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Mitch Fusillo
Duquesne University

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Creatine: The Power Behind the Powder

By Mitch Fusillo

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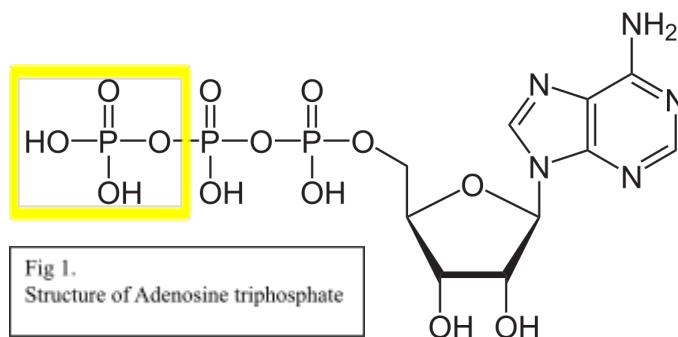
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Staff Article

Creatine – what is it and does it work? How does it contribute to muscle growth?

The fitness industry can be a troubling place to navigate as a consumer. Many well-intentioned people are manipulated by the tsunami of influencers and products that each individually promise a unique pathway to health and excellence. Supplements, exercise programs, specific techniques, and sponsored apparel are ingenious ways to siphon money from the pockets of consumers. All nonsense distracts from the relatively simple process of muscle growth. Fitness companies have created a culture where the gym is not something you can simply walk away from after training. Commitment does not stem from consistent routine, but is demanded through conformity. If you identify as someone who loves the gym, then it has to be proved through your physique, your look, your knowledge, and your health.

However, this conformity and necessity to “prove yourself” can lead some astray into making decisions that are unfounded from a scientific standpoint and are flat-out wastes of money.



Supplements are, perhaps, the greatest example of this. Many are falsely marketed or make epic promises to give its user an outstanding figure or athletic performance. Alas, while the mind may be convinced by these products' persuasions, the body certainly does not budge

in the same way. Whether it is fat burners or testosterone boosters, most of these “magic” supplements turn out to be useless powders sold at \$20 per container. No matter the promises, the body is impossible to cheat. Some corners cannot be cut regarding certain metabolic processes, and the most that can be obtained by products that claim they can override the body are a placebo effect and an empty wallet. However, browsing the aisle of the average fitness section of your local CVS or simply consulting local gym-goers will bring more diverse options. One of the more commonly accepted supplements among gym discourse is creatine.

However, no matter how long someone has been lifting or how much they can bench, the answer to why creatine just “works” can drastically vary based on the individual (and what influencer they get their information from). The explanations I have been told for creatine’s effectiveness have ranged from “it helps you hold more water weight” to “it helps you recover faster” to “it reduces lactic acid accumulation”. So, for the most part, it is accepted that creatine is effective for training, but there is not a commonly accepted reason for why that is. Through my journey in fitness, I have anecdotally experienced creatine to be effective, as I found that it helped increase the volume and intensity of training, but the lack of unanimous sentiment of how creatine functions has always been a particularly interesting question. Most likely, this is due to the major source of information for health and exercise coming from social media. Social media reaches millions of people, sharing personal content and all kinds of information, including those related to exercise and health. However, the scientific quality of

the posted information is questionable. For example, a study in Brazil analyzed “health and fitness” centered accounts with over 100,000 followers and found that, out of all the posts recorded, only 13 (~2.7%) cited a reference endorsing the information [1]. The lack of evidence-based information in the fitness industry is unacceptable. So, using my background in cellular biology, I set out to find tangible evidence for the function of creatine and how it affects the body.

As a start, it is pertinent to acknowledge that creatine, or any other supplement, are not necessary for muscle growth. Humans have been training for thousands of years, and the capacity to become stronger was not unlocked by Arnold Schwarzenegger in the 70s. We are built to perform with our musculoskeletal system and simple nutrition. In essence, there is no such thing as a “mandatory supplement” for muscle growth. With that said, creatine is something that does aid in muscle growth regardless. Creatine helps the body maximize its performance by allowing for greater work capacity. It does this by promoting the regeneration of ADP to ATP (adenosine diphosphate to adenosine triphosphate) [Fig. 1]. ATP is the body’s energy currency [2]. The structure of adenosine triphosphate consists of its namesake triphosphate and its phosphodiester bonds linking it together, attached to a five-carbon sugar ring (ribose) and a nitrogenous adenine group. The potential energy is stored in the phosphodiester bonds of the



Fig 2. –
“Doing Work”

triphosphate. The severing of the triphosphate into a diphosphate by hydrolysis releases the potential energy stored in the bonds and allows for work to be done with it in the body. However, after the reaction, the product of ADP is unable to be used as an energy source. Therefore, the ADP must be transformed back into ATP before the body can continue to do work. In this way, creatine phosphate aids the process of regeneration by donating a phosphate to ADP to produce ATP more efficiently.

There are additional pathways for the body to phosphorylate ADP, but creatine helps supplement this process [3]. Creatine is naturally occurring in the body, but it can be absorbed through other external sources, almost exclusively through uncooked meats. However, as the effective dosage of creatine is 3 grams per day for an adult, it can be quite difficult to obtain a sufficient dose of creatine through consumption of food alone, as its proportional dosage in foods is extremely low, to the point where it is not viable a source of creatine.

