25]. Another study evaluated a seasonal pattern of vitamin D in Italian Serie elite male soccer players and supported the association between vitamin D levels to muscular problems, neuromuscular pains, predisposition to injuries and performance [16]. Insufficient levels of vitamin D in the body resulted in an increase in the number of falls in the third age. Vitamin D treatment effectively reduces the risk of falls in older adults and restores balance [30]. A recent study investigated the association between vitamin D levels, physical activity, muscle strength and fractures in women and concluded that low levels of vitamin D associated with inferior physical activity level, gait speed and balance [24].

Additionally, a similar study evaluated the Vitamin D status and muscle function in post-menarcheal adolescent girls and concluded that vitamin D was significantly associated with muscle power and force in adolescent girls [44]. In another older study the authors showed that Vitamin D supplementation improves neuromuscular function in older people who fall and a second relevant study investigated the association of vitamin D levels concentration with physical performance and its falls in older persons and the correlation of vitamin D levels to physical performance and falls in older persons confirmed [45].

Moreover, a study in Chile evaluated the effects of vitamin D supplementation and exercise training on physical performance in vitamin D deficient elderly subjects and concluded that vitamin D supplementation improved gait speed and body sway [5]. One more relative study investigated if Vitamin D supplementation improves neuromuscular function in older people who fall and concluded that vitamin D supplementation, in fallers with vitamin D insufficiency, has a significant beneficial effect on functional performance, reaction time and balance, but not muscle strength [13].

Vitamin D deficiency is well recognized in a study with athletes and dancers in which the results showed that athletes and dancers practice indoor in winter months had lower levels of vitamin D than those practices outdoor [11]. A study that examined Vitamin D status of females in an elite gymnastics program has showed that indoor practice has a big possibility to decrease vitamin D levels [34]. Additionally, a similar study regarding of Vitamin D insufficiency in professional hockey players showed contrasting results even though the practice was indoor [38]. A recent study on adolescent girls reported a positive association between serum vitamin D levels and jump height, jump velocity, and power [44]. Similarly, an older study in college athletes and students have

documented the correlation of exposure to ultraviolet radiation with cardiovascular capacity, muscle strength and speed [6].

In addition, a study in young boys with low levels of vitamin D showed that vitamin D supplementation caused an increase in muscle strength [32]. Furthermore, a consisted literature indicates that increase and decrease of physical and athletic performance associated with vitamin D levels in human body [33]. Also, a study evaluated the association between vitamin D status and physical performance and concluded that Vitamin D status was associated with poor physical performance [29]. A recent meta-analysis study evaluated the prevalence of vitamin D inadequacy in athletes and concluded that a regular investigation of vitamin D status using reliable assays and supplementation is essential to ensure healthy athletes. At the same time, also concluded that the correlation of injuries to vitamin D levels in human body is unclear [19]. Another study evaluated the effect of vitamin D in wheelchair injured athletes and the results support the unclear association of vitamin D with injuries [21]. Nevertheless, a study evaluated Vitamin D status and biomarkers of inflammation in runners and supported a possible link between decreased vitamin D status and one particular marker of inflammation [46].

Investigation on the relationship between Vitamin D levels to athletic performance were evaluated by another study and showed that Vitamin D may improve athletic performance in vitamin D deficient athletes [6]. A second recent study evaluated the plausible ergogenic effects of vitamin D on athletic performance and recovery concluded that doses exceeding the recommendations for vitamin D could aid athletic performance [12].

On the contrary, in a recent study looking at whether vitamin D supplementation affected the physical performance of athletes, the results showed that there was no effect on athletic performance [18]. A third study evaluated the effects of vitamin D supplementation in leg press and vertical jump height and concluded that vitamin D did not improve the selected physical performance measures [9, 10]. A similar study evaluated if vitamin D supplementation amplifies eccentric exercise-induced muscle damage in NASCAR pit crew athletes and concluded that vitamin D supplementation had no effect on muscle function tests, and amplified muscle damage markers in NASCAR pit crew athletes following eccentric exercise [37]. A recent study examined the association between vitamin D supplementation and physical performance in adolescent swimmers and concluded that vitamin D supplementation did not improve physical performance [15].

A recent study focuses on the influence of Vitamin D supplementation alone on physical fitness (strength, endurance, and balance) in post-menopausal women, showed that none of the selected physical performance improved [3]. A review study investigated the sports health benefits of vitamin D and supported that increasing levels of vitamin D reduce inflammation, pain, and myopathy while increasing muscle protein synthesis, ATP concentration, strength, jump height, jump velocity, jump power, exercise capacity, and physical performance [23]. A recent study examined the association between serum vitamin D levels and the ergometric evaluation of muscle strength, aerobic capacity, and speed in professional soccer players and concluded that vitamin D levels are associated with the ergometric evaluation of muscle strength, sprinting capacity, and VO2max in professional soccer players, irrespective the levels of performance [31]. A second recent study investigated if Vitamin D supplementation improve sprint performance in professional rugby players and showed that despite significantly improving vitamin D status in these professional rugby union players, vitamin D supplementation had little impact on physical performance outcomes. Thus, it is unlikely that vitamin D supplementation is an ergogenic aid in this group of athletes [17]. A relative study examined the association between vitamin D status and maximal-intensity exercise performance in junior and collegiate hockey players and showed that if vitamin D status is causally related to maximal-intensity exercise performance in athletes, the effect size is likely small [20]. A study evaluated the Vitamin D supplementation in Gaelic players and showed that there was no significant effect on maximal VO2, skeletal muscle or lung function [42]. Vitamin D level status in female military personnel after combat training decreased, thus enhancing the correlation of vitamin D with exercise [2]. A recent study evaluated the effect of vitamin D supplementation on exercise performance in healthy participants and showed that there was an improvement in exercise performance [1]. In addition, a study evaluated the concentration of vitamin D in non-supplemented professional athletes and healthy adults during the winter months in the UK and concluded that inadequate vitamin D concentration is detrimental to musculoskeletal performance in athletes [9, 10]. A relative review examined the effect of vitamin D supplementation on skeletal muscle function in athletes and confirmed that supplements had a positive effect on muscle function in athletes with insufficient of vitamin D [43]. Furthermore, a study evaluated the vitamin D deficiency and exercise in young competitive rowers and concluded that vitamin D deficiency is common during winter in young athletes and this effect may negatively influence athletic performance [26].

1. CONLUSION

In summary, vitamin D levels have a very important role in physical and athletic performance. It is well documented and demonstrated that vitamin D levels especially in the elderly, are related to muscle strength, balance, neuromuscular functions and falls. Deficiency of vitamin D in the body has been shown to reduce physical and athletic performance. In the contrary, it has accepted that in people with adequate levels of vitamin D the physical and athletic performance has improved. Vitamin D supplementation is probably the best method of increasing vitamin D levels in people with inadequate levels, which is documented to be correlated with performance. Vitamin D levels vary according to sport, latitude and ethnicity. In order to achieve optimal athletic performance, continuous monitoring of vitamin D levels is required, especially during periods of low levels sun exposure. *A* slight correlation of injuries to vitamin D levels in human body has been recorded, however is unclear and further research is needed.

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