

Pre-workout supplements essay



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Pre-workout supplements are a newer category of products that are designed to increase workout intensity and energy. These products are being used by millions of athletes today, and there have been a lot of questions raised about the long-term effects of them. There are a lot of different brands in this industry, but most of the products contain the same main ingredients: Creatine, nitric oxide, vitamin B, and caffeine. There has been quite a bit of research done on these ingredients individually, but together they have not been studied very much, which is why a lot of athletes avoid them.

Another problem with these products is that athletes are becoming dependent on them instead of using them as a supplement to an adequate diet. In this paper we will look at each of the ingredients individually and see how the different components work together. Probably the most important of the ingredients in these supplements is Creatine. Creatine is a compound that can be made in our bodies or taken as a dietary supplement. Creatine is composed of three amino acids: Glycine, Arginine, and Methionine.

Our liver has the ability to combine these amino acids to synthesize Creatine, but some athletes believe it is beneficial to take in more than your body can produce because of how Creatine is used in the body. Creatine can be used as an energy source by recycling Adenosine diphosphate (ADP) into Adenosine triphosphate (ATP). In order for skeletal muscles to have energy, ATP stored in the body is converted into ADP, giving off energy. Unfortunately the body cannot store an unlimited supply of ATP, so the energy supply usually does not even last a minute.

The reason why athletes take a Creatine supplement is because it can combine with phosphate to make Creatine phosphate, which can then react with ADP and turn the diphosphate back into a triphosphate usable once again for energy (Dotson). So, athletes use Creatine as a form of extra energy during workouts. There are about 120g of Creatine in our bodies already, but many weight lifters suggest that if you take Creatine supplements your energy levels will increase during workouts. A big problem is that the dosages have not been studied, so the suggested amount to take varies from an extra 5-15g (Dotson).

Nitric oxide is another substance found in most pre-workout supplements. Nitric Oxide is what really started the entire pre-workout industry with a product called “ NO Explode” by BSN. The product was loaded with extra Nitric Oxide and caffeine, and a lot of other products from different companies branched off of this. Nitric oxide (NO) is an important signaling molecule that acts in many tissues to regulate a diverse range of physiological and cellular processes. Originally it was studied to help identify the agent responsible for promoting blood vessel relaxation and regulating vascular tone, but athletes found benefits in NO eventually.

When athletes put their bodies under stress by running or doing other physical exercise, the muscles in their bodies need more oxygen, which is supplied by the blood. As the heart pumps harder during physical activity, the lining in the arteries releases nitric oxide into the blood. This causes the walls of veins and arteries to relax and widen, which allows more blood to pass through giving the muscles the oxygen they need. The increased

oxygen to the muscles leads to decreased inflammation and an increase in endurance and strength (Kelly).

Not surprisingly, athletes and body builders have tried to take advantage of Nitric Oxide as a supplement in their training, but the usefulness has been questioned in younger athletes. The ability for Nitric Oxide to be released in the blood peaks in younger athletes between the ages of 15-25, and Nitric Oxide supplements have been most well known for their cardiovascular benefits. When plaque is built up in arteries, the capacity to produce Nitric Oxide decreases, so physicians prescribe some patients with Nitric Oxide hoping it can help with the decreased blood flow to due clotting.

The effects in younger athletes are questioned because the arteries cannot release an unlimited supply of nitric oxide, so consuming more than normal may not have any benefits at all. Additionally, taking too much Nitric Oxide, even if prescribed by a doctor for a cardiovascular issue, can lead to hypotension- low blood pressure (Side Effects). For this reason and questions of whether or not it is beneficial to younger age groups, many athletes choose pre-workouts that do not contain Nitric Oxide. Caffeine is a huge component in pre-workout supplements, and is probably the one ingredient that is most controversial.

Chemically, caffeine does promote alertness and focus, but the long-term effects and other side effects are what scare most people away from taking additional caffeine to what many people already take on a daily basis. When someone gets tired, it is because of a chemical called adenosine. Adenosine builds up in the brain whenever you are awake, and it binds to adenosine

receptors on brain cells. The binding of adenosine causes drowsiness by slowing down nerve cell activity. To a nerve cell, caffeine looks just like adenosine, so caffeine is able to bind to the adenosine receptors in your brain.

However, caffeine does not slow down the cell's activity like adenosine would. The cell cannot “ see” adenosine anymore because caffeine is taking up all the receptors adenosine binds to, so instead of slowing down because of the adenosine level, the cells speed up. Now there are lots of neurons firing in the brain, and the pituitary gland then sees all of the brain activity and thinks some sort of emergency must be occurring, so it releases hormones that tell the adrenal glands to produce adrenaline. Adrenaline is the “ fight or flight” hormone.

Your pupils dilate, your heart beats faster, and the liver releases sugar into the bloodstream for extra energy. Caffeine is taken on a daily basis by about 85% of Americans who have the financial capability (Weinberg). The government has suggested that in our daily diets we consume no more than 400mg per day, which is why pre-workout supplements containing caffeine are being scrutinized (Jegtvig). One serving of Assault by MusclePharm has 200mg of caffeine and Animal Rage, another popular brand of pre-workout, has over 300mg (bodybuilding. com). Consuming too much caffeine can bring on a number of different side effects.

