Consuming Caffeinated or Non-Caffeinated Energy Shots has No Effect on Mood or Performance

Original Research

Jose Antonio[1], Tobin Silver[1], Peter Byers[1], Lia Jiannine[1]

[1]*Department of Health and Human Performance, Nova Southeastern University, Davie, Florida/USA*

Open Access

Published: January 10, 2024

Research Directs in Strength and Performance: *2024, Volume 4 (Issue 1): 2*

ISSN: 2768-5187

Abstract

Introduction: The purpose of this investigation was to determine the effects of two different energy drinks on mood as well as mental and physical performance.

Methods: In a randomized, double-blind, placebo-controlled investigation, subjects (n=60, 22 male, 38 female) were assigned to a caffeinated energy shot (Alpha Brain), a non-caffeinated energy shot (Ginger Rescue), or a placebo with no caffeine. Subjects were pre-tested on the psychomotor vigilance task (PVT), which is a measure of sustained attention, Profile of Mood States, and handgrip strength. Consequently, they consumed either the Alpha Brain shot, Ginger Rescue shot, or the placebo. One hour post-consumption, the assessments were repeated.

Results: There were no between-group differences ($p>0.05$) for any of the assessments regarding the change score (M±SD): PVT – Alpha Brain -3±15 msec, Ginger Rescue -21±60 msec, Placebo 1±21 msec; Total mood disturbance score – Alpha Brain -7.0±14.5, Ginger Rescue -4.1±11.1, Placebo -0.7±8.5; Peak handgrip – Alpha Brain 0.3±3.5 kg, Ginger Rescue 0.3±4.5 kg, Placebo -0.6±3.1 kg.

Conclusions: The acute consumption of an energy shot, regardless of whether it is caffeinated, did not affect mood, handgrip strength, or sustained attention.

Key Words: nootropic, supplement, attention, vigilance

Corresponding author: Jose Antonio PhD, Jose.Antonio@nova.edu

Introduction

Energy drinks and energy shots are pre-packaged beverages that are similar in nature; however, energy shots are more concentrated and are typically available in volumes of 74 mL or 2.5 fluid ounces, whereas one of the most popular energy drinks contains 355 ml or 12 fluid ounces [1,2]. However, it is not clear if the smaller volume in the shot would produce a different effect than a traditional energy drink. In a small investigation by Schubert et al., four well-trained male runners participated in a three-arm randomized study with a single-blind, placebo-controlled crossover research design[3,4]. Each participant completed three separate trials, wherein they ingested two ounces (equivalent to 59 mL) of distinct treatments, including a placebo, Guayakí Yerba Maté Organic Energy Shot™ (containing 140 mg of caffeine), or Red Bull Energy Shot™ (containing 80 mg of caffeine), 45 minutes before engaging in physical exercise. These trials were spaced at least a week apart. During each trial, the subjects performed a five-kilometer time trial on a motorized treadmill. They found no significant effect of the shots. On the other hand, Wesnes et al. found that an energy shot that contained 157 mg of caffeine improved mental performance[5]. That is, compared to a placebo, the shot improved alertness as well as episodic memory[5]. Thus, the purpose of this investigation was to assess the effects of caffeinated and non-caffeinated energy shots on mental and physical performance.

Scientific Methods

Participants

The research cohort was comprised of 60 physically active individuals (male n=22, female n=38) (Table 1). A physically active individual was defined as someone engaging in exercise activities (e.g., aerobic and resistance training) at least three times per week regularly for the past 6-12 months. The study was conducted following the principles of the Helsinki Declaration, with approval from the Institutional Review Board at the university (IRB# 2023-4290). All participants provided written informed consent, and information regarding exercise history and caffeine consumption was collected through a questionnaire, which included details about weekly exercise duration, types of exercise, and years of training.

Table 1. Demographics**.**

Group	Alpha-Brain	Ginger Shots	Placebo
Sex	6 male, 14 female	10 male, 10 female	6 male, 14 female
Age years	21±2	21±2	21±1
Height cm	164.5±9.9	170.8±11.0	165.0±10.6
Body mass kg	71.2±12.3	75.2±15.5	78.0±26.0
Lean body mass kg	50.7±12.7	54.1±15.1	50.8±13.9
Fat mass kg	19.3±10.8	18.6±9.0	22.5±16.5
Body fat %	29.0±12.7	24.3±9.6	26.3±12.2
Total body water liters	40.6±15.4	42.2±10.5	40.6±10.8
Total years of training	8.2±8.1	7.8±4.7	5.9±3.6
Average hours of cardio per week	2.6±2.0	4.5±3.6	3.4±3.0
Average hours of resistance exercise per week	4.5±3.7	4.2±2.8	4.3±2.8
Avg. of other exercise per week	2.9±4.2	1.1±2.4	2.0±2.6
Avg. daily caffeine intake mg (self-report)	134±156	111±146	118±152

Data are expressed as the mean ± standard deviation. Legend: cm – centimeter; kg – kilogram; mg – milligram. There were no significant differences between the groups.

