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The placebo effect of preworkout drink on muscular strength

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TITLE: THE PLACEBO EFFECT OF PREWORKOUT DRINK ON MUSCULAR STRENGTH

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The purpose of this paper was to investigate the placebo effect of a preworkout drink on muscular strength with leg press and bench press. Eighteen, experienced college aged males with at least 2 years of resistance training, volunteered for this study. The participants had different conditions on three separate days. Participants were given a condition which included a treatment, placebo, and control. The treatment was a fruit punch flavored preworkout drink (1MR Vortex by B.P.I. Sports) which contained caffeine. The amount of caffeine was equivalent of two cups of coffee. The placebo was a non-nutritional, caffeine-free, fruit punch flavor Hawaiian Punch. Both were consumed in 6 ounces of water. The control consisted of only the testing. On the testing days participants engaged in 1 repetition max (1RM) testing. The leg press results were 447.3 ± 92.1 kg for treatment, 439.0 ± 86.6 kg for placebo, and 439.3 ± 98.7 kg for control. There were no significant differences (p=.4213, F(2,17)=.887) between the conditions. The bench press results were 115.8 ± 19.1 kg for the treatment, 113.5 ± 16.6 kg for the placebo, and 113.8 ± 19.5 kg for the control. There were no significant differences (p=.1485, F(2,17)=2.018) between the conditions. In conclusion, there was no effect of placebo or preworkout drink in comparison with control.

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CHAPTER I

INTRODUCTION

Caffeine is the most widely used substance when it comes to exercise and daily use. Caffeine itself plays an important role in many peoples lives as the dependence of it is a reality. Many individuals actually wake up and instantly think about brewing a cup of coffee or going to get their favorite cup of coffee from a local establishment. Caffeine is a very abundant product that is easily bought with no age restriction. The product can be bought at any convienent store, online, or through supplements but dosages may vary in these products.The ergogenic benefits are very broad: increasing endurance, enhancing muscle contractions, alertness, improved physical performance, and hydration (Ennis, 2014). There are many individuals who use a preworkout product whose main ingredient is caffeine. Most people put a reliance on these preworkout drinks to help them get through the workout or just simply through the day.

Caffeine also plays a significant role in muscular strength. Athletes and recreational weight lifters use caffeine to enhance the results of their overall lifts. In a study by Astorino, Rohmann & Firth (2008), they mention that 7mg/kg caffeine dose significantly enhanced muscular strength but 5 mg/kg had very little effect. According to this study, an 86 kg athlete would have to consume a minimum 600 mg of caffeine to see a prominent difference in strength. Caffeine also has more effects during muscular strength. Throughout resistance exercise a person can experience microtears in the muscular tissue and caffeine can reduce this pain (Motl, O'Conner & Dishman, 2003). It also can enhance excitation contraction coupling which can explain the quick jump in strength when a person consumed the drug before resistance training (Lopes, Aubier, Jardim, Aranda, & Macklem, 1983). Another reason caffeine is an excellent ergogenic

aid is that it helps a person feel more energetic by stimulating the central nervous system (Graham, 2001). All of these mechanisms can contribute to more forceful contractions within muscle tissue that can allow a person to utilize more motor units. Even though caffeine there are not a lot of studies on caffeine and muscular strength it appears that the right dose can be ergogenic (Astorino et al., 2008).

Placebos can also effect the strength of an individual. A placebo gives a researcher an idea of what the body can achieve without the actual substance that is being tested. For instance, Outlaw et al. 2004 tested the effects of a preworkout supplement and a placebo. Since they were testing a preworkout supplement they matched the color and taste of the product with the placebo. It is hypothesized that the placebo will have a profound effect in muscular strength compared to the preworkout. Placebo also plays an important role in studies because it provides an indication of the psychological effects of a product. The purpose of this study was to examine the effects of a placebo drink in comparison with a preworkout drink and control for muscular strength in the leg and bench press.

CHAPTER II

METHODS

Participants

Eighteen healthy, well trained (>2 years of resistance training experience) male students (height 181.2 ± 6.6 cm, mass 85.4 ± 11.5 kg, ages 23.0 ± 2.9) from Southern Illinois University Carbondale were recruited for this study. They were in good health for the last 30 days, free of orthopedic problems, neurologic dysfunction, and reported no previous or present injuries before participating in the study. All of the participants were orally informed of the research process. After oral acknowledgement of a willingness to participate, participants read over and signed a written informed consent for this study. Southern Illinois University Human Subjects Committee approved this study prior to the any testing of the participants.

