

DNA: An Investigation of the Three-Day Strength Guarantee Made by Magnum Nutraceuticals in Regards to their Branch Chained Amino Acid Supplement DNA

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This small pilot study used a double-blinded, between subject experimental design in an attempt to investigate the claim made by Magnum Nutraceuticals in regards to their newest supplement, DNA. The manufacturer has a three-day guarantee saying that if an individual takes this supplement for three days then they will experience an increase in strength (more repetitions to their normal weight lifting regimen). Two groups (placebo and experimental) performed three different weight lifting exercises (squats, chin-ups, bench press) while lifting ½ of their body weight per manufacturer's instructions. The groups met on two different occasions separated by three days in between. The first meeting the participants completed the three aforementioned exercises and were assigned into the placebo or intervention group. After the baseline the participants were instructed to take their pills as directed for the next three days with the third day being a repeat of the three exercises to compare with baseline. Once all 13 participants (N=7 intervention, N=6 placebo) completed the final workout, the results were scored and significant differences were noted in all three exercises after excluding the numbers from the outlier in the experimental group. There was one minor adverse effect (dyspepsia) experienced with the use of the supplement though all ingredients contained within DNA had GRAS status as designated by the FDA. It was concluded that participants taking DNA had a significant increase in strength when compared against the placebo group for squats, bench, and pull-ups. DNA was shown to be reasonably safe and may help athletes increase repetitions when training with a similar exercise regimen.

Keywords: BCAA, strength supplements, supplemental nutrition

Introduction

Magnum Nutraceuticals is a supplement company based in the Canada area and has been in business since 2005. Magnum has been a popular brand among athletes using supplementation as evident by the fact that the company's products can be found in over 40 different countries. The supplement market is a multimillion-dollar industry where many different companies attempt to distinguish their products with general claims and guarantees. Magnum attempts to distinguish itself by commissioning certified good manufacturing practices (CGMP), site licensed pharmaceutical facilities that undergo regular government auditing for quality assurance, and the use of pharmaceutical grade ingredients.

As competition in the supplement market increases so does the pressure for supplement companies to support the general claims they make on selected products. Magnum Nutraceuticals manufacturers a branched-chained amino acid supplement, which they label as DNA with the claim of a three-day strength guarantee.

The premise behind this claim lays in the fact that protein supplements have always been a popular choice for athletes because protein is one of the three macronutrients (carbohydrates and fats being the other two) used by the body to support essential biological and provide bulk energy⁴. Proteins begin digestion into amino acids in the stomach and then are built into new proteins as needed by the body.

Amino acids are the basic building blocks of proteins and serve a variety of functions within the body⁷. Amino acids can be classified as essential or non-essential (those obtained through the diet). There are three amino acids further classified as branched chain amino acids (BCAA's) because of their chemical structure and include leucine, isoleucine, and valine³. These are the three most known among athletes

because they are used in the muscles. It is suggested that a high intake of BCAA's will stimulate amino acids to be used for building new proteins (thus increase muscle mass) instead of being burned as energy⁸. BCAA's are a common product produced by supplement companies that focus advertising efforts to consumers looking to increase strength.

There has been a great deal of research surrounding BCAA's as a result. Some of these speak favorably towards supplement use with a 2013 study concluding that a BCAA pre-workout supplement suggested an increase in lean body mass and muscle hypertrophy in resistance-trained men¹⁴. Other such studies have even suggested other applications for BCAA products by supplementing to reduce muscle soreness and damage¹⁶. Favorable results however aren't widely accepted as research has also suggested no such correlation exist. In 2014 a study suggested that BCAA supplementation was ineffective to prevent muscle power loss or damage during exercise¹ and a 2011 suggest clinical efficacy regarding similar supplements are simply not strong enough to make recommendations on¹⁰. These conflicting reports make the case for further research to accurately portray the role of BCAA supplementation in athletes.