Protocol

This study employed a randomized, double-blind, placebo-controlled design in which research participants visited the laboratory on one occasion for testing. Participants were initially assessed via the following: psychomotor vigilance test (PVT), Profile of Mood States (POMS), and handgrip strength. Subsequently, they consumed either the placebo (PLA), Alpha Brain shot (ABS), or the Ginger Rescue shot (GRS) (Table 1). The placebo consisted of Crystal Light. The shots were not matched for flavor or color because the two products are entirely different in that regard. Nonetheless, the shots were poured into a small paper cup so that subjects did not know what they were consuming. One hour after consuming the shot, research participants were re-tested.

Body composition analysis was performed using a multi-frequency bioelectrical impedance assessment device (InBody 270) to measure parameters such as body mass, fat mass, lean body mass, body fat percentage, and total body water in liters. Participants stood barefoot on the device's platform, grasping handles with additional electrodes, resulting in a one-minute assessment.

The Profile of Mood States (POMS) questionnaire, a validated psychological test, was administered online to evaluate participants' mood[6]. The POMS includes six mood scales designed for clinical use and prompts participants to indicate

their emotional state by selecting options like "not at all," "a little," "moderately," "quite a bit," or "extremely" next to words describing different emotions.

Supplement facts for Alpha Brain.

Calories	10
Sodium	30
Vitamin B6	5mg
Vitamin B12	500 mcg
N-Acetyl L-Tyrosine	1000mcg
Organic KSM-66 Ashwagandha	300mg
Cognizin Citicoline	250mg
Lion's mane	250mg
L-Theanine	100mg
InnovaTea Natural Caffeine	50mg
Huperzia Serrata	10mg

Supplement Facts for Ginger Shot

Calories	50
Total fat	1g
Total Carbohydrate	10g
Dietary Fiber	2g
Total Sugars	6g
Protein	1g
Potassium	135mg
Ginger Juice	18ml
Turmeric Juice	5.4

Alpha Brain shot (top), Ginger Rescue shot (bottom) – Supplement Facts panel

The Psychomotor Vigilance Test (PVT) was conducted using Apple iPads using automated testing software (Vigilance Buddy by Research Buddies). It involved participants responding as quickly as possible to stimuli displayed on the screen. The PVT assessed vigilant attention and lasted five minutes.

Peak and average (based on three attempts) handgrip strength was also assessed. Each subject was instructed to perform a maximal handgrip in a standing position with the arm parallel to the body and the elbow fully extended. Subjects rested approximately 20-30 seconds between each attempt.

Statistical Analysis

Statistical analysis was conducted using GraphPad (Prism 6) software, with data presented as mean ± SD. A one-way ANOVA was performed to determine if significant differences existed between the three groups. An appropriate post-hoc test (i.e., Tukey's multiple comparisons test) was done to determine which groups differed.

Results

Consuming a caffeinated or non-caffeinated energy drink did not affect measures of sustained attention (Table 2), mood (Table 3), or handgrip strength (Table 4).

Table 2. Psychomotor Vigilance Task.

	Alpha Brain	Ginger Rescue	Placebo
Pre-reaction time	306±28	312±72	303±29
Post-reaction time	303±30	291±33	302±31
Change	-3±15	-21±60	1±21
Pre-false starts	2.3±2.3	5.2±4.3	2.8±3.0
Post-false starts	2.2±2.3	3.6±2.7	2.9±2.0
Change	-0.1±1.4	-1.6±3.7	0.1±2.3

The data are expressed as the mean ± standard deviation. There were no differences between the groups for the change score. For reaction time: F (2, 57) = 1.677, P=0.1960. For false starts: F (2, 57) = 2.553, P=0.0867.
For reaction time: Alpha Brain vs. Ginger Rescue p=0.3017; Alpha Brain vs. Placebo p=0.9839; Ginger Rescue vs. Placebo p=0.2275
For false starts: Alpha Brain vs. Ginger Rescue p=0.1596; Alpha Brain vs. Placebo p=0.9823; Ginger Rescue vs. Placebo p=0.1118

