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# EFFECTS OF RED BULL ON WINGATE TESTING OF COLLEGE AGED STUDENTS

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## ABSTRACT

**Mueller EL, Weise MM, Rado LC, Cass TJ.** Effects of Red Bull on Wingate Testing of College Aged Students. *Journal of Undergraduate Kinesiology Research* 2007;2(2):12-18. **Purpose:** Sports drinks that contain taurine and caffeine help boost the body's physical output and mental state during exercise. There are a variety of options on the market today. The purpose of this study was to take one specific energy drink- Red Bull- and see what, if any, effects it may have on anaerobic performance. **Methods:** To test whether Red Bull or the placebo affected performance we used a double-blind, random-assignment study. Our subjects were recreationally active, college-aged students who were not addicted to caffeine. The mean age of our subjects was 21.3 ± 1.4 yrs. The average height was 173.1 ± 8.5 cm. The mean weight for the subjects in our study was 71.6 ± 12.0 lbs. The subjects were given either Red Bull or a placebo drink 15 min. before they were to complete their 30-s. Wingate test. After an adequate warm-up, they completed the Wingate test in silence to negate other ergogenic aids. **Results:** The data collected showed that Red Bull made a statistically insignificant difference in the anaerobic performance of the subjects. This is proven by our statistics, which showed that peak power relative to weight with the consumption of Red Bull was 9.5 ± 1.4 w/kg in comparison to the placebo which was 9.2 ± 1.4 w/kg. **Conclusion:** Based on the evidence obtained from this study, the effect of Red Bull on the performance of athletes before they performed an anaerobic test or exercises was insignificant. The caffeine and taurine did not enhance the performances as the product claims; therefore, it is not worth the two dollar cost of the beverage for people who are looking to increase their performance.

**Key Words:** Energy drinks, Wingate test, caffeine, Exercise, Anaerobic performance, Taurine, Ergogenic

## INTRODUCTION

Physically active individuals are constantly searching for ways to replenish fluids while at the same time increasing exercise performance. Several options available to the physically active include water, Gatorade, Powerade, protein drinks, and a variety of other energy drinks, including Red Bull. These beverages can also be used as ergogenic aids. Ergogenic aids, as defined in the 1997 edition of the Robergs and Roberts' *Exercise Physiology* textbook, are physical, mechanical, nutritional, psychological or pharmacologic substances or treatments that either directly improves physiological variables associated with exercise performance or remove subjective restraints that may limit physiologic capacity (1). In other words, an ergogenic aid can take many different forms such as increased carbohydrate intake, steroids, or energy drinks, and may increase performance not only physically, but mentally as well.

Sports and energy drinks are performance-enhancing substances that affect the human body and its performance on different levels. Sports drinks are used to prevent dehydration, supply carbohydrates, replenish electrolytes, and take care of the body during and after exercise. Energy drinks focus more on enhancing the athlete's performance. Energy drinks are not to be used for rehydration purposes. Instead, the caffeine and taurine in Red Bull help boost the body's physical output and mental state during exercise. These substances are not only for professional athletes, as recreational athletes may also use sport or energy drinks to help improve their physical and mental state during exercise.

One popular energy drink on the market today is Red Bull. On the product's website, www.red-bull.com, the manufacturers claim that drinking Red Bull enhances physical endurance, concentration and reaction speed. The main ingredients of Red Bull include taurine and caffeine. Taurine aids in contractile function in skeletal muscle. The increase in contractile function occurs by increasing calcium content, which amplifies muscle force generation and aids in the body's ability to produce power (2).

Caffeine, another main component of Red Bull, has been shown to enhance anaerobic power, but it has also been known to increase aerobic endurance, strength and reaction time. It does not directly improve levels of physical fitness, but it could help people train for more prolonged periods of time with a greater power output. The effects of caffeine have been known to last as little as 60 seconds or as long as two hours (3).

