

ROCKET SCIENCE: An Investigation of Magnum Rocket Science on Memory, Athletic Performance, Endurance, and Energy

Nicholas Conley^a and Jessica Campisi^a

This small pilot study used a double blind, between-subject, experimental design for the goal of investigating Magnum ROCKET SCIENCE and assess its claim to enhance memory, athletic performance, endurance, and energy. The placebo and the experimental groups performed four separate measures for each of the dependent variables. Memory was measured using a short-term memory test. Athletic performance was measured using repetitive exercise. Endurance was measured through exercise eliciting 70% of VO₂ max. Energy was measured through a subjective questionnaire. All the results were recorded and compared to baseline assessments. Once the ten participants (N = 5 per group) completed two full sessions, the results were scored and significant differences were noted: Memory $t(7.26) = p < 0.05$, Athletic Performance $t(6.04) = p < 0.05$, Endurance $t(6.43) = p < 0.05$, and Energy $t(4.78) = p < 0.05$. There was zero adverse effects experienced with the use of the supplement. It was concluded that the participants taking ROCKET SCIENCE had a significant increase in memory, athletic performance, endurance, and energy when compared to the placebo group. ROCKET SCIENCE was shown to be reasonably safe with no side effects reported and may help athletes reach their individual training goals related to the product's claims while performing similar exercises.

Keywords: Athletic supplement; athletic performance; nutritional supplements

Introduction

The use of performance enhancement supplements by athletes is widespread and rapidly growing¹⁰. Provision of extra energy, performance improvement, and fatigue prevention are among the major reasons athletes report supplement use.¹² However, there is little scientific evidence supporting beneficial effects of nutritional supplements in athletes. In addition to these unconfirmed claims lie the risks of adverse reactions.⁵

Disconnect between these claims indicate a need for further studies and additional evaluation of the safety and efficacy of these products. This study will evaluate the newest product from Magnum Nutraceuticals, ROCKET SCIENCE™ that claims to increase memory, athletic

performance, endurance, and energy while providing a tolerable safety profile for consumers. ROCKET SCIENCE is a supplement composed of the following active ingredients: anhydrous caffeine, dicaffeine malate, L-tyrosine, vincpocetine, L-theanine, dendrobium, hordenine, phenylethylamine, and citocoline. The proposed mechanism of action for each specific ingredient largely remains unknown, but the combination of ingredients was created to extend the half-life of the supplement and provide longer lasting effects (per the manufacturer). A general overview for each individual supplement can be found in Table 1. This study investigates this connection while testing the claims made by the manufacturer in an effort to provide consumers with data regarding safety and efficacy of this nutritional supplement.

Table 1: Ingredient Profile.

The ingredients contained in ROCKET SCIENCE are commonly found in many over the counter supplements and obtain regularly through diet. The manufacturer has certified that appropriate research has been done to ensure the safety and efficacy of each ingredient. All ingredients appear to be reasonably safe when consumed in appropriate amounts by healthy individuals.

- 1) Caffeine Anhydrous
 - a. Half-Life: between 2.5 and 4.5 hours
 - b. Reported AE: nervousness, irritability, diuresis, tachycardia, dyspepsia
 - c. Proposed Moa: acts as a central nervous system stimulant, reducing physical fatigue and restoring alertness when drowsiness occurs. Its ability to produce increased wakefulness, faster and clearer flow of thought, increased focus, and better general body coordination has lead it to be the world's most widely consumed psychoactive drug.
- 2) Dicaffeine Malate
 - a. Half Life: between 5 and 7 hours
 - b. Reported AE: nervousness, irritability, diuresis, tachycardia, dyspepsia
 - c. Proposed Moa: is a mix of caffeine and malic acid. Beyond all of the benefits of caffeine mentioned above, the addition of malic acid calms the digestive effects of caffeine and also replenishes the energy produced by the caffeine.

