

## The effect of a caffeine energy drink on cardiovascular responses during intense exercise

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**Background and Purpose:** Despite the growing popularity of energy drinks, many do not realize the negative effects on the cardiovascular system. Little research has investigated the electrocardiographic effects of energy drinks. The purpose of this study was to examine the effects of energy drink ingestion on the cardiovascular system at rest and during exercise.

**Methods:** Seven healthy adults ( $24.3 \pm 3.5$  yrs;  $wt = 66.0 \pm 2.2$  kg) participated in this double blind study. Subjects ingested a placebo (PL) or Redline (RL) energy drink (240ml; 316 mg caffeine) 40 minutes before maximal graded exercise test (GXT). Subjects were asked to fast for 8 hours and withhold from caffeine for 24 hours. Subjects were tested no more than one week apart at the same time of day. Resting HR, BP, and ECG were taken in the supine position. Exercise HR, BP, ECG, RPE, and rate-pressure-product (RPP) were monitored continuously during exercise. Recovery HR, BP, and ECG were taken every min for 4 minutes. Dependent t-test was used to measure differences between trials. Significance was set at the 0.05 level.

**Results:** Maximal oxygen consumption was lower in the RL trial ( $37.9 \pm 5.7$  ml $\cdot$ kg $^{-1}\cdot$ min $^{-1}$ ) compared to the PL trial ( $39.7 \pm 6.5$  ml $\cdot$ kg $^{-1}\cdot$ min $^{-1}$ ;  $p = 0.02$ ). Trends were noted for the number of ectopic beats (ETB) between the trials with a five to one ratio for the RL and PL, respectively (RL = 106 total ectopic beats; PL = 21 total ectopic beats). Sub-maximal exercise heart demand (RPP, mmHg $\cdot$ bts $\cdot$ min $^{-1}$ ) at the same workload, was considerably higher in the RL trial ( $224.9 \pm 39.9$  mmHg $\cdot$ bts $\cdot$ min $^{-1}$ ;  $p = 0.04$ ) compared to PL ( $195.8 \pm 22.9$  mmHg $\cdot$ bts $\cdot$ min $^{-1}$ ). Recovery DBP was significantly higher at one min. in the RL trial ( $51.6 \pm 25.1$  mmHg) compared to PL ( $25.4 \pm 33.8$  mmHg;  $p = 0.05$ ). Three and four min recovery DBP were not significantly different yet showed a trend for the RL trial to stay elevated by a mean of 11 mmHg above the PL trial.

**Conclusion:** Based on the results of this study, we found that energy drinks lowered estimated fitness levels while elevating heart demand and recovery BP. Future research should include a larger sample size, use of gas exchange, and evaluation of racial differences in cardiovascular demand during exercise after energy drink consumption.