



The effect of acute creatine supplementation on non-invasive assessment of vascular function using FMD



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Abstract

PURPOSE: This study examined the effect of a single day, loading dose of creatine on vascular health and endothelium-dependent vasodilation. **METHODS:** Nine healthy adults (22 ± 4 yrs.; BMI: 24.7 ± 4.2 kg/m²) performed two flow-mediated dilation (FMD) assessments. For each FMD assessment, a blood pressure cuff was placed 5-7 cm distal to the antecubital fossa. Baseline brachial artery diameter was measured for 2 minutes using a Doppler ultrasound operating in B-mode placed along the brachial artery. After the 2 minutes of baseline brachial artery diameter was collected, the blood pressure cuff was inflated to 275 mmHg for 5 minutes. After 5 minutes, the blood pressure cuff was deflated allowing the reperfusion of blood into the forearm, and the brachial artery diameter was measured for an additional 2.5 minutes post-reperfusion. %FMD was calculated as the percent change in brachial artery diameter from baseline. FMD measurements were assessed before and after a one-day, 20-gram creatine load (5-gram dose given 4 times throughout the day). Participants were asked to report back to the laboratory within 12 hours of taking the final creatine dose. Mean differences between conditions were assessed using matched-pairs t-tests, and significance was established if $p < 0.05$. **RESULTS:** Baseline brachial artery diameters were similar between groups (CON: 0.37 ± 0.08 cm, Creatine: 0.37 ± 0.07 cm, $t = 0.525$, $p > 0.05$). Peak brachial artery diameter post-occlusion was also similar between conditions (CON: 0.41 ± 0.09 cm; Creatine: 0.41 ± 0.07 cm, $t = 0.470$, $p > 0.05$). %FMD was also similar before and after creatine supplementation (CON: 9.88 ± 2.50%, Creatine: 9.87 ± 3.11%, $t = 0.009$, $p > 0.05$). **CONCLUSION:** There is no significant impact on flow-mediated dilation following an acute, 20-gram dose of creatine monohydrate. Both baseline diameter and %FMD were similar before and after creatine supplementation. **PRACTICAL APPLICATION:** A one-day, standard loading dose of creatine is not enough to elicit any proposed antioxidative effects on vascular health in young, healthy adults as evidenced from the baseline brachial artery diameters. Additionally, acute creatine supplementation does not appear to cause any greater vasodilation following occlusion compared to control. While the antioxidative properties of an acute dose of creatine may be more apparent in older populations or in diseased populations, a standard loading dose of creatine may not increase exercise performance through endothelial-dependent increases in muscle blood flow during exercise.

Background

- Accumulation of reactive oxygen species within the vasculature has been shown to contribute to endothelial cell dysfunction, an early biomarker of cardiovascular disease.
- Antioxidants and supplements with antioxidative properties, could be increasingly important in reversing the progression of cardiovascular disease.
- While creatine monohydrate is commonly used as a fitness supplement to promote increases in muscular strength, recent studies have shown that creatine may act as an antioxidant, thereby improving vascular health and increasing the potential for exercise-induced vasodilation.

Purpose

This study examined the effect of a single day, loading dose of creatine on vascular health and endothelium-dependent vasodilation.

Methods

- Nine healthy adults (22 ± 4 yrs.; BMI: 24.7 ± 4.2 kg/m²) performed two flow-mediated dilation (FMD) assessments
- Blood pressure cuff was placed 5-7 cm distal to the antecubital fossa
- FMD measurements were assessed before and after a one-day, 20-gram creatine load (5-gram dose given 4 times throughout the day)

