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ORIGINAL ARTICLE

Effects of coffee and caffeine anhydrous on strength and sprint performance

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Abstract
Caffeine and coffee are widely used among active individuals to enhance performance. The purpose of the current study was to compare the effects of acute coffee (COF) and caffeine anhydrous (CAF) intake on strength and sprint performance. Fifty-four resistance-trained males completed strength testing, consisting of one-rep max (1RM) and repetitions to fatigue (RTF) at 80% of 1RM for leg press (LP) and bench press (BP). Participants then completed five, 10-second cycle ergometer sprints separated by one minute of rest. Peak power (PP) and total work (TW) were recorded for each sprint. At least 48 hours later, participants returned and ingested a beverage containing CAF (300 mg flat dose; yielding 3–5 mg/kg bodyweight), COF (8.9 g; 303 mg caffeine), or placebo (PLA; 3.8 g non-caloric flavouring) 30 minutes before testing. LP 1RM was improved more by COF than CAF ($p = .04$), but not PLA ($p = .99$). Significant interactions were not observed for BP 1RM, BP RTF, or LP RTF ($p > .05$). There were no sprint × treatment interactions for PP or TW ($p > .05$). 95% confidence intervals revealed a significant improvement in sprint 1 TW for CAF, but not COF or PLA. For PLA, significant reductions were observed in sprint 4 PP, sprint 2 TW, sprint 4 TW, and average TW; significant reductions were not observed with CAF or COF. Neither COF nor CAF improved strength outcomes more than PLA, while both groups attenuated sprint power reductions to a similar degree. Coffee and caffeine anhydrous may be considered suitable pre-exercise caffeine sources for high-intensity exercise.

Keywords: *Ergogenic aids, high-intensity exercise, anaerobic exercise, resistance training, maximal strength*

Introduction

Caffeine is the most widely consumed psychoactive substance in the world, with estimates of average daily intakes as high as 4 mg/kg of bodyweight in US adults (Barone & Roberts, 1996). Caffeine was first shown to improve exercise performance by Costill, Dalsky, and Fink (1978), who demonstrated an increase in cycling time to exhaustion following coffee consumption. The primary ergogenic mechanism of caffeine is antagonism of adenosine receptors (Goldstein et al., 2010). Caffeine may also affect performance via both central and peripheral mechanisms by altering pain and effort perception (Doherty & Smith, 2005), calcium kinetics in the sarcoplasmic reticulum (Allen & Westerblad, 1995; Tallis, James, Cox, & Duncan, 2012; Weber & Herz, 1968), and sodium/potassium ATPase pump activity (Mohr, Nielsen, & Bangsbo, 2011), among other potential mechanisms (Goldstein et al., 2010). Caffeine in doses of 3–6 mg/kg bodyweight has been consistently shown to enhance endurance performance (Goldstein et al., 2010), but findings have been equivocal in the context of strength and sprint performance. Evidence currently suggests that caffeine may improve sprint performance in trained subjects (Collomp, Ahmaidi, Chatard, Audran, & Prefaut, 1992; Del Coso, Muñoz-Fernández et al., 2012; Lara et al., 2014; Wiles, Coleman, Tegerdine, & Swaine, 2006; Woolf, Bidwell, & Carlson, 2008), but not in untrained subjects (Collomp, Ahmaidi, Audran, Chanal, & Prefaut, 1991; Crowe, Leicht, & Spinks, 2006; Greer, McLean, & Graham, 1998; Lorino, Lloyd, Crixell, & Walker, 2006). Collomp et al. (1992) investigated the effects of caffeine

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