Table 3. Mood States

	Alpha Brain	Ginger Rescue	Placebo
TMDS pre	15.7±16.3	19.9±24.3	15.7±15.1
TMDS post	8.7±10.6	15.9±21.9	15.1±20.2
Change	-7.0±14.5	-4.1±11.1	-0.7±8.5
Vigor pre	13.4±4.7	14.3±5.4	10.4±5.0
Vigor post	12.2±5.5	13.1±7.1	10.6±5.6
Change	-1.2±4.2	-1.2±4.5	0.3±3.7
Fatigue pre	7.1±3.6	7.8±4.5	6.3±5.2
Fatigue post	5.0±3.2	6.7±4.8	5.5±4.5
Change	-2.2±4.2	-1.1±3.7	-0.8±2.5

The data are expressed as the mean ± standard deviation. Legend: TMDS – total mood disturbance score. There were no differences between the groups for the change score. For TMDS: F (2, 57) = 1.493, P=0.2334. For Vigor: F (2, 57)=0.7869, P=0.4601. For Fatigue: F (2, 57) = 0.8046, P=0.4523. For TMDS: Alpha Brain vs. Ginger Rescue p=0.7033; Alpha Brain vs. Placebo p=0.2043; Ginger Rescue vs. Placebo p=0.6273. For Vigor: Alpha Brain vs. Ginger Rescue p=0.9992; Alpha Brain vs. Placebo p=0.5383; Ginger Rescue vs. Placebo p=0.5150. For Fatigue: Alpha Brain vs. Ginger Rescue p=0.6337; Alpha Brain vs. Placebo p=0.4471; Ginger Rescue vs. Placebo p=0.9502.

Discussion

The purpose of this investigation was to examine the acute effects of a caffeinated and non-caffeinated energy shot on indices of mood, sustained attention, and physical performance. The current study indicated that neither the caffeinated (Alpha Brain) nor non-caffeinated (Ginger Rescue) shot affected mood (i.e., Profile of Mood States), handgrip strength, or sustained attention (i.e., psychomotor vigilance test).

Table 4. Handgrip.

	Alpha Brain	Ginger Rescue	Placebo
Peak handgrip pre	39.0±12.2	38.4±9.7	38.7±11.8
Peak handgrip post	39.3±12.0	38.7±9.8	38.2±11.9
Change	0.3±3.5	0.3±4.5	-0.6±3.1
Mean handgrip pre	36.9±11.7	35.8±9.1	36.7±11.0
Mean handgrip post	37.3±11.7	36.6±9.5	37.1±11.7
Change	0.5±2.7	0.8±3.8	0.5±2.2

The data are expressed as the mean ± standard deviation. There were no differences between the groups for the change score. The values are in kilograms. For peak handgrip: F (2, 57) = 0.01538, P=0.9847. For mean handgrip: F (2, 57) = 0.07910, P=0.9240. For peak handgrip: Alpha Brain vs. Ginger Rescue p=0.9937; Alpha Brain vs. Placebo p=0.9940; Ginger Rescue vs. Placebo p=0.9834. For mean handgrip: Alpha Brain vs. Ginger Rescue p=0.9435; Alpha Brain vs. Placebo p=0.9993; Ginger Rescue vs. Placebo p=0.9307.

Prior studies on energy shots have demonstrated equivocal results. Schubert et al. found that two different caffeinated energy shots (i.e., Red Bull [80 mg caffeine), Guayakí Yerba Maté Organic Energy Shot [140 mg caffeine]) had no effect on a 5-kilometer time trial in six highly trained male runners[4]. Moreover, Seifert and colleagues conducted a study in a group of trained cyclists in which they compared the effects of two energy shots to a placebo[7]. One of the shots was called Body Glove Surge®, which contained carbohydrates, protein, and caffeine (i.e., 18 grams of carbohydrates, 3 grams of protein, and 150 mg of caffeine per serving). The second treatment was 5 Hour Energy® (containing approximately 205 mg of caffeine, approximately 480 mg of taurine, and 30 mg of niacin per 57 mL serving). The control group received a non-caloric liquid placebo (PL). During cycling exercise, the total caffeine intake was 375 mg for the Body Glove Surge® group and 512 mg for the 5-Hour Energy® group. Participants consumed half a serving (28 mL) of their respective treatment 30 minutes into the exercise, followed by a full serving (57 mL) after 60 minutes and another full serving (57 mL) after 90 minutes of exercise. The purported goal of this strategy was to ensure that participants had peak caffeine levels for the performance tests conducted at the end of the two-hour exercise. Interestingly, the Body Glove Surge group improved both cycling power output following two hours of moderate and high-intensity interval cycling compared to the placebo and Red Bull. Despite the larger caffeine dose of Red Bull compared to Body Glove Surge, there was no effect on power output.

