



The Effects of Acute Caffeine Ingestion on Perceived Exertion and Muscular Strength Endurance

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Abstract

Caffeine is a widely used stimulant found in coffee beans, tea leaves, cola nuts and cocoa beans. It has been suggested by the results of research studies that caffeine has an ergogenic effect in sports and physical activity. Much of the available research literature often supports caffeine's purported effects during endurance sports, but is limited concerning the performance benefits during strength sports lasting less than 3 minutes. **PURPOSE:** The purpose of this study was to examine the effects of caffeine supplementation on perception of workload intensity and muscular strength endurance during deadlift performance to failure. **METHODS:** Five recreationally (26.4 ± 6.07 yrs) active males attending UTA voluntarily participated in this study. Each subject reported on two occasions, separated by 48 hours, and consumed either a caffeine (C) or placebo (P) solution. Resting values for heart rate (HR) and blood lactate (BLA) were obtained for each subject prior to exercise performance. Each subject then performed deadlifts to failure using 60% of their previously determined one repetition maximum (1RM). Immediately after exercise, measurements were taken for peak heart rate (PHR), peak blood lactate (PBLA), rate of perceived exertion (RPE), total mass lifted (TML), and repetitions performed (RP). **RESULTS:** There was no statistical difference between caffeine and placebo ingestion for the following variables: Repetitions [(P) 21 ± 5.48 , (C) 23 ± 9.85 ; $p = 0.489$], PBLA [(P) 8.98 ± 1.27 mmol/L, (C) 9.76 ± 2.81 mmol/L; $p = 0.347$], PHR [(P) 136 ± 16.60 bpm, (C) 136.6 ± 14.42 bpm; $p = 0.877$], RPE [(P) 15.4 ± 1.67 , (C) 16 ± 2.55 ; $p = 0.305$], TML [(P) 1643.2 ± 723.35 kg, (C) 1841.84 ± 1102.50 kg; $p = 0.430$]. **CONCLUSION:** The results from this study indicated no statistically significant difference in the physiological variables resulting from caffeine supplementation. However, there was an improvement in work output at the specified intensity with caffeine ingestion among the sample. Future research should include a larger sample size to determine statistical significance.

Purpose

The purpose of this study was to examine the effects of caffeine supplementation on perception of workload intensity and muscular strength endurance during deadlift performance to failure.

