



EFFECTS OF ENERGY DRINK AS AN ERGOGENIC AID ON ANAEROBIC ACTIVITY OF PAKISTANI PLAYERS

Muhammad Zeeshan

Lecturer, Government Municipal Graduate College Faisalabad

Email: mzeeshan2850@gmail.com

Muhammad Furqan Ashraf

Director Sports Superior College Faisalabad

furqan.waince@yahoo.com

Tanveer Hameed

Associate Professor

Govt. Municipal Graduate College Faisalabad

tanveerhameed1979@gmail.com

ABSTARACT

Fitness enthusiasts and athletes are always looking for the ways to increase their physical activity performance. This is the core reason that they are willing to intake different types of supplements for the purpose of either developing aerobic or anaerobic or both the abilities. The action of caffeine is effected by many factors. The research on anaerobic exercise performance is very partial, that's why the need to investigate and study on strength work and anaerobic performance is relatively huge. This study examined the effects of caffeinated energy drink and caffeinated dark chocolate to make comparison as an ergogenic aid on anaerobic performance of leg press and bench press exercises. In experimental method of quantitative research, thirty two recreational participants (mean age 20.75 ± 2.2 years) performed leg press and bench press exercises. Participants were randomly assigned a dark chocolate group or energy drink group. After ingesting caffeinated dark chocolate or energy drink, they were examined on two dependent variables (Bench press performance and leg press performance). Data was tested via a dependent samples t-test with p value set at $P < 0.05$. Bench press trials showed (Dark chocolate = 55.9 ± 20.8 kg; Energy drink = 63.1 ± 21.3 kg; $p = .338$). Leg press trials showed results (Dark chocolate = 216.75 ± 19.4 kg; Energy drink = 222 ± 18.1 kg; $p = .435$). No significance differences were established for dark chocolate group and energy drink group in both of the exercises. The findings of the study showed improvement in performance in both groups. The findings were insignificant ($P < 0.05$), both the caffeinated groups have nearly same effects on anaerobic performance of leg press and bench press exercises when the exercises were performed after 45 minutes of ingestion. Future research should focus to investigate the factors that effected the caffeine's action.

Keywords: Energy drinks, Athletes, Ergogenic Aid, Anaerobic Activities

INTRODUCTION

Fitness enthusiasts and athletes are always looking for the ways to increase their physical activity ability. This is the core reason that they are willing to intake different types of supplements for the purpose of either developing aerobic or anaerobic or both the abilities. Usage of energy drinks now a day is common example of such type of supplements. It could be said that availability of different types of energy drinks in the market place all over the world is driven by such demand. The present study will be a significance endeavor about the most commonly consumed alkaloids worldwide in the form of coffee, tea, or soft drinks to know caffeine effect on anaerobic exercise.

Objectives

- 1) To make comparison the effects of two different forms of caffeine intake (i.e. Red Bull vs Dark Chocolate) on athletes' upper body anaerobic exercise.



- 2) To make comparison the effects of two different forms of caffeine (i.e. Red Bull vs Dark Chocolate) on athletes' lower body anaerobic exercise.
- 3) To make comparison, the effects of caffeine on upper body and lower body exercise performance.

Hypothesis

Ho1: Energy drink group will show more improvement in anaerobic abilities than dark chocolate group.

Ho2: Dark chocolate group will show more improvement in anaerobic abilities than energy drink group.

Ho0: Both energy drink group and dark chocolate group will show equal improvement or no improvement in their anaerobic abilities.

REVIEW OF LITERATURE

Many scientific studies investigated the effect of caffeine to increase the performance during exercise. Most of these studies have paid attention on the performance of aerobic exercise, and have very partial attention of investigating the anaerobic exercise performance. This literature review will sum up the possible mechanisms of the actions for caffeine having ergogenic effects and will give a general idea of the ingestion of caffeine and describe its effect on:

- Performance during aerobic exercise
- Performance during anaerobic exercise
- Performance during resistance exercise

Finally, a discussion of frequent dose, its reaction and problems related to menstrual cycle at the result of caffeine intake will be existed. Reasons that possible are following Ergogenic outcome of caffeine:

Possible Reasons following Caffeine's Ergogenic Effect

Nelig and Debry, (1994) described that caffeine had strong effects on performance through stimulus of central nervous system, with the initiation of free fatty acids (FFA) used through the muscles (it affects as glycogen sparring), enhancement in neuromuscular conduction and make probability of increase in muscle contraction. Ryu, (2001) studied and exposed that in long-term sub maximal oxygen consuming workout caffeine animates the CNS, upgrade neuromuscular conduction, and expand contractility of skeletal. Though, a number of similar studies showed that there was no improvement in the same parameters in short-term and intensive exercises like muscular power exercises and endurance exercises of high intensity. Nelig and Debry, (1994) and Ryu, (2001) established that caffeine affected aerobic performance strongly through stimulus of central nervous system, upgrade neuromuscular conduction, and expand contractility of skeletal. Consequently keeping in view the establishment of Nelig and Debry, (1994) and Ryu, (2001) will ensure that the participants in this study who consumed caffeine during the conduction of study as a relationship that has already established by Nelig and Debry, (1994) and Ryu, (2001) in this regard.

Graham, (2001) expressed that it is not viewed as the essential component behind the ergogenic impacts of caffeine on sub maximal perseverance execution. There is a considerable amount of confirmation recommending that caffeine utilization builds plasma Free Fatty Acid for skeletal muscles to use as a vitality substrate. Graham, (2001); Roberts, (2007); Ryu, (2001) exposed that Caffeine builds the break of fat tissue in perseverance practices which grows Free

Fatty Acids in the blood. By the extended availability of this energy substrate for the skeletal muscles, there is a diminished reliance on glycogen store allowing the sparing of glycogen to be used later, subsequently, enhancing continuance execution. Subsequently, caffeine is said to have a "glycogen-saving" impact on sub maximal, prolonged activity. Also, research demonstrates that caffeine utilization before performing sub maximal, prolonged activity builds VO₂ and fat oxidation post exercise too. Graham, (2001); Roberts, (2007); Ryu, (2001) established that caffeine effected the performance by stimulating central nervous system, with the initiation of free fatty acids (FFA), increasing oxygen consuming capacity and fat oxidation of skeletal muscles. Therefore present research will investigate that if the caffeine has same effects on anaerobic performance by stimulating central nervous system, with the initiation of free fatty acids (FFA), increasing oxygen consuming capacity and fat oxidation of skeletal muscles as it affected on aerobic performance.

Effects of Dark chocolate on performance

Most of the researches regarding Dark Chocolate has primarily focused on positive influences on cardiovascular fitness and has very partial intention against the effects regarding exercise performance.

Allgrove et al. (2011) concluded that use of 40 g Dark Chocolate for 14 days was linked with decrease oxidative-stress markers subsequent lengthened extensive exercise and improved enlistment of Free Fatty Acids following work out. Thus, there is not any research that has expressed the relation connecting the reported increases in nitric oxide (NO) and so far the nitrate levels as a result after eating of Dark Chocolate and so for its prospective to decrease oxygen requirement in moderate intensity work out and improve performance in high-intensity work out.

Effects of Caffeine on Aerobic Exercise Performance

Graham and Spriet, (1991) exhibited that short to moderate measurement of caffeine that is 3 - 6 mg per kilogram of body weight delivered a more prominent impact on perseverance execution, that is, an ideal opportunity to depletion at 85% of their most extreme oxygen consuming limit (VO₂MAX), as compare to high dosages that is 9 mg per kilogram of body weight. Graham and Spriet, (1991) established that short to moderate measurements that is 3 - 6 mg per kilogram of body weight of caffeine delivered a more prominent impact on perseverance execution as compare to high dosage that is 9 mg per kilogram of body weight. Thus, this research utilized 80 mg of caffeine and checking out the impact of caffeinated energy drink and caffeinated dark chocolate on anaerobic execution and power generation.