Caffeine increases dopamine levels in the same way that amphetamines do. Dopamine is a neurotransmitter that, in certain parts of the brain, activates the pleasure center. It is suspected that this dopamine connection

contributes to caffeine addiction. Caffeine has also been shown to lead to sleeping problems and irregular heartbeats. A study was done on a group of cyclists in England testing the effects of caffeine on metabolic rates and endurance performance. Nine cyclists, seven men and two women, exercised until exhaustion on a bike at 80% of their Vo₂ (maximal oxygen uptake).

There were two main trials in the experiment: trial D, which required that the subjects consume decaffeinated coffee before exercise, and trial C, which required that the subjects consume a cup of coffee containing 330mg of caffeine one hour before exercise. In trial C, the subjects were able to perform an average of 90.2 min of exercise at 80% of their Vo₂ max, compared to only 75.5 min for the decaffeinated coffee group (Costill). Judging by these results, caffeine does show significant help in training, but the long-term usage can lead to dependence on the substance as well as other complications discussed earlier.

It is up to the athlete whether he or she is willing to use the stimulant to better their performance, taking into account the fact that there are certain risks involved with long-term caffeine usage. Another ingredient found in the majority of pre-workouts is B vitamins, which are important to our bodies for energy purposes. Vitamin B₁₂ is one of the most common B vitamins found in pre-workouts, because it functions in the process of converting carbohydrates, proteins, and fats into energy. This provides athletes with a method of better utilizing stored energy already in their bodies (Obikoya).

Another important B vitamin that provides focus and alertness is vitamin B₁, or Thiamine. Without an adequate supply of vitamin B₁, the protective

tissues around nerves, known as myelin sheaths, can degenerate causing pain, prickly sensations, and nerve deadening. Because of this, vitamin B1 is the other source of “ mental focus” that pre-workouts advertise, the other being caffeine (Thiamine). Riboflavin, or vitamin B2, is used by the body to support red blood cell production and carbohydrate metabolism (Obikoya).

These are the major vitamins found in pre-workout supplements, and they are probably the least controversial and debated ingredients in pre-workout supplements. B-vitamins can also be found in energy drinks and even in our diets in foods such as meat and dairy. Lastly, 1, 3 Dimethylamylamine is found in about half of pre-workout supplements and has a few different functions. To begin with, 1, 3 dimethylamylamine, also known as DMAA, is a natural stimulant that is derived from the oil of the geranium flower’s stem.

It behaves like a mixture of caffeine and a very weak version of Adderall, which is a drug that is taken by people with Attention-Deficit-Disorder (ADD) to help them improve focus and energy. DMAA also works as a bronchodilator, which expands your lungs (Bloomer). For this reason, swimmers, runners, and other athletes that participate in aerobic training are more likely to take pre-workouts containing DMAA. Additionally, 1, 3 Dimethylamylamine is an appetite suppressant, which promotes weight-loss (Bloomer). Separately, all of these benefits sound great, but when you combine them into one supplement is when problems can occur.

DMAA is giving you a lot of energy to keep working out harder and harder, but it is also curbing your appetite, making hard for a lot of people to consume the right amount of food they need given the amount of exercise

they are performing. Another drawback with DMAA is that it is banned by the NCAA and other governing athletic bodies due to the reason mentioned above. Thirdly, DMAA is a vasoconstrictor, tightening the veins and reducing blood flow, which, as previously mentioned in this paper, goes against what nitric oxide supplements do (1, 3 Dimethylamylamine).

Now that the basic components of pre-workout supplements have been listed, we can now cover the differences in brands, types, etc. For starters, there are two main categories of pre-workouts: stimulant-free, and those with stimulants. All this really means is that some brands include caffeine dosages in their product (products with stimulants), and others do not (stimulant-free). Those products that are termed stimulant-free are usually referred to as nitric oxide supplements, but essentially they are the same minus the caffeine.

Two important reasons that people choose stimulant-free products are that caffeine based products are banned by many athletic organizations, and many people experience a mental and physical crash about an hour after working out from the caffeine and the DMAA. Another reason stimulant-free products have a bigger market is the whole issue of cycling caffeine based supplements. Since caffeine works by attaching to the adenosine receptors on the brain, these receptors need a break after taking in large amounts of caffeine.

Most pre-workout supplements containing caffeine suggest that individuals take two to three weeks off for every two to three months on a stimulant loaded pre-workout (bodybuilding. com). Summing up all of these ingredients

discussed, pre-workout supplements attempt to give athletes an advantage by maximizing energy and focus while training. However, it is important to note that these products are “ supplements. ” They are meant to supplement an already healthy diet full of the necessary proteins and carbohydrates.

A lot of the long-term side effects associated with these products may be unknown, but it is very clear that if a proper diet is not maintained, the athlete will not grow stronger physically and may become dependent on these products. Whether or not these products should be consumed while knowing little about whether the long-term effects could be dangerous, should be assessed by every individual before consuming these supplements. It will be very interesting to see whether or not these supplements will still be allowed in athletic organizations such as the NCAA and other professional institutions in the future.