- 3) Beta-Phenylethylamine
 - a. Half-Life: between 20 and 30 minutes
 - b. Reported AE: none reported in healthy adults
 - c. Proposed MOA: is an organic compound and a natural monoamine alkaloid, a trace amine, also the name of a class of chemicals with many members well known for psychoactive drug and stimulant effects. If correctly activated (see Hordenine below), PEA produces a state of bliss without a crash.
- 4) L-Tyrosine (S)-alpha-Amino-4-hydroxybenzenepropanoic acid
 - a. Half-Life: between 1 and 2 hours
 - b. Reported AE: nausea, diarrhea, vomiting, nervousness
 - c. Proposed MOA: is a nonessential amino acid that is a building block of protein. It's part of the chemical reactions in your body that create the neurotransmitter dopamine and other hormones. The main effects of L-tyrosine that have been reported are acute effects in preventing a decline in cognitive function in response to physical stress such as weight training and other forms of exercise – this allows the athlete to remain focused and alert.
- 5) Dendrobium Nobile 10:1 Stem Extract
 - a. Half-Life: between 20 minutes and 30 minutes
 - b. Reported AE: none
 - c. Proposed MOA: is a member of the orchid plant family and is one of the 50 fundamental herbs used in Traditional Chinese Medicine. Dendrobium contains powerful alkaloids that activate dopamine release, which is central to mood and cognition. This stimulates physical strength, energy, mood and mental focus.
- 6) L-Theanine (Gamma-glutamylethylamide)
 - a. Half-Life: between 58 and 74 minutes
 - b. Reported AE: hypotension, alter mental status
 - c. Proposed MOA: is an amino acid and a glutamic acid analog primarily found in tea (*Camellia sinensis*), which has the ability to cross the blood-brain barrier, creating psychoactive properties. Theanine has been studied for its ability to reduce mental and physical stress, improve cognition and boost mood and cognitive performance in a synergistic manner with caffeine.
- 7) Hordenine (N,N-Dimethyltyramine)
 - a. Half-Life: between 45 and 60 minutes
 - b. Reported AE: none
 - c. Proposed MOA: is a mild short acting CNS stimulant that causes a release of norepinephrine. It's also a highly selective substrate of MAO-B and acts as a temporary reversible MAO-B inhibitor. Because hordenine crosses the blood brain barrier it is able to inhibit MAO-B enzymes in both the body and brain. Hordenine is highly attracted to MAO-B enzymes, but doesn't destroy them, instead it temporarily ties them up, allowing other weaker MAO-B substrates like Phenylethylamine to pass through unaffected and be fully activated.
- 8) Citicoline (cytidine 5'-diphosphocholine)
 - a. Half-Life: between 3.5 and 4 hours
 - b. Reported AE: nausea, vomiting, diarrhea, bradycardia, hypotension
 - c. Proposed MOA: is a psychostimulant/nootropic. One of the main benefits of Citicoline is that it increases the level of Acetylcholine within the brain. This is a neurotransmitter used to communicate between your neurons that plays a vital role in the development and formation of memory and a number of other cognitive processes. With Citicoline use, overall brain metabolism is enhanced and blood circulation improves, which helps to increase oxygen uptake and glucose metabolism. Many users also note an improved level of mental energy. This leads to an increase in attention span, focus, and concentration as well as greater amounts of motivation and vitality.
- 9) Vinpocetine:
 - a. Half-Life: between 1 and 2 hours
 - b. Reported AE: dyspepsia, urticarial, tachycardia, headache, dizziness
 - c. Proposed MOA: comes from the periwinkle plant. Vincamine is extracted from periwinkle and an alkaloid extract of vincamine becomes vinpocetine. Vinpocetine is a natural substance that is effective at increasing memory, mental focus, and blood flow to the brain. Vinpocetine increases ATP production and the utilization of glucose and oxygen in the brain.

Methods

Participants

Ten male participants were recruited for this study. Each participant was between the ages of 18-29 in the surrounding area of Kernersville, North Carolina. The participants were obtained from a series of emails sent to local gyms. To be considered, participants had to be involved in at least one sport at least three times a week. Exclusion criteria were

comprised of any history of significant injury or medical issue that would prevent the participants from taking part in the selected exercises (cardiovascular issues). The participants were informed that the research was being used to collect information on the supplement ROCKET SCIENCE and its influence on memory, athletic performance, endurance, and energy. All personal information regarding the participants will be kept confidential and will not be released to the public

Design

This study used a double-blinded, between-subject experimental design. An allocation is provided in **Figure 1**. The independent variable consisted of the participant receiving the intervention (ROCKET SCIENCE) or the placebo. Four dependent variables were measured: (1) increase in performance on the memory test (2) the increase in repetitions performed during pushups (3) the time elapsed

before fatigue for the treadmill test, and (4) the energy survey score. The placebo group (N=5) combined with the experimental group (N=5) gave a total number of 10 participants involved. The placebo group had an average age of 25 years old. The experimental group had an average age of 24 years old. This small sample size will serve as a pilot study for future investigations. The Wingate University Research Review Board approved this study.