Malek et.al., (2006) exposed that intense caffeine utilization preceding activity has been appeared to enhance vigorous execution and wellness parameters, though, extensive utilization (alongside high-impact preparing) has no impact on oxygen consuming execution and fitness. While most studies agree that direct measures of caffeine enhances high-impact execution (continuance and speed) and improves fat assembly (bringing about an increment in plasma free unsaturated fats, or FFA) to utilize as energy (Dodd et al., 1993); (French et al.,1991); (Graham and Spriet 1991); (Graham 2001); (Powers and Dodd.,1985); (Sachan and Hongu 2000); (Sasaki et al., 1987); (Tarnopolsky 1994); (Tarnopolsky and Cupido., 2000).

Effects of Caffeine on Anaerobic Exercise Performance

Research regarding caffeine whether it delivers any impact on anaerobic execution is in the earliest stages. Exploration appear to incline for caffeine enhancing muscular endurance (specific and dynamic), yet not muscular strength, and yet is not in agreement for caffeine enhancing maximal muscular power.

Alford et al, (2001); Astorino et al, (2008); Beck et al, (2006); Bell et al, (2001); Forbes et al, (2007); Greer et al, (1998) reported interrelated outcomes in respect to the impacts that has caffeine toward the tension created inside skeletal muscle amid maximal intentional reduction and titanic stimulus at distinctive frequencies. Titanic stimulus of low rate delivered more noteworthy pressure amid the caffeine trial, subsequent to intake 6 mg of caffeine per kg of the weight of body (i.e., a calm estimations of caffeine), as compare to the placebo treatment trials on the grounds that of an increase in calcium release in sarcoplasmic reticulum with an increment in the sympathy of the skeletal muscle toward calcium. Similar was not valid for maximal voluntary contraction. In this manner, caffeine straightforwardly stimulate skeletal muscle amid endurance trial (specific and dynamic), however not amid trials that require maximal strength. Alford et al, (2001); Astorino et al, (2008); Beck et al, (2006); Bell et al, (2001); Forbes et al, (2007); Greer et al, (1998) established that caffeine basically stimulate skeletal muscle amid endurance trial (specific and dynamic), however not amid trials that require maximal strength.

Effects of Energy Drinks on Bench Press and Leg Press Exercise Performance

Studies which analyzed the impacts of caffeinated beverages (containing caffeine as same as an essential ergogenic component) on performance of anaerobic activity have demonstrated clashing outcome.

Forbes et al, (2007) investigated the impacts of Red Bull® (Energy Drink) on bench press execution of muscle endurance. One hour taking after intake of a Red Bull® (by a caffeine quantity of 2 mg per kg of body weight) or fake treatment drink, sixteen guys and females demonstrated three arrangements of the bench press trials with 70% of one-repetition most noteworthy (with one minute rest among sets). The research established a basic change in endurance of muscle of abdominal area in bench press exercise.

Quantity, Side Effects, and Health Implications

Still there is a lot of discussion like to the dosage, the reactions, and wellbeing ramifications of endless and intense utilization of caffeine. At the point when considering caffeine measurements, imperative inquiries to be examined consist of:

1. What sum is the ideal and safe?
2. How is it conveyed?
3. What are the right systems, modes, and examples of organization?

Graham, (2001); Paluska, (2003) studied that the regular symptoms of too much consumption of caffeine (i.e., > 9mg per kg of body mass or > 500 mg all out), specially for inconsistent users, are reliance, patience, tremors, bad temper, mood change, and disturbance. These reactions are particularly critical in aggressive settings and that's why caffeine is prohibited by various governing bodies of sports.

Research Methodology

Quantitative research was conducted to examine the effects of dark chocolate and energy drink on anaerobic performance of Pakistani players. Experiment method was used for the study.

Thirty two participants were selected and randomly divided in two groups. One group was energy drink group and the second was dark chocolate group. The strength of each group was sixteen members. All the participants performed two exercises in every session. Selected anaerobic exercises were bench press and leg press. One group performed the exercises after using energy drink and the other group after ingesting dark chocolate. According to Richard Shavelson and Lisa Towne this experimental study design is the ideal method in comparative



study. Experiments are usually the most accurate studies and these studies include the most decisive power. These are mostly useful in supporting hypothesis concerning cause and effect relationship.

Population & sample

Participants were recruited from the Lyallpur Gym situated in Eden garden Faisalabad and Quyyum Football Club Faisalabad. Participants, who were actually in good physical position and who involved themselves in various type of physical movement as a minimum three times for every week were selected to take part in the study. Before conducting the study participants done personal and health record questionnaires, sign a familiar consent report, and clear to take part in the study.

Thirty two recreationally trained (as a minimum three times physically active in a week) volunteer males (18 to 24 years of age) participated in this study. Participants were randomly assigned a group: a dark chocolate group and energy drink group. All participants performed the exercises in gym in different sessions. Participants were initially assessed by interview for their eligibility. No one from the participants had a history of cardiovascular or respiratory disease and/or proof of musculoskeletal damage. Subjects were recruited on the basis that they were engaged in any physical activity program at the time of recruitment at least three times in a week.

Nature of data and strategy of inquiry

Data was taken in a gym situated in Eden Valley Faisalabad, Pakistan. The researcher wanted to find out the effects of energy drink and dark chocolate on anaerobic performance. So, in this comparative study both groups performed the two anaerobic exercises after ingesting energy drink and dark chocolate. Data readings were taken in kilograms. At the end of this study, the researcher wanted to conclude that which forms of caffeine is more effective and give better results.

First Session Description

It was consisted of the following things:

- 1) Program that integrated a physical exam, personal/medical history and informed agreement questionnaires.
- 2) Familiarization and baseline testing which integrated leg press and bench press testing, a practice of testing procedure that will be utilized.
- 3) Random assigned to either energy drink group or dark chocolate group

Body weight and height

Height of the participants was measured bare footed to using a stadiometer with every participant's back aligned with the wall. And the weight of each participant was calculated to the nearby kilogram by a digital platform scale.

Pre-test session

Participants who qualified the entrance criteria and were clear to take part were invited to participate in Pre Test Session in Lyallpur Gym. Participants were instructed not to do any resistance exercise 48 hours before attending in Pre Test Session. These directions were given to the participants after they agreed with the offer to take part. First of all participants were familiarized with the study through written and verbal details according to the design of study. They were instructed about how to perform the exercises. An expert trainer of the gym gave the demo to the participants. Subsequently, participants were asked to complete the test in equally the leg press (LP) and bench press (BP) exercises by using standard procedures. For

each exercise, total weight lifted was written in record. They were asked to lift the weight as they could lift their maximum.



Figure3. 1 Leg press machine



Figure3. 2 Bench press machine

Instructions regarding study duration

Participants were instructed to avoid doing resistance exercise for the duration of the study that was two weeks and avoid any exhaustive training for 48 hours before every session of testing. Participants were instructed to avoid from taking caffeine for 48 hours before every testing session. To facilitate make it easy, they were instructed orally as well as written to

- 1) Avoid from ingesting caffeine-containing food during the study
- 2) Read the nutrition label of food item to notice that caffeine is not an ingredient of that food or how much caffeine it contains.
- 3) Try to consume the similar foods a day before every training session. Tests were conducted in evening.

Supplementation procedure

Participants were requested to leave all nutritional sources of caffeine such as coffee, energy drink and chocolates for 48 hours prior to testing. Participants came in the Gym and



ingested the energy drink and dark chocolate as assigned to use for the test. All the participants were clothed in a T-shirt, and shorts.

Now the testing session was consisted of the participant performing the Bench Press and Leg Press exercises after ingesting energy drink and dark chocolate. In this Session all the participants of energy drink group consumed the energy drink red bull® 250ml energy drink and the other dark chocolate group used the Toblerone dark chocolate 45 minutes prior to perform exercises.

Post Testing

Prior to performing the exercise tests, the participants were asked to do warm up for 10 minutes that was consist of equally dynamic and static exercises. The exercise tests consisted of a leg press, chest press. In this part of the study all the participants performed both exercises of leg press and bench press one by one. They were instructed to lift maximum weight as they can lift. Three sets of each exercise were necessary to measure the weight. The participants were given extra effort if any of them asked to lift more weight. Total weight that was lifted and the number of repetitions done following each test were written for record.