Despite these varied findings, Magnum Nutraceuticals has recognized the popularity of branch-chained amino acids and associated a three-day strength guarantee on their BCAA supplement, DNA. The purpose of this research is to investigate the three-day guarantee and provide consumers with results so that they can make an educated decision when it comes to selecting a supplement. The ingredients of DNA all fall within the Food Drug Administration's GRAS (generally regarded as safe) index because of their high tolerability and safe profile. The manufacturer (Magnum Nutraceuticals) has provided a general overview of the product as seen in **Table 7** as well as an ingredient list with proposed mechanism of actions for each in **Table 8**

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Table 7: Manufacturer Product Overview



What is Magnum DNA®?

Magnum DNA® is an anabolic formula that combines the powerful muscle-regenerating effects of Branched Chain Amino Acids (BCAAs) with the hardening and muscle expanding Glycine/Arginine ingredient. DNA® also contains the intense anabolism-triggering ingredient L-Leucine Alpha KIC to ensure the most complete, natural muscle gains rarely produced in a non-hormonal supplement. These scientifically proven ingredients have been known to improve density of muscles and strength, recovery and athletic performance. Only a formula this concentrated comes with a 3-day strength guarantee!* Branched Chain Amino Acids (BCAAs) are known as the building blocks of muscle. They must be present for muscle development and growth. The essential BCAAs are leucine, isoleucine and valine. These BCAAs are classified as “essential” because the human body does not produce them – they must be taken through supplementation.

Magnum DNA® produced the following results

- Instant strength
- Improved recovery
- Increased endurance
- Increased protein synthesis (utilization of protein)
- Long-term increased lean muscle mass
- Long-term muscle hardening and definition

What is unique about Magnum DNA®?

- It offers 7 of the most innovative, pure, Pharmaceutical Grade sources of BCAAs, including the latest Ethyl Ester & Ketoisocaproate Calcium technology
- Ethyl Ester is the first

bonding molecule to pass the blood-brain barrier, thus effectively saturating every cell in the body with a larger dose of the attached BCAA • Ketoisocaproate Calcium (KIC) is perfectly anti-catabolic – it assists in muscle growth by changing the environment in your body from catabolic (muscle wasting) to anabolic (muscle building) • It also supplies a potent dose of Glycine-L-Arginine – an ingredient scientifically proven to enhance muscle performance and recovery from fatigue by sustaining muscle force and overall output

Manufacturer Product Overview

Recommended Dose:
Take 8 capsules on an empty stomach** 15 minutes prior to training.
****Empty stomach is the key to the absorption and ultimately your success with Magnum DNA™.**

Supplement Facts	
Amount per serving	% Daily Value
L-Isoleucine Proprietary Blend 1,000 mg	†
L-Isoleucine Ethyl Ester HCl	
L-Isoleucine	
L-Valine Proprietary Blend 1,000 mg	†
L-Valine Ethyl Ester HCl	
L-Valine	
L-Leucine Proprietary Blend 1,000 mg	†
L-Leucine Ethyl Ester HCl	
L-Leucine	
L-Leucine Alpha Ketoisocaproate Calcium 1:1	†
1,000 mg	
Glycine-L-Arginine 1,000 mg	†
Vitamin B3 (Niacin) 3.0mg	17%
Vitamin B6 0.3mg	15%
Vitamin B12 1.0mcg	17%
Folic Acid 50.0mcg	13%

† Daily Value not established

Other ingredients: Magnesium Stearate; Silicon Dioxide Colloidal

Magnum® Nutraceuticals is dedicated to integrity in producing the highest quality sports nutrition supplements.

In a completely unregulated industry, Magnum® commissions only CGMP (Certified Good Manufacturing Practices), Site Licensed (Pharmaceutical) Manufacturing Facilities to produce our highly advanced, quality formulas. These facilities are Government audited for quality assurance and label claims. Through this, our clients can be guaranteed that every ingredient used is Pharmaceutical Grade and our formulas will be far more effective in a much shorter period of time. Magnum® goes this extra distance to provide the absolute highest quality ingredients possible for every formula and to instill confidence in our clients that Magnum® is the brand to trust.