Research has shown the effects of caffeine to be inconsistent. Anselme et al. conducted a study regarding caffeine intake and its effect on cycling power. The study showed that caffeine significantly increased maximal anaerobic power by seven percent in a force velocity exercise test (4). On the other hand, Greer et al. found that caffeine supplementation actually decreased peak and average power during the final stages of repeated 30-s. Wingate tests (5). However, Collomp et al. found that the administration of caffeine had no significant effect on maximal and mean power during a 30-s Wingate test (6). One last study done by Lorino et al. on 16 recreationally active young males aged 21 to 28, indicated that a 6 mg*kg dose of caffeine does not enhance power output measured by the 30-s. Wingate test. The subjects, who ranged in weight from 62.3 kg to 129.1 kg, all received the same amount of caffeine without regard to weight or stature, which may or may not have affected the outcome of the study (7).

The conflicting studies on caffeine and taurine consumption raise several questions, which hopefully will be answered by this research. The purpose of this study was to determine if Red Bull consumption, prior to a 30-s. Wingate test, increased peak performance in comparison to a placebo. Based on Red Bull's claims, we hypothesized that Red Bull consumption would increase peak performance.

## METHODS

### Subjects

The subjects of our study were college-aged (18-25 years old) men and women who were recreationally active (participated in physical activity for 30 min. 2-3 times per week) and were not addicted to caffeine. There were eleven women and seven men in our study who were selected by word of mouth and mass email. After a detailed description of all testing procedures was provided, written informed consent was obtained from all subjects. The subjects were also asked to complete a health history questionnaire and PAR-Q. Once this paperwork was completed and we determined that the subject was healthy enough to participate in our study, the subject's demographics were taken and are indicated in Table1. This investigation was approved by the University's Institutional Review Board.

| Variable | Mean ± Standard Deviation |
|---|---|
| Age (yrs.) | 21.3 ± 1.4 |
| Height (cm) | 173.1 ± 8.5 |
| Weight (kg.) | 71.6 ± 12.0 |
| Pre-test Systolic Blood Pressure (mmHg) | 120.1 ± 6.8 |
| Pre-test Diastolic Blood Pressure (mmHg) | 66.0 ± 7.0 |

**Table 1**. Subject demographics represented in our study.

### Instrumentation

The 30 s. Wingate test was used to measure peak anaerobic power to allow us to compare the difference in peak power depending on which beverage the individual consumed. Specifically, we used the Monark ergomedic 894 Ea model manufactured in Sweden. The Wingate test is a reliable test based on the high test-retest comparisons of subjects. To complete our data and all of our calculations, we used the Monark anaerobic testing software v. 1.0.

Before the test was started, we measured the subject's height using a stadiometer and weight using a calibrated scale. We collected blood pressure from using a sphygmomanometer and a

stethoscope to get a pre-test reading. Blood pressure was only used to determine if a subject was appropriate to take part in our study and was not used as a variable to compare after our study was completed.

**Procedures**

After following the pre-test instructions, which included: no vigorous exercise 24 hr. before testing, between 6 and 8 hr. of sleep, no alcohol consumption 24 hr. prior to testing, no large meals two hours before testing, and no caffeine consumption 24 hr. before the study, the subjects' height, weight, and blood pressure were taken. Although we did not use blood pressure as a variable in our study, we took it initially to ensure that subjects were healthy and would be able to complete the tests without causing harm. These measurements were taken by group members who were not involved in preparing the drink mixture. This was a double blind, randomized experiment where both the participant and the majority of the group were unaware of which drink a participant was receiving at a given time. To accomplish this, only one member of the research group had any contact with the mixing of the beverages and the knowledge of which participant was receiving either the Red Bull with Raspberry Ice Crystal Light added or the placebo, which included water and Raspberry Ice Crystal Light. To try to ensure the participants were unaware of what beverage they were consuming, Raspberry Ice Crystal Light was added to the beverages and the drinks were put into a dark red bottle to further mask appearances of the beverages. By doing the double blind experiment, the other three group members and subjects were not aware of what beverage a subject was consuming during each trial. To ensure randomization in the study, the order in which the subjects received the beverages was unsystematic.

