

A Comparison of Citrulline and Arginine for Increasing Exercise-Induced Vasodilation and Blood Flow

Jordan R. Moon^{1,2}, Roxanne M. Vogel^{1,3}, Paul H. Falcone¹, Matt M. Mosman¹, Aaron C. Tribby¹, Chad M. Hughes⁴, Jonathan D. Griffin⁵, Schyler B. Tabor⁶, Dylan J. LeFever⁷, Stephen B. McCaughey⁷, Michael P. Kim⁷, Jordan M. Joy^{1,3}

¹ MusclePharm Sports Science Institute, Denver, CO, USA, ²Department of Sports Exercise Science, United States Sports Academy, Daphne, AL, USA, ³ Department of Human Performance, Concordia University Chicago, River Forest, IL, USA, ⁴ Department of Movement Science, Grand Valley State University, Allendale, MI, USA, ⁵ Department of Biomedical Engineering, Widener University, Chester, PA, USA, ⁶ The Hospitality College, Johnson and Wales University, Denver, CO, USA, ⁷ Department of Human Performance and Sport, Metropolitan State University, Denver, CO, USA



INTRODUCTION

One goal of supplementation has been to increase blood flow to skeletal muscle during exercise. Raw L-citrulline (RC) and raw L-arginine (RA) has often been used for its vasodilatory effects, and recently, citrulline and arginine have been bound to a whey peptide (CP and AP, respectively) to increase bioavailability. Previous research has investigated higher and often impractical doses of these ingredients not found commercially. Therefore the purpose of this study was to compare the acute hemodynamic effects of RC, CP, RA, and AP following resistance exercise in healthy, men when administered at a common, commercial dose.

METHODS

Experimental Design

In a double-blind, crossover, placebo-controlled design, 11 recreationally-active males ingested either RC, CP, RA or AP. After ingestion, subjects performed 3 sets of 15 right arm bicep curls at 30 and 120 minutes post-supplementation. Brachial artery vessel diameter and blood flow volume were measured using a Doppler Ultrasound and compared with both resting baseline and active control values.

Subjects

- 11 Recreationally-Active Males (28.2 ± 5.0yrs.)

Exercise Intervention

- Right Arm Isolated Bicep Curls
 - 3 sets of 15 repetitions with 30 second rest breaks

Supplement Ingestion

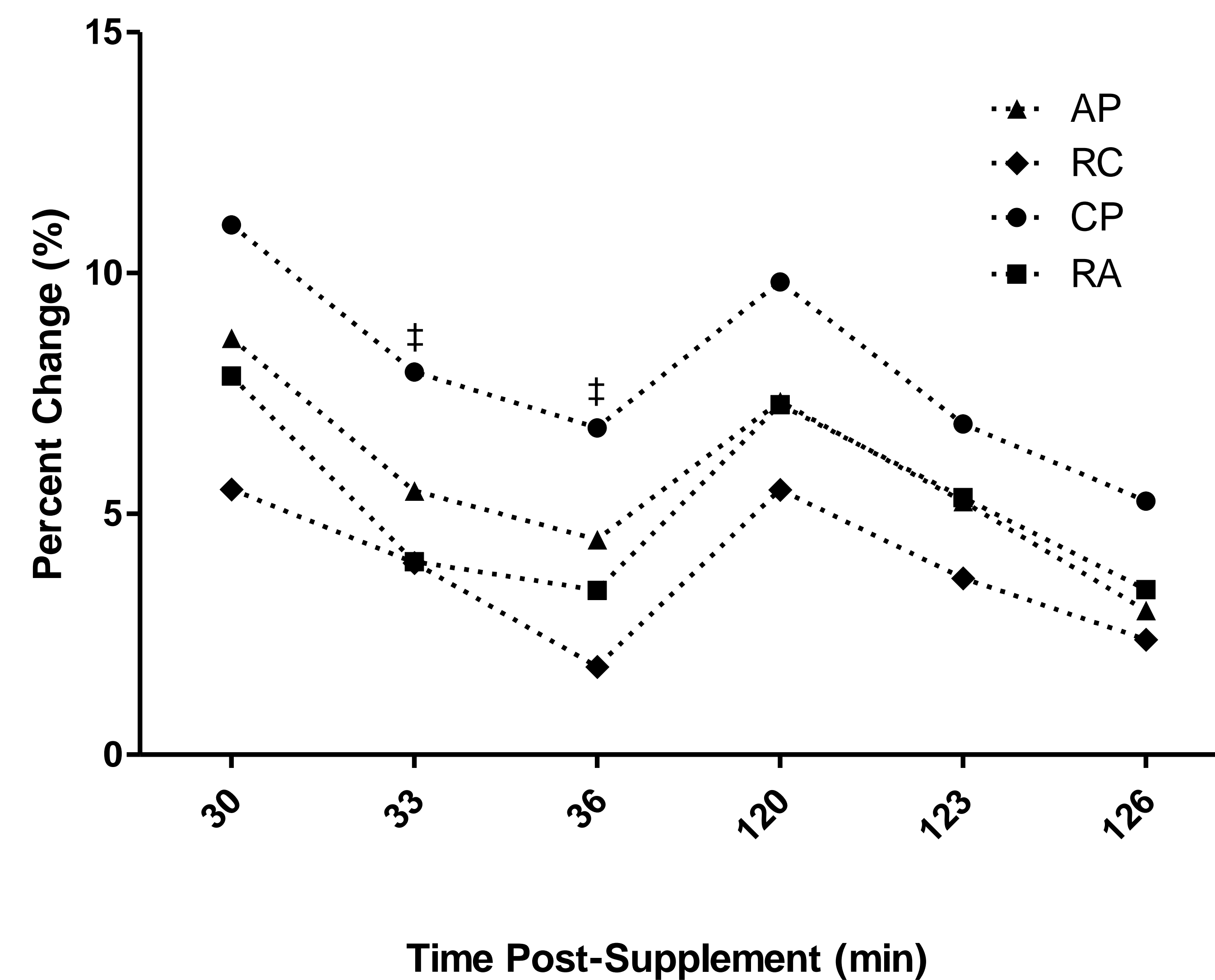
- 1.87g of Raw L-Citrulline
- 3.67g of Citrulline Peptide (Citrulline content = 1.87g)
- 1.87g of Raw L-Arginine
- 3.07g of Arginine Peptide (Arginine content = 1.87g)