Who is Magnum DNA® meant for?

Uses weights with their training program • Is looking to improve strength and endurance • Is trying to increase lean muscle mass & improve body composition • Is a bodybuilder, fitness competitor or athlete

The World’s 1st Pharmaceutical Grade Anabolic Activating Experience!

An extremely anabolic pre-workout formula unlike any other! DNA users routinely report that they are able to do more reps with the same weight from their previous workout from their very first dose! Strength, power, recovery, endurance & muscle hardening all attained within 3 days! DNA is truly an awesome supplement because it's the only BCAA based anabolic formula that you will feel from your very first workout.

How to use

Serving Size 8 capsules 160 capsules per bottle

Recommended Dose: Take 8 capsules on an empty stomach** 15 minutes prior to training ****Empty stomach is the key to the absorption and ultimately your success with Magnum DNA**

Table 8: Ingredient Profile

The ingredients contained in DNA are known as branch chained amino acids (BCAAs) and are readily obtained through a protein rich diet. The low likelihood of adverse reactions from intake of BCAAs as well as their safe profile has earned the ingredients contained within DNA generally regarded as safe (GRAS status) from the FDA. This makes for a very tolerable product whose potential pharmaceutical nature is outlined below by Magnum Nutraceuticals. This information should give consumers a better understand at the proposed science behind the supplement.

Magnum's DNA Ingredient Profile - Serving Size: 8 capsules

Recommended Dose: Take 8 capsules on an empty stomach 15 to 20 minutes prior to training

BCAA's In General

These three amino acids—Valine, Isoleucine, and Leucine—account for one third of the protein in muscle tissue. This significant contribution makes them important for helping build muscle and increase energy in muscle cells. They are also converted to other amino acids when deficiencies arise.

1) L-Isoleucine Proprietary Blend 1,000mg (L-Isoleucine Ethyl Ester HCl, L-Isoleucine)

Isoleucine is an essential branched-chain amino acid (BCAA). A building block of protein, isoleucine plays a vital role in protein synthesis, muscle building, and preventing muscle loss.

Isoleucine, like all BCAA's, is used by athletes whose muscles are excessively stressed by overtraining to promote healing of injured tissues, speed recovery, protect against muscle-tissue breakdown, and possibly increase lean mass. Isoleucine also stabilizes blood sugar to regulate energy levels during exercise and is needed for the formation of hemoglobin, which carries iron in the blood. In addition, Isoleucine is used as fuel by muscle cells and may spare other amino acids from being burned.

2) L-Valine Proprietary Blend 1,000mg (L-Valine Ethyl Ester HCl, L-Valine)

Valine, an essential branched-chain amino acid (BCAA), is an energy source for muscles and helps repair tissues. A building block of protein, Valine also plays a vital role in muscle building, immune-system function, and balancing natural levels of water and nitrogen. Valine also supplies exercising muscles with fuel, sparing other amino acids and is a unique essential amino acid in that it may act as a stimulant and is stored largely in muscle tissue - where it is used as an energy source when our muscles are activated.

Ingredient Profile

3) L-Leucine Proprietary Blend 1,000mg (L-Leucine Ethyl Ester HCl, L-Leucine)

L-Leucine Alpha Ketoisocaproate Calcium 1:1 - 1,000mg

Leucine is an essential branched-chain amino acid (BCAA) used as an energy source for muscles. A building block of protein, Leucine plays a vital role in immune-system function as well as muscle protection, fuel, and repair. Leucine boosts gains in muscle mass by increasing available fuel for muscle cells and preserving muscle energy stores since our muscles use Leucine directly for fueling any work they perform. Researchers estimate that up to 90% of dietary Leucine is used for energy during exercise and consider it the limiting amino acid when athletes don't consume additional amounts to make up for what's used by the body. With the addition of Alpha-Ketoisocaproic acid (α -KIC) to further enhance the buffering of lactic acid (muscle toxin) and increase the levels of L-Leucine at the site of muscle, DNA's proprietary Leucine formulation aims to increase strength gains and cellular energy beyond all other BCAA formulations.

