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**EFFECT OF CAFFEINE SUPPLEMENTATION ON METABOLISM
AND PHYSICAL AND COGNITIVE FUNCTION IN FEMALE
INTERMITTENT GAMES PLAYERS**

By

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ABSTRACT

Purpose: To investigate the effects of caffeine ingestion on metabolism and physical and cognitive performance in female team-sport players taking a monophasic oral contraceptive.

Method: In a randomized, double-blind, placebo-controlled crossover design, 10 participants (age 23.6 ± 4.1 y; height 1.62 ± 0.06 m; body mass 59.0 ± 5.3 kg; $\dot{V}O_2$ max 50.0 ± 5.3 ml·kg⁻¹·min⁻¹) completed a 90 min intermittent treadmill-running protocol twice, during days 5-8 and 18-22 of their pill cycle. All participants were taking a monophasic oral contraceptive of the same hormonal composition (Levlen ED, Nordette, Monofeme, or Microgynon). During the familiarisation session participants completed a maximal oxygen uptake test, practiced the cognitive, strength, power testing, and underwent 30 min of the running protocol. Upon arrival at the laboratory for the main trials, hydration status was measured via urine specific gravity (USG) using a handheld refractometer and a heart rate (HR) monitor fitted. A capsule containing 6 mg·kg⁻¹ body mass (BM) of anhydrous caffeine or placebo (Maltodextrin, 1.62 kJ·g⁻¹) was administered 45 min before commencing exercise with a 500 ml bolus of water. Further 3 ml·kg⁻¹ BM boluses of water were provided every 15 min during exercise. Before, during and after the exercise protocol, venous blood samples were taken and cognitive (Choice Reaction Time, CRT; Digit Vigilance, DV; Stroop test), perceptual (Ratings of Perceived Exertion, RPE; Feeling Scale, FS; Felt Arousal Scale, FAS; Profile of Mood States, POMS), and physical tests (countermovement jump, CMJ; strength testing on the isokinetic dynamometer) were administered. These tests were then all performed again at a follow-up 12 h post session in the morning, including a venipuncture blood sample, and the addition of sleep quality assessment using the Leeds Sleep Evaluation Questionnaire (LSEQ).

Results: There were no significant effects of caffeine supplementation on HR, USG, CMJ, isometric strength, RPE, cognitive performance or glucose and insulin concentrations. Caffeine supplementation improved levels of pleasure, activation and vigour compared to

placebo, and reduced levels of fatigue ($P < 0.05$). Caffeine supplementation also improved average power in eccentric contractions of the knee extensors and flexors, and peak torque in the eccentric contractions of the knee flexors ($P < 0.05$). Getting to sleep and subsequent quality of sleep was impaired following caffeine supplementation ($P < 0.05$). Free fatty acid (FFA) concentration increased over the duration of exercise ($P < 0.05$), and increased at a greater rate on the caffeine trial ($P < 0.05$). **Conclusions:** This is the first controlled study to examine caffeine supplementation in female games players who are taking a low-dose monophasic oral contraceptive, using an intermittent based running protocol. These athletes experienced an improved performance in various strength and power aspects, but no improvement in cognitive performance. Perceptual and mood responses were also improved as a result of caffeine supplementation. Metabolically, caffeine had an effect on markers of fat metabolism but not on carbohydrate metabolism.

Keywords: caffeine, female, metabolism, performance, intermittent exercise

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