



Effect of Caffeine Ingestion on Softball Pitching Velocity and Accuracy

EXERCISE SCIENCE
SACRED HEART UNIVERSITY

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ABSTRACT

The efficacy of caffeine on sports performance has been extensively researched during steady-state sports, but the influence on motor skills remain understudied.

Purpose: The present pilot investigation sought to determine the effects of moderately low caffeine ingestion on softball pitching accuracy and ball velocity.

Methods: In a single blind design, five (n=5) female club softball players were either given a pill containing either caffeine (3 mg/kg body weight) (CAFF) from a commercially available product or a non-stimulant carbohydrate-based powder (maltodextrin) as a placebo (PLAC). After an hour of rest and self-selected warm-up post-ingestion, participants performed a total of 30 pitches (20 fastballs, 10 curveballs); pitching velocity and accuracy (% pitches in the strike zone) were determined by a portable pitching analysis software. Paired t-tests were used to determine statistical significance, and Cohen's d was used to describe effect sizes.

Results: Participants had significantly ($p < 0.05$) improved pitching velocity following the CAFF treatment (46.6 ± 6.3 mph) as compared to the PLAC treatment (42.8 mph ± 5.7 mph). There was not a significant difference ($p > 0.05$) between pitching accuracy for the CAFF treatment ($50.4 \pm 7.9\%$) and the PLAC treatment ($43.6 \pm 7.1\%$). **Conclusion:** This evidence suggests that moderately low caffeine dosage may improve softball pitching velocity without deleterious effects on accuracy.

Can caffeine improve pitching power output without compromising motor skill-dependent accuracy?

Caffeine is the most consumed psychoactive drug in the world and is widely considered to be a potential ergogenic aid in various sports.^{3,6} Some of the benefits of caffeine ingestion on exercise performance include, but are not limited to, improvements in aerobic endurance, local muscular endurance, movement velocity, power output, and sport specific motor skill performance.²⁻³ However, caffeine's effect on sport specific motor skill function is still considered understudied. The purpose of this pilot study was to determine potential effects sizes of moderately low caffeine ingestion on softball pitching accuracy and velocity. Provided medium-to-high effect sizes are present, data will be used to determine participant size (n) needs for a subsequent investigation.

PARTICIPANTS

Five collegiate club athlete softball players participated in this study after providing informed consent. All methods were approved by the Sacred Heart University Institutional Review Board. The mean age, height, and body weight of the participants was 21 ± 2 years, 64 ± 2 inches, and 144 ± 2 pounds, respectively.

METHODS

Participants arrived in the lab after a 4 hour fast. They were not allowed to consume any caffeine via food or drink for 24 hours prior to testing. The subjects consumed either 3 mg/kg body mass of caffeine (CAFF) contained within a commercially available supplement (Vivarin®, Media Consumer Healthcare Inc., Somerset, NJ) or a placebo pill (PLAC) containing 1/4 teaspoon (4 Calories) of maltodextrin (Muscle Feast, Nashport OH), an easily digestible carbohydrate and a commonly used placebo in dietary supplement research. Both substances (Vivarin® or maltodextrin) were contained in identical, non-translucent gelatin capsules as to blind subjects to treatment type. A 3mg/kg dosage is generally considered to be on the low end of moderate in sports nutrition research.³ All pills were made with the use of an A & D EJ- 200 scale (Grainger®, Lake Forest, IL), and treatment order was randomized for the initial participant, with subsequent participants alternating in order to reduce any potential order effects.

After one hour of rest,³ participants performed a self-selected warm-up consistent with their typical practice. Participants performed 30 pitches (20 fastballs, 10 curveballs) into a target 43 feet away (standard mound to plate distance in college softball) with Rapsodo 2.0 software (Rapsodo®, St. Louis, MO) tracking strike zone accuracy and softball velocity.⁴

Participants returned 7 days later and repeated all testing procedures with the alternate treatment.

Data were analyzed via a dependent t-test, and Cohen's d was used to determine effect sizes.

RESULTS

Five participants completed all testing procedures and were included in the final statistical analyses. Results can be seen in Table 1.

Table 1: Effects of Caffeine on Pitching Velocity and Accuracy

Treatment	Velocity (mph)		Accuracy (%)	
	Placebo	Caffeine	Placebo	Caffeine
Mean	42.8	46.6	43.6	50.4
SD	5.7	6.3	7.1	7.9
p Value		0.03		0.27
Effect Size (d)		1.47		0.57

DISCUSSION

The present data suggest that there may be improvement on softball pitching velocity from moderately low caffeine ingestion. The results for accuracy are promising in that the non-significant effect was still an improvement over the PLAC condition.

These results are consistent with previous investigations. Baker et al. report that caffeine and carbohydrate have the greatest number of published reports supporting their ability to enhance acute motor skill and cognitive performance in athletic populations.² In addition, Guest et al. state that a strong, positive correlation exists between caffeine and motor skill performance.³

TAKE HOME MESSAGE: A low-moderate caffeine dose improved softball pitching velocity without compromising accuracy.

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