Method

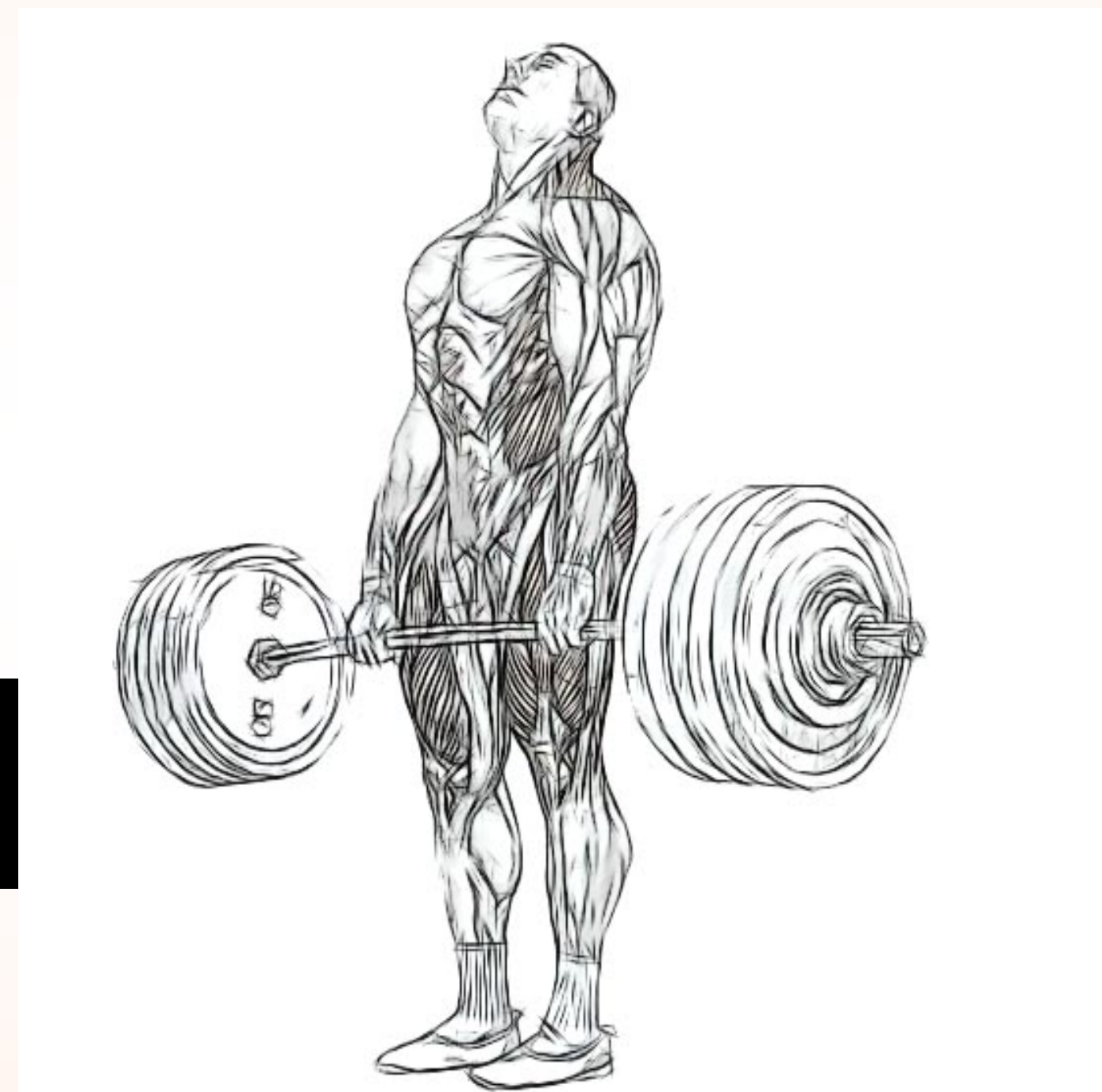
Participants

- Five recreationally active male UTA students (26.4 ± 6.07 years) participated in the non-consecutive three day study.
- All subjects had at least six months of prior weightlifting experience, specifically in performing deadlifts.
- Participants submitted signed consent forms and were approved for human subject study by the review board of the University of Texas at Arlington.
- Participants stated they had no previous back, hip, knee or ankle pathologies that would contraindicate their participation in the study.
- Participants abstained from all forms of lower extremity exercise and caffeine 48 hours prior to testing.

Method (cont'd)

Procedure

- Subjects reported to the UTA Biomechanics Research Laboratory for three non-consecutive days of testing.
- The first day was reserved for height and weight measurements and determination of deadlift one repetition maximum (1RM) for each subject.
- Each subject reported for two additional testing sessions in which they consumed either a caffeine (C) or placebo (P) solution one hour prior to exercise performance.



- Resting heart rate (RHR) and blood lactate (RBLA) were obtained for each subject during the waiting period.
- Each subject then performed deadlift repetitions until failure, using 60% of their previously determined 1RM.
- Upon completion of the exercise, measurements were taken for peak heart rate (PHR), peak blood lactate (PBLA), rating of perceived exertion (RPE), total mass lifted (TML), and the number of repetitions performed.
- On the last testing day, each subject consumed the opposite solution from which they were given during the previous session and repeated the protocol.

Instrumentation

- An Accusport Lactate Analyzer was used to measure resting and peak blood lactate ($\text{mmol} \cdot \text{L}^{-1}$) levels.
- Resting and peak heart rate ($\text{b} \cdot \text{min}^{-1}$) was measured using a Polar FT1 Fitness Heart Rate Monitor with chest strap transmitter.
- RPE was reported by the subjects using the Borg scale of perceived exertion.
- Deadlifts were performed using an Eleiko 45lb hexagon deadlift/shrug bar.

Statistical Analysis

- Caffeine and placebo conditions were analyzed using paired t -tests for each variable.
- Alpha level set at $\alpha = .05$
- Data were analyzed using Microsoft Excel



Figure 3. Accusport Lactate Analyzer used to measure blood lactate for each subject before and after deadlift performance.

