



2018

The Safety and Efficacy of Creatine Supplementation in the General Public

Cody Baxter
University of North Dakota

[How does access to this work benefit you? Let us know!](#)

Follow this and additional works at: <https://commons.und.edu/pas-grad-posters>



Part of the [Amino Acids, Peptides, and Proteins Commons](#)

Recommended Citation

Baxter, Cody, "The Safety and Efficacy of Creatine Supplementation in the General Public" (2018).
Physician Assistant Scholarly Project Posters. 4.
<https://commons.und.edu/pas-grad-posters/4>

This Poster is brought to you for free and open access by the Department of Physician Studies at UND Scholarly Commons. It has been accepted for inclusion in Physician Assistant Scholarly Project Posters by an authorized administrator of UND Scholarly Commons. For more information, please contact und.common@library.und.edu.

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

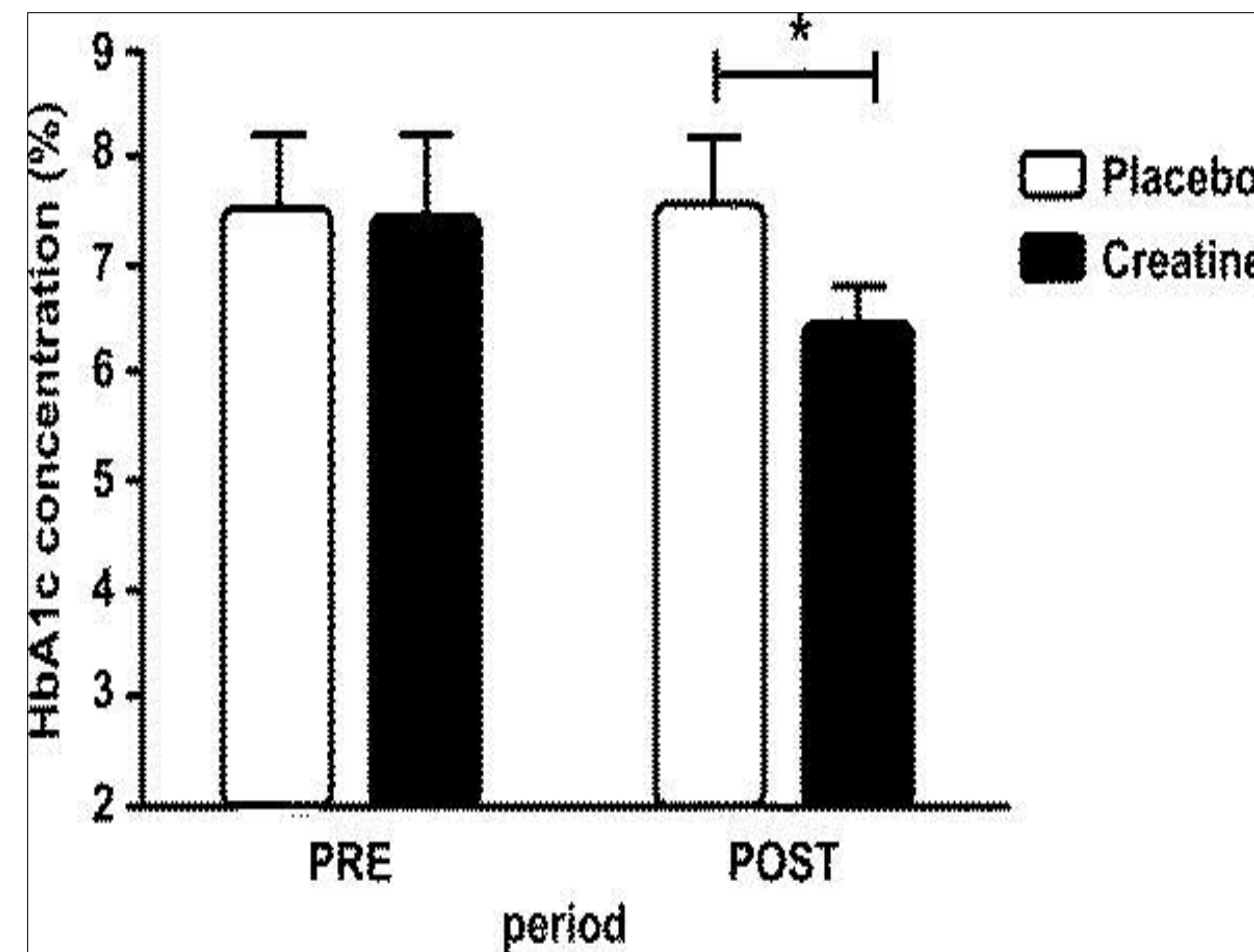
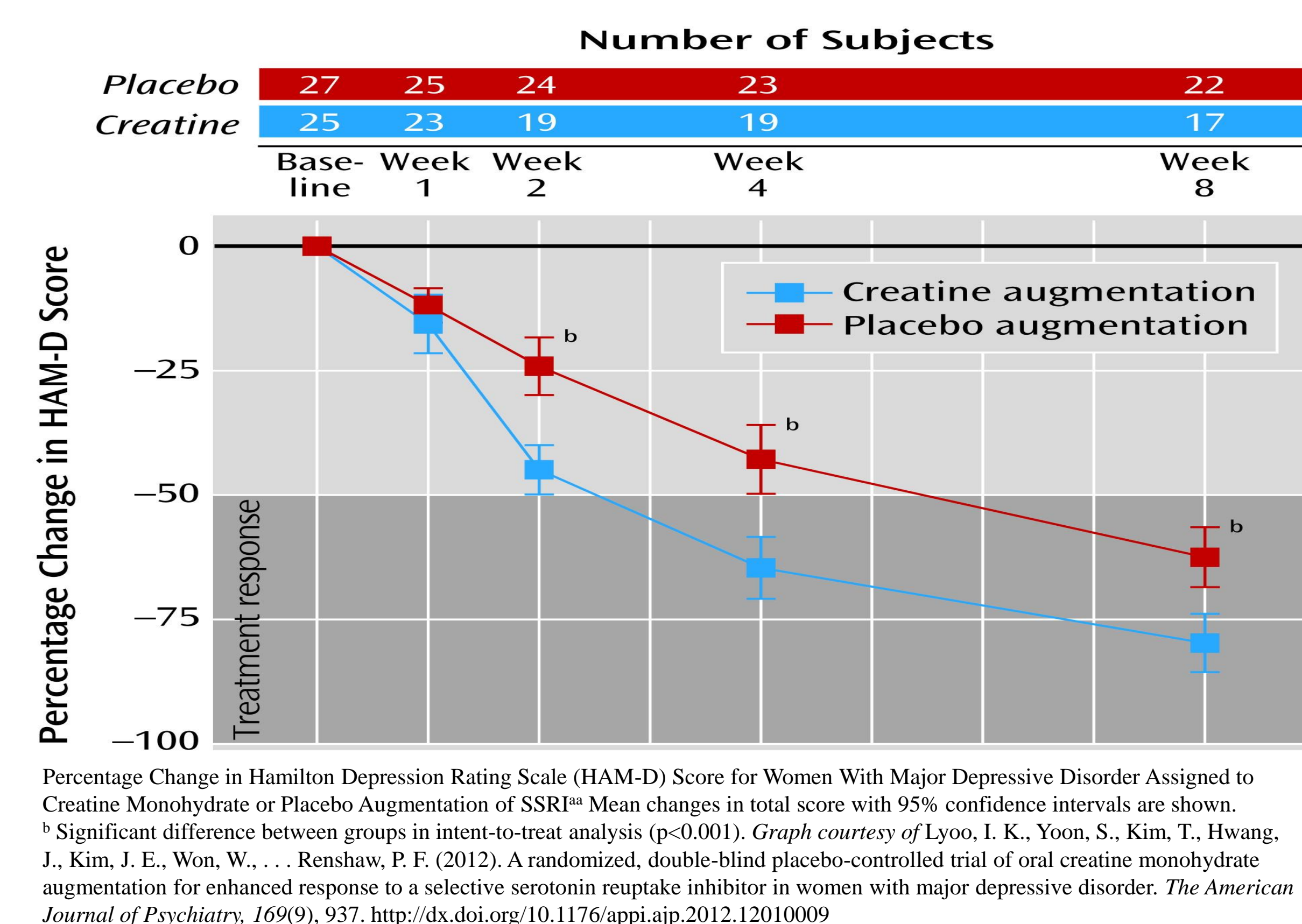
The purpose of this study was to determine whether supplementation with creatine monohydrate is efficacious beyond the realm of its most popular use, which is in athletics. This study investigated the safety of creatine supplementation in the general population. References were collected through a review 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 further narrowed down by conditions 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. Clinicians 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 activity.

Statement of the Problem

Creatine is used by athletes worldwide; however, creatine has also been studied for numerous other potential benefits in both general and disease-specific populations. 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.



Effects of creatine supplementation combined with exercise training in type 2 diabetic patients on HbA1c concentrations. *Interaction effect (P = 0.004; estimated difference of means = -1.1%, 95% CI = -1.9% to -0.4%). Graph courtesy of Gualano, B., de Salles Painelli, V., Roschel, H., Artioli, G. G., Neves, M. J., De Sá Pinto, Ana Lúcia, . . . Lancha, A. H. J. (2011a). Creatine in type 2 diabetes: A randomized, double-blind, placebo-controlled trial. *Medicine & Science in Sports & Exercise*, 43(5), 770-778. <http://dx.doi.org/10.1249/MSS.0b013e3181fcee7d>

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 earlier treatment response compared to escitalopram and placebo.
- Creatine should be avoided in bipolar depression due to its possibility of inducing mania (Toniolo, Fernandes, Silva, da Silva Dias, and Lafer 2016).

