



# The Effects of Nitric Oxide Precursor Supplementation on Maximal Exercise and Oxygen Consumption

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## Abstract

Introduction: Nitric oxide is a gaseous molecule produced inside the body that is believed to cause vasodilation and increased oxygen extraction rates in active muscle. The purpose of this study was to determine if supplementation with a nitric oxide precursor, arginine alpha-ketoglutarate (AAKG), prior to exercise will affect maximal oxygen consumption during a maximal exercise test ( $VO_2\max$ ), when compared to a placebo. Methods: Five active healthy male subjects participated in this study, in which they were required to complete to maximal exercise test. This study used both repeated measures as well as randomization of administering supplements. Demographic values for age, height, and weight were recorded (age  $23.2 \pm 1.79$  years, ht  $1.81 \pm 0.061$  m, wt  $93.42 \pm 4.13$  kg). Next, the subject ingested either the placebo or the nitric oxide precursor and heart rate monitors were attached. The subjects sat for 30 minutes to allow for adequate digestion and absorption, then, resting heart rate and blood pressure were taken. Subjects then completed a  $VO_2\max$  test, using the Bruce protocol, to voluntary exhaustion. Data was recorded and analyzed using Microsoft Excel. Student's t-tests were performed to determine significance and statistical significance was set to  $p \leq .05$ . Results: All of the original subjects that initially volunteered for participation in the study successfully completed each of the two trials. No significant differences were found between the trials for heart rate, time to exhaustion, systolic blood pressure, diastolic blood pressure, and relative maximal oxygen consumption. Conclusion: The current study demonstrated that short-term supplementation of the nitric oxide precursor, AAKG, did not result in significant differences between trials. Further research needs to be completed to accurately determine the possible ergogenic effects of nitric oxide precursor supplementation.

## Purpose

The purpose of this study is to evaluate the effects of supplementation of a nitric oxide precursor, arginine-alpha-ketoglutarate, on maximal exercise and oxygen consumption

## Methods

Five healthy college aged male subjects were selected and participated in this study. Each subject was required to complete two maximal exercise tests on two separate occasions separated by at least 24 hours. This study used both repeated measures as well as randomization of administering supplements. No restrictions were placed on subject's normal exercise routine or diet; however each subject was informed to not ingest caffeine within 12 hours of each scheduled testing time.

## Methods (cont'd)

Upon arrival to the lab each subject ingested either the vitamin C placebo or the nitric oxide precursor supplement, AAKG, and heart rate monitors were attached. After thirty minutes had passed to allow for adequate digestion and absorption of the supplements resting heart rate and blood pressure were taken. All subject's received an equal dose of the AAKG supplement, which was 3 grams. Each test followed the Bruce protocol and continued through each three minute stage until subject reached voluntary maximal exercise intensity. Variables that were measured and analyzed included: Systolic blood pressure, diastolic blood pressure, maximal heart rate, relative maximal oxygen consumption, and time to exhaustion. The values used for data analysis were all values that occurred at each subject's maximum intensity. All data was analyzed using Microsoft Excel 2007, t-tests were used to determine statistical significance between variables. Statistical significance was set at a value of  $p \leq .05$ .

## Results

All five of the original subjects that initially volunteered for participation in the study successfully completed each of the two trials. Subjects reported no adverse affects of supplementation. Results from the study concluded that there was no significant difference in maximal heart rate attained between each trial ( $p=.88$ ). Also no significant difference was found in subject's time to exhaustion between trials, the difference between average times to exhaustion of all subjects between the two trials was only 6 seconds. ( $p=.86$ ). No significant difference was found between trials in relative maximal oxygen consumption ( $p=.43$ ). The average value of relative oxygen consumption of the placebo group was 39.76 ml/kg/min, while the average value for the nitric oxide precursor trial was 37.42 ml/kg/min; a decrease of roughly 6.25%. The values recorded for systolic blood pressure in those who received the nitric oxide precursor prior to exercise were decreased by roughly 2.68% when compared to the trial in which subjects received the placebo. However, this decrease was not significant, ( $p=.41$ ).