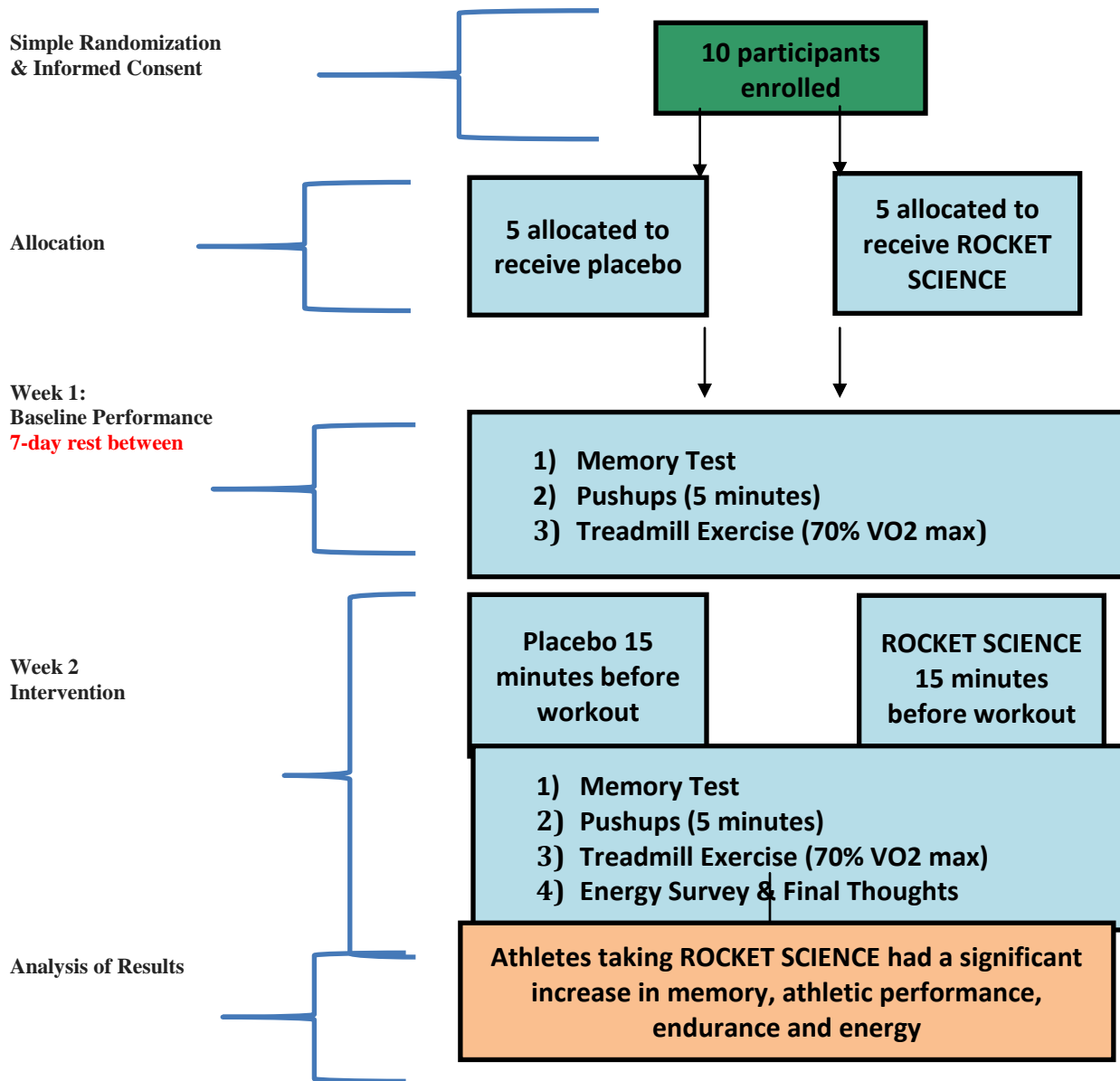


Figure 1: Explanation of the study design

Materials

The supplement ROCKET SCIENCE and the Placebo were both provided by Magnum Nutraceuticals. The serving size for each was three capsules. ROCKET SCIENCE (or placebo) was provided 15 -minutes before activity as recommended by the manufacturer. A brief survey was developed by the researcher to help collect the opinion of the participants in regards to the intervention as well as to subjectively measure the feeling of energy. The survey used an ordinal scale in which participants ranked the supplement based on efficacy.