Results

Table 2. Mean and SD of demographic variables.		
	Mean	Standard Deviation
Age (years)	26.4	6.07
Weight (kg)	78.9	15.63
Height (cm)	176.2	12.19
Deadlift 1RM (kg)	130	37.45
60% 1RM (kg)	77.28	21.76

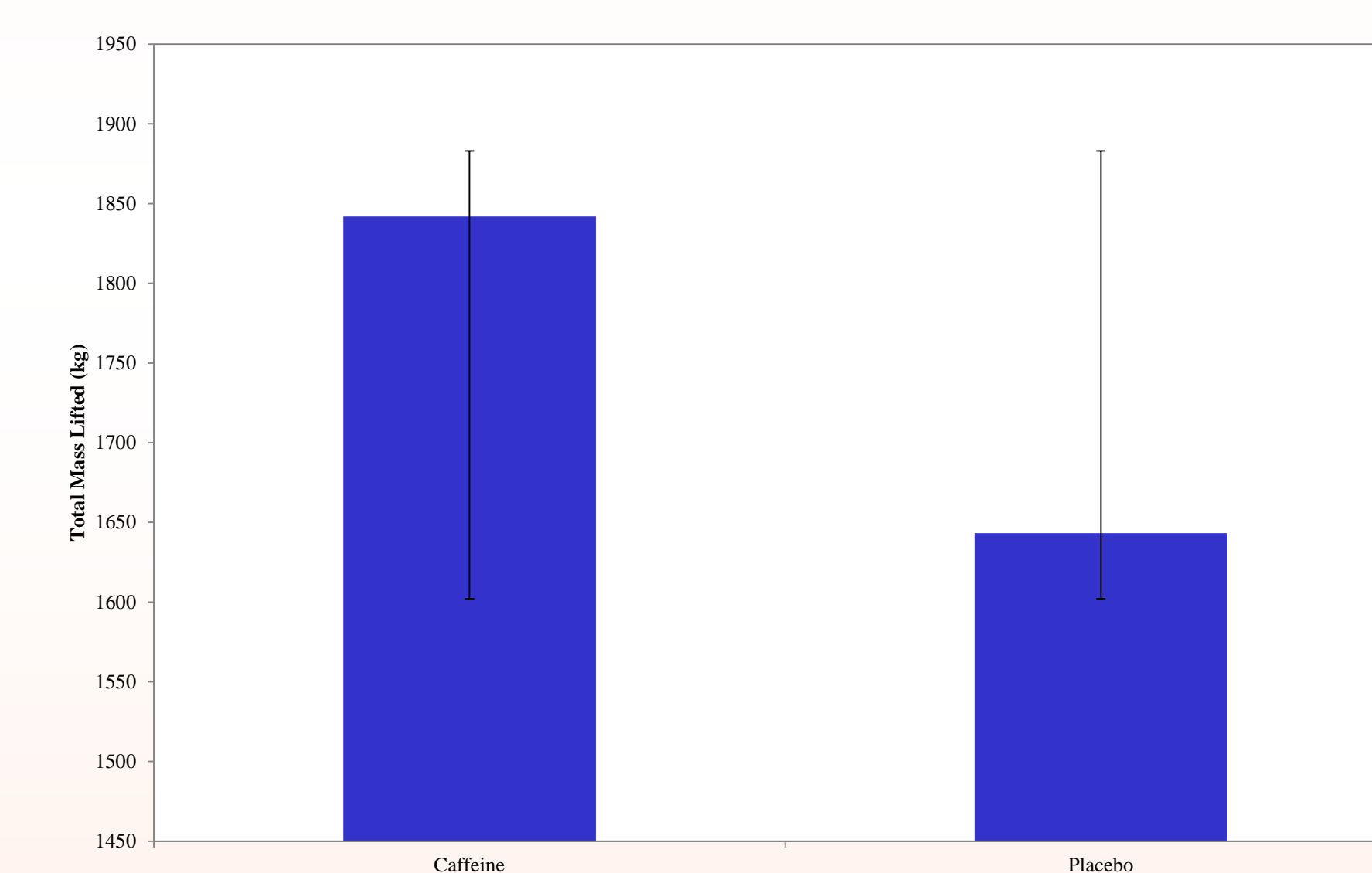


Figure 1. Mean \pm SD of total mass lifted(kg) during deadlift repetitions to failure at 60% 1RM in caffeine ($5\text{mg} \cdot \text{kg}^{-1}$) and placebo conditions.

Table 1. Mean \pm SD for reps, mass lifted, RPE, PHR, and PBLA after deadlift repetitions to failure at 60% 1RM in caffeine ($5 \text{ mg} \cdot \text{kg}^{-1}$) and placebo conditions.*			
	Caffeine	Placebo	p
Reps	23 ± 9.85	21 ± 5.48	0.489
Mass Lifted (kg)	1841.84 ± 1102.50	1643.2 ± 723.35	0.430
PHR ($\text{b} \cdot \text{min}^{-1}$)	136.6 ± 14.42	136 ± 16.60	0.877
PBLa ($\text{mmol} \cdot \text{L}^{-1}$)	9.76 ± 2.81	8.98 ± 1.27	0.347
RPE	16 ± 2.55	15.4 ± 1.67	0.305

*PHR = peak heart rate; PBLa = peak blood lactate; RPE = rating of perceived exertion.

