

A Literature Review of the Effects of Creatine and Caffeine on Athlete Strength and Performance

Mirna Bebawi (bebawi@usc.edu), Michaela Maher (mmmaher@usc.edu), Nicole Papazian (npapazia@usc.edu)

Faculty Advisor: Dr. Kari Franson, PharmD, PhD, BCPP

Background/Purpose

Supplementation is a common practice among athletes, with creatine and caffeine being the most popular and widely used. Creatine, a naturally occurring compound found in muscle tissue, has been studied for its potential to enhance strength and power. Its role in cellular energy metabolism, particularly during high-intensity exercise, makes it a popular choice among athletes seeking to optimize their performance in activities requiring power or repeated efforts. Additionally, caffeine, a widely consumed stimulant, has been shown to improve endurance performance. This study aims to examine the use of creatine and caffeine to enhance athletes' performance while remaining safe and productive.

Methods

This literature review was conducted through the use of PubMed to analyze published articles between January 2010 to January 2023. The MeSH terms associated with this study include “Athletes”, “Athletic Performance”, “Creatine”, “Caffeine”, “Physical endurance”, and “Dietary Supplements” to generate articles that are randomized-control trials, clinical trials, case reports, systematic reviews, and meta-analyses. Boolean operators (AND, OR) were implemented to help narrow results to topic specificity.

Results

A total of 57 studies were reviewed, and 23 are included in this review. Of the studies included, six reported a greater improvement in muscle mass with participants ingesting 20 grams per day of creatine. The effects on fat-free mass ranged from a 2.5% - 3.6% increase compared to placebo. The improvements in time to exhaustion with the use of creatine are not as consistent, ranging between 1.0% - 11.0% compared to placebo. Caffeine supplementation in doses between 5-13 mg/kg may significantly improve time to exhaustion; changes in time to exhaustion are 3.1% - 8.3% increased compared to placebo. When comparing the supplements in combination use (creatine + caffeine), improvement in time to exhaustion demonstrated a 5% - 10% increase compared to placebo. Both, creatine and caffeine, are generally considered safe when used at recommended doses, with minimal side effects. Gastrointestinal discomfort and temporary weight gain are adverse effects experienced with creatine usage; insomnia and increased heart rate for those using caffeine.

Conclusion

Overall, integrating supplements such as creatine and caffeine into athletic training regimens shows promise for optimizing performance outcomes. The findings suggest the use of supplements appropriately can significantly enhance athletic performance, particularly in terms of muscle strength and endurance. However, further research is warranted to determine the optimal dosage and the combined usage of creatine and caffeine.