Study design

Participants were instructed to report to the recreation center at Southern Illinois University Carbondale on 3 separate days. Each day had different condition which was given prior to 1 Repetition Maximum (1RM) testing. The conditions were control, placebo, and treatment. A 3 x 3 Latin Square was used to randomize each participant's treatment order across the trials. The Latin Square ensured that 6 participants received a different treatment each day. The researcher and participants were blind to which treatment was given on each day. On the days where a drink was administered, participants were instructed to drink all of the solution, which was in 6 ounces of water. Participants waited 30 minutes before performing the 1RM warm up protocol and lifts. The time between each condition was a minimum of 48 hours.

Independent variables

Control. The control consisted of neither the placebo nor treatment drink being consumed. The participant was instructed to perform the warmup and 1RM lifts with maximal effort.

Placebo. The placebo was a non-nutritional, caffeine-free, fruit punch flavor Hawaiian Punch packet (The Jel Sert Company, West Chicago, IL). Placebo was consumed in a solution of 6 ounces of water 30 minutes prior to testing.

Treatment. The treatment was a preworkout drink made by B.P.I Sports named 1.M.R Vortex (BPI Sports, Hollywood, FL). The flavor of the treatment was fruit punch. It contained the equivalent of two cups of coffee for a single serving (160mg caffeine). A single serving was employed as the treatment. The preworkout drink was placed in 6 ounces of water and consumed 30 minutes prior to testing.

Dependent variables

Muscular Strength. Muscular strength was defined as a 1RM for Leg press and Bench Press. The researcher ensured the participant was spotted throughout the range of motion (ROM). The warm up protocol administered by the researcher consisted of asking the participant what their estimated 1RM is for each lift. Two initial working sets were performed before the 1RM lift. The first set consisted of 10 repetitions at 50% of their estimated 1RM. The second set consisted of 8 repetitions at 85% of their estimated 1RM. The participant was required to wait a minimum of 90 seconds to a maximum of 120 seconds between the warmup set and 1RM lifts. Once the 1RM lifts began, if a participant successfully completed the attempted weight the weight was incremented by 10-20 pounds for the leg press and 5-10 pounds for the bench press.

Leg press. The leg press machine the participants used was the Hammer Strength Plate-Loaded Linear Leg Press. Participants were instructed to complete a 1RM lift. For the lift to count as a successful repetition, the weight had to be lowered to a level just past 90 degrees knee flexion, paused, and lifted to full knee extension without the help of the principle investigator.

Bench Press. The bench press that participants used was the Hammer Strength Flat Bench Machine. Participants were instructed to complete a 1RM lift, in a controlled manor. For the repetition to count, the bar must have been lowered to the chest, paused, and then lifted to full elbow extension without the help of the principal investigator.

Statistical Analysis

All statistical data were analyzed with SuperANOVA (Abacus Concepts, Inc., Berkeley, CA). Differences between the three conditions were analyzed with a one-way repeated measures (ANOVA). Descriptive statistics are presented as mean ± SD. The significance level was set at $\alpha = .05$.

CHAPTER III

RESULTS

Leg Press

The mean 1RM leg press for the treatment was 447.3 ± 92.1 kg. The mean 1RM leg press for the placebo was 439.0 ± 86.6 kg. The mean 1RM leg press for the control was 439.3 ± 98.7 kg. There were no significant differences (p=.4213, F(2,17)=.887) between the treatment, placebo, or control conditions.

Bench Press

The mean 1RM bench press for the treatment was 115.8 ± 19.1 kg. The mean 1RM bench press for the placebo was 113.5 ± 16.6 kg. The mean 1RM bench press for the control was 113.8 ± 19.5 kg. There were no significant differences (p=.1485, F(2,17)=2.018) between the treatment, placebo, or control conditions.