Data management

Data was taken from the Gym in four different sessions. First session was pre-test in which the participants perform the leg press and bench press exercises without ingesting energy drink or dark chocolate. The data of this session would be compared with other sessions to conclude the improvement in measurement after using beverages. The other three sessions include ingesting energy drink by one group and dark chocolate by the other group 45 minutes before performing leg press and bench press exercises. Reading was taken in kilogram. In the testing of bench-press, the bar was placed over the participant's chest to keep the arms flexed on 90°. All the participants perform both exercises one by one in every session and the weight lifted their maximum was taken for record. Participants were instructed to lift the maximum weight.

RESULTS

Thirty two volunteers that were physically active at least three to five days in a week participated during the study. All thirty two participants completed the study and were integrated in the final analysis. All the participants were male. Descriptive statistics of participants' age, height, weight, and body mass index are existed in Table below. Descriptive data for 1 Repetition maximum in each exercise is also existed in Table. For the assessment of the null hypotheses, dependent samples *t*-tests were organized to conclude that if there were major discrimination in bench press total weight (kg) between dark chocolate group and energy drink group, in leg press overall weight (kg) between dark chocolate group and energy drink group, and in total workout weight (kg) between energy drink group and dark chocolate group. Moreover effect sizes were calculated for both dependent variables in the direction of determining some significance difference in the results of *t*-tests (Cohen's *d*). The results are calculated and listed below in Tables

Characteristics of the participants

Table4. 1 Characteristics of the participants of the study (N=32)

Variable	Mean	Standard Deviation
Age(years)	20.75	±2.2



Height (centimeters)	168.7	±5.86
Weight (kilogram)	62.125	±7.86
BMI	21.83	±2.48

Age of the participants was taken in years. Height was measured while standing with back against the wall and feet together. Weight was measured on weight machine. BMI stands for Body Mass Index and was considered with this formula (Weight in kilograms divided by height in meter square). Table4.1 showed that the average age of all the participants is 20.75 ± 2.2 years. Mean of height is 168.7 ± 5.86 centimeters. Weight is showed in kilograms and its mean is 62.125 ± 7.86 . Mean BMI of the participants is 21.83 ± 2.48 .

Table4. 2 Dark chocolate group statistical description

Sr.no	Name	Age	Height	Weight	BMI
1	Athlete 1	20	157.5	56	22.6
2	Athlete 2	24	170	78	27
3	Athlete 3	23	170	82	28.4
4	Athlete 4	18	170	64	22.1
5	Athlete 5	18	160	55	22.1
6	Athlete 6	24	170	74	25.6
7	Athlete 7	24	173	78	26.1
8	Athlete 8	20	178	63	19.9
9	Athlete 9	19	170	60	20.8
10	Athlete 10	20	170	64	22.1
11	Athlete 11	20	165	56	20.6
12	Athlete 12	18	168	55	19.5
13	Athlete 13	19	162.5	57	21.6
14	Athlete 14	18	168	53	18.8
15	Athlete 15	18	162.5	54	20.4
16	Athlete 16	21	162.5	56	21.2



Table4. 3 Average characteristic of the participants of dark chocolate group

Variable	Mean	Standard Deviation
Age(years)	20.25	±2.29
Height (centimeters)	167.31	±5.26
Weight (kilogram)	62.81	±9.78
BMI	22.43	±2.84

Table4.3 showed that the average age of dark chocolate group is 20.25 ± 2.29 years. Mean of height is 167.31 ± 5.26 centimeters. Weight is showed in kilograms and its mean is 62.81 ± 9.78 . Mean BMI of this group is 22.43 ± 2.84 .

Table4. 4 Energy Drink group statistical description

Sr.no	Name	Age	Height	Weight	BMI
1	Athlete 1	23	173	66	22.1
2	Athlete 2	22	165	62	22.8
3	Athlete 3	19	188	60	17
4	Athlete 4	23	168	65	23
5	Athlete 5	22	170	58	20.1
6	Athlete 6	19	162.5	57	21.6
7	Athlete 7	24	173	78	26.1
8	Athlete 8	18	173	61	20.4
9	Athlete 9	20	170	67	23.2
10	Athlete 10	23	162.5	56	21.2
11	Athlete 11	18	165	57	20.9
12	Athlete 12	20	175	59	19.3



13	Athlete 13	20	170	59	20.4
14	Athlete 14	22	173	63	21
15	Athlete 15	24	168	58	20.5
16	Athlete 16	23	165	57	20.9

Age of the participants was taken in years. Height was measured while standing with your back against the wall and your feet together. Weight was measured on weight machine. BMI stands for Body Mass Index and was considered with the formula (Weight in kilograms divided by height in meter square).

Table4. 5 Average characteristic of the participants of energy drink group

Variable	Mean	Standard Deviation
Age(years)	21.25	± 2.08
Height (centimeters)	170.06	± 6.22
Weight (kilogram)	61.44	± 5.59
BMI	21.28	± 1.99

Table 4.5 showed that the average age of energy drink group is 21.25 ± 2.08 years. Mean of height is 170.06 ± 6.22 centimeters. Weight is showed in kilograms and its mean is 61.44 ± 5.59 . Mean BMI of this group is 21.28 ± 1.99 .

Leg press trials of pre test in both groups (Energy drink and Dark chocolate)

Table4. 6 Energy drink group results in pre test of Leg press activity

Serial No	Name	Leg press Pre test (Kg)
1	Athlete 1	170
2	Athlete 2	190
3	Athlete 3	190
4	Athlete 4	170
5	Athlete 5	210

6	Athlete 6	190
7	Athlete 7	190
8	Athlete 8	190
9	Athlete 9	150
10	Athlete 10	210
11	Athlete 11	230
12	Athlete 12	170
13	Athlete 13	170
14	Athlete 14	150
15	Athlete 15	180
16	Athlete 16	190

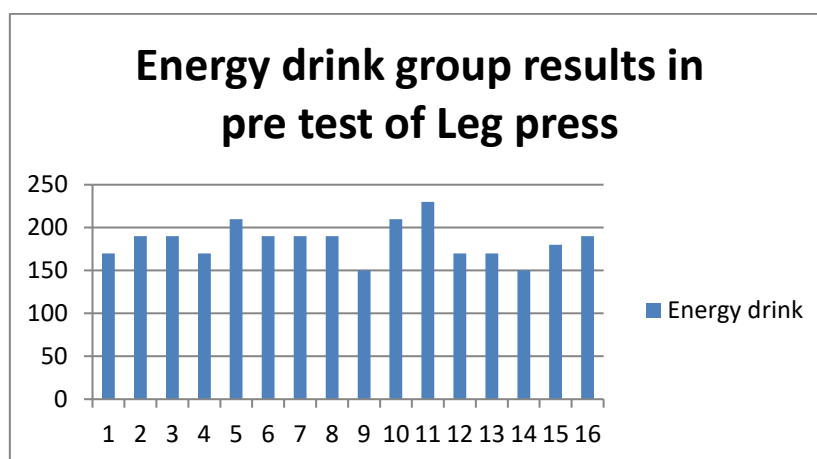


Figure4. 1 Energy drink group results in pre test of Leg press

Participants were already assigned in two groups (dark chocolate group and energy drink group). After arriving in the gym for the testing, participants sat and rested for 5 to 10 minutes. First of all, the athletes warmed up their bodies for 10 to 15 minutes. Then they practiced leg press activity for 5 to 10 minutes. After warming up and after some practice, they performed the leg press exercise test in a sequence of numbers and the readings were taken that are mentioned in above table. The readings of the leg press weight lifted were taken in kilograms.