To accurately administer the same amount of Red Bull to each individual based on their weight, an equation was created. The amount of Red Bull administered was based on an average weight of 75 kg, which was divided by 8.3 oz of Red Bull (the amount in 1 can). This gave us an average number of ounces per kilogram for an average person weighing 75 kg. For every 9 kg more than the average 75 kg person weighed, an additional 1 oz of Red Bull was added to the mixture. An identical concept was followed in reverse for individuals who weighed 9 kg less than the average 75 kg person; one ounce was deducted from their Red Bull mixture. The drink mixture was administered to the subject 15 min. before the test was to begin and the subjects were instructed to drink the beverage within 2 min. of receiving it. After this was finished, the subjects were given 8 min. to rest before they began their 5 min. warm up on an exercise bike. At this time, the subject's information was entered into the Monark Anaerobic Testing software v 1.0. In order to complete all data entry, height and weight were converted to the nearest kilogram and centimeter. Before the subject began the Wingate Test, the seat height was adjusted and the weight in kilograms was added to the weight basket, keeping in mind that the basket weighed .5 kg. After the subject's 5 min. warm up was completed, they were instructed to pedal as fast as they could while the program was activated to begin the Wingate Test. When maximum pedal speed was reached the weight basket was dropped. The test was completed in silence, except for a 15-s. warning, in order to ensure that the only ergogenic aid acting on the participants' performances was in fact the Red Bull or placebo drink. After the 30-s. test commenced, the weight scale was lifted and the subject was instructed to continue pedaling at an easy pace for at least 5 min. as a cool-down. At this time the results were printed and used for interpretation. The cool-down lasted until the subject felt comfortable enough to stop. The subjects completed two Wingate tests 48 hr. apart, one with the Red Bull mixture, and the other with the placebo mixture. The order of the tests was determined randomly by the group member who was responsible for the drink mixtures.

**Statistical Analyses**

Paired *t*-tests were used to compare mean peak power and peak power relative to body mass, as well as the difference following Red Bull vs. placebo consumption. SPSS 14.0 was used for all statistical analyses. Level of significance was set at *p* less than or equal to 0.05.

**RESULTS**

There were no significant differences (p≥.05) between Red Bull versus placebo consumption for all measured variables. Mean, Standard Deviation, T-Values, and P- Values are presented in Table 2.

| Variable | Mean ± Standard Deviation | | T-statistic | P-value |
|---|---|---|---|---|
| | Red Bull | Placebo | | |
| Peak Power (w) | 689.7 ± 207.9 | 670.8 ± 198.2 | 1.4 | .2 |
| Peak Power (w/kg) | 9.5 ± 1.4 | 9.2 ± 1.4 | 1.2 | .2 |
| Average Power (w) | 524.5 ± 159.9 | 515.5 ± 148.7 | 1.0 | .3 |
| Average Power (w/kg) | 7.2 ± 1.3 | 7.1 ± 1.3 | .8 | .5 |
| Minimum Power (w) | 398.2 ± 106.3 | 400.5 ± 108.1 | -.2 | .9 |
| Minimum Power (w/kg) | 5.5 ± 1.0 | 5.6 ± 1.1 | -.5 | .6 |
| Power Drop (%) | 292.5 ± 120.1 | 270.2 ± 135.1 | 1.2 | .3 |
| Power Drop (w/kg) | 4.0 ± 1.0 | 3.7 ± 1.2 | 1.3 | .2 |

**Table 2.** Physiological responses to Wingate testing with and without Red Bull consumption.

**DISCUSSION**

Red Bull, a popular energy drink, makes claims that it will increase physical performance. Our study was designed in an attempt to prove whether or not this is a true claim. Based on Red Bull's assertions, we hypothesized that the energy drink would enhance variables associated with a 30-s. Wingate test. However, we failed to confirm our research hypothesis for all variables measured.