Diabetes

- Gualano et al. (2011a) reported 5g creatine/day combined with exercise lowered HbA1c by 1.1% compared to no change in the control group. These same participants showed no change in their kidney function after 12 weeks of creatine use (Gualano et al. 2011b).
- Alves et al. (2012) found creatine supplementation increased presence GLUT-4 receptors, which explains one of the mechanisms by which creatine helps regulate glycemic control.

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

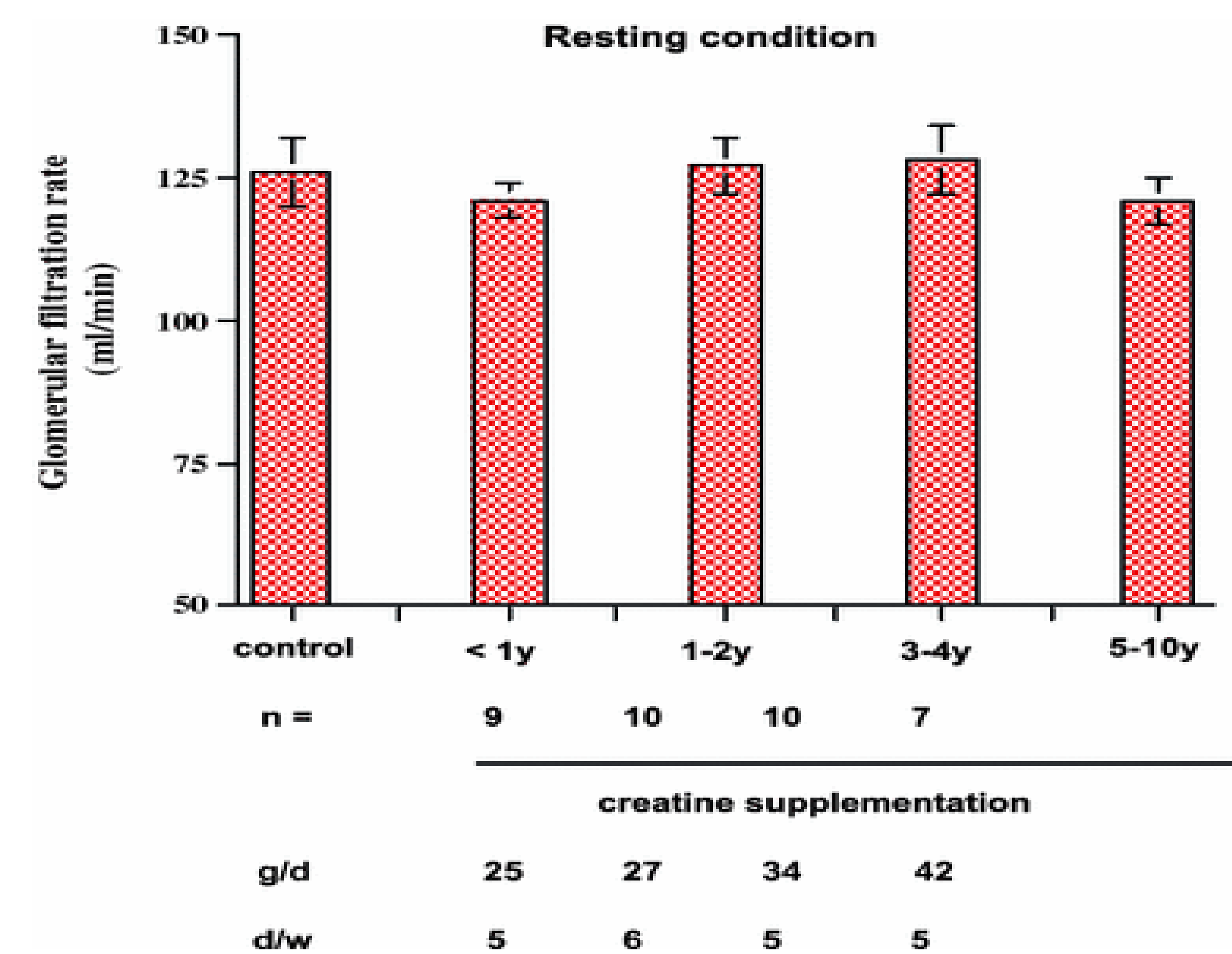
- Improved glycemic control, especially when paired with exercise, due to increase in GLUT-4 membrane content.
- Does not impair kidney function in patients with T2DM.