Procedures

After informed consent was received from the ten participants, they were categorized into groups using simple randomization. All participants were instructed that they would individually meet with a researcher on two different occasions separated by seven days of rest. The participants were asked to maintain normal daily activity while taking part in the study.

There were four different measures of the study. These measures were recorded with a participant exercise log (Figure 2). The first was a memory test developed by Washington University, which assesses short-term memory. This test was administered 15 minutes after ingestion of the placebo/intervention and contained six different levels. Each

level contained a string of characters that would briefly flash across the screen. Participants were instructed to recall as many characters as possible in-between each level. As the levels progressed, additional letters were introduced to the participant. Level one only had a total of two characters, while level six had a total of sixteen characters.

Following the memory test, the participant started the exercise portion of the trial. They were given five minutes to complete as many pushups as possible¹. This served as a measure of athletic performance. At the conclusion of pushups the participant was synced with a heart monitor and directed to exercise on a treadmill. The treadmill was slowly increased in intensity every thirty seconds until the participant reached above 70% VO₂ max¹⁴. A calculation measured VO₂ by the following formula: using resting heart rate and age: VO₂ max = 15.3 x (MHR/RHR), MHR = Maximum heart rate (beats/minute) calculated using age = 208 - (0.7 x age), RHR = Resting heart rate (beats/minute) = number of heartbeats in 20 seconds x 3. Once 70% VO₂ max was reached, time was recorded and the participant was instructed to exercise until they felt they could no longer continue. Time measured from this point until fatigue served as a measure of endurance. These three measures were completed twice (one baseline measurement and one experimental measurement), with the first session serving as baseline. On the second visit, the intervention/placebo was introduced.

Participant Number:	Sex:	Age:	Group: PLACEBO / RS
<u>Baseline + Intervention</u> [seven days between each session]			
The first part of the study will be assessing memory. This will be done through an online test that will ask you to recall a series of letters. Once completed, you will undergo the fitness portion, where you will complete as many pushups as you can within five minutes. After five minutes, you will exercise (on treadmill) until you experience fatigue. When fatigue is reached another questionnaire will be administered to measure survey. The energy questionnaire will only be completed at the completion of the second session.			
(____) VO ₂ max = 15.3 (MHR / RHR) (____) MHR = 208 - (0.7 x age)			
(____) RHR = beats in 20 seconds x 3 (____) %MHR = 0.6463 x % VO ₂ m + 37.182			
1) Memory Score (15 minutes after intake)			
Stage 1	Baseline:	Intervention:	
Stage 2	Baseline:	Intervention:	
Stage 3	Baseline:	Intervention:	
Stage 4	Baseline:	Intervention:	
Stage 5	Baseline:	Intervention:	
Stage 6	Baseline:	Intervention:	
2) Pushups (as many repetitions as possible in five minutes)			
	Baseline:	Intervention:	
3) Time to Fatigue (exercise above 70% of VO ₂ max)			
	Baseline:	Intervention:	
4) Energy Survey Score			

Figure 2: An explanation of measures that were recorded with a participant exercise log.

At the conclusion of all exercises on the second visit, a survey was administered as well in an effort to measure energy (Figure 3). The survey consisted of a ten-point scale

with ten being the highest level of agreeability and one being the lowest. The survey was as follows: 1-My level of energy before the workout routine; 2-My level of energy during the

workout routine; 3-My level of energy after the workout routine, 4-I felt it was easy to recover after completing the workout routine; 5-The level of energy I had compared to other exercises of similar intensities; 6-This product made the overall workout routine easier to complete, 7-This product overall increased my energy level. In addition to the survey responses, the participants were asked to list their opinion regarding the intervention as well as the sports in which they were involved. A summary of the data collection can be seen in Figure 4.

These measures were selected because the manufacturer claimed ROCKET SCIENCE could increase memory, athletic

performance, endurance, and energy. A doctorate student from Wingate University School of Pharmacy conducted the individual sessions with the participants.

Statistical analysis

An independent t-test was used to conclude if there was a difference between the primary endpoints of the intervention group and the placebo group. This t-test was implemented four different times in an attempt to measure the four different endpoints: memory, athletic performance, endurance, and energy. An alpha of 0.05 was set to determine significance between each test group.