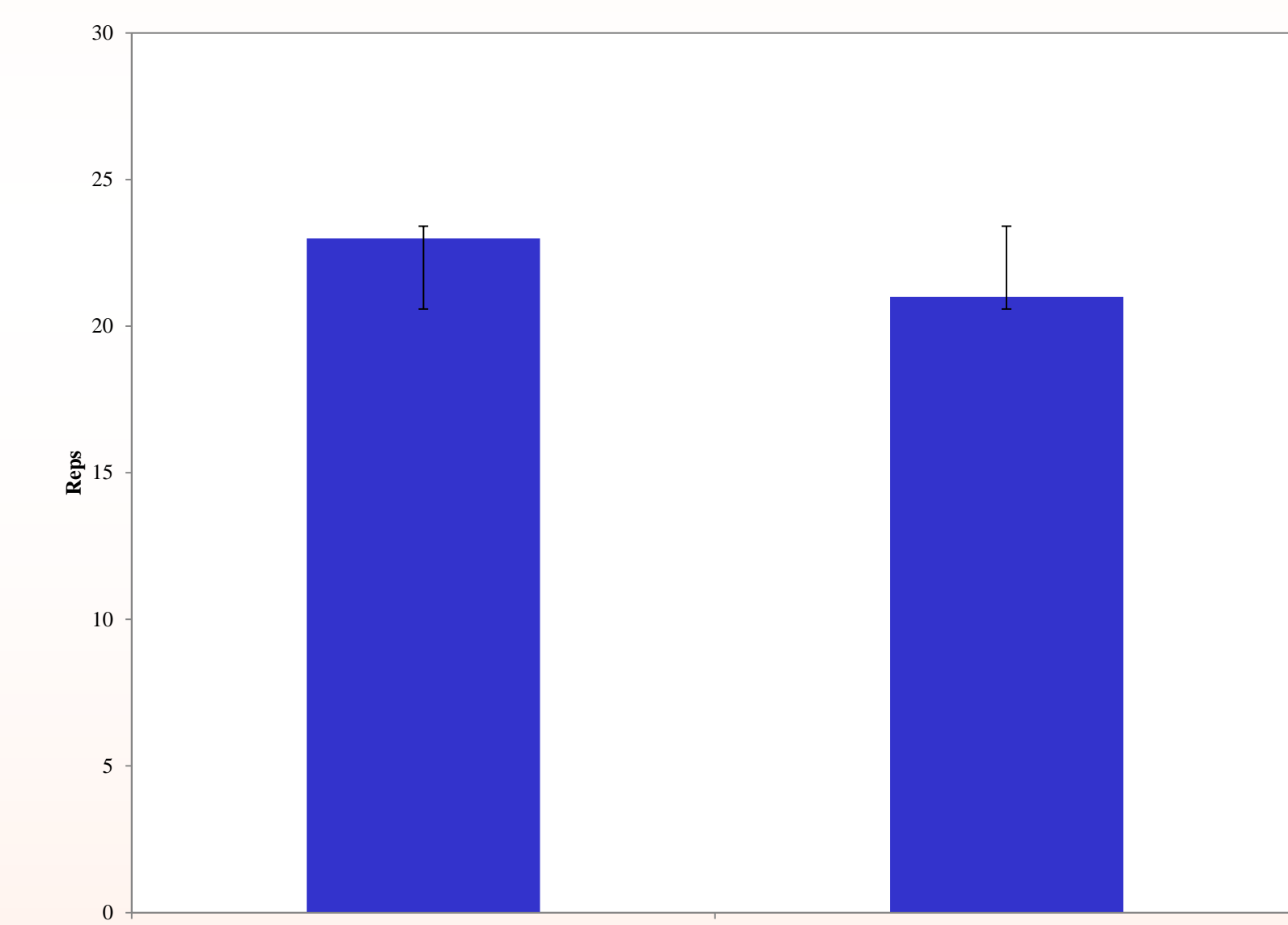


Figure 2. Mean \pm SD of deadlift repetitions to failure at 60% 1RM in caffeine ($5 \text{ mg} \cdot \text{kg}^{-1}$) and placebo conditions.

Conclusions

- Results of the study indicate that there is no significant effect of caffeine supplementation on RPE and muscular strength endurance.
- Due to the time limitations of the study, a sufficient sample size could not be tested in order to observe a more significant effect, despite the minor increases outlined by Figures 1 and 2.