Table 2: Values Recorded During Maximal Exercise In Each Trial

	Placebo				AAKG			
	Mean	S.D.	Max	Min	Mean	S.D.	Max	Min
SBP(mmHg)	184.2	10.7	200	172	179.4	6.1	186	170
DBP(mmHg)	79	5.5	85	70	78	3.5	80	72
HR(bpm)	190	7	198	180	189	10	202	176
VO2(ml/kg/min)	39.76	4.9	44.9	33.3	37.42	3.9	41.7	33.1
TIME(min)	11.14	0.61	12	10.33	11.24	1	13	10.55

## Results (cont'd)

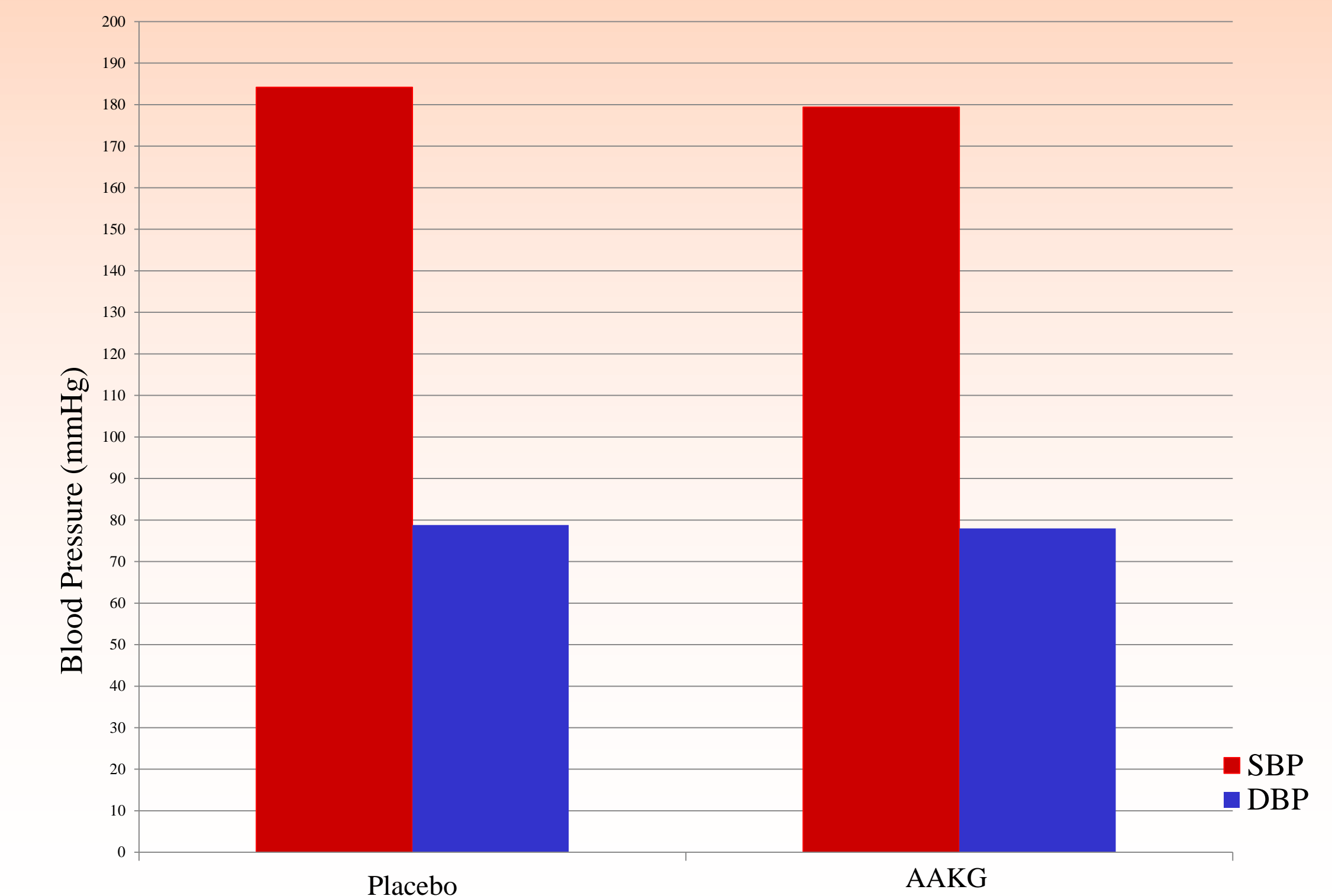


Figure 1: Blood Pressure Response In Each Trial During Maximal Exercise

## Conclusions

The current study demonstrated that short-term supplementation of the nitric oxide precursor, arginine alpha-ketoglutarate, did not result in increased relative maximal oxygen consumption. Also, there were no significant differences between trials in systolic blood pressure, diastolic blood pressure, maximal heart rate, or time to exhaustion. Further research needs to be completed to accurately determine the possible ergogenic effects of nitric oxide precursor supplementation

## References

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