Participant Energy Questionnaire										
1) My level of energy before the workout routine:	1	2	3	4	5	6	7	8	9	10
2) My level of energy during the workout routine:	1	2	3	4	5	6	7	8	9	10
3) My level of energy after the workout routine:	1	2	3	4	5	6	7	8	9	10
4) I felt it was easy to recover after completing the workout routine:	1	2	3	4	5	6	7	8	9	10
5) The level of energy I had compared to other exercises of similar intensities:	1	2	3	4	5	6	7	8	9	10
6) This product made the overall workout routine easier to complete:	1	2	3	4	5	6	7	8	9	10
7) This product overall increased my energy levels:	1	2	3	4	5	6	7	8	9	10
8) In my own words, my opinion of ROCKET SCIENCE:	<hr/> <hr/>									
9) I'm involved in the following sports:	<hr/> <hr/>									
10) I experienced the following adverse reactions:	<hr/>									

Figure 3: Survey that was administered

Data Collection Charts

Participant #	Baseline	ROCKET SCIENCE	Change
1 (18 years old)	Memory: 19 Pushups: 67 Endurance: 408s	Memory: 22 Pushups: 77 Endurance: 667s Energy: 59	Memory: ↑ 3 (+15.78%) Pushups: ↑ 10 (+14.92%) Endurance: ↑259s (+63.48%) Energy: 84%
2 (22 years old)	Memory: 23 Pushups: 132 Endurance: 169s	Memory: 26 Pushups: 142 Endurance: 192s Energy: 42/70	Memory: ↑ 3 (+13.04%) Pushups: ↑ 10 (+7.57%) Endurance: ↑23s (+13.60%) Energy: 60%
3 (29 years old)	Memory: 19 Pushups: 129 Endurance: 58s	Memory: 29 Pushups: 157 Endurance: 140s Energy: 40	Memory: ↑ 10 (+52.63%) Pushups: ↑ 28 (+21.70%) Endurance: ↑82s (+141.37%) Energy: 57%
4 (28 years old)	Memory: 25 Pushups: 116 Endurance: 262s	Memory: 27 Pushups: 126 Endurance: 382s Energy: 43/70	Memory: ↑ 2 (+8%) Pushups: ↑ 10 (+8.62%) Endurance: ↑120s (+45.80%) Energy: 61%
5 (28 years old)	Memory: 22 Pushups: 95 Endurance: 205s	Memory: 26 Pushups: 105 Endurance: 325s Energy: 52/70	Memory: ↑4 (+18.18%) Pushups: ↑10 (+10.52%) Endurance: ↑120s (+58.53%) Energy: 74%
Participant #	Baseline	PLACEBO	Change
6 (18 years old)	Memory: 21 Pushups: 55 Endurance: 268s	Memory: 24 Pushups: 46 Endurance: 348s Energy: 33	Memory: ↑ 3 (14.28%) Pushups: ↓9 (-16.36%) Endurance: ↑ 80s (+29.85%) Energy: 47%
7 (27 years old)	Memory: 19 Pushups: 60 Endurance: 51s	Memory: 18 Pushups: 53 Endurance: 96s Energy: 33	Memory: ↓ 1 (-5.26) Pushups: ↓ 7 (-11.66%) Endurance: ↑ 45s (+88.235) Energy: 47%
8 (27 years old)	Memory: 23 Pushups: 65 Endurance: 282s	Memory: 23 Pushups: 64 Endurance: 234 Energy: 37	Memory: 0 Pushups: ↓ 1 (-1.53%) Endurance: ↓ 48s (-17.02%) Energy: 52%

Participant #	Baseline	PLACEBO	Change
9 (24 years old)	Memory: 25 Pushups: 82 Endurance: 218s	Memory: 23 Pushups: 80 Endurance: 208s Energy 30	Memory: ↓ 2 (-8%) Pushups: ↓ 2 (-2.43%) Endurance: ↓ 10s (-4.58%) Energy: 43%
10 (24 years old)	Memory: 27 Pushups: 94 Endurance: 292s	Memory: 24 Pushups: 95 Endurance: 283s Energy: 36	Memory: ↓ 3 (-11.11%) Pushups: ↑ 1 (+1.06%) Endurance: ↓ 9s (-3.08%) Energy: 51%

Figure 4: Data collection charts

Results

Statistical analysis was performed to conclude if the increase in all four measures was due to the intervention (**Table 2**). The improvement in memory experience in the ROCKET SCIENCE group when compared to the placebo group was statistically significant $t(7.26) = p < 0.05$. All participants

that took the supplement experienced an increase in memory performance. The most significant increase in memory was experienced by participant #3 who had an increase of 10 and the lowest was participant #4 who had an increase of 2. The standard deviation for the placebo group was 2.20. The standard deviation for the intervention group was 3.20.