Table4. 7 Dark chocolate group results in pre test of Leg press activity

Sr.No	Name	Leg press Pre test
1	Athlete 1	170
2	Athlete 2	170
3	Athlete 3	190
4	Athlete 4	150
5	Athlete 5	140
6	Athlete 6	190
7	Athlete 7	250
8	Athlete 8	230
9	Athlete 9	200
10	Athlete 10	170
11	Athlete 11	190
12	Athlete 12	210
13	Athlete 13	190
14	Athlete 14	200
15	Athlete 15	160
16	Athlete 16	190

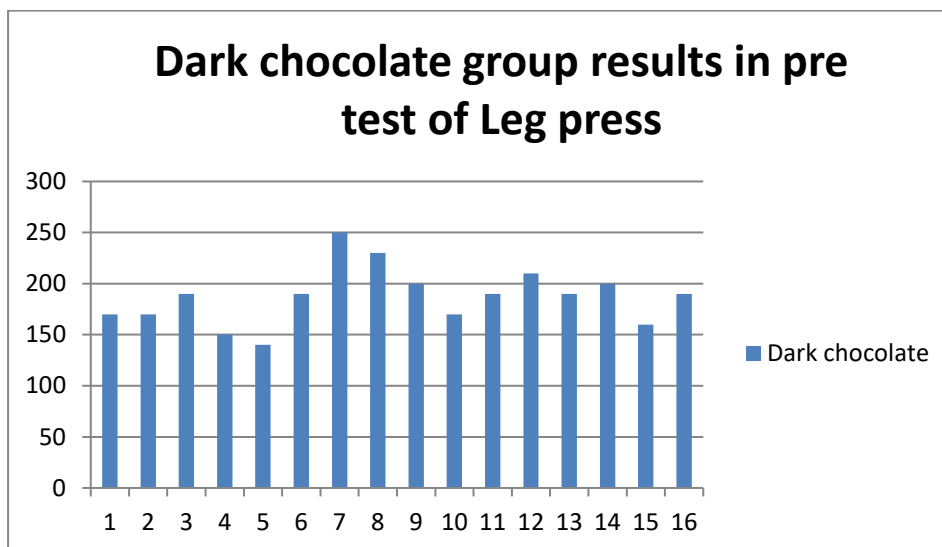


Figure4. 2 Dark chocolate group results in pre test of Leg press

Participants were already assigned in two groups (dark chocolate group and energy drink group). After arriving in the gym for the testing, participants sat and rested for 5 to 10 minutes. First of all, the athletes warmed up their bodies for 10 to 15 minutes. Then they practiced leg press activity for 5 to 10 minutes. After warming up and after some practice, they performed the leg press exercise test in a sequence of numbers and the readings were taken that are mentioned in above table. The readings of the leg press weight lifted were taken in kilograms.

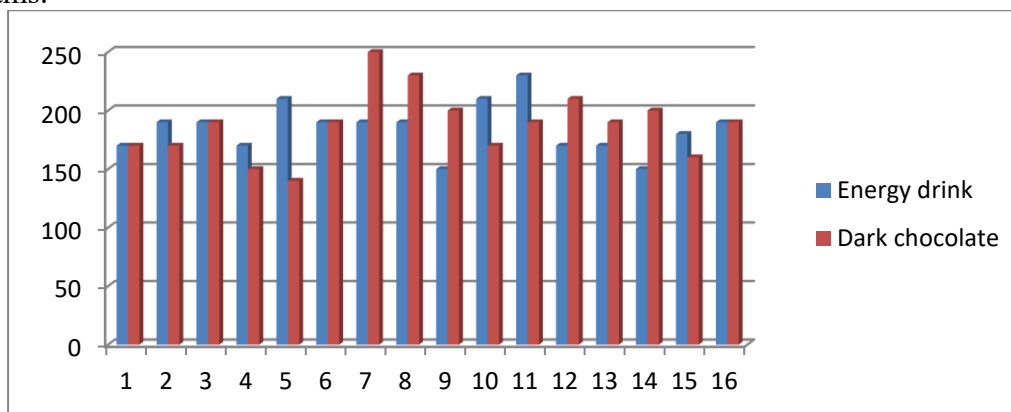


Figure4. 3 Pre test leg press comparative graph of energy drink group and dark chocolate group

Bench press trials of pre test in both groups (Energy drink and Dark chocolate)

Table4. 8 Energy deink group test results in pre test of bench press activity

Sr.No	Name	Bench press Pre test
1	Athlete 1	43



2	Athlete 2	53
3	Athlete 3	103
4	Athlete 4	53
5	Athlete 5	33
6	Athlete 6	73
7	Athlete 7	83
8	Athlete 8	33
9	Athlete 9	53
10	Athlete 10	43
11	Athlete 11	43
12	Athlete 12	33
13	Athlete 13	39
14	Athlete 14	33
15	Athlete 15	43
16	Athlete 16	43

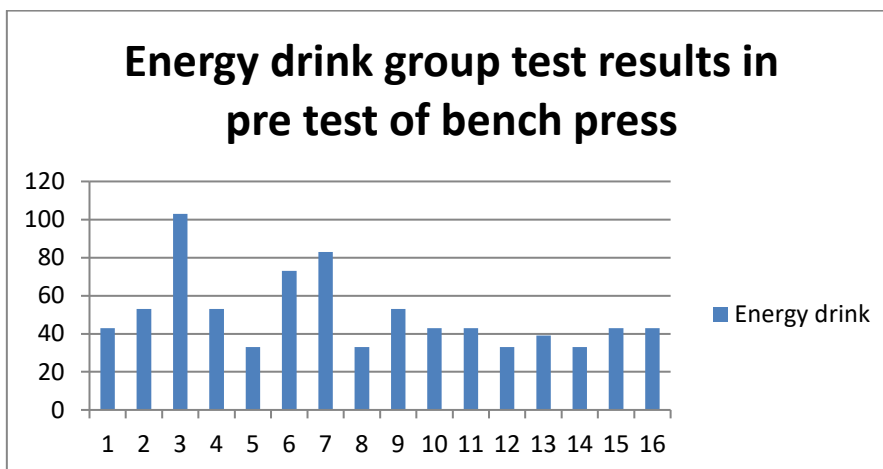


Figure4. 4 Energy drink group results in pre test of Bench press

Participants were already assigned in two groups (dark chocolate group and energy drink group). After arriving in the gym for the testing, participants sat and rested for 5 to 10 minutes. First of all, the athletes warmed up their bodies for 10 to 15 minutes. Then they practiced leg press activity for 5 to 10 minutes. After warming up and after some practice, they performed the bench press exercise test in a sequence of numbers and the readings were taken that are mentioned in above table. The readings of the bench press weight lifted were taken in kilograms.

Table4. 9 Dark chocolate group results in pre test of bench press activity

Sr.No	Name	Bench press Pre test
1	Athlete 1	43
2	Athlete 2	33
3	Athlete 3	39
4	Athlete 4	43
5	Athlete 5	53
6	Athlete 6	33
7	Athlete 7	123
8	Athlete 8	53

9	Athlete 9	39
10	Athlete 10	33
11	Athlete 11	43
12	Athlete 12	43
13	Athlete 13	43
14	Athlete 14	49
15	Athlete 15	33
16	Athlete 16	43

