Vitamin D’s Effect on Muscle Strength Throughout the Body

A recent meta-analysis of controlled trials published in Journal of Science and Medicine in Sport suggests that vitamin D supplementation increases both lower and upper limb muscle strength.

As you may know, vitamin D’s more classic roles in human health involve the muscles and the bones. Studies consistently show that vitamin D increases muscle strength by increasing the size of muscle fibers and increasing the rate of protein synthesis.

Much of this research has been in the form of randomized controlled trials, meaning researchers can confidently make statements of causality based on results from these trials. With that said, some trials indicate a positive effect for vitamin D on muscle strength, while others suggest vitamin D has no role.

Meta-analyses of vitamin D research are inherently limited because of different study design (i.e. using different doses for different durations or achieving different final 25(OH)D levels). Yet, they still add to clinical understanding and provide a more encompassing look at vitamin D’s role in a specific condition by analyzing multiple studies.

A large meta-analysis consisting of 4,824 participants found that vitamin D supplementation increased lower muscle strength. However, the studies included in the meta-analysis mostly consisted of elderly participants with an average age of 66.

In order to fully illustrate vitamin D’s role in health, in this case muscle strength, it is necessary to determine how it affects all ages. This results in a general understanding of the effects across many different types of individuals.

To help further clarify the relationship between vitamin D supplementation and muscle strength, researchers from London conducted another meta-analysis, but this time among young healthy individuals.

Dr. Peter Tomlinson and colleagues went through an extensive process of inclusion and elimination. They looked up controlled trials that evaluated vitamin D supplementation on muscle strength among participants aged 18 to 40 years old. Seven studies fit the criteria. Six studies were randomized controlled trials and one was just a controlled trial. They only included studies that used physiological doses of vitamin D.

They assessed the quality of the studies using several methods, including the PEDro method, which ranks studies on a scale of 1-11 with a higher ranking of 9-11 being considered excellent quality. The average ranking of the studies included in this analysis was an 8.7.

Six studies administered vitamin D3 supplements while one study did not specify which form of vitamin D supplements they used. The dosage varied from 4,000 IU per day to 60,000 IU per week.

The researchers collected the data from these studies and analyzed the effects of vitamin D supplementation on muscle strength for 310 participants.

Here’s what the results showed:

Average baseline vitamin D levels between all studies was calculated to be 12.3 ng/ml. Only four studies reported average vitamin D status above 20 ng/ml after supplementation.

Compared to placebo, vitamin D supplementation had a significant beneficial effect on upper limb muscle strength (P = 0.005).

Compared to placebo, vitamin D supplementation had a significant beneficial effect on lower limb muscle strength (P = 0.004).

The researchers concluded:

“This review has found that vitamin D3 supplementation improves upper and lower limb muscle strength in a healthy, adult, athletic and non-athletic population between the ages of 18 and 40.”

The researchers note that the small number of studies may limit their results. They also only looked at studies of young adults, meaning these results cannot be generalized to other populations such as in specific genders or in athletes.

Despite these limitations, the meta-analysis had powerful findings, especially due to its inclusion of homogeneous controlled trials. A high degree of homogeneity means the studies were very similar and therefore easier to compare the findings to one another.

The evidence for a role for vitamin D in muscle strength, while still not definitively proven, is compelling. The remaining information needed is for randomized controlled trials to determine the exact dose and levels of vitamin D required for optimal muscle strength.

Until then, we think healthy adults should continue taking 5,000 IU/day of vitamin D3 to maintain levels between 40 and 80 ng/ml.


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