Table 2: Result Analysis

Demographics	N	Mean Age	Males	Race
Placebo	5	25	5	W
Rocket Science	5	24	5	W

** Due to the small nature of this study, recruitment was done to ensure as much similarity as possible between groups. All participants were Caucasian males between the ages of 18-29 from the surrounding area. All were also currently involved in a regular athletic activity at least three times per week.*

Means	Memory	Pushups	Endurance	Energy
Placebo	-0.06 (-2.01%)	-3.6 (-5.87%)	+11.6 sec (18.68%)	48%
Rocket Science	+4.4 (21.52%)	+13.6 (12.66%)	+112.8 sec (64.56%)	67.2%

**Comparing descriptive statistics reveals that there was an increase in all four measures of the intervention group when compared to the placebo group. This warrants the need for future studies to determine if similar numbers can be replicated.*

Std. Dev	Memory	Pushups	Endurance	Energy
Placebo	2.30	4.21	50.58	3.60
Rocket Science	3.20	8.04	86.84	11.43

** The above data details the standard deviation between each group. The intervention group yielded a higher standard deviation when compared to the placebo group.*

Memory:		
Type	Sig. (2-tailed)	df
Equal Variances Assumed	0.022126	7.2622
Equal Variances Not Assumed	0.244523	7.2622

** $t(7.26) = P < 0.05$, thus the data was concluded statistically significant. The participants that took ROCKET SCIENCE had a significantly increase in memory when compared to the placebo group.*

Pushups (Performance):

Type	Sig. (2-tailed)	df
Equal Variances Assumed	0.007497	6.0401
Equal Variances Not Assumed	0.000540	6.0401

* $t(6.04) = P < 0.05$, thus the data was concluded statistically significant. The participants that took ROCKET SCIENCE had a significantly increase in pushups when compared to the placebo group.

Endurance (Time to Fatigue):

Type	Sig. (2-tailed)	df
Equal Variances Assumed	0.041239	6.4339
Equal Variances Not Assumed	0.048473	6.4339

* $t(6.43) = P < 0.05$, thus the data was concluded statistically significant. The participants that took ROCKET SCIENCE had a significantly increase in endurance when compared to the placebo group.

Energy Score (Survey):

Type	Sig. (2-tailed)	df
Equal Variances Assumed	0.007173	4.7859
Equal Variances Not Assumed	0.017064	4.7859

* $t(4.78) = P < 0.05$, thus the data was concluded statistically significant. The participants that took ROCKET SCIENCE had a significantly increase in energy when compared to the placebo group.

In regards to athletic performance $t(6.04) = p < 0.05$ thus it was concluded statistically significant. All participants that took the intervention experienced an increase in pushups (athletic performance). The largest increase was seen participant #3 who had an increase of 28 repetitions. The lowest was an increase of 10 repetitions as experienced by the remaining four participants. The standard deviation for the Placebo group was 4.21. The standard deviation for the intervention group was 8.04.

In regards to endurance (time to fatigue after VO_2 was achieved on treadmill) $t(6.43) = p < 0.05$ thus it was concluded statistically significant. All participants that took the intervention experienced an increase in endurance. The highest was participant #4 who had an increase of 120 seconds. The lowest was participant #2 was able to run an additional 23 seconds after consuming the intervention. The standard deviation for the placebo group was 50.58. The standard deviation for the intervention group was 86.84.

In regards to energy $t(4.78) = P < 0.05$ thus it was concluded statically significant. All participants that took the supplement experienced an increase in energy. The highest was participant #1 who recorded a score of 84% and the lowest was participant #3 with a score of 57%. These numbers show the change when all scores were compared with both baseline and intervention. The standard deviation for the placebo group was 3.60. The standard deviation for the intervention group was 11.43. The opinion survey was completed on the final session and was averaged across participants that received ROCKET SCIENCE and the placebo. The average score for the placebo group on the energy survey was 48%. The average score for the intervention group on the energy survey was 67.2%.

From the ten participants that took the intervention, no adverse reactions were reported. This can be seen in addition to individual opinions in Table 3.