Though there have been no studies done specifically using Red Bull based on our research, there have been numerous studies regarding caffeine consumption and anaerobic exercise, the results of which have been conflicting. Collomp et al. performed a test similar to our study in which a 30-s. Wingate test was conducted. They reported that there was no increase on maximal and mean power (6). Although Lorino et al. did not perform a Wingate; their study found similar results to the Collomp et al. study in that the caffeine had no significant impact on anaerobic performance (7). Similarly, Greer et al. found that caffeine had no ergogenic effect on power output during repeated

bouts of short-term, intense exercise (5). On the other hand, Anselme et al. found that the caffeine increased max anaerobic power during a repeated 6-s. cycle sprint test (4). Evident from the conflicting research on caffeine consumption, we found it necessary to do further, more specific research on caffeine consumption specifically looking at Red Bull consumption and how it related to anaerobic power. Through our data, we found that there was no significant difference in peak power between the Wingates in which the subjects consumed Red Bull and the Wingates where the subjects consumed the placebo drink, as similarly noted in other studies including Collomp et al., Lorino et al., and Greer et al.

Though the Red Bull had no effect on our subjects' performance during the Wingate tests, it did have an adverse effect on their stomachs. Numerous subjects complained of an upset stomach from both the placebo and the Red Bull shortly after consuming the beverages. Also, even after completing the Wingate tests, several subjects noted that they had excess energy due to the caffeine they had just ingested.

Our study specifically addressed the effects of Red Bull on peak performance which has not been done in a study before. Our study was innovative in the fact that it was a double blind that used randomization in order to negate limitations. Previous research has been indecisive about caffeine ingestion in connection with increases in peak performance. Our study was also ground-breaking because, when giving our subjects their dosage of Red Bull, we took into consideration their weight, which, in our research, we had not seen done before. The studies we referenced gave a set amount to males and females without regard to weight, which meant that women, who often weighed less than males, as a result had more caffeine in their systems while performing the tests. This may have biased the studies, so we took that fact into consideration when designing our study and deciding how to distribute the Red Bull to our subjects.

Our recommendations for future studies would be to lengthen the timeline of the study. Because of time constraints, we had the subjects wait only 15 min. after consuming their beverage before taking the Wingate test. Caffeine is rapidly absorbed, and plasma concentrations approximate a maximum level in one hour (3). Based on this research, a wait time of at least an hour would be appropriate to ensure that the caffeine is properly absorbed throughout the subjects' bodies. Another recommendation would be to mask the placebo in a better way. Because the Red Bull was carbonated and the placebo was not, some subjects could easily tell which was which. The Crystal Light masked the flavor of the Red Bull sufficiently, but due to lack of carbonation in the placebo, some subjects' tests may have been altered if they had an inclination of which beverage they were consuming. In order to fix this, the Red Bull could be opened and then left out over night or for at least a few hours prior to testing to try and get rid of the carbonation. This would help eliminate subjects being able to figure out which drink they were consuming based on the carbonation of the Red Bull.

## CONCLUSION

Red Bull markets itself to be a performance-enhancing energy drink enhanced with caffeine and taurine. However, based on our study, we conclude that Red Bull is not, in fact, an ergogenic aid. After having subjects complete two 30-s Wingate tests: one with Red Bull and one with a placebo, it was concluded that the effects of Red Bull on peak performance are not significant. To our knowledge this is the first study done looking at the ergogenic properties of Red Bull. Future research is necessary to either refute or confirm our findings on our specific anaerobic test or other tests to measure different properties or demographic categories. Overall, based on the evidence obtained by our study, we can now say that, within such a short time frame, Red Bull's claims of increased power and exercise performance by consuming their product are not true.

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