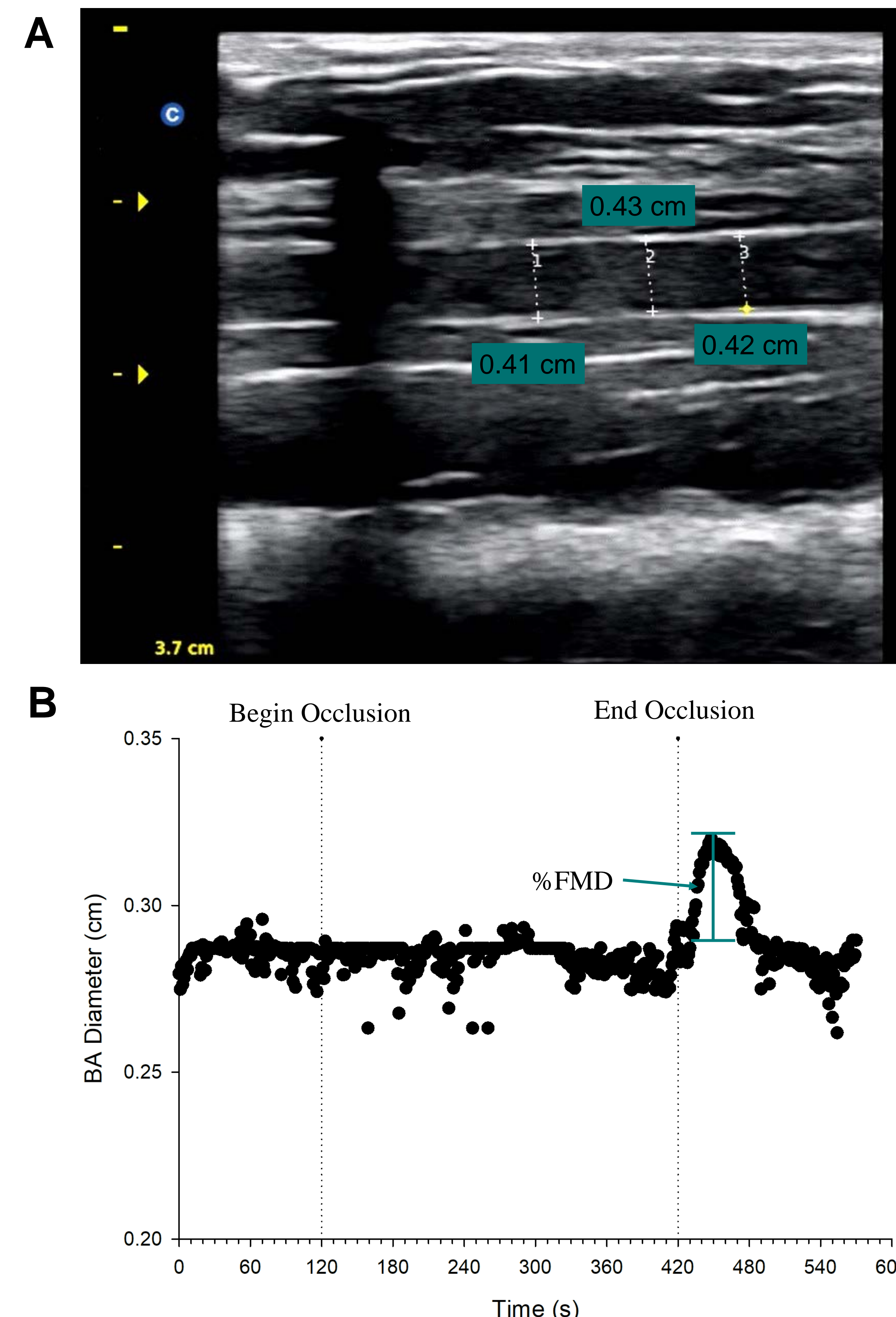


Figure 1. Representative data of a single subject measurement of resting brachial artery diameter (A). Changes in brachial artery diameter were assessed using FloWave.US. Baseline brachial artery diameter was measured for 2 minutes using a Doppler ultrasound operating in B-mode placed along the brachial artery. After baseline brachial artery diameter was measured, a blood pressure cuff was inflated to 275 mmHg for 5 minutes, then deflated and additional BA diameter measurements were taken for 2.5 minutes. %FMD was calculated as the percent change in brachial artery diameter from baseline (B).

Conclusion/Practical Applications

Antioxidant properties of an acute dose of creatine may be more apparent in older populations or diseased populations, however a standard loading dose of creatine does not elicit antioxidative effects on vascular health in young, healthy adults.