Mumford et al. demonstrated that the intake of a moderate caffeine dose (VDF FutureCeutricals Inc.) with approximately 1.9 mg/kg body weight before and during a game of golf enhanced golf-specific performance metrics and diminished fatigue among experienced golfers[8]. Wesnes et al. compared 5-Hour Energy® with 157 mg of caffeine to a placebo in 94 healthy volunteers[5]. They assessed whether an energy shot would affect cognitive function and mood in volunteers over a 6-hour time frame. They discovered that this particular energy shot has the potential to enhance key aspects of cognitive performance for as long as six hours when compared to a placebo in healthy individuals who are moderately sleep-deprived[5]. On the other hand, Bloomer and colleagues found that in 10 healthy young men and women, the same energy shot (i.e., 5-Hour Energy) did not affect mood or cognitive performance.

It is not clear why discrepancies exist between these investigations. The population studied, the mode of physical or mental assessment, and the dosages of the active ingredients all differ between investigations. Certainly, one can argue that the dose of caffeine in the current investigation (i.e., 50 mg in Alpha Brain and 0 mg in the Ginger Rescue) was grossly inadequate to produce an effect. Regarding Alpha Brain, there are at least half a dozen ingredients that purport to have an ergogenic effect. Thus, even the combination of those ingredients plus caffeine had no physiological effect. It should be noted that the caffeine dose in the current study, when expressed per unit body weight, is 0.7 mg caffeine/kg body weight.

According to the ISSN's Position Stand on energy drinks and shots[1], ingesting energy drinks or shots 10-60 minutes prior to physical activity can enhance mental concentration, alertness, anaerobic performance, and/or endurance performance when the dosage exceeds 3 mg/kg body weight. Furthermore, the potential performance enhancement

found in energy shots is primarily from caffeine[1]. Numerous energy shots include a variety of components that have not undergone individual or combined research to assess their impact on physical and cognitive performance. Consequently, it would be wise to conduct studies on these products to establish their effectiveness in both single-nutrient and multi-nutrient formulations while also evaluating their safety.

Conclusions

The acute consumption of these particular energy shots did not affect measures of sustained attention, mood, or handgrip strength. We contend that the shots are underdosed with regard to caffeine. Moreover, the purported combination of ingredients in conjunction with caffeine demonstrates no effect.

References

1. Jagim AR, Harty PS, Tinsley GM, et al. International society of sports nutrition position stand: energy drinks and energy shots. *Journal of the International Society of Sports Nutrition.* 2023;20(1):2171314.
2. Quinlivan A, Irwin C, Grant GD, et al. The effects of Red Bull energy drink compared with caffeine on cycling time-trial performance. *Int J Sports Physiol Perform.* 2015;10(7):897-901.
3. Schubert MM. Caffeinated" Energy Shots" and Distance Running Performance in Trained Runners. 2011.
4. Schubert MM, Astorino TA, Azevedo Jr JL. The effects of caffeinated "energy shots" on time trial performance. *Nutrients.* 2013;5(6):2062-2075.
5. Wesnes KA, Barrett ML, Udani JK. An evaluation of the cognitive and mood effects of an energy shot over a 6 h period in volunteers. A randomized, double-blind, placebo controlled, cross-over study. *Appetite.* 2013;67:105-113.
6. Pereira A, Araújo A, Cabaços C, et al. Profile of mood states-12: same validity, more usability. *European Psychiatry.* 2023;66(S1):S553-S554.
7. Seifert JG, Connor DA. The influence of commercial energy shots on response time and power output in recreational cyclists. *Journal of the International Society of Sports Nutrition.* 2014;11(1):56.
8. Mumford PW, Tribby AC, Poole CN, et al. Effect of caffeine on golf performance and fatigue during a competitive tournament. *Medicine & Science in Sports & Exercise.* 2016;48(1):132-138.