4) Glycine-L-Arginine - 1,000mg

When Arginine is combined with Glycine, it's been shown to increase muscle Creatine content - boosting performance during anaerobic training sessions (like weight training), and enhancing muscle and strength capacity. It also increases cellular energy by controlling blood sugar levels, protecting against ATP depletion, and by shuttling toxic substances such as lactic acid out of the body. The combination of these two ingredients has been clinically proven to be superior (versus either ingredient separately) at improving muscular growth before and after trauma, and increasing nitrogen retention following trauma. Further evidence has shown that during rapid growth phases (such as weight training), the body demands even more Glycine and some studies have indicated that Glycine causes an increase in strength, perhaps attributable to its effects on growth-hormone levels and/or cell volume.

5) Vitamin B3 (Niacin) - 3.0mg

B3 or niacin plays a key role in over 100 functions necessary for health and is especially important for energy production and, as a vasodilator- increasing blood circulation. It aids in the production of enzymes that convert carbohydrates, glucose, and fats into useable energy and regulates blood glucose levels and supports the body's response to insulin

6) Vitamin B6 - 0.3mg

Vitamin B6 plays a key role in converting the proteins you eat into the amino acids that make up your muscles. In addition, it assists in the availability of energy and the formation of important neurotransmitters (like serotonin) and the maintenance of a healthy immune system. It is a powerful precursor to positive physical and mental well being.

Ingredient Profile

7) Vitamin B12 - 1.0mcg

Vitamin B12 is one of the most intriguing vitamins and also one of the most complex. It plays many critical roles in our bodies, including maintenance of our nervous systems, formation of red blood cells, energy metabolism, and the proper functioning of our brains. Its importance to our bodies' optimal performance defines the meaning of the word "essential."

Vitamin B12 has the capacity to increase energy, and a deficiency of B-12 will have a debilitating effect on performance and energy. While serious deficiencies are not a common occurrence in normally healthy people, an athlete's body is taxed by intense workouts and dietary modifications that remove them from the average/normal population.

8) Folic Acid - 50.0mcg

Folic acid or folate, one of the B-complex vitamins, is necessary for the synthesis of DNA and SAME — which keep our cells healthy and able to replicate, as well as enhance mood. It is also necessary to keep homocysteine levels in check, which is needed for our bodies' metabolism of both amino acids and sugars.

Deficiencies are common and can lead to a wide range of symptoms, including fatigue, depression, and even acne. Plus, it's necessary for the metabolism of amino acids, the building blocks of protein, and to transform sugars into useable energy. It's important to stave off any deficiency of folic acid, as lacking enough of this vitamin can inhibit both muscular and nervous system function.