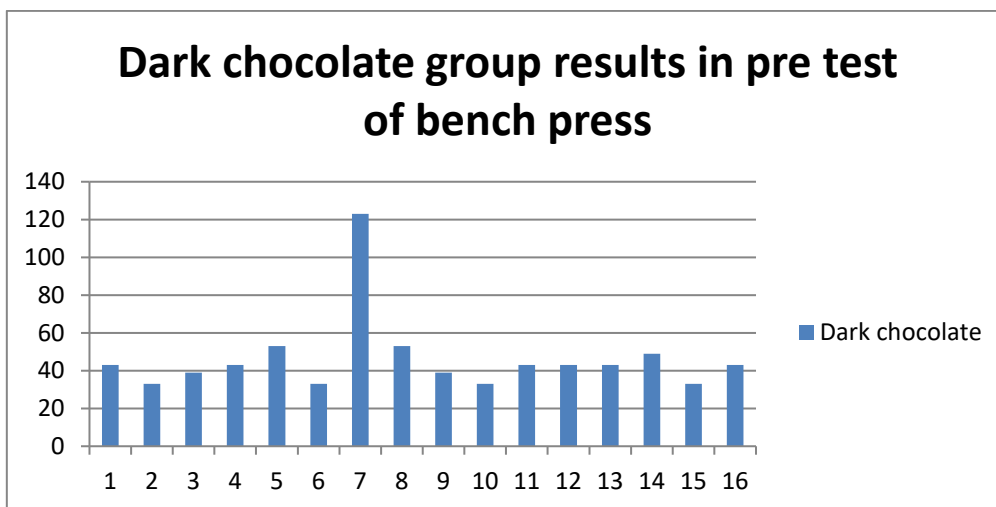


Figure4. 5 Dark chocolate group results in pre test of Bench press

Participants were already assigned in two groups (dark chocolate group and energy drink group). After arriving in the gym for the testing, participants sat and rested for 5 to 10 minutes. First of all, the athletes warmed up their bodies for 10 to 15 minutes. Then they practiced leg press activity for 5 to 10 minutes. After warming up and after some practice, they performed the bench press exercise test in a sequence of numbers and the readings were taken that are mentioned in above table. The readings of the leg press weight lifted were taken in kilograms.



Leg press trials of post test in both groups (Energy drink and Dark chocolate)

Table4. 10 Energy drink group test results in post test of Leg press activity

Sr.No	Name	Leg press Post test
1	Athlete 1	226
2	Athlete 2	240
3	Athlete 3	240
4	Athlete 4	200
5	Athlete 5	220
6	Athlete 6	236
7	Athlete 7	240
8	Athlete 8	230
9	Athlete 9	190
10	Athlete 10	230
11	Athlete 11	250
12	Athlete 12	210
13	Athlete 13	210
14	Athlete 14	190
15	Athlete 15	220
16	Athlete 16	220

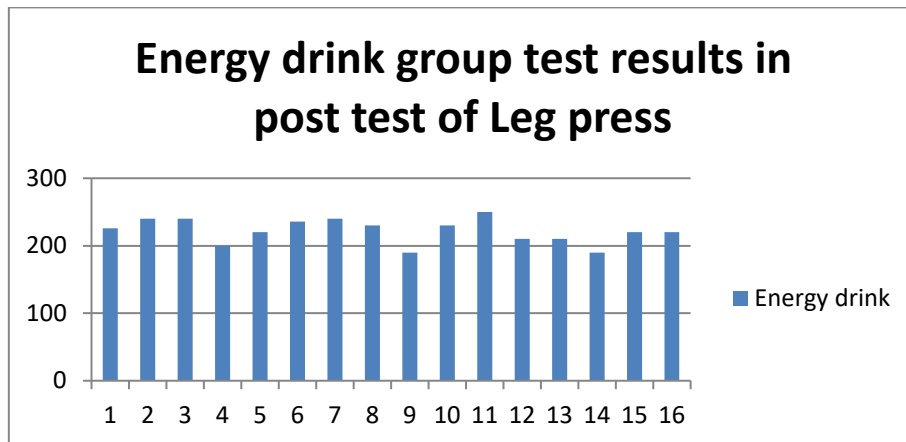


Figure4. 6 Energy drink group results in post test of leg press

Participants were already assigned in two groups (dark chocolate group and energy drink group). After arriving in the gym for the testing, participants sat and rested for 5 to 10 minutes. Then, energy drink group consumed a Red bull energy drink of 250 grams containing 80 mg of caffeine. Forty five minutes after ingestion, participants started the session's tests. After warming up and some practice on leg press machine, they perform the test in a sequence of numbers one by one. The readings were taken in kilograms.



Figure4. 7 Energy drink group participants in leg press post test

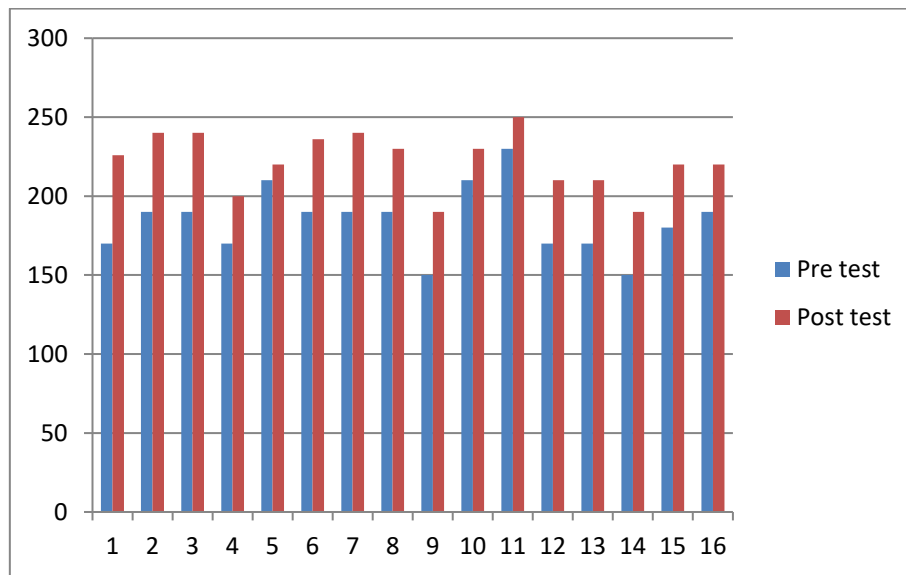


Figure4. 8Comparative graph of leg press Pre test and post test of Energy drink group



Table4. 11 Dark chocolate group results in post test of Leg press activity

Sr.No	Name	Leg press Post test
1	Athlete 1	236
2	Athlete 2	210
3	Athlete 3	220
4	Athlete 4	180
5	Athlete 5	190
6	Athlete 6	210
7	Athlete 7	260
8	Athlete 8	236
9	Athlete 9	230
10	Athlete 10	206
11	Athlete 11	210
12	Athlete 12	230
13	Athlete 13	200
14	Athlete 14	220
15	Athlete 15	210
16	Athlete 16	220

Participants were already assigned in two groups (dark chocolate group and energy drink group). After arriving in the gym for the testing, participants sat and rested for 5 to 10 minutes. Then, dark chocolate group consumed a Toblerone chocolate of 100 gram containing 80 mg of caffeine. Forty five minutes after ingestion, participants started the tests of the session. After warming up and some practice on bench press machine, they perform the test in a sequence of numbers one by one. The readings were taken in kilograms.



Figure4. 9 Dark chocolate group participants in leg press post test

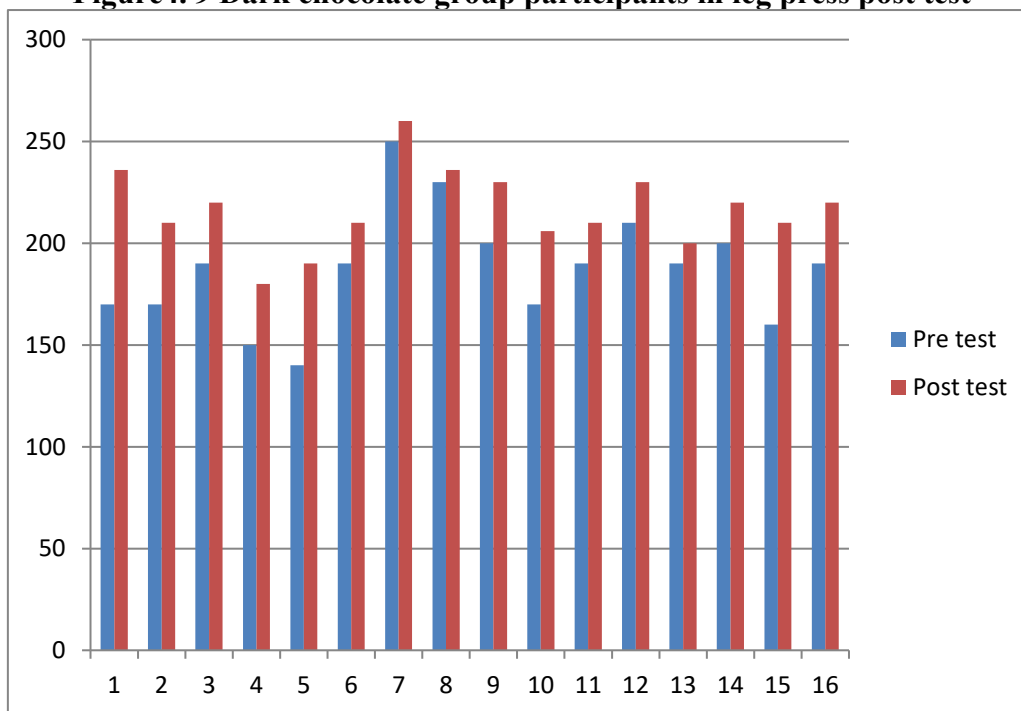


Figure4. 10Comparative graph of leg press Pre test and post test of Dark chocolate group