Results

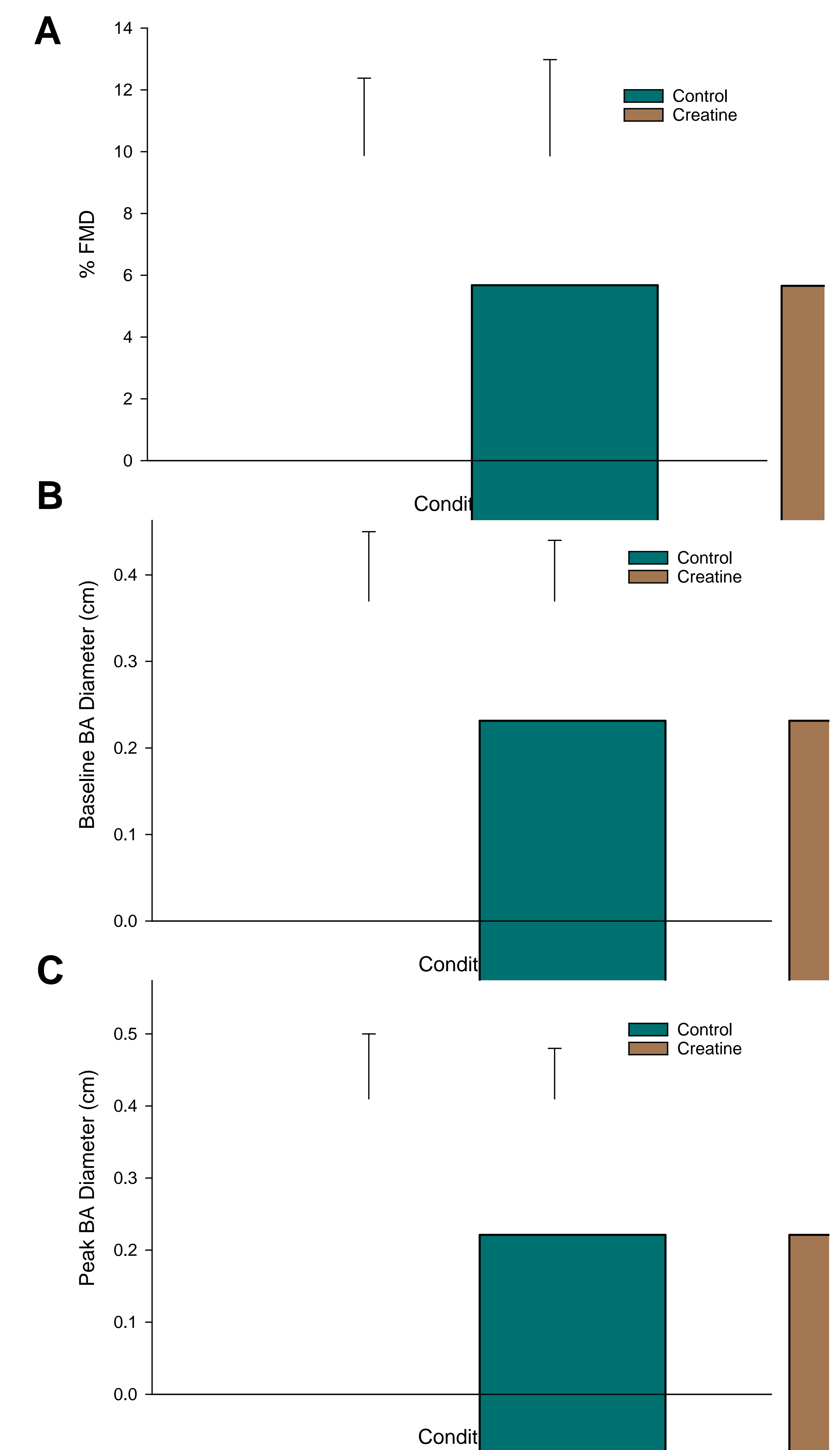


Figure 2. Data represented at means ± SD. Mean %FMD for control and creatine (A), baseline brachial artery diameter (cm) for control and creatine (B), peak baseline brachial artery diameter during control and creatine (C). No significant differences between conditions.

References

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