Methods

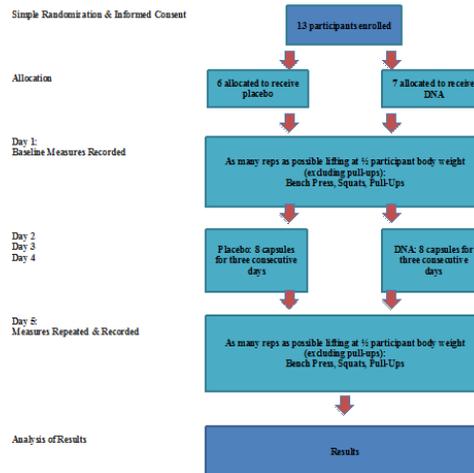
Participants

13 male participants were recruited for this study. 7 were allocated to the experimental group and 6 were allocated to the placebo group. Each participant was between the ages of 18-44 in the surrounding area of Kernersville, North Carolina. The average age was 28 for the placebo group and 29 for the intervention group. The participants were obtained from a series of flyers that were posted at local gyms. To be considered, selected participants had to be involved in at least one sport regularly (3x a week). Exclusion criteria were comprised of any history of significant injury or medical issues that would prevent the participant from taking part in the selected exercises. The participants were informed that this research was being used to investigate the 3-day strength guarantee of DNA as manufactured by Magnum Nutraceuticals. All personal information regarding the participants was kept confidential and destroyed at the conclusion of the study.

Design

This study used a double-blinded, between subject experimental design. The independent variable consisted of the participant receiving the intervention (DNA) or the placebo. Three dependent variables were measured: (1) increase in squat repetitions, (2) increase in chin-ups, and (3) increase in bench press repetitions. All exercises were performed at ½ the participant's body weight (except for the chin-ups). The placebo group (N=6) combined with the experimental group (N=7) gave a total number of 13 participants involved. The participants performed the exercises on the first session that served as their baseline and then were instructed to take the placebo/intervention for three consecutive days with 10 fluid ounces of water. On the third day of taking the supplement/placebo the participants returned to repeat the three exercises. Compliance was self-reported by participants. This was a very small sample size and will serve as a pilot study for future investigations. The Wingate University research review board gave this study an exemption due to minimal risk from ingredients (GRAS Status) and the lack of patient identifying information used. An overview of the design has been illustrated in **Table 5**.

Table 5: Study Design



Materials

The supplement DNA and the Placebo were both provided by Magnum Nutraceuticals. The serving size for each was eight capsules to be taken with 10 fluid ounces of water as instructed from the manufacturer. The participant had to take the placebo/intervention for three consecutive days around the same time every day. A brief handout was developed by the researcher to help collect the opinions of the participants, to help assess compliance rates, and to record all repetitions related to the exercises. This handout can be seen in **Table 6**.

Participant Exercise Log

Participant Number: _____

Name: _____ Age: _____ Sex: _____

Weight: _____ % Weight: _____ Placebo/Intervention

Day 1: Baseline (Squats, Chin Ups, Bench): Participant will complete as many repetitions as they can while lifting 1/2 of their body weight for the following exercises:

A. Squats _____

B. Chin Ups _____

C. Bench _____

Day 2: all participants take 8 capsules of DNA or placebo

A. Participant verbally states compliance: YES / NO _____

Day 3: all participants take 8 capsules of DNA or placebo

A. Participant verbally states compliance: YES / NO _____

Day 4: all participants take 8 capsules of DNA or placebo and repeats exercise procedures from day one. Participant verbally states compliance: YES / NO _____

A. Squats _____

B. Chin Ups _____

C. Bench _____

I'm involved in the following sports: _____

My thoughts regarding DNA: _____

I experienced the following side effects: _____

Procedures

After informed consent was received from all 13 participants, they were categorized into groups using simple randomization. All participants were instructed that they would meet as a group with the researcher on two different occasions that were separated by two days. The participants were asked to maintain normal daily activity while taking part in the study. There were three different measures of the study; (1) increase in squat repetitions, (2) increase in chin-ups repetitions, (3) and an increase in bench press repetitions. A professional bodybuilder demonstrated all exercises to participants before the study. These three exercises were determined by the manufacturer to test the claim that their supplement product DNA will increase strength after three days of consecutive use. A digital scale was used to capture the weight of each participant to determine the amount of weight they would use for each exercise. All exercises were weighted at 1/2 the body weight of each participant (minus chin-ups) as instructed by Magnum Nutraceuticals.

After all three exercises were completed and documented the participants were instructed to take either the placebo/intervention for three days and return to the study on the third day to repeat the exercises. Participants were instructed to continue their daily routines and supplement use. Patients were individually asked to report compliance on the third day. A doctorate student from Wingate University School of Pharmacy conducted the individual sessions of the participants with the supervision of a professional bodybuilder to ensure proper form and technique. The trained student was blinded and individually led each group of participants to utilize a double blind design.