Figure 4.10 show comparison of pre test and post test trials of bench press of dark chocolate groups. Series 1 is pre test leg press measurement and series 2 is post test leg press measurement. Total participants of dark chocolate group are sixteen. Measurement is taken in kilograms.



Bench press trials of post test in both groups (Energy drink and Dark chocolate)

Table4. 12 Energy drink group test results post test of bench press activity

Sr.No	Name	Bench press Post test
1	Athlete 1	49
2	Athlete 2	69
3	Athlete 3	119
4	Athlete 4	73
5	Athlete 5	43
6	Athlete 6	83
7	Athlete 7	99
8	Athlete 8	53
9	Athlete 9	59
10	Athlete 10	53
11	Athlete 11	59
12	Athlete 12	43
13	Athlete 13	53
14	Athlete 14	43
15	Athlete 15	59
16	Athlete 16	53

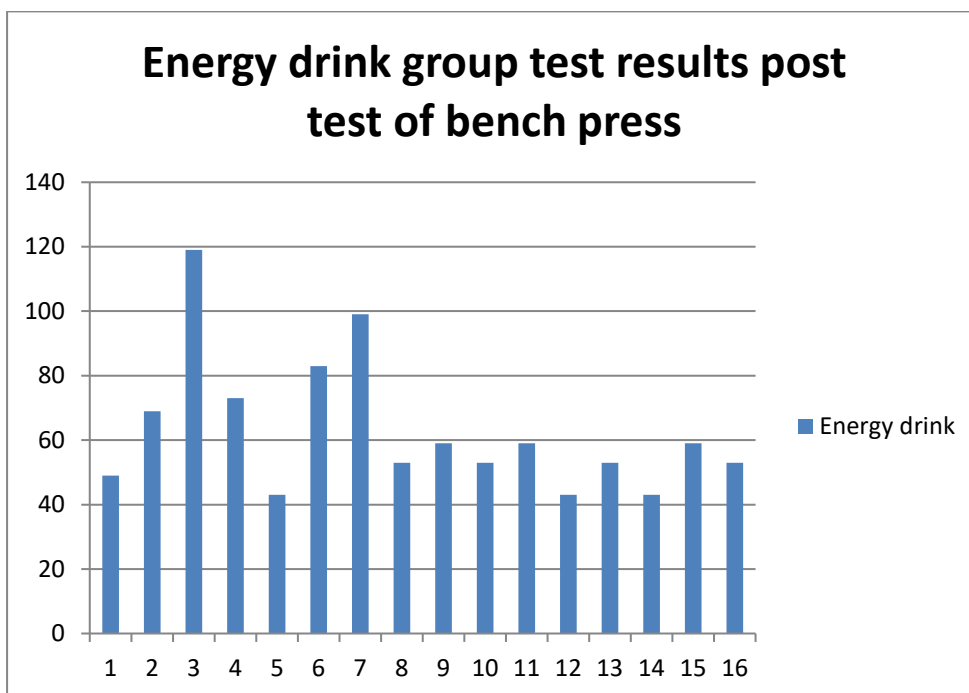


Figure4. 11 Energy drink group participants in bench press post test

Participants were already assigned in two groups (dark chocolate group and energy drink group). After arriving in the gym for the testing, participants sat and rested for 5 to 10 minutes. Then, energy drink group consumed a Red bull energy drink of 250 grams containing 80 mg of caffeine. Forty five minutes after ingestion, participants started the tests of the session. After warming up and some practice on bench press machine, they perform the test in a sequence of numbers one by one. The readings were taken in kilograms.



Figure4. 12 Energy drink group performing post test bench press

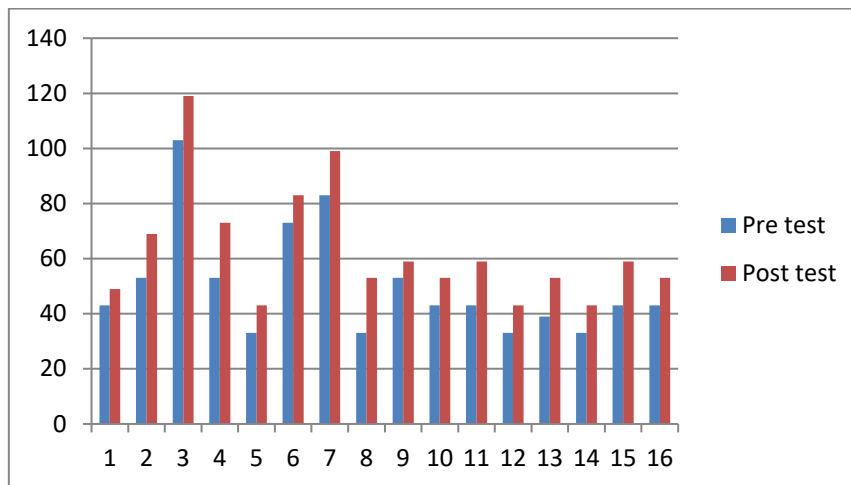


Figure4. 13 Comparative graph of bench press Pre test and post test of energy drink group

Figure 4.13 show comparison of pre test and post test trials of bench press of energy drink groups. Series 1 is pre test bench press measurement and series 2 is post test bench press measurement. Total participants of energy drink group are sixteen. Measurement is taken in kilograms.



Table4. 13 Dark chocolate group results in post test of bench press activity

Sr.No	Name	Bench press Post test
1	Athlete 1	55
2	Athlete 2	43
3	Athlete 3	51
4	Athlete 4	49
5	Athlete 5	63
6	Athlete 6	43
7	Athlete 7	129
8	Athlete 8	63
9	Athlete 9	51
10	Athlete 10	43
11	Athlete 11	43
12	Athlete 12	49
13	Athlete 13	53
14	Athlete 14	63
15	Athlete 15	43
16	Athlete 16	53

