



On Weightlifting Supplements and Their Consequences

Matthew Pepi

1. As an avid weightlifter myself, I have always heard talk of supplements. Whether it's the main topic of conversation in the gym or if people ask you if you take any, the topic of supplements seems to be immortal and as a weightlifter or even an athlete, you cannot run away from them. One of the main reasons for this is because athletes around the world are constantly trying to improve performance, and taking supplements is often one of their first options. A couple months ago, I found myself in the same category as these athletes, I wanted to improve my performance in the gym and so I decided to take supplements, a very hypocritical thing for me to do. I was always one of those people who put a negative name on supplements, whether it be pre-workout, BCAAs, EAAs, Beta-Alanine, or creatine, I never did them, because I thought they did not work, were a waste of money, and most importantly, bad for your health. Out of all of these supplements available to body builders, I started using two of the most prominent and popular out of the bunch, creatine and BCAAs. According to Dr. Jose Antonio, Program Director and Associate Professor of Exercise and Sports Science at Southeastern University in Florida, "Creatine is an amino acid derived substrate or fuel, it comes from methionine, arginine, and glycine" (Creatine Answered). In addition, according to Dr. David Minkoff, whose field is emergency medicine, the three amino acids found in BCAAs are leucine, isoleucine, and valine. They are considered essential to the body and are only introduced into it through diet. Both of these amino acid-derived supplements are so popular in the world of athletes, because

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they are known for their ergogenic effects, intended to enhance performance, endurance, or recovery. Creatine specifically has been said to increase lean-muscle mass in person, while BCAAs hastens the recovery time of the body due to a workout. Although the companies who produce these supplements share the potential benefits of them, many people do not trust them – a common opinion I once believed - and therefore do not take them. Luckily, Recent research reveals fairly important contrasting arguments against the benefits of these supplements, but overwhelmingly uncovers valuable information on the workings and advantages of them, supporting and proving the legitimacy of their effects.

2. One of the many reasons people refrain from using these supplements is because Creatine and BCAAs are unfamiliar substances. Uncommon vocabulary that may confuse people when learning about BCAAs and creatine are DOMS, CK, and LDH. According to Mohammad Hossein Rahimi, who studies nutrition and biochemistry at Tehran University in Iran, and his colleagues, DOMS, delayed-onset muscle soreness, is the inexplicable pain in the skeletal muscle felt in a matter of hours or days as one recovers from a typical exercise. In addition, DOMS is not only a painful feeling, but can negatively influence the efficiency of muscles and can take away from the muscles' natural ability to generate force. Further, CK - creatine kinase - and LDH - lactate dehydrogenase - both indicate muscle damage and they are determined by the primary site of muscle damage and the training circumstances for those taking part. (1)(2-3)(5-6). Frequently, these unusual terms are used when professionals describe creatine and BCAAs, possibly scaring people away from taking them, but they are quite simple once understood. Antonio states that, no other supplement on the market is more heavily researched than creatine in terms of increasing lean body mass (Creatine Answered). This is a reassuring statement, because while the stereotypical negative thoughts behind creatine may cloud the want for people to supplement with it, what most people don't know is that it is the most heavily researched supplement on the market. In addition, according to Dr. Darryn Willoughby, Professor of Exercise and Biochemical Nutrition at Baylor University, creatine is among the most well-liked ergogenic supplements taken in athletics (26). It is very unlikely that a pro athlete, especially in sports such as hockey, football, or baseball, is not supplementing with creatine,

further marking its familiarity in the world beyond the world of amateur athletes. BCAAs are not far from familiar either and Minkoff states that amino acids are comprised of carbon, hydrogen, oxygen, and nitrogen and there are 22 different amino acids that are used in the body. People often believe that they're ingesting something foreign into the body when taking BCAAs, but they are actually just supplementing important amino acids that the body needs and cannot supply on its own.

3. Although the benefits of these effects are consistent amongst the population, the effects of these supplements may differ for some individuals. Willoughby points out that some creatine studies have also concerned women. They have shown creatine has ergogenic effects in women, but these effects, such as weight gain, fat-free mass, and an increase in muscle performance appear at a slower rate than in men. Although there is a differing result of the speed of creatine's beneficial effects between genders, this is an important observation, because it shows that the supplement works for anyone, independent of gender. He also notes that the results of creatine supplementation can differ among individuals since not everyone will have the same response to the supplement (26)(36). Similarly, Rahimi et al. report that the results of BCAA supplementation with regard to exercise-induced muscle damage vary due to multiple elements within the body that affect the perception of soreness (5). Genetically, some people are more prone to soreness than others and elements in their bodies will send more signals to the brain recognizing this soreness. For these people, BCAAs will not have as large an effect on reducing DOMS than other people, because more factors are attributing towards their perception of soreness. In the way that some medicine has more beneficial effects on certain types of people than others, is a parallel way that the benefits of creatine and BCAAs are genetically affected. Rahimi et al. also point out, "The variations in BCAA classifications between countries; different manufacturers of BCAA; and the percent of leucine, isoleucine, and valine may contribute to the inconsistencies in results" (6). Not all BCAA supplements are created the same, because different companies have different formulas on how they create their product and the same can be said for creatine. So, a recommendation for people supplementing with BCAAs and creatine is that if they find a brand that positively works for them, then they should stick with the same

brand, for if they changed products, the effects of the supplement on the body could become less apparent. While these differing results are important in understanding creatine and BCAAs, they often lead professionals to believe in counter arguments against the benefits of these supplements.