Osteoarthritis

- Increased lean mass, muscle strength, and physical function.
- Combined with exercise, may stop or reduce progress 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.



Glomerular filtration rate (ml/min) calculated from plasma Cystatin-C determination among young athletes with no creatine supplementation (control) and individuals who regularly, several days per week, ingested exogenous creatine during less than a year to several years. All values are within the normal range for a clinically normal population. The number (n) of young individuals (mean age: 14-28 years), the daily quantity per day (g/day) and the number of days per week (day/week) of creatine supplementation are given for each category. Graph courtesy of Kim, H., Kim, C., Carpentier, A., & Poortmans, J. (2011). Studies on the safety of creatine supplementation. *Amino Acids*, 40(5), 1409-1418. <http://dx.doi.org/10.1007/s00726-011-0878-2>

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.
- Clinicians should consider trialing creatine therapy, especially if traditional treatment options are failing to provide adequate response.
- Further large scale trials showing benefits of creatine will be needed before creatine becomes a more widely accepted treatment option.
- Based on the current studies, clinicians should NOT discourage patients from creatine use if asked about its safety.

References

- Alves, C., Ferreira, J., de Siqueira-Filho, M., Carvalho, C., Lancha Jr, A., & Gualano, B. (2012). Creatine-induced glucose uptake in type 2 diabetes: A role for AMPK-[alpha]? *Amino Acids*, 43(4), 1803. <http://dx.doi.org/10.1007/s00726-012-1246-6>
- Gualano, B., de Salles Painelli, V., Roschel, H., Artioli, G. G., Neves, M. J., De Sá Pinto, Ana Lúcia, . . . Lancha, A. H. J. (2011a). Creatine in type 2 diabetes: A randomized, double-blind, placebo-controlled trial. *Medicine & Science in Sports & Exercise*, 43(5), 770-778. <http://dx.doi.org/10.1249/MSS.0b013e3181fcee7d>
- Gualano, B., de Salles Painelli, V., Roschel, H., Lugaresi, R., Dorea, E., Artioli, G., . . . Lancha Junior, A. (2011b). Creatine supplementation does not impair kidney function in type 2 diabetic patients: A randomized, double-blind, placebo-controlled, clinical trial. *European Journal of Applied Physiology*, 111(5), 749-756. <http://dx.doi.org/10.1007/s00421-010-1676-3>
- Kim, H., Kim, C., Carpentier, A., & Poortmans, J. (2011). Studies on the safety of creatine supplementation. *Amino Acids*, 40(5), 1409-1418. <http://dx.doi.org/10.1007/s00726-011-0878-2>
- Kreider, R. B., Kalman, D. S., Antonio, J., Ziegenfuss, T. N., Wildman, R., Collins, R., . . . Lopez, H. L. (2017). International Society of Sports Nutrition position stand: Safety and efficacy of creatine supplementation in exercise, sport, and medicine. *Journal of the International Society of Sports Nutrition*, 14 <http://dx.doi.org/10.1186/s12970-017-0173-z>
- Lyoo, I. K., Yoon, S., Kim, T., Hwang, J., Kim, J. E., Won, W., . . . Renshaw, P. F. (2012). A randomized, double-blind placebo-controlled trial of oral creatine monohydrate augmentation for enhanced response to a selective serotonin reuptake inhibitor in women with major depressive disorder. *The American Journal of Psychiatry*, 169(9), 937. <http://dx.doi.org/10.1176/appi.ajp.2012.12010009>
- Neves, M. J., Gualano, B., Roschel, H., Fuller, R., Benatti, F. B., De Sá Pinto, Ana Lucia, . . . Bonfá, E. (2011). Beneficial effect of creatine supplementation in knee osteoarthritis. *Medicine & Science in Sports & Exercise*, 43(8), 1538-1543. <http://dx.doi.org/10.1249/MSS.0b013e3182118592>
- Toniolo, R. A., Fernandes, Francy de Brito Ferreira, Silva, M., Dias, R. d. S., & Lafer, B. (2017). Cognitive effects of creatine monohydrate adjunctive therapy in patients with bipolar depression: Results from a randomized, double-blind, placebo-controlled trial. *Journal of Affective Disorders*, 224(Supplement C), 69-75. <http://dx.doi.org/10.1016/j.jad.2016.11.029>

Acknowledgements

Many thanks to my classmates for their moral support and gallows humor at many points throughout this program. I would like to thank my wife, Teila Baxter, for supporting me and encouraging me to pursue a topic I am passionate about. Lastly, thank you to my son, Rocky Baxter, for being a good kid and also just so you get to see your name on my poster.