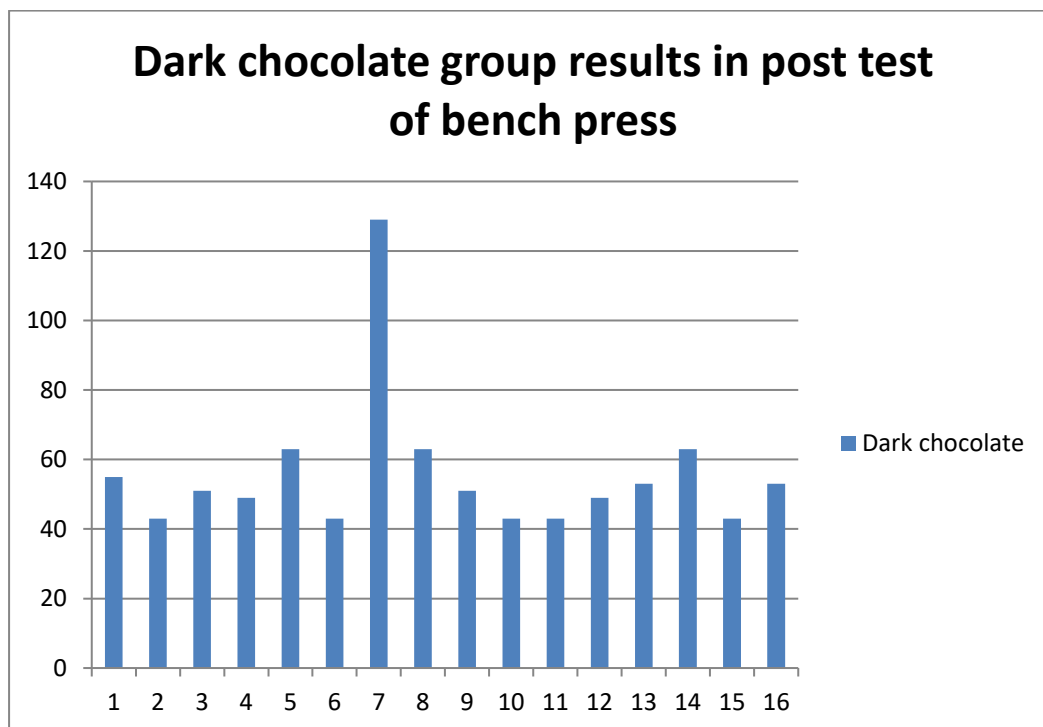


Figure4. 14 Dark chocolate group participants in bench press post test

Participants were already assigned in two groups (dark chocolate group and energy drink group). After arriving in the gym for the session, participants sat and rested for 5 to 10 minutes. Then, dark chocolate group consumed a Toblerone chocolate of 100 gram containing 80 mg of caffeine. Forty five minutes after ingestion, participants started the tests of the session. After warming up and some practice on bench press machine, they perform the test in a sequence of numbers one by one. The readings were taken in kilograms.



Figure4. 15 Comparative graph of bench press Pre test and post test of Dark chocolate group

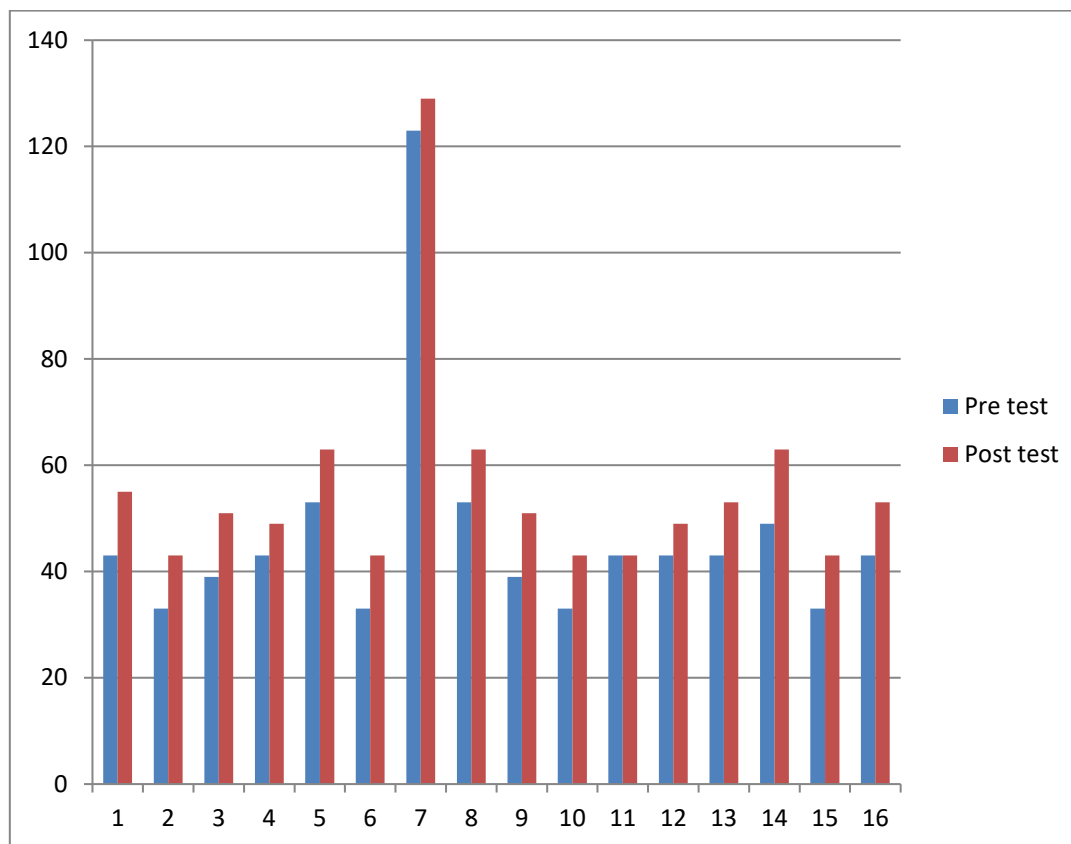


Figure 4.16 Comparative graph of bench press Pre test and post test of Dark chocolate group

Figure 4.16 show comparison of pre test and post test trials of bench press of dark chocolate groups. Series 1 is pre test bench press measurement and series 2 is post test bench press measurement. Total participants of energy drink group are sixteen. Measurement is taken in kilograms.

Findings & Discussions

Research question no 1/ H_1

H_1 declared that energy drink group will show more improvement in anaerobic abilities than dark chocolate group. At the end of the study statistically differences were established in bench press overall lifted weights as well as leg press total lifted weight among the energy drink tests and the dark chocolate tests. Bench press differences (Dark chocolate = 55.9 ± 20.8 kg; energy drink = 63.1 ± 21.3 kg; $p = .338$). Leg press differences (Dark chocolate = 216.75 ± 19.4 kg; Energy drink = 222 ± 18.1 kg; $p = .435$). Thus, based on results, we rejected the null hypothesis (H_0) because energy drink group did not show more improvement than dark chocolate group.

Research question no 2/ H_2

H_2 declared that dark chocolate group will show more improvement in anaerobic abilities than energy drink group. At the end of the study no statistically major differences were established in leg press overall lifted weight as well as bench press total lifted weight among the energy drinks tests and the dark chocolate tests. Bench press comparisons (Energy drink = 222 ± 18.1 kg; Dark chocolate = 216.75 ± 19.4 kg; $p = .435$). Leg press comparisons (Energy

drink = 63.1 ±21.3 kg; Dark chocolate = 55.9 ±20.8kg; $p = .338$). Thus, based on results, we rejected the null hypothesis (H_2) because dark chocolate group did not show more improvement than energy drink group.

Research question no 3/ H_0

H_0 declared that both energy drink group and dark chocolate group will show equal improvement in their anaerobic abilities. At the end of the study no statistically major differences were established in whole body overall lifted weight in bench press trials as well as leg press total lifted weight among the energy drink tests and the dark chocolate tests Bench press differences (Energy drink = 63.1 ±21.3 kg; Dark chocolate = 55.9 ±20.8kg; $p = .338$). Leg press differences (Dark chocolate = 216.75 ± 19.4kg; Energy drink = 222± 18.1 kg; $p = .435$). Thus, based on results, we failed to reject the null hypothesis (H_0).

The study investigated the findings of energy drink as an ergogenic assistant on anaerobic work out ability. The most important, statistical, result of present study is that the use of energy drink as compare to dark chocolate create more ergogenic effect in increasing anaerobic exercise performance in strength exercises of lifting weight (i.e., bench press overall weight, leg press overall weight and total workout weight) while energy drink and dark chocolate consumed before forty-five minutes to perform exercises. Yet, owing to the little effect size of both t -tests, the non-significant outcomes mean that there is no dissimilarity among the both groups. There was found 19.8% improvement in bench press total lifted weight and 15.6% improvement in leg press total lifted weight during the dark chocolate group trials. There was found 25.6% improvement in bench press overall lifted weight and 20.4% improvement in leg press overall lifted weight during the energy drink group trials. Thus, it is concluded from the results that ingestion of energy drink produces more ergogenic effect than dark chocolate by increasing anaerobic exercise performance in strength exercises of lifting weight.

