



Effects of Nitric Oxide Supplementation on Maximal Graded Exercise

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Introduction

Nitric oxide (NO) is a naturally occurring substance in the body. It is released during exercise, stimulating vasodilatation, which increases blood flow to the muscles. It has become a popular form of supplementation in the past few years, gaining popularity over creatine use (which it is now often stacked with). Companies introduced nitric oxide as a supplement similar to creatine; naturally occurring in the body to aid in exercise, and by increasing the supply, they claim that it would enhance the user's exercise capacity. However, there are few studies done that test the actual physiological effects of nitric oxide supplementation on exercise, and even fewer that use a placebo incorporating caffeine to isolate the effects of nitric oxide itself.

An increase in vasodilatation at the muscle tissue, increasing blood flow, also increases the amount of oxygen readily available to the tissue. Therefore, claims have been made that nitric oxide supplements increase mental acuity and focus, muscle fullness via "blood-engorged pumps", increased fat loss, increased strength, power, and endurance, and creatine retention. Since the product claims to improve exercise performance via increased vasodilatation and blood engorgement, it would be appropriate to investigate respiratory responses during exercise. An increase in oxygen delivery could theoretically increase oxygen consumption; or the oxygen extracted from red blood cells at the tissue level. The best way to test the claim for mental acuity, endurance, and recuperation is to take the user's rate of perceived exertion and record the amount of time they can exercise.

To truly test maximal oxygen consumption and exertion, a graded maximal exercise must be used. Nitric oxide supplements also have large amount of caffeine in the product due to caffeine's effects as an ergogenic aid. Therefore to test the effects of nitric oxide supplementation alone, a placebo stacked with caffeine must be used.

Purpose

The purpose of this study was to assess the effects of nitric oxide supplementation on the performance during maximal graded exercise when compared to a placebo.

Methods

- 8 subjects ages 18 to 30 years, male and/or female volunteered
 - All were asked about their sensitivity to caffeine
- A Physical Activity Readiness Questionnaire (Par-Q) was given to each subject to assess their ability for max exercise
- Each subject was randomly assigned to use either the NO supplement or the control first, and the other second
- Each subject performed a maximal treadmill exercise test two times, using the NO supplement once, and the control once
- The course of the test followed Bruce protocols exactly, and the subject was carefully monitored throughout the test to check for his/her desire to end the test
 - 5 minutes rest period, in which resting values were taken before starting and at minute 5
 - When Bruce protocol began, minute ventilation, heart rate, and RPE were taken in last 15 sec of every minute
 - Workloads increased every 3 minutes, and continued until exhaustion
 - Recovery period of 5 min, heart rate, minute ventilation, and RPE taken at minute 1, 3, and 5
- Subjects were asked to return for their second bout of exercise as close to 1 week after their 1st as possible, depending most on the availability of the subject
- The supplement given was a nitric oxide supplement called NO Shotgun, which is a supplement that includes caffeine and creatine
- Subjects, in addition to the Par-Q, were given a copy of the supplement label to check for any allergies or reactions they may have had to ingredients in the product. If they had any known negative reactions, they were not allowed to participate
- Subjects drank 1 scoop (24g) of the NO supplement powder in 8 – 10 oz of water prior to exercise, 15 minutes before exercise
- The control was 1 tbsp (14g) of Gatorade powder mixed in 8 – 10 oz of water
- A Nodoz (caffeine) tablet (200 mg - regular dose) was added to the control to equalize the effects of caffeine found in the supplement, NO Shotgun.

Methods (cont'd)

Subjects were asked to avoid caffeine and any supplementation/ vitamins for 12 hours before the test

Results

There were no significant differences ($p \geq 0.05$) found between supplementation with nitric oxide versus placebo. Using a paired sample t-tests, $p = .594$ for HR, $p = .341$ for VO_2 , $p = .362$ for V_E , $p = .668$ for RPE, and $p = .694$ for time to exhaustion. For mean maximal values in the nitric oxide group, HR was 194 ± 8.03 bpm, VO_2 was 42.92 ± 5.44 ml/kg/min, V_E was 91.18 ± 16.68 L/min, RPE was 17 ± 1.41 , and time to exhaustion was 11.43 ± 1.11 min. For mean maximal values in the placebo group, HR was 195 ± 7.17 bpm, VO_2 was 44.27 ± 4.53 ml/kg/min, V_E was 93.55 ± 17.17 L/min, RPE was 17.25 ± 2.05 , time to exhaustion was $11.39 \pm .98$ min.