Statistically analysis

An independent t-test (2-tailed) with assumed equal variances was used to conclude if there was a significant difference between the primary endpoints of the intervention and the placebo group. This t-test was implemented three different times for each of the three primary endpoints and then a fourth time with all endpoints classified together. An alpha 0.05 was set to determine significance between each variable. Equal variances were assumed due to the similarities between groups. The outlier for each exercise in the experimental group was identified and excluded to give a total of six numbers from each group. All numbers were calculated as a form of percent increase/decrease in order to compare groups and all half numbers were rounded down.

Results

Statistical analysis was performed to conclude if the increase in strength from all three measures was due to the intervention. This can be seen in **Table 4** while the data collected throughout the study can be seen in **Table 1** for the experimental group and **Table 2** for the placebo group.

In regards to squats $p = < 0.05$ (0.0175) thus it was concluded statistically significant. All participants in the experimental group had an increase in repetitions when compared to the placebo group. The outlier from the experimental group during squats was participant #6. Participant #6 performed 56 squats on the first day followed by 117 squats on the final day. This resulted in a 108% percent increase and thus this number will not be included for statistical analysis. This number was the outlier and was ultimately removed because it

does not reflect typical results for the average individual and may inflate the overall data resulting in false conclusions. To show a significant difference when the outlier is removed should further strengthen any results concluded from the study.

Table 4: Statistical Analysis

A student t-test (2-tailed) was performed 4 times. The first 3 were performed individually on each separate exercise and the final included all measures together. The % increase was used as a comparison. The statistical analysis was performed without the outlier for each individual exercise for the intervention group. All half-numbers were rounded down. Equal variances were assumed due to the similarities between groups.

Type		Sig. (2-tailed)	
Equal Variances Assumed		0.0175	
Equal Variances Not Assumed		0.0232	
t = P < 0.05, thus the data was concluded statistically significant with equal variances assumed. The participants that took DNA had a significantly increase in strength during the squat exercise when compared to the placebo group.			
Type		Sig. (2-tailed)	
Equal Variances Assumed		0.0326	
Equal Variances Not Assumed		0.0332	
t = P < 0.05, thus the data was concluded statistically significant with equal variances assumed. The participants that took DNA had a significantly increase strength during the bench exercise when compared to the placebo group.			
Type		Sig. (2-tailed)	
Equal Variances Assumed		0.042	
Equal Variances Not Assumed		0.054	
t = P < 0.05, thus the data was concluded statistically significant with equal variances assumed. The participants that took DNA had a significantly increase in strength during the pull-up exercise when compared to the placebo group.			
Type		Sig. (2-tailed)	
Equal Variances Assumed		0.001	
Equal Variances Not Assumed		0.004	
t = P < 0.05, thus the data was concluded statistically significant with equal variances assumed. The participants that took DNA had a significantly increase strength during all three exercises when compared to the placebo group.			
Descriptive Analysis:			
Group	Squats (Average)	Bench (Average)	Pull-Ups (Average)
Placebo	7.3%	7.6%	0%
DNA w/o outliers	7.25%	7.23%	7.20%
DNA+ outliers	7.37%	7.27%	7.31%

Table 1: Experimental Group Results

Participants	Age	Weight	Squats	Bench	Pull-Ups
#1	29	170 (85)	32 (31) 7.59%	36 (34) 7.50%	17 (18) 7.5%
#2	27	200 (100)	27 (31) 7.14%	25 (28) 7.16%	3 (4) 7.33%
#3	36	190 (95)	39 (41) 7.5%	46 (57) 7.25%	7 (11) 7.57%
#4	23	200 (100)	26 (35) 7.54%	45 (58) 7.28%	25 (24) 7.4%
#5	18	170 (85)	32 (33) 7.3%	35 (38) 7.8%	12 (13) 7.8%
#6	30	217 (108)	56 (117) 7.108%	66 (92) 7.59%	12 (14) 7.16%
#7	44	208 (104)	30 (42) 7.40%	38 (49) 7.28%	3 (5) 7.100%
Average:	29	193 (96)	7.25%	7.23%	7.20%

