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Effects of Energy Drinks on Short Term Memory and the Reaction Time

“Energy drink” is generally defined as a “drink which contains ingredients claimed to enhance both mental and physical performance.” The ingredients are different, so the effects probably vary. The World Health Organization is considering energy drink consumption a public health threat, and believes that aggressive marketing campaigns towards children, teens, and young adults needs more regulation. In 2011, in the US, 20,000 patients asked for emergency medical services after consuming energy drinks – either alone (most of the cases) or mixed with another stimulant.

Are the effects on mental and physical performance really worth a visit to the emergency room? Of course not.

Are the effects real or placebo?

Let’s see what a research on Bonaire tells us.

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Effects of Energy Drinks on Short Term Memory and the Reaction Time

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Introduction

An energy drink is a type of beverage containing stimulant drugs, chiefly taurine, which is marketed as providing mental and physical stimulation. They may or may not be carbonated and many also contain sugar or other sweeteners, herbal extracts and amino acids. Other commonly used ingredients are guarana, yerba mate, caffeine, acai and glucuronolactone. Studies have shown that taurine, when mixed with caffeine, has increased athletic performance by increasing mental functioning. The goal of our research was to confirm if they really improve an individual's mental functioning - namely reaction time and short term memory. Our hypothesis was that the administration of the energy drink would improve both reaction time and short term memory. Excessive consumption of energy drinks may induce mild to moderate euphoria primarily caused by stimulant properties of caffeine and may also induce agitation, anxiety, irritability and insomnia.

References

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Material and Methods

The effects of energy drinks on short term memory were evaluated in a placebo controlled study design. We pooled our test subjects from the MD3 and MD4 population at St. James School of medicine, Bonaire for a total number of 20 volunteers: 10 female and 10 male, age range of 21-26 years. Two groups of participants with nonrandom allocation to "low" and "high frequency" consumption categories were further divided into two sub-groups. The substances used in the treatment were Redbull and a placebo (sugar + apple juice). Participants were asked to wait for 30 minutes prior to taking the reaction and recall tests. Subjects were assessed at the beginning of the first week to set a baseline for memory function. The tests were given one month after the initial test date and recorded by the same designated researcher. All of the data were transcribed onto excel spreadsheets for computation. Tested were reaction time and short term memory, both using online tools (humanbenchmark.com tests and <http://faculty.washington.edu/chudler/stm0.html>, respectively). The reaction test prompted each participant to respond to light signals which was measured in m/sec, and the recall test allowed participants one minute to view and memorize a list of letter, followed by another minute to write down as many letters as they can recall from the original list.

Figure 1: High and Low Frequency Control Group Reaction Time vs Experimental Group Reaction Time (msec)

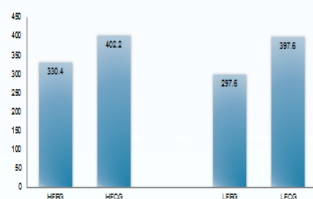


Figure 3: High Frequency Control Group Recall Percentage vs Low Frequency Recall Control Percentage

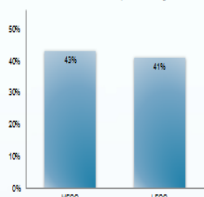


Figure 4: High Frequency Experimental Group Recall Percentage vs Low Frequency Experimental Group Recall Percentage

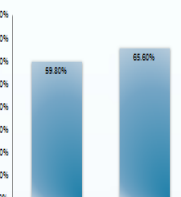


Figure 2: High and Low Frequency Control Group Recall Percentage vs Experimental Group Recall Percentage

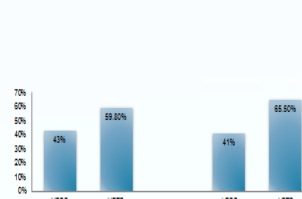


Figure 5: High Frequency Control Group Reaction Time vs Low Frequency Control Group Reaction Time (msec)

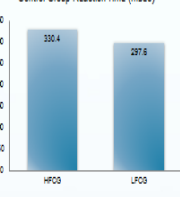


Figure 6: High Frequency Experimental Group Reaction Time vs Low Frequency Experimental Group Reaction Time (msec)

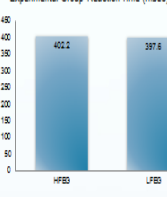


Figure 7: Reaction Time vs Age

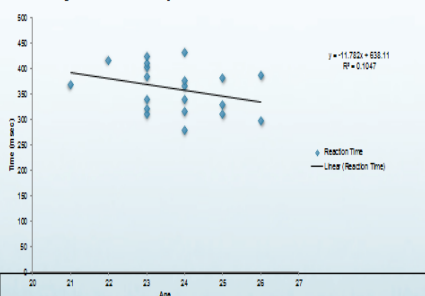
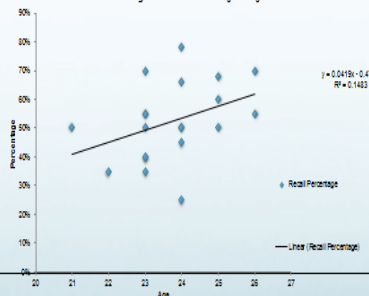


Figure 8: Recall Percentage vs Age



Results

Paired T test for comparison of mean before and after reaction time and recall percentage showed statistically significant difference ($p < 0.000$).

Recall percentage Higher and reaction time faster in experimental group compared to the control group.

Pearson's correlation coefficient between age and reaction time and recall percentage showed moderate correlation ($r = 0.493$).

Statistically correlation between age and recall percentage and age and reaction time with a Sig. (2-Tailed) value of 0.027

Discussion

The findings of our study were consistent with similar research done on energy drinks and mental functioning. Our results show that reaction time and short term memory improved after administration of the Red Bull. We also see an interesting correlation that as the age increases in our test subjects, so do the results of the reaction time and memory test.

The results can be attributed to the major ingredients of the Red Bull, namely Taurine, Caffeine, and Glucuronolactone. Taurine is picking up interest in media because recent research on rodents demonstrated its effects on the proliferation of cells in dentate gyrus of hippocampus and Purkinje neurons in cerebellum. Caffeine, another major Red Bull ingredient, works on the Adenosine receptors A1 and A2 that are abundant in neocortex and basal ganglia. Glucuronolactone acts as an antioxidant and waste remover and promoted endurance. To what extent could animal studies can apply to humans remains to be further evaluated.

Excessive consumption of energy drinks has side effects primarily related to the stimulant properties of caffeine. Energy drinks are also commonly mixed with alcohol or stimulants and this mixture can have serious, even fatal, effects. In some states in the US caffeinated alcoholic energy drinks had been banned because of that.

Conclusions and recommendations

Our results show that reaction time and short term memory improved after administration of the Red Bull. Our sample size however was very small which makes it difficult to conclude if the results are statistically significant. It is also difficult to pinpoint which ingredients are responsible for the results of the experiment because the study looked at effects of Red Bull and not its ingredients specifically: some ingredients may be present in very small quantities, but they could be more potent. Also, the potency of Red Bull seems to be influenced by the age. Future researches on Red Bull, an in depth analysis on the quantity and effects of each and every ingredient in different age groups and a larger sample size shall be performed to explain the effects of energy drinks in humans.