

# Exploring the Benefits of Creatine for Physical and Mental Health

Analysis by [Dr. Joseph Mercola](#)

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## STORY AT-A-GLANCE

- › Creatine is a nitrogenous organic acid that enhances athletic performance, builds muscle mass and decreases body fat when combined with exercise. It's found naturally in the body and supports energy production
- › Creatine supplements can help improve physical performance, increase lean body mass and support muscle recovery. Its benefits are seen across various demographics and fitness levels
- › Beyond exercise, creatine boosts brain health by supporting energy-dependent functions like cognition and memory. It acts as a neuromodulator and may have protective effects on your mental functions
- › Studies show creatine can help counter the effects of sleep deprivation on cognitive performance, potentially benefiting first responders, healthcare workers and others needing optimal brain function despite lack of sleep
- › Creatine is found in animal-based foods, particularly grass fed meat and milk. Supplementation with creatine monohydrate is considered safe at recommended doses of 3 to 5 grams per day

The powerful benefits of creatine are now being widely recognized, with experts even recommending it as the go-to fitness supplement that can give you “the best bang for your buck.”<sup>1</sup> Apart from enhancing athletic performance, studies have also credited it for

helping build body mass and decrease body fat percentage when combined with exercise.<sup>2</sup>

But even if you're not a bodybuilder or professional athlete, you can benefit from increasing your creatine intake and optimizing your levels. Let's take a closer look at what creatine can do for you.

## What Is Creatine?

Although creatine is often referred to as an "amino acid," it isn't one of the 20 amino acids that are considered the building blocks of protein. Rather, creatine is a nitrogenous organic acid made from three true amino acids, namely glycine, arginine and methionine.<sup>3,4</sup>

Your body naturally produces creatine – 95% of your body's creatine supply is found in your skeletal muscle while 5% is in your brain. It supplies energy to the cells throughout your body, especially muscle cells, and is transported through your blood.<sup>5</sup>

But how exactly does your body use creatine and transform it into energy? Basically, creatine binds to phosphate to create a compound called creatine phosphate or phosphocreatine.<sup>6</sup> Creatine phosphate is then used in the production of adenosine triphosphate (ATP), which is the fuel your cells need during exercise. It converts adenosine diphosphate (ADP) to ATP.

As your muscles work, such as when you're exercising, ATP is then broken down to release energy. The more ATP available for your cells to use, the more energy you have, leading to better performance and quicker recovery.<sup>7,8</sup> The website Educational Wave gives a more detailed step-by-step explanation on the energy production mechanism of creatine.<sup>9</sup>

***"1. Phosphocreatine formation – Creatine combines with phosphate to form phosphocreatine, which acts as a readily available energy reservoir.***

**2. ATP hydrolysis** – During muscle contraction, ATP is hydrolyzed into adenosine diphosphate (ADP) and inorganic phosphate, releasing energy for muscular work.

**3. Phosphocreatine donation** – Phosphocreatine donates its phosphate group to ADP, converting it back to ATP, thereby replenishing energy stores swiftly.

**4. Repeat cycle** – This cycle allows for rapid regeneration of ATP, supporting continued high-energy activities.”

## **Creatine Versus Creatinine – What’s the Difference?**

Although they may sound similar, creatine and creatinine are two different substances. Creatine supplies energy to your cells, while creatinine is the byproduct made from when creatine is broken down in your muscle tissue, which occurs after your body digests protein.<sup>10</sup> Around 1% to 2% of the creatine found in your muscles is broken down into creatinine before it is excreted from your body via your urine.<sup>11</sup>

However, creatinine has more uses, particularly for determining the state of your health. For example, your healthcare provider may determine the health of your kidneys by analyzing your urine samples and testing for creatinine levels.

Your kidneys are responsible for eliminating waste products from your body, and if it has elevated levels of creatinine for an extended period, it could indicate that there’s a buildup of waste in your body, meaning you’re potentially at risk for kidney stones or chronic kidney disease.<sup>12</sup> On the other hand, if you have low levels of creatinine, it may indicate an issue with your body’s creatine production or a problem with your liver.<sup>13</sup>

## **Creatine Improves Physical Performance and Supports Recovery**

One of the most celebrated benefits of creatine is its ability to enhance athletic performance, and potential to help increase muscle strength, size and power. In a July 2024 meta-analysis published in The Journal of Strength and Conditioning Research,<sup>14</sup>

the researchers found that combining creatine with resistance training workout helped increase muscle mass and decrease fat.