Table 3: Explains the result summary

Participant	Rocket Science Opinions	Participant	Placebo Opinions
1	Worked great for recovery after workout	6	Didn't seem to provide any energy
2	Great, seemed to work	7	Neutral
3	Notably better recovery with slightly more energy	8	I don't think it helped
4	Something worth trying again	9	No difference
5	Felt it helped with the exercises	10	Couldn't tell a difference

* *Comparing opinions of ROCKET SCIENCE versus the opinions of Placebo reveals that participants on the intervention actually admitted to feeling a difference while exercising. The Placebo effect is common during studies, where individuals feel some sort of effect through the simple act of taking a pill (rather placebo or intervention) and these opinions have helped eliminated this possibility and potentially suggest that ROCKET SCIENCE had a positive influence on the participant.*

Adverse Reactions:

# Participants	# Reported
10	0

* All of the participants reported zero adverse events. Even though this was a small sample population, this suggests that the supplement seems to be reasonably safe in healthy active adults between ages 18-29. Typically supplements will influence some sort of biological effect on the body and it remains to be seen what side effects would be experienced within the larger population. These side effects could have been masked from the intensity of the exercises involved.

Discussion

The purpose of this research project was to examine the claim from Magnum Nutraceuticals in regards to evaluation of adverse events and efficacy of their new sports supplement ROCKET SCIENCE. The manufacturer claims that this new product will increase memory, athletic performance, endurance, and energy. This study tested these claims in young, healthy athletes in an effort to provide scientific support to assist consumers in their selection of over-the-counter sports supplementation.

Previous studies have shown that performance-enhancing supplements may have varying effects on individuals based on a number of characteristics or habits including ingestion timing, mode of ingestion, and type of activities performed¹⁰. Therefore, consumers may require experimentation with several manufacturers and products before identifying the one that works best for them. While ROCKET SCIENCE may not be the product for everyone, this study supports that it can help increase memory, athletic performance, endurance, and energy for the select exercises tested. This study should serve as a pilot study for future research.

This study has a number of limitations that are summarized below. Due to limited resources, the sample size only included ten participants. This is a very small number and future research should be done with a larger sample size to see if results are duplicated. Future research should also include a third arm (control, placebo, ROCKET SCIENCE) in an effort to see if measures are significant between all three treatments. There were no baseline characteristics describing the normal activity levels or supplement-use history of each of the participants. The results could be due to natural improvement in physical and mental performance as a result of exercises performed during weekly assessments as opposed to the actual benefit from the supplement. This is particularly relevant for the participants that had less experience with these types of activities at baseline. The mechanism of action for how this supplement increased the measured variables remains unspecific and more research should be done to clarify these results.

This study provides statistically significant data indicating that ROCKET SCIENCE can help athletes increase in the following areas: (1) memory, (2) athletic performance, (3) endurance, and (4) energy while performing similar activities as seen with this trial. With further research

containing larger sample sizes, more conclusions may be made as to the clinical applications of this supplement. Overall, the intervention appears to be reasonably safe in healthy individuals when consumed in appropriate amounts and shows promise as a potential supplement for use with regular activities similar to those portrayed in the study.

References

Artioli G, Gualano B, Smith A, et al. Role of B-Alanine Supplementation on Muscle Carnosine and Exercise Performance. *Journal of the American College of Sports Medicine*. 2010; 42(6): 1162-1173.

Barrett K.E., Barman S.M., Boitano S., Brooks H.L. (2012). Chapter 26. Digestion, Absorption, & Nutritional Principles. In K.E. Barrett, S.M. Barman, S. Boitano, H.L. Brooks (Eds), *Ganong's Review of Medical Physiology*, 24e.

Barrows K. (2013). Chapter e5. Complementary & Alternative Medicine. In M.A. Papadakis, S.J. McPhee, M.W. Rabow (Eds), *CURRENT Medical Diagnosis & Treatment 2013*.

Benardot D. Training with supplements: determining which ergogenic aids can improve performance and performance nutrition plans: combined power and endurance sports, in fluids and supplements for training and performance. In: Benardot D, editor. *Nutrition for serious athletes*. Chicago: Human Kinetics; 2000. pp. 123–37.

Buell JL, Franks R, Ransone J, Powers ME. National Athletic Trainers' Association position statement: evaluation of drug supplements for performance nutrition. *Journal of Athletic Training*. 2013; 48(1): 124-36.