The numbers in parentheses () reflect the following values:

- **Weight:** 1/2 of participant's bodyweight. This was to be used for the amount of weight the participant would lift in each exercise (minus pull-ups).
- **Squats:** number of repetitions completed on day three when lifting 1/2 of body weight. The first number in column is number of repetitions completed at baseline.
- **Bench:** number of repetitions completed on day three when lifting 1/2 of body weight. The first number in column is number of repetitions completed at baseline.
- **Pull-Ups:** number of repetitions on day three. The first number in column is number of repetitions completed at baseline.

Discussion:

- All participants had an increase in repetitions when compared to baseline in all three exercises. The % increase can be seen as noted by the % symbol.
- All repetitions noted in orange mark outliers and scores will not be used for statistical analysis.
- The average age was 29 with an average weight 193 lb (96lb adjusted).

Table 2: Placebo Group Results

Participants	Age	Weight	Squat	Bench	Pull-Ups
#8	27	170 (85)	43 (32) 7.25%	44 (41) 7.0%	8 (7) 7.12%
#9	27	190 (85)	17 (17) 0%	34 (35) 7.5%	5 (5) 0%
#10	34	218 (107)	29 (27) 7.0%	22 (29) 7.31%	7 (7) 0%
#11	27	190 (95)	38 (40) 7.5%	45 (47) 7.4%	6 (6) 0%
#12	27	170 (85)	52 (53) 7.1%	36 (35) 0%	10 (11) 7.10%
#13	28	160 (80)	33 (33) 7.0%	28 (30) 7.7%	8 (8) 0%
Average	28	183 (92)	7.3%	7.0%	0%

The numbers in parentheses () reflect the following values:

- **Weight:** % of participant's body weight. This was to be used for the amount of weight the participant would lift in each exercise (minus pull-ups).
- **Squats:** number of repetitions completed on day three when lifting 1/2 of body weight. The first number in column is number of repetitions completed at baseline.
- **Bench:** number of repetitions completed on day three when lifting 1/2 of body weight. The first number in column is number of repetitions completed at baseline.
- **Pull-Ups:** number of repetitions on day three. The first number in column is number of repetitions completed at baseline.

Discussion:

- From 18 exercises, 8 showed a % increase while 4 showed a % decrease and 6 showed no changes when both sessions were compared. The % increase or decrease can be seen as denoted by ? or ? symbol respectively.
- The average age was 28 with an average weight 183lb (82lb adjusted).

In regards to the bench exercise $p = < 0.05$ (0.0326) thus it was concluded statistically significant. All participants in the experimental group had an increase in repetitions when compared to the placebo group. The outlier from the experimental group during bench was participant #1. Participant #1 performed 36 repetitions on the first day followed by 54 on the final day. This resulted in a 50% percent increase and thus this number will not be included for statistical analysis. This number was the outlier and was ultimately removed because it does not reflect typical results for the average individual and may inflate the overall data resulting in false conclusions. To show a significant difference when the outlier is removed should further strengthen any results concluded from the study.

In regards to pull-ups $p = < 0.05$ (0.042) thus it was concluded statistically significant. All participants in the experimental group had an increase in repetitions when compared to the placebo group. The outlier from the experimental group during pull-ups was participant #7. Participant #7 performed 3 pull-ups on the first day followed by 6 on the final. This resulted in a 100% percent increase and thus this number will not be included for statistical analysis. This number was the outlier and was ultimately removed because it does not reflect typical results for the average individual and may inflate the overall data resulting in false conclusions. To show a significant difference when the outlier is removed should further strengthen any results concluded from the study.