Based on data from 12 studies, the researchers found that people who did resistance training and took creatine supplements increased their lean body mass by 1.14 kilograms (2.5 pounds) and reduced their body fat percentage by 0.88% compared to just doing the workout. They also reduced their total body fat mass by 0.73 kilograms (1.6 pounds).<sup>15</sup>

A separate meta-analysis, published in the Journal of the International Society of Sports Nutrition,<sup>16</sup> reported similar findings. Based on their report, the increase in body mass among the participants who supplemented with creatine was independent of other factors, including gender, age, fitness level, dosage and even their preferred exercise routine. The study authors concluded:

*“Based on previous research findings, which did not report any adverse effects related to the use of creatine supplements on the overall well-being of participants, it seems that people who are apparently healthy may experience benefits from the performance-enhancing properties of creatine supplementation.”<sup>17</sup>*

Creatine may also help speed up muscle recovery. According to Cleveland Clinic,<sup>18</sup> this substance activates satellite cells in your muscles, which then helps heal and seal the microtears that form on your muscle fibers during exercise.

Another study<sup>19</sup> also found that creatine has anti-inflammatory properties that may help ease fatigue both in endurance athletes and people who do low-intensity workouts, further supporting the notion that creatine imparts benefits regardless of the individuals' fitness level or intensity of the workout. According to the researchers:

*“Creatine is known to act as an energy buffer, but it has also been suggested to exert inhibitory effects on muscle damage and peripheral inflammation ... The anti-inflammatory effects of creatine were pronounced in slow-twitch skeletal muscle, suggesting that creatine may be useful for relieving fatigue in*

*endurance athletes and non-athletic individuals who perform low-intensity exercise.”<sup>20</sup>*

## **Creatine’s Benefits Go Beyond Exercise**

Aside from the fitness or physical “gains” that creatine provides, there’s now compelling research supporting its advantages for brain health. The brain, despite making up only 2% of your bodyweight, is the most energy-dependent organ – it uses up to 20% of your total energy.<sup>21</sup> With its ability to boost energy production, creatine’s benefits may extend to your brain.

According to Symbios Health,<sup>22</sup> creatine aids your brain cells by supporting brain functions like oxidative phosphorylation – this is the ability of the cells to oxidize nutrients to release chemical needed for ATP production. This is particularly important to your energy-dependent brain functions, such as cognition, memory recall and problem solving.

A 2023 study<sup>23</sup> also highlighted creatine’s ability as a neuromodulator that may have protective effects on various mental functions. The researchers found that creatine interacts with various receptors, therefore affecting the central transmission process.

*“[C]reatine could interact with the N-methyl-D-aspartate receptor, Na<sup>+</sup>-K<sup>+</sup>-ATPase enzyme, GABA<sub>A</sub> receptor, serotonin 1A receptors, and presumably  $\alpha$ 1-adrenoceptor and play critical roles in the central transmission process which implies that creatine can be considered a neuromodulator,” the researchers concluded.<sup>24</sup>*

However, some experts say that there may be limitations to creatine’s efficiency in boosting cognitive function. In a Medical News Today article,<sup>25</sup> Marco Machado, Ph.D., explained that creatine’s potential to improve thinking skills may only be utilized in specific circumstances and by certain groups of people, saying:

*“Particularly, it [creatine] has shown promise in improving cognition among older adults, especially those with lower intake of animal-derived foods, as well*

*as in cases of mild brain trauma and sleep deprivation.”<sup>26</sup>*

## **Creatine Can Boost Your Brain Function When You’re Sleep-Deprived**

A February 2024 paper published in Scientific Reports<sup>27</sup> delves into this topic further, specifically focusing on creatine’s ability to counter the effects of sleep deprivation. Fifteen healthy participants were asked to stay awake the entire night, for two days – during the first night, they were provided with creatine, but in the second night, only a placebo was provided. The researchers then observed their brain function by conducting memory and reaction time tests.