The findings of the study showed improvement in performance of both groups. Results showed that energy drink group improvement is a little bit greater than dark chocolate group in the performance of both the exercises of leg press and bench press. The findings of the study concluded that for bench press overall weight lifted, the energy drink group lifted more total weight (5.8% additional) than the dark chocolate group. And in leg press, the energy drink group lifted more total weight (4.8% more) than the dark chocolate group.

Total weight lifted in both groups

Table4. 14 Total weight lifted in one repetition maximum in the bench press exercise and the leg press exercise (Expressed as Absolute)

Variable	(Mean ± SD) Pre test	(Mean ± SD) Post test	Increase percentage
Absolute BP 1 RM (kg) Dark chocolate group	46.6 ± 21.4	55.9 ±20.8	19.84%



Absolute BP 1 RM (kg) Energy rink group	50.25 ± 20	63.1 ± 21.3	25.62%
Absolute LP 1 RM (kg) Dark chocolate group	187.5 ± 28.2	216.75 ± 19.4	15.6%
Absolute LP 1 RM (kg) Energy drink group	184.4 ± 21.3	222 ± 18.1	20.4%

Note.

- RM stands for repetition maximum
- BP stands for bench press
- LP stands for leg press
- SD stands for standard deviation

The readings of the table showed that there was found a 19.8% increase in bench press total lifted weight and a 15.6% increase in leg press total lifted weight during the dark chocolate group trials. There was found a 25.6% increase in bench press total lifted weight and a 20.4% increase in leg press total lifted weight during the energy drink group trials.

Post test leg press comparison of dark chocolate group and energy drink group

Table4. 15 Group Statistics of leg press exercise

	Groups	N	Mean	Std. Deviation	Std. Error Mean
Values	1.00	16	222.0000	18.12549	4.53137
	2.00	16	216.7500	19.38900	4.84725

In table 5.15 group 1 is energy drink group and group 2 is dark chocolate group. Group 1 is energy drink group and group 2 is dark chocolate group. Each group has 16 participants. The mean of energy drink group is 63.1250 and the mean of dark chocolate group is 55.8750 and the standard deviation is 21.31001 and 20.79704 respectively.

Table4. 16 Independent Samples Test of leg press exercise

t-test for Equality of Means								
							95% Confidence Interval of the Difference	
	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper	
Values								
Equal variances assumed	.791	30	.435	5.25000	6.63545	-8.30139	18.80139	

Table4.16 showed the results in post test leg press comparison of dark chocolate group and energy drink group are not significant. Group 1 is energy drink group and group 2 is dark chocolate group. The details of both groups are given in above table. The *p*.value is 0.435 which is an indicator of non significant results.

Post test bench press comparison of dark chocolate group and energy drink group

Table4. 17 Group Statistics of bench press exercise

	Groups	N	Mean	Std. Deviation	Std. Error Mean
Values	1.00	16	63.1250	21.31001	5.32750
	2.00	16	55.8750	20.79704	5.19926

In table 4.17 Group 1 is energy drink group and group 2 is dark chocolate group. Each group has 16 participants. The mean of energy drink group is 63.1250 and the mean of dark chocolate group is 55.8750 and the standard deviation is 21.31001 and 20.79704 respectively.

Table4. 18 Independent Samples Test of bench press exercise

t-test for Equality of Means							
							95% Confidence Interval of the Difference
	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	.974	30	.338	7.25000	7.44410	-7.95287	22.45287
Values							

Table4.11 the results in post test bench press comparison of dark chocolate group and energy drink group are not significant. Group 1 is energy drink group and group 2 is dark chocolate group. The details of both groups are given in above table. The *p*.value is 0.338 which is an indicator of non significant results.

Table4. 19 Test comparison for dependent variables

Variable	Dark chocolate group (mean ± SD;kg)	Energy drink group (mean ± SD;kg)	p Value
BP TW	55.9 ±20.8	63.1 ±21.3	.338
LP TW	216.75 ± 19.4	222± 18.1	.435

Table 4.19 indicates that Dark chocolate group (mean ± SD;kg) bench press total weight is 55.9 ±20.8 and Energy drink group (mean ± SD;kg) is 63.1 ±21.3. Dark chocolate group (mean ± SD;kg) leg press total weight is 216.75 ± 19.4 and Energy drink group (mean ± SD;kg) leg press total weight is 222± 18.1.

Note.

- BP TW = Bench Press Total weight (kg)
- LP TW = Leg Press Total weight (kg)
- Data was analyzed using Dependent Samples *t*-Tests

References



- Allgrove, J. Farrell E, Gleeson M, Williamson G., & Cooper K. (2011). Regular dark chocolate consumption's reduction of oxidative stress and increase of free-fatty-acid mobilization in response to prolonged cycling. *International Journal of Sports Nutrition and Exercise Metabolism*, 21(2):113–23.
- Alford, C., Cox, H., & Wescott, R. (2001). The effects of Red Bull Energy Drink on human performance and mood. *Amino Acids*, 21, 139-150.
- Astorino, T. A., Rohman, R. L., & Firth, K. (2008). Effect of caffeine ingestion on one-repetition maximum muscular strength. *European Journal of Applied Physiology*, 102(2), 127-132.
- Beck, T. W., Housh, T. J., Malek, M. H., Mielke, M., & Hendrix, R. (2008). The acute effect of a caffeine-containing supplement on bench press strength and time to running exhaustion. *Journal of Strength and Conditioning Research*, 22(5), 1654-1658.
- Bell, D. G., Jacobs, I., & Ellerington, K. (2001). Effect of caffeine and ephedrine ingestion on anaerobic exercise performance. *Medicine and Science in Sports and Exercise*, 33(8), 1399 – 1403.
- Forbes, S. C., Candow, D. G., Little, J. P., Magnus, C., & Chilibeck, P. D. (2007). Effects of Red Bull Energy Drink on repeated Wingate cycle performance and benchpress muscle endurance. *International Journal of Sports Nutrition and Exercise Metabolism*, 17, 433- 444.
- Graham, T. E. & Spriet, L. L. (1991). Performance and metabolic responses to a high caffeine dose during prolonged exercise. *Journal of Applied Physiology*, 71(6), 2292-2298.
- Graham, T. E. (2001). Caffeine, coffee and ephedrine: impact on exercise performance and metabolism. *Canadian Journal of Applied Physiology*, 26, 10-119.
- Greer, F., McLean, C., & Graham, T. E. (1998). Caffeine, performance, and metabolism during repeated Wingate exercise tests. *Journal of Applied Physiology*, 85(4), 1502-1508.
- Malek, M. H., Housh, T. J., Coburn, J. W., Beck, T. W., Schmidt, R. J., Housh, D. J., and Johnson, G. O. (2006). Effects of eight weeks of caffeine supplementation and endurance training on aerobic fitness and body composition. *Journal of Strength and Conditioning Research*, 20(4), 751 – 755.
- Nelig, A. & Debry, G. (1994). Caffeine and sports activity: a review. *International Journal of Sports Medicine*, 15(5), 215-223.
- Powers, S. K., & Dodd, S. (1985). Caffeine and endurance performance. *Sports Medicine*, 2(3), 165-174.
- Ryu, S., Choi, S. K., Joung, S. S., Suh, H., Cha, Y. S., Lee, S., & Lim K. (2001). Caffeine as a lipolytic food component increases endurance performance in rats and athletes. *Journal of Nutrition Science and Vitaminology*, 47(2), 139-146.
- Sachan, D. S., & Hongu, N. (2000). Increases in VO₂max and metabolic markers of fat oxidation by caffeine, carnitine, and choline supplementation in rats. *Journal of Nutritional Biochemistry*, 11(10), 521- 526.
- Tarnopolsky, M. & Cupido, C. (2000). Caffeine potentiates low frequency skeletal muscle force in habitual and non-habitual caffeine consumers. *Journal of Applied Physiology*, 89(5), 1719-1724.