The placebo group was involved in 18 individual exercises with 8 showing a % increase, 4 showing a % decrease, and 6 showing no change when both sessions were compared.

5 out of the 7 participants in the experimental group were involved in weightlifting compared to 4 out of the 6 in the placebo group. Participant #2 of the experimental group experienced one minor episode of dyspepsia during the study Participant #4 reported a bad aftertaste. Self reported data for both groups is seen in **Table 3**.

Table 3: Experimental Group Self-Reported Data

Participants	Sports	Thoughts	Adverse Reactions
#1	Weightlifting	<i>I don't it's great</i>	None
#2	Basketball, Soccer	<i>It works</i>	Dyspepsia
#3	Weightlifting, Judo	<i>Showed Results</i>	None
#4	Wrestling	<i>Bad Aftertaste</i>	None
#5	Weightlifting	<i>I didn't feel anything</i>	None
#6	Weightlifting	<i>Good Results</i>	None
#7	Weightlifting	<i>Good Results</i>	None

Discussions:

- **Sports:** 5 out of 7 participants were involved with weightlifting. This is appropriate as the target audience of the manufacturer would be an individual looking to increase strength and muscle mass.
- **Adverse Events:** 1 out of the 7 participants claimed an adverse event (Dyspepsia). When asked about this event, Participant #2 admitted only one episode occurred during day two of supplementation.
- **Thoughts:** feedback in general remained positive for the supplement with the exception of participant #5 who was neutral.

Placebo Group Self-Reported Data

Participants	Sports	Adverse Reactions
#8	Weightlifting, Soccer	None
#9	Golf, Football	None
#10	Weightlifting, Soccer	None
#11	Basketball	None
#12	Weightlifting, Soccer	None
#13	Weightlifting	None

Discussions:

- **Sports:** 4 out of 6 participants were involved with weightlifting. This is similar to that of the experimental group.
- **Adverse Events:** 0 side effects were reported by the participants taking the placebo. This would be as expected.
- **Thoughts:** feedback was not collected on thoughts for the placebo group.

When all exercises were grouped as one $P < 0.05$ (0.001). This concluded that overall the experimental group had a significant increase of strength when comparing the exercises as a percent of increase when compared to the placebo group. The three exercises were also descriptively analyzed as an average. The placebo group had an overall average of percent increase of -3% (squats), 6% (bench), and 0% pull-ups. In contrast the experimental group had an overall average of percent increase of 25% (squats), 23% (bench), and 20% (pull-ups).

Discussion

The purpose of this research was to examine the claim from Magnum Nutraceuticals in regards to their branched-chain amino acid supplement DNA and investigate the labeled three-day strength guarantee. At the conclusion of the study it was found that all three measures had a significant increase of repetitions when comparing the intervention group to the placebo group. This would suggest that DNA could possibly show an increase in strength when used for three consecutive days while performing the three selected exercises used in the study.

It is important to note that this study used a small sample size and should serve as the foundation for future studies. The results should not be generalized to the public and it is reminded that all supplements work differently in every individual. This research should provide consumers with some insight regarding the supplement DNA, but it is also advised to consult your physician before partaking in any supplementation or workout regiment. Future studies should replicate the design with the selected exercises within a larger population to see if results can be duplicated. In addition to the small sample size other limitations were the self-reporting of compliance by participants as well as not being able to regulate any other possible supplements used by participants. This could account for the significant increase of strength in the experimental group if participants were using additional supplements that supported muscle development.

Overall, DNA appears to be a reasonably safe supplement with a tolerable and safe ingredient profile. Previous studies have shown mixed results regarding BCAA's, but some do favorably associate the supplement with increase strength and performance in athletes during exercise training. Research on this supplement should continue to see if further association can be determined, but this study suggests that the three-day strength guarantee held intact for the participants who participated in the three selected exercises.

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