



# EFFECTS OF ENERGY DRINKS ON HEART RATE

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## I. BACKGROUND

Southwest High school is surrounded by mini marts loaded with sugary products. Among these are caffeinated drinks such as, Red Bull, Monster and RockStar. The school's alumni consist of mainly Latinos and African Americans. Based on our experiment results, the majority of the students consume energy drinks. Some health consequences that can occur are an increase on blood pressure that can lead to hypertension and cardiovascular diseases. Aware of the amount of students that drink these and aware of the risks, we conducted an experiment that tested the effects on energy drinks on heart rate.

## II. HYPOTHESIS

Drinking 8 ounces of energy drink will increase our heart rate.

## III. AIM

The purpose of this investigation was to examine the effect that energy drinks have on human heart rate.

## IV. METHODS

All studies involved healthy individuals aged 16-18 years old. Monster energy drink was selected based on availability and perceived popularity. Heart rate was determined by palpation of carotid or radial pulse over 20 seconds.

### Determining the effect of consuming a popular energy drink on heart rate:

- 33 females and 31 males
- Recorded subjects' heart rates immediately before drinking energy drink (average rate over 15 minutes).
- All subjects drank 8oz Monster energy (1 serving size according to manufacturer's label) and recorded their heart rates periodically over 6 hours
- Subjects refrained from strenuous activity over the course of the study

### Determining the effect of energy drink consumption on heart rate recovery after exercise:

- 19 females and 14 males
- Initial, resting heart rate was determined immediately before drinking energy drink (average of at least 3 determinations over 10 minutes).
- 50% of the subjects drank 8oz. Monster over 2 minutes. The remaining subjects drank nothing.
- All subjects performed 50 jumping jacks over 1 minute.
- Subjects recorded their heart rates immediately after exercising, and periodically thereafter: every minute over 7 minutes; every 5 minutes over the next 40 minutes and every 30 minutes over the next 6 hours.

## V. RESULTS

### Effect of drinking Monster on resting heart rate

Drinking Monster stimulated a trend towards higher mean heart rate during the first 40 minutes, however the increase is not statistically significant. After 40 minutes, mean heart rate begins to fall and is significantly lower than pre-drink heart rate between 4-5 hours post-drink with a peak drop of  $18 \pm 1\%$  (mean  $\pm$  SEM; \* $p < 0.05$  using ANOVA with Dunnett's multiple comparisons post-test)

### Effect of drinking Monster on heart rate recovery after exercise

As expected, our exercise regime induced a significant increase in heart rate in both control subjects and test subjects who drank 8oz. Monster. While heart rate in subjects who drank Monster showed a trend toward higher heart rate at all time points compared with control subjects, the increased heart rate is not quite significant. Heart rate in test subjects also showed a trend towards slower recovery after exercise than control subjects. Using a two-tail, paired Student's T-test to compare mean heart rate at each time point with mean baseline heart rate, heart rate in control subjects remains significantly higher (\* $p < 0.05$ , mean  $\pm$  SEM) than baseline until 5 minutes post-exercise, while the heart rate of test subjects who drank Monster remained significantly elevated until 7 minutes post-exercise.

Figure 1

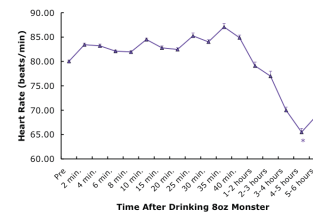
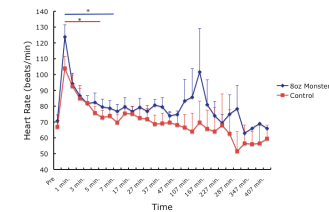


Figure 2



## VI. CONCLUSIONS

Drinking 8oz Monster did not cause any significant increase in resting heart rate as we initially hypothesized. The fall in resting heart rate several hours after drinking Monster may be associated with a feeling of lower energy or, "crashing," described by many subjects. Other groups have reported a similar drop in heart rate in response to caffeine consumption (Turley and Gerst. *Med. Sci. Sports. Exerc.* 2006). Caffeine is a major component of most energy drinks, including Monster, and we hypothesize that caffeine in energy drinks may cause an initial increase in blood pressure that results in baroreceptor-stimulated decrease in heart rate in an attempt to compensate for the increased blood pressure. It is this resulting drop in heart rate that may account for "crashing."

Drinking energy drinks may also raise heart rate during exercise and slow heart rate recovery after exercise.

We propose repeating these experiments using larger study groups, collecting blood pressure data in addition to heart rate, and studying the separate effects of individual ingredients found in energy drinks.

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