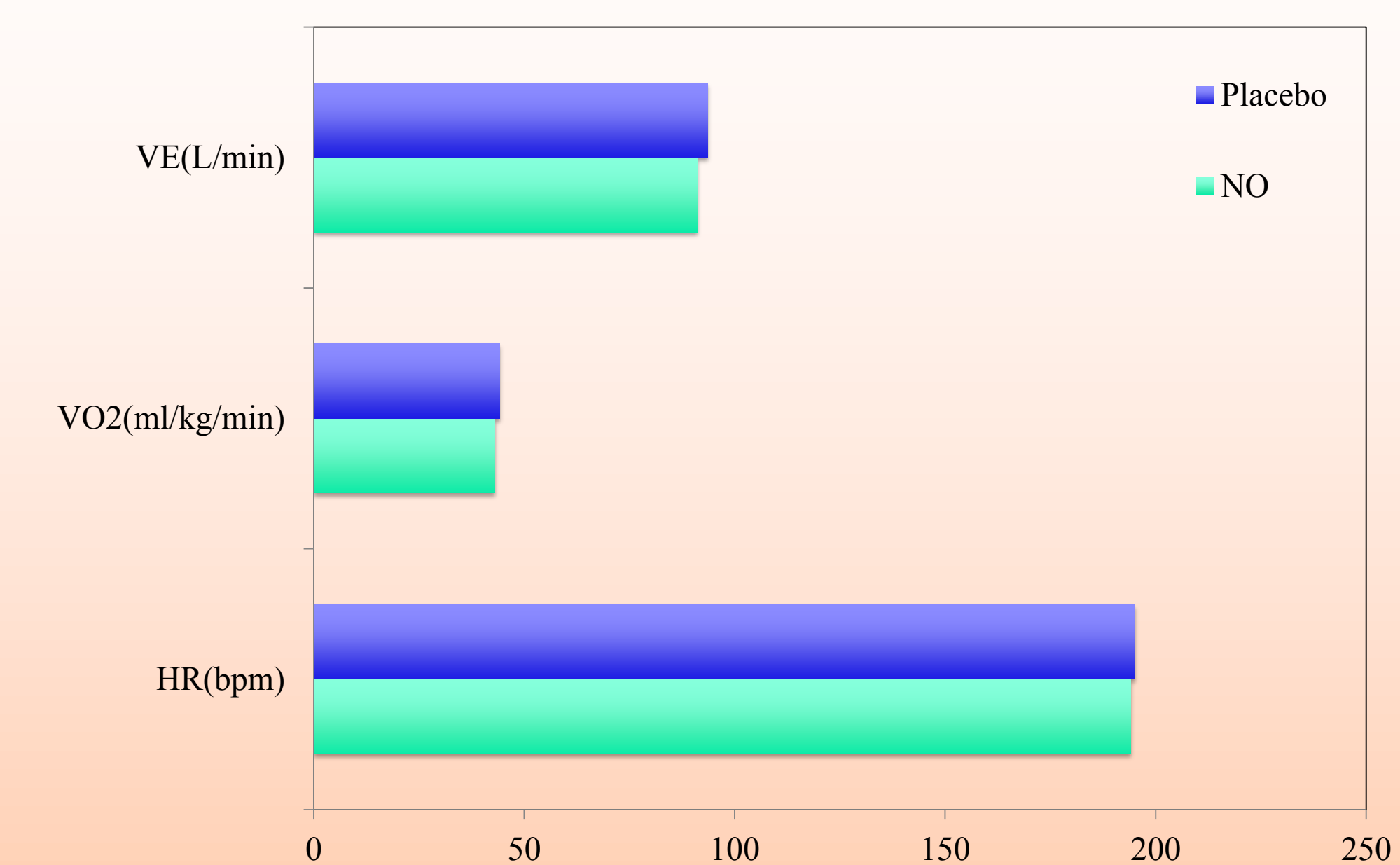


Figure 1: Ve, VO₂, and HR

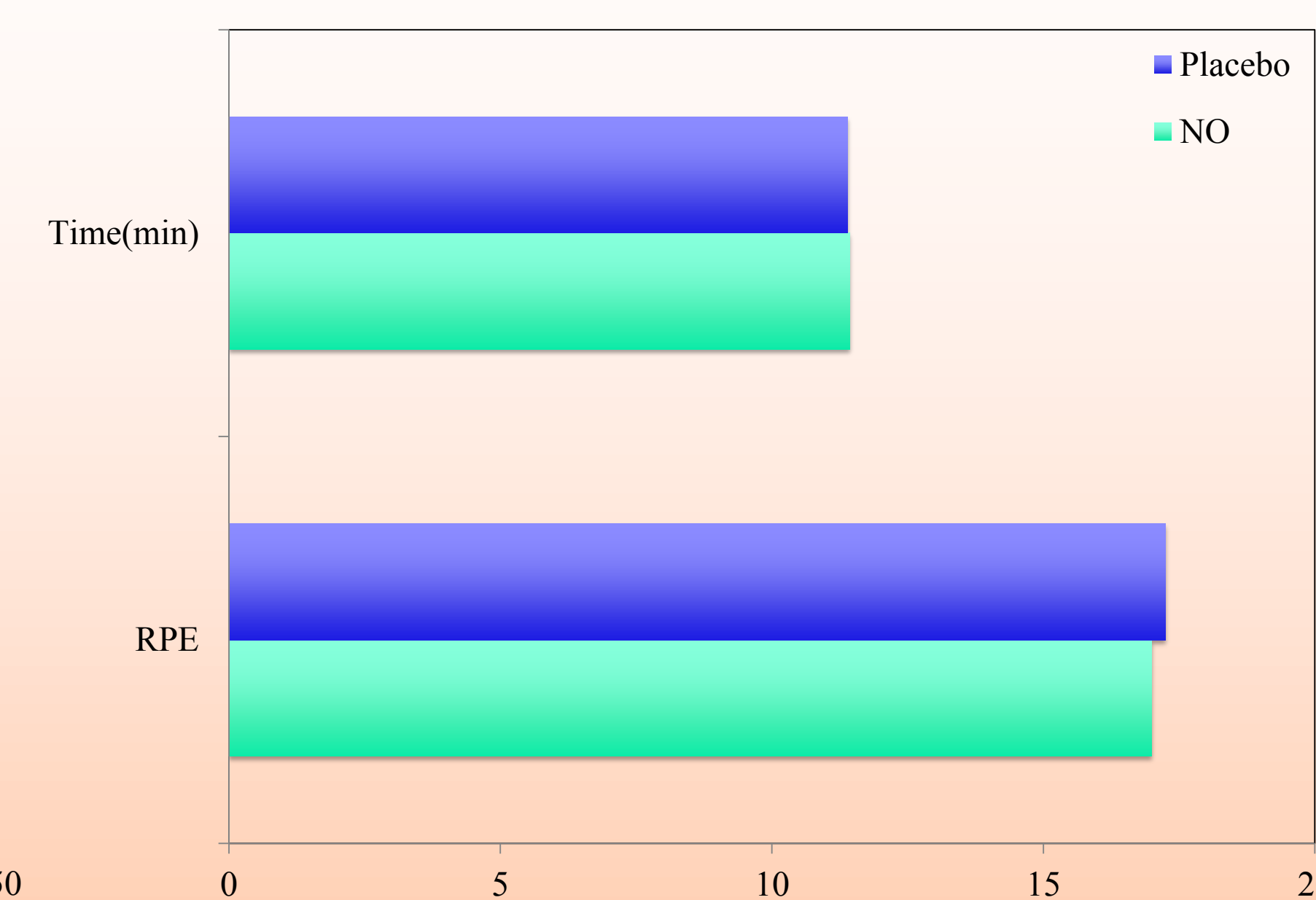


Figure 2: Time to Exhaustion and RPE

Conclusions

As determined by statistical analyses, there were no significant differences between the nitric oxide group and the placebo group. However, the mean value of relative VO_2 and V_E among the placebo group was actually higher. There was a slightly lower RPE for the nitric oxide group, which may have contributed to the slightly longer time to exhaustion. Heart rate was similar in both groups. There may be benefits to prolonged use of nitric oxide supplementation, but more research needs to be done.