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Cody Baxter
University of North Dakota

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The Safety and Efficacy of Creatine Supplementation in the General Public

Cody Baxter, PA-S
Department of Physician Assistant Studies, University of North Dakota School of Medicine & Health Sciences
Grand Forks, ND 58202-9037

Abstract
The purpose of this study was to determine whether supplementation with creatine monohydrate is efficacious beyond the realm of its most popular use, which is in athletics. This study investigated the safety of creatine supplementation in the general population. References were collected through a review of PubMed and Scopus databases. Initial keywords searched were creatine supplementation and creatine safety. Where possible, trials with human subjects were utilized. Studies focused on creatine’s effects in athletes or weightlifting parameters were eliminated. Topics were reviewed with the most amount of research and medical concerns recognized as common to primary care. Creatine supplementation showed potential benefits in treatment for major depressive disorder, diabetes, bone density, and osteoarthritis. Mild weight gain due to the osmotic effect of creatine was the only side effect noted in the evidence. Kidney function is not affected by creatine supplementation. Creatine supplementation has potential benefits for many different patient populations, with the only side effect of creatine supplementation being mild weight gain due to the osmotic effect of increased creatine saturation in the body. Physicians should consider creatine supplementation without fear of potential serious adverse effects based on the available evidence.

Introduction
Creatine is a naturally occurring compound composed of three amino acids: glycine, arginine, and methionine. (Kreider et al. 2017) Approximately 95% of creatine is found within skeletal muscle, with the remainder being found in the brain and testes (in males). Creatine supplementation increases muscle phosphocreatine concentration, reduces muscle acidosis and oxidative metabolism, and increases lean body mass. Creatine has been extensively studied for its use as an ergogenic aid in athletes of all sports, particularly those involving short bursts of intense exercise. These results are not nearly as well known, and creatine is not widely used outside of the athlete population. Clinicians may be missing opportunities to utilize creatine, which is a cheap, over-the-counter nutritional aid. Additionally, there is often concern voiced over the safety of creatine supplementation, often citing deleterious effects on hydration, kidney function, or overall health. These concerns may not be founded in actual scientific evidence.

Research Questions
• Does creatine supplementation provide benefit in any patient populations besides athletes?
• Is creatine supplementation safe?

Literature Review
A search of the literature showed creatine has been studied for multiple common disease processes including depression, type 2 diabetes mellitus, and osteoarthritis.

Depression
Lyoo et al. (2012) found that adding creatine to escitalopram resulted in a faster treatment response compared to escitalopram and placebo. Creatine should be avoided in bipolar disorder due to its possibility of inducing mania (Tonolio, Fernandes, Silva, da Silva Dias, and Lafar 2016).

Diabetes
• Gualano et al. (2011a) reported 5g creatine/day combined with exercise lowered HbA1c by 1.1% compared to no change in the kidney function after 12 weeks of creatine use (Gualano et al. 2011b). Alves et al. (2012) found creatine supplementation increased plasma Cystatin C, which shows a positive effect on creatine’s ability to help regulate glomerular dysfunction.

Osteoarthritis
Neves et al. (2011) studied creatine supplementation in patients with knee osteoarthritis. The creatine group showed improved quality of life and decreased pain compared to the placebo group.

Safety
• A review of over 1,000 creatine studies (Kreider et al. 2017) showed no evidence of any adverse effects of creatine supplementation up to 30g/day and/or 5 years.
• The only consistent effect noted was mild lean mass gain, primarily due to the osmotic effect of creatine.
• Creatine has been shown to be safe in age ranges from infant to geriatric, and even in pregnancy.

Discussion
Depression
• Has shown potential to improve depression symptoms when used in conjunction with SSRIs.
• May make onset of efficacy faster for SSRIs.
• Should be avoided with bipolar depression due to risk of inducing manic episodes.

Diabetes
• Improved glycemic control, especially when paired with exercise, due to increase in GLUT-4 membrane content.
• Does not impair kidney function in patients with T2DM.

Osteoarthritis
• Increased lean mass, muscle strength, and physical function.
• Combined with exercise, may stop or reduce progression of osteoarthritis.

Safety
• Only potential side effect is mild weight gain due to increases in lean mass. Studies going as long as five years and with doses up to 30g/day identify no other adverse effects. Has been studied in infants, adolescents, adults, and pregnancy with no evidence of additional side effects.

Applicability to Clinical Practice
• Depression, diabetes, and osteoarthritis are common diseases encountered by all primary care practitioners.
• Creatine has numerous reported benefits and very few adverse affects. This makes creatine a possible adjunctive therapy for treatment of these diseases.
• Physicians should consider trialing creatine therapy, especially if traditional treatment options are failing to provide adequate response.

References

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