Vessel Diameter and Blood Flow Volume

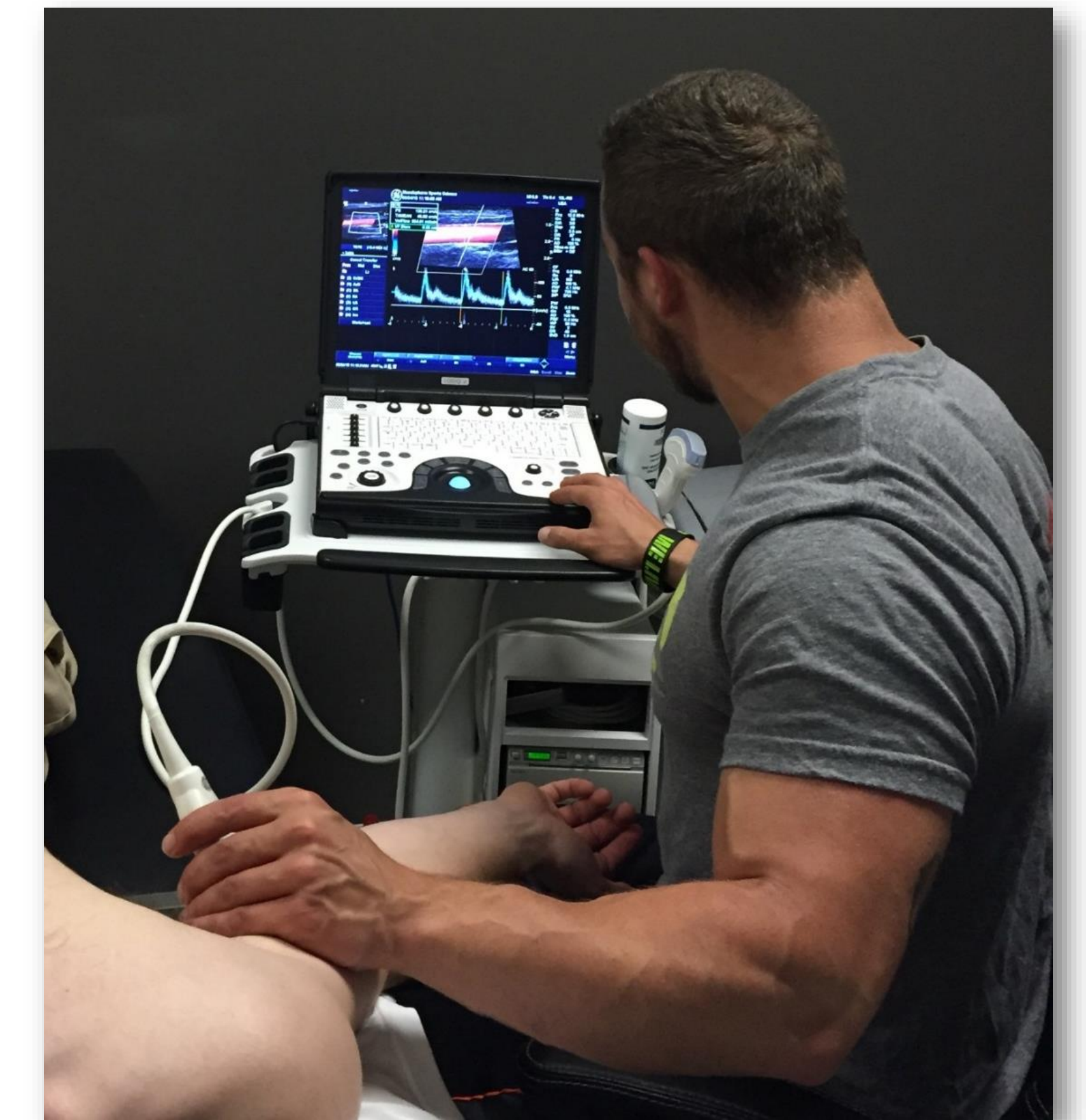
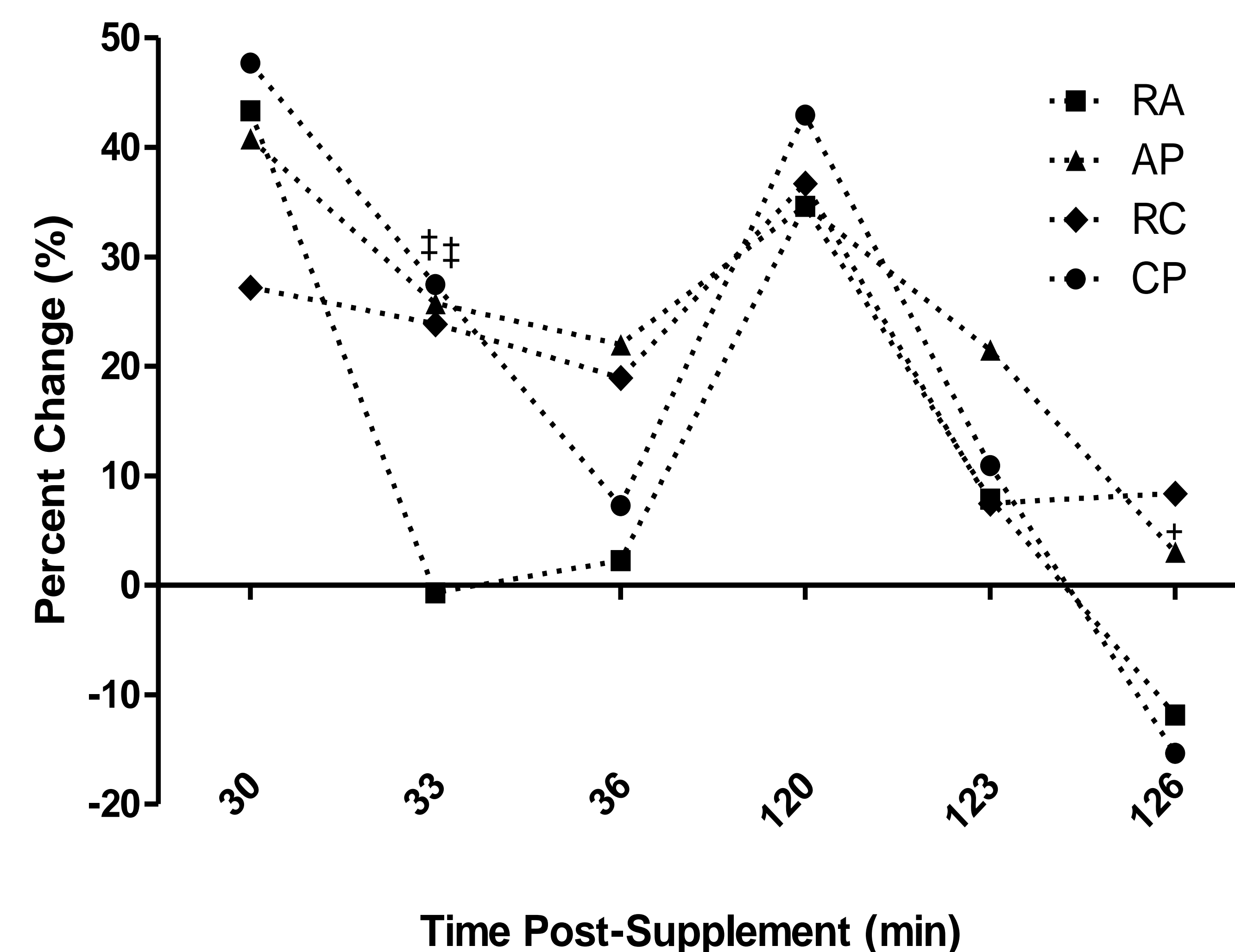
- Measured via Doppler Ultrasound
 - Baseline no exercise time points (min): 0, 3, 6
 - Post-supplementation time points (min): 30, 33, 36, 120, 123, 126

RESULTS

Changes in Vessel Diameter Between Arginine and Citrulline Treatments



Changes in Blood Flow Volume Between Arginine and Citrulline Treatments



CONCLUSIONS

It appears that citrulline-based ingredients are more effective than arginine-based ingredients when modulating vasodilation and blood flow. Furthermore, the effects of supplementation may be positively influenced through whey peptide bound states.

ACKNOWLEDGMENTS

This study was funded by MusclePharm, Corp. (Denver, CO) and Glanbia Nutritionals.



REFERENCES

- Jäger, Ralf, et al. "Oral adenosine-5'-triphosphate (ATP) administration increases blood flow following exercise in animals and humans." *Journal of the International Society of Sports Nutrition* 11.1 (2014): 28.
- Schwedhelm, Edzard, et al. "Pharmacokinetic and pharmacodynamic properties of oral L-citrulline and L-arginine: impact on nitric oxide metabolism." *British journal of clinical pharmacology* 65.1 (2008): 51-59.