They found that taking creatine partly prevented energy-related changes brought on by sleep deprivation, leading to less fatigue and better results in the cognitive tests, particularly improvements in processing capacity and short-term memory.

*“[C]reatine has the potential to be used in prolonged cognitive activity during sleep deprivation. Our study showed the effect of a high dose of creatine against sleep deprivation-induced deterioration in cognitive performance, lasting up to 9 [hours] and showing its maximum cognitive effect at 4 [hours] after oral administration,”* the researchers concluded.<sup>28</sup>

Scott Forbes, Ph.D., who was not involved in the sleep deprivation study but have co-authored the meta-analysis on creatine’s effect on body mass mentioned above (as well as other studies on creatine and brain health), praises creatine’s on the impressive ability to impart significant increases in brain performance,<sup>29</sup> especially since previous research have speculated that taking high doses for long periods of time is crucial to elevate creatine levels and produce any benefits. Speaking to Medical News Today, Forbes comments:

*“Since a lot of people experience sleep deprivation, this is some really cool data that shows creatine works. More research is needed, but these findings could be highly applicable to first responders – firefighters, military, police –*

*healthcare workers, pilots, or athletes who may have trouble sleeping yet need to have their brains functioning at a high level.”<sup>30</sup>*

## **Creatine May Help with PTSD Recovery**

In my previous article, [“Relationship Found Between Creatine in the Brain and Recovery from Traumatic Stress,”](#) I discussed how creatine may be beneficial for veterans who are dealing with post-traumatic stress disorder (PTSD). A study published in the Journal of Affective Disorders revealed how this compound may assist war veterans in recovering from the stress brought on by their traumatic experiences.<sup>31</sup>

The scientists conducted brain scans on 25 U.S. veterans and looked at their anterior cingulate cortex (ACC), a brain region involved in processing negative emotional states. They found that veterans who have higher levels of creatine in their ACC had greater reductions in stress in the time since their last traumatic experience.

*“This line of research suggests that individual differences in the stress recovery process may be involved in the pathogenesis of PTSD. Thus, understanding factors associated with recovery from traumatic life events may provide novel insights into the assessment, prevention and treatment of PTSD and other trauma-related conditions,”* the researchers said.<sup>32</sup>

These findings support the notion of how important sufficient cellular energy is to achieve optimal brain function. Having a surplus of cellular energy creation is crucial for your brain to work optimally. To learn more about creatine’s benefits against stress and how to deal with traumatic stress, I recommend reading the article linked above.

## **Creatine Food Sources and Supplementation**

I don’t recommend resorting to supplements as your first choice for getting your daily nutrition, when there are actually healthy foods sources that can provide sufficient levels of the nutrients you need. In the case of creatine, the best dietary sources are animal-based foods. Creatine is only found in animal products, not plants.

Grass fed milk and meats are among the best sources, with the exception of conventionally raised pork and chicken – they are high in [linoleic acid \(LA\)](#), which is the most destructive ingredient in your diet. Excessive LA intake can interfere with your cellular energy production and cancel out the benefits you may be getting from creatine.

However, the levels of creatine in grass fed meats may not be enough to give you the high doses you need to have a noticeable impact on your well-being. In this case, you may consider creatine supplementation.

There are different formulations of creatine available today, but the one I recommend, creatine monohydrate, has been studied most frequently and therefore has the strongest evidence of health benefits. Make sure to look for a reputable manufacturer and to take only the recommended dose.

Are there any side effects when taking creatine? The answer is no – as long as you stay within the recommended dose. According to Harvard Health Publishing,<sup>33</sup> the recommended dose is 3 to 5 grams per day; there's no advantage to taking high doses, as you will only end up straining your kidneys.

Furthermore, ingesting creatine in doses as high as 10 grams per day can lead to gastrointestinal discomfort and diarrhea; if you take 20 grams daily, you may end up with water retention in your body.<sup>34</sup> So, remember to stay within the recommended dose.

## Sources and References

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