Furthermore, cooking the raw meat that contains it will end up denaturing the creatine within it. So, creatine is actually relatively hard to find in external sources. This was the basis for the creation of creatine as a supplement. In this way, a teaspoon of creatine powder can deliver the same amount of creatine as the consumption of 30 ounces of raw beef. For many, creatine powders are the only way to efficiently obtain enough creatine in their diet to supplement their training. Yet, there are still more discrepancies about creatine such as the chemical form.

Luckily, simply using logic can deduce the best creatine form, regardless of brand. In the types of creatine – each with their own unique claims and advertising – it is best to use creatine monohydrate. It is the most economical type of option and has been the most extensively studied form of creatine (with over 290 human trials) [4]. Creatine HCl and ethyl ester are often marketed with high promise, but don't possess the highly reliable studies that monohydrate has to back up its performance [5]. In summation, creatine monohydrate is the best option for the common activities of the fitness consumer [Fig. 2].

Now, theoretical applications are great, but in the world of exercise and weightlifting, there tends to be more of a focus on the physical. Most people cannot physically witness the cellular machinery using creatine, but they can be witness to a noticeably better training session. In this way, the effectiveness of creatine has been chronicled by giving quantitative measurement to exercise performance. In one 2003 study by a Texas A&M professor, short-term creatine

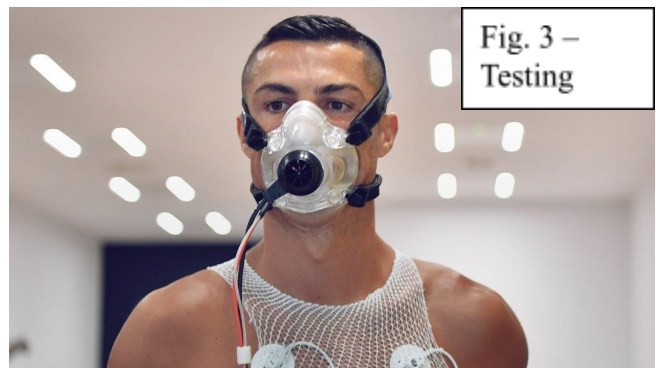


Fig. 3 –
Testing

supplementation had been reported to improve maximal power/strength (5-15%), work performed during sets of maximal effort muscle contractions (5-15%), single-effort sprint performance (1-5%), and work performed during repetitive sprint performance (5-15%) [6].

Additionally, a bench-press study in 2003 [7] demonstrated an increase in bench press 1RM ranged from 3 to 45%, and the improvement in weightlifting performance in the bench

press ranged from 16 to 43%. Finally, a 1997 study [8] was undertaken to investigate the influence of oral supplementation with creatine monohydrate on muscular performance during repeated sets of high-intensity resistance exercise [Fig. 3]. In the study, creatine supplementation resulted in a significant improvement in peak power output during all five sets of jump squats and a significant improvement in repetitions during all five sets of bench presses. Thus, through these studies, there was substantial evidence to indicate that creatine supplementation during resistance training is more effective at increasing muscle strength and weightlifting performance than resistance training alone.

Some detractors may state that there are many chemicals, such as steroid or human growth hormone, which can stimulate unnatural growths in strength and muscle content in the body. I can understand these claims because it is important that health in one area of the body is not sacrificing the health of another. In fact, the harsh chemicals that professional bodybuilders are known to use come with many adverse side effects [9]. It is crucial that the internal health of the body is not martyred for the sake of a healthy-looking physique. Fortunately, these concerns do not apply to creatine. This is not a research chemical or a shady substance as the performance enhancement effects of creatine have been well documented. As a result, it has remained available on the shelves of American consumer stores for many years, unlike a vast majority of other supplements which claimed to be “performance enhancers”. The evidence is nearly irrefutable that creatine supplementation acutely enhances exercise capacity for people of all ages, while simultaneously being safe to use. According to a

study by Texas A&M, testing in athletes for blood and urine samples for metabolic markers, such as muscle and liver enzymes, electrolytes, lipid profiles, hematological markers, and lymphocytes, while additionally quantitatively and qualitatively analyzing clinical status and renal function, indicated that long-term creatine supplementation up to 21 months does not appear to adversely affect markers of health status in athletes undergoing intense training in comparison to athletes who do not take creatine [10].

It is important to remember that muscle growth, [11] the basic underlying principles of progressive overload, consistency, and hypertrophy must be present in order for creatine to optimally function. As well as training, proper nutrition and sleep are extremely vital to fulfilling your goals and living happily.

In conclusion, creatine has proven to be an exceptional supplement for anyone looking to safely increase their athletic performance and recovery. Nonetheless, as good as any supplement may be, it is critical for the consumer to do their own research and come up with an exercise plan that is most sustainable for their own life.

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Picture References:

Fig 1. - https://en.wikipedia.org/wiki/Adenosine_triphosphate

Fig 2. - <https://www.trainheroic.com/blog/olympic-weightlifting-programs/>

Fig 3. - https://www.youtube.com/watch?v=g6vtUUnv_MY

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