Burns RD, Schiller MR, Merrick MA, Wolf KN. Intercollegiate student athlete use of nutritional supplements and the role of athletic trainers and dietitians in nutrition counseling. *J Am Diet Assoc*. 2004;104(2):246–9.

Cribb PJ, Hayes A: Effects of supplement timing and resistance exercise on skeletal muscle hypertrophy. *Med Sci Sports Exerc* 2006, 38:1918-1925

Dennehy C.E., Tsourounis C. (2012). Chapter 64. Dietary Supplements & Herbal Medications. In B.G. Katzung, S.B. Masters, A.J. Trevor (Eds), *Basic & Clinical Pharmacology*, 12e.

Dwyer J. (2012). Chapter 73. Nutrient Requirements and Dietary Assessment. In D.L. Longo, A.S. Fauci, D.L. Kasper, S.L. Hauser, J.L. Jameson, J. Loscalzo (Eds), *Harrison's Principles of Internal Medicine*, 18e.

Froiland K, Koszewski W, Hingst J, Kopecky L. Nutritional supplement use among college athletes and their sources of information. *Int J Sport Nutr Exerc Metab*. 2004;14(1):104–20.

Ganio M, Klau J, Casa D, et al. Effect of Caffeine on Sport-Specific Endurance Performance: A Systematic Review. *Journal of Strength and Conditioning Research*. 2009; 23(1): 315-324.

Hoffman JR, Ratamess NA, Tranchina CP, Rashti SL, Kang J, Faigenbaum AD: Effect of protein-supplement timing on strength, power, and body-composition changes in resistance-trained men. *Int J Sport Nutr Exerc Metab* 2009, 19:172-185

- Kern B, Robinson TL, Manninen AH. Effects of beta-alanine supplementation on exercise performance during a competitive wrestling season: an 8-week open label pilot study. *Journal of the International Society of Sports Nutrition*. 2008;5(Suppl 1):P2.
- Plowman, Sharon A., and Smith, Denise L. "Exercise Physiology for Health Fitness, and Performance." Second Edition Reprint. Lippincott Williams & Wilkins. 2008.
- Rahnama N, Gaeini AA, Kazemi F. The effectiveness of two energy drinks on selected indices of maximal cardiorespiratory fitness and blood lactate levels in male athletes. *J Res Med Sci*. 2010;15(3):127-32.
- Richmond, Scott R, Godard, et al. The Effects of Varied Rest Periods Between Sets to Failure Using the Bench Press in Recreationally Trained Men. *Journal of Strength & Conditioning Research*. 2004; 18(4): 689-983.
- Sale C, Saunders B, Harris R. Effect of beta-alanine supplementation on muscle carnosine concentrations and exercise performance. *Amino Acids*. 2010; 39(2): 321-333.
- Spillane M, Schoch R, Cooke M, Harvey T, Greenwood M, Kreider R, Willoughby DS: The effects of creatine ethyl ester supplementation combined with heavy resistance training on body composition, muscle performance, and serum and muscle creatine levels. *J Int Soc Sports Nutr* 2009, 6:6
- Stark M, Lukaszuk J, Prawitz A, Salacinski A: Protein timing and its effects on muscular hypertrophy and strength in individuals engaged in weight-training. *J Int Soc Sports Nutr* 2012, 9:54
- Tipton K, Wolfe RR: Protein and amino acids for athletes. *J Sports Sci* 2004, 22:65-79
- Trevor AJ, Katzung BG, Masters SB. Chapter 60. Dietary Supplements & Herbal Medications. In: Trevor AJ, Katzung BG, Masters SB, eds. *Pharmacology: Examination & Board Review*. 9th ed. New York: McGraw-Hill; 2010.
- Volek JS, Kraemer WJ, Bush JA, Boetes M, Incledon T, Clark KL, Lynch JM: Creatine supplementation enhances muscular performance during high-intensity resistance exercise. *J Am Diet Assoc* 1997, 97:765-770.
- Walsh A, Gonzalez A, Ratamess N, et al. Improved time to exhaustion following ingestion of the energy drink Amino Impact™ *Journal of the International Society of Sports Nutrition*. 2010; 7(14): 1550.
- Ziegenfuss T, Landis J, Hofheins J. Effect of a supplement containing primarily beta alanine, arginine, creatine malate, and glycerol monostearate on exercise-induced changes in lean mass of the arms. *Journal of the International Society of Sports Nutrition*. 2008;5(Suppl 1):P16.