4. Although hundreds of studies have proven the benefits of creatine and BCAAs, many people still believe that some of their positive effects do not occur. Minkoff reports that if all eight essential amino acids are not present in the body, the three amino acids supplemented from BCAAs will be used for energy. He also states that if one takes BCAAs alone, they have the same effect on the body as would eating a banana. Apparently, supplementing BCAAs without any additional supplements is a waste of time and as Minkoff emphasizes, "don't waste your money." However, according to Dr. David Sinclair, Professor of Genetics and co-Director of Biology of Aging at Harvard Medical School, in the short-term, supplementing with BCAAs will benefit a person's performance. A contrasting opinion to Minkoff's, Sinclair believes BCAAs do promote a person's performance, but Sinclair also thinks that in the long term, BCAAs will provide negative effects. Sinclair suggests that because amino acids often activate the mTOR pathway in animals, which leads to a lower lifespan, the same could be true for humans. This negative effect tries to show that BCAAs are not completely beneficial and could be potentially harmful. Similarly, although heavily studied and proven, professionals still continue to believe in non-beneficial factors of creatine. According to Dr. Magali Louis, Head of Research and Education at AISTS – International Academy of Sport Science and Technology in Switzerland, and her colleagues, in their study over a span of five days, creatine supplementation had no observable benefits with regards to the anabolism of specific human muscle (6). This suggests that creatine has an inability of the anabolic mechanism towards specific human muscle, or in other words, the ability to build lean-muscle mass. Further, Louis et al. reported no notable differences in the concentrations of ATP in the subjects' bodies had occurred by the end of the study, compared to the concentration values before the study (4). This observation tries to get rid of the idea that creatine can increase the energy levels, therefore increase endurance, of an individual during a workout. While there may be many contrasting ideas against BCAAs and creatine, these ideas can be proven wrong

and dismissed by beginning to learn about how each supplement works in the body.

5. Many people wonder if creatine and BCAAs are safe and by diving into their bodily functions, along with doctor opinions, this can be answered. According to the experiment of Dr. Chia-Chi Wang, who focuses on exercise physiology at National Taipei University in Taiwan, and his colleagues, recent findings on creatine usage have shown that it has a possibility of reducing muscle damage from physical activity. It does this by “stabilizing the sarcolemma and regulating mitochondrial permeability” (2). Wang et al. also note that the decreased levels of muscle damage from creatine usage could be resulting from the creatine, “binding to phospholipid heads, stabilizing the membrane phospholipid bilayer, decreasing membrane fluidity and producing a more ordered state in the membrane.” They explain that the strength improvements resulting from creatine supplementation, “could result from several mechanisms, including alteration in the expression of myogenic transcription factors, an increase in satellite cell mitotic activity” (2)(8) (7) Their findings are also supported by Willoughby who comments that the consumption of creatine resulted in an increase of the subject’s muscle performance, muscle fiber size, the amount of myogenic cells, and muscle myonuclei density over a 6 week period. The number of myogenic cells in the body is an important factor in the size increase of adult skeletal muscle. Lastly, Willoughby reports that creatine performs a central function in cellular bioenergetics, especially in the reformation of ATP, adenosine triphosphate, which is crucial for muscular contraction (35)(34)(25). While many of these bodily mechanisms may sound foreign, the most important thing to keep in mind, as Antonio reports, is that “The safety data on creatine is unparalleled, it is one of the safest supplements out there” (Creatine Answered). While not as extensive and in-depth, BCAA research on how they work in the body is precise, due to their functions being straight forward. For example, according to Dr. Jim Stoppani, whose field is Exercise Physiology, one of the amino acids in BCAAs, leucine, helps to elevate insulin levels in the body, which helps to supply nutrients to the muscle cells. Rahimi et al. further explain that BCAAs are broken down in the skeletal muscle, aiding in averting protein breakdown and raising protein synthesis (1). All of these mechanisms will occur regardless of how you take each supplement, but by

understanding the most efficient way in supplementing BCAAs and creatine, one can maximize the effects and benefits of them.

