



Cerebrovascular blood velocity responses during moderate-intensity continuous vs high-intensity interval exercise in inactive middle-aged adults

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Introduction

- Due to an increasing elderly population we are witnessing a corresponding increase in the burden of neurovascular disease (1).
- In response to this there is now a growing interest in preventative measures, such as exercise programs to combat these conditions and protect cerebrovascular health (2).
- High intensity interval exercise (HIIE) has been shown to be equally, if not more effective than moderate intensity continuous training (MICT) at improving peripheral vascular health despite its shorter time commitment (3). However, the effect of HIIE on cerebrovascular circulation is unclear.
- Therefore this study aimed to measure the middle cerebral artery blood velocity (MCAv) response during 30 min bouts of MICT and HIIE of two different intensities in middle aged adults.

Methods

Participants

- 10 males (mean \pm SD age, 50.55 \pm 9.71 years) and 7 females (48.57 \pm 8.48 years) volunteered to participate in this study.
- Chosen participants were inactive with a mean maximal oxygen uptake ($\dot{V}O_2\max$) of 29.9 \pm 5.13 ml.kg⁻¹.min⁻¹
- Participants visited the laboratory on four separate occasions.

Preliminary Visits (Visit 1)

- Visit 1: $\dot{V}O_2\max$ was determined using ramp incremental and constant load verification bout on a cycle ergometer, allowing us to determine gas exchange threshold