CHAPTER IV

DISCUSSION

The purpose of this study was to examine the effect of a placebo drink in comparison with a preworkout drink and control with respect to muscular strength. There was no effect of the placebo or preworkout drink on leg press or bench press muscular strength. All subjects were caffeine users. The dose in this preworkout drink can regularly be seen in coffee, tea, or caffeinated beverages. The preworkout treatment had the highest mean muscular strength but not significantly greater. The caffeine dose of the preworkout drink was 160mg, a moderate dose. The mean reported preworkout use of caffeine by the participants was 240mg. Thus the caffeine dose used in this study was a low dose for these participants. The results are not surprising, a modest but non-significant increase in muscular strength. The results of this study agree with the review by Warren, Park, Maresca, McKinbans, and Millard-Stafford (2010). Caffeine has a small but measurable effect on muscular strength. Warren et al. (2010) found that the effect was strongest for the knee extensors and this may be the reason that the greatest caffeine effect of this study was for the leg press. This was a 2% but non-significant increase in muscular strength likely because of the exercise and the low dose of caffeine.

Over the course of the study, the trial-to-trial mean muscular strengths were interesting. For each trial, the mean increased regardless of condition. In other words, no matter what treatment the participant received their 1RM increased during the week of testing. Over the week this quick jump in strength was present in both the leg press and bench press even though these were highly experienced weight lifters. For the leg press the 1RM increased from 448.8 ± 87.8 kg for trial 1 to 467.2 ± 86.0 kg for trial 2 to

483.3 ± 87.1 kg for trial 3. This was an increase of 34.5 kg across the testing days. For the bench press, trial 1 was 119.8 ± 17.9 kg and 119.4 ± 17.8 kg for trial 2 and 122.8 ± 17.1 kg for trial 3. This was an increase of 3.0 kg across the testing days. These were 7.7% for the leg press and 2.5% for the bench press. They are generally considered small increases and within the coefficient of variation of these measurements. These participants had a quick jump in strength across the week. The participants were told to refrain from any resistance training that would render them sore to ensure a true 1RM. Most of the participants increased their 1RM whether it was for the leg or bench press. It is unclear why this happened but since a latin square was used to rotate the conditions between the subjects this phenomenon did not effect the outcome of the study.

CONCLUSION

The overall effect of the placebo showed no significant differences compared to the treatment or control. Through the trials there was a phenomena seen called a quick jump in strength. Participants experienced strength gains over the three trials regardless of the condition.

REFERENCES

Astorino, T. A., Rohmann, R. L., & Firth, K. (2008). Effect of caffeine ingestion on one-repetition maximum. *European Journal of Applied Physiology, 102*, 127-132.

Beck, T. W., Housh, T. J., Schmidt, R. J., Johnson, G. O., Housh, D. J., Coburn, J. W., & Malek, M. H. (2006). A caffeinated energy drink improves jump performance in adolescent basketball players. *Journal of Strength and Conditioning Research, 20*(3), 506-510.

Burke, L. M. (2008). Caffeine and sports performance. *Applied Physiology, Nutrition & Metabolism, 33*, 1319-1334.

Ennis, D. (2014). The Effects of Caffeine on Health: The Benefits Outweigh the Risks. *Perspective (University of New Hampshire), 1-5*.

Graham, T.E., (2001). Caffeine and exercise: metabolism, endurance, and performance. *Sports Medicine, 31,* (11), 785–807.

Lopes, J.M., Aubier, M., Jardim, J., Aranda, J.V., & Macklem, P.T., (1983). Effect of caffeine on skeletal muscle function before and after fatigue*. Journal of Applied Physiology, 54,* (5), 1303–1305.

Motl, R.W., O'Connor, P.J., & Dishman, R.K. (2003). Effect of caffeine on perceptions of leg muscle pain during moderate intensity cycling exercise. *Journal of Pain*, *4*, (6):316–321

Outlaw, J. J., Wilborn, C. D., Smith-Ryan, A. E., Hayward, S. E., Urbina, S. L., Taylor, L. W., & Foster, C. A. (2014). Acute effects of a commercially-available pre-workout supplement on markers of training: a double-blind study. *Journal Of The International Society Of Sports Nutrition, 11*(1), 2-19.

Warren, G. L., Park, N. D., Maresca, R. D., McKinbans, K. I., & Millard-Stafford, M. L. (2010). Effect of caffeine ingestion on muscular strength and endurance: A meta-analysis. *Medicine & Science in Sports & Exercise,* 1375-1387.

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