6. Supplementation of creatine and BCAAs can be done at the right time and at the correct quantity. Companies sell creatine in both powder and pill form and it does not matter which kind a person takes; it is all preference. On the other hand, BCAAs is only sold in powder form. The suggested way of supplementing with creatine is with two phases, the loading phase, and the maintenance phase. Willoughby reports that a typical creatine supplementation cycle starts with the loading phase where creatine is consumed in dosages of 20 grams a day for five to seven days. Following the loading phase, is the maintenance phase, where creatine is supplemented in 5-gram amounts per day (26). Contrastingly, BCAAs does not have to be 'loaded' nor 'maintained' and is not as complex as creatine's supplementation procedure. Rahimi et al. comment that, the meta-analysis performed exhibited that BCAAs are helpful and advantageous in terms of muscle soreness when taken after exercise, but in-effective when taken during exercising (2). Most people drink BCAAs during their workout, using it as a substitute for water, but as research has shown, that method of consumption is inefficient and wastes money, for it has minimal to no effectiveness during a workout. To further complicate the correct way of supplementing with creatine, Antonio suggests that if someone is taking creatine regularly, it is not important when he or she supplements with it. It is simply important to get the recommended 3-6 grams a day. However, if someone cycles on and off creatine, it is best to take creatine after a workout, similar to the consumption method of BCAAs (Creatine Answered). By taking BCAAs and creatine in the correct way, the benefits of each supplement will be maximized.
7. There are many benefits as a result of supplementing with creatine and BCAAs. To start, Rahimi et al. confirm, the usage of BCAAs greatly minimized the efflux of CK after a workout. Their research showed that CK is reduced for up to a day, from taking BCAAs before and within a 24-hour range after exercise (5). Similarly, Wang et al. note that after the study, CK levels were greatly decreased in the creatine group when compared to the CK levels of the placebo group. Based off this research, both BCAAs and creatine are beneficial in decreasing CK levels, or in other words, minimizing the muscle damage caused from a workout.

8. No specific information was gathered on what age groups or types of people benefit from BCAAs more than others, but for creatine, this data is well known. Antonio notes that creatine supplementation is important for children, with research showing that if supplemented during a traumatic brain injury, it can help protect the brain and speed up recovery times. He also mentions that creatine supplementation is important for older people, 60-80, because there is data that shows that creatine monohydrate can improve their daily living, by increasing lean body mass and strength. Additionally, creatine is most beneficial for people who are on a vegetarian or vegan diet. They lack creatine in their diet, because it is naturally obtained when someone eats fish or meat (Creatine Answered).
9. For BCAAs, Rahimi et al. note, BCAA effectiveness examined in other studies, has shown that muscle damage and the recovery process from heavy endurance activities are lessened and sped up from BCAA supplementation. (1) They also report that the benefits of BCAAs are connected to improved muscle function and point out that this is due to a reduction of muscle strength and muscle power loss after exercise. Lastly, from their research, Rahimi et al. conclude, "The current evidence-based information demonstrates that supplementation with BCAA is better than passive recovery or rest after various forms of exhaustive and damaging exercise" (1)(7).
10. Although BCAAs and creatine are similar in reducing muscle damage, contrastingly, creatine also builds lean muscle and increases muscular strength and endurance. In a four-week exercise program, designed for research by Wang et al., subjects loaded on creatine with 20g for six days and then maintained their supplementation with 2g for the remainder of the study. Wang et al. write, "The study concluded that creatine supplementation combined with complex training improved maximal muscular strength and reduced muscle damage during training." As evidence, the strength of a subject's one rep max increased in both the placebo and creatine groups after the four-week training period. On average, it increased by 44.66lbs for the creatine group and 33.99lbs for the placebo group (1)(5). To strengthen this idea, Antonio also reports that over 300 research studies have shown creatine not only elevates lean body mass, but over a 2-3-month span of supplementing, creatine has also been shown to increase strength and muscular endurance (Creatine

Answered). Most importantly for many, Willoughby mentions that creatine has also been shown to be an important catalyst in the increase of body weight and muscle hypertrophy, muscle cell size increase, when it is taken and paired with resistance training (25-26).

11. By collecting data from research and gaining an understanding on how each supplement works, the legitimacy of these supplements, creatine and BCAAs, has been proven. Taking a deeper look into the background of these supplements from understanding the positive research surrounding them, doctor's opinions, and the types of athletes who supplement with them, new found familiarity and trust with creatine and BCAAs was gained to prove that they are not as uncommon or foreign to the world as one may think. In addition, by understanding how these supplements may have differing results from one person to the next, it is understood that these nutritional supplements may work better for someone more than others but does not take away from their effectiveness within a population. Also, counter arguments against these supplements were provided by some professionals but were able to be dismissed by understanding more about how they work in the body and what bodily mechanisms they affected. Not only did this teach us the targeted areas that these supplements affected, but it also gave insight into the safety of these supplements and what they truly did, opening a door of familiarity and shying away from the unknown. Next, the correct way of taking these supplements was learned, to prove how to maximize the efficiency of each supplement's benefits. Lastly, the benefits of creatine and BCAAs were provided to ultimately concrete the presence of their positive effects and to seal the discussion on their legitimacy. As fitness continues to become more and more advertised, the world of supplements will continue to grow and different supplements will start to hit the market. Since supplement regulation is monitored by the companies who create the supplements it is important to fully understand what one is ingesting before taking a supplement. By learning about and proving the safety and legitimacy of supplements, the ultimate goal of improving one's performance and fitness level can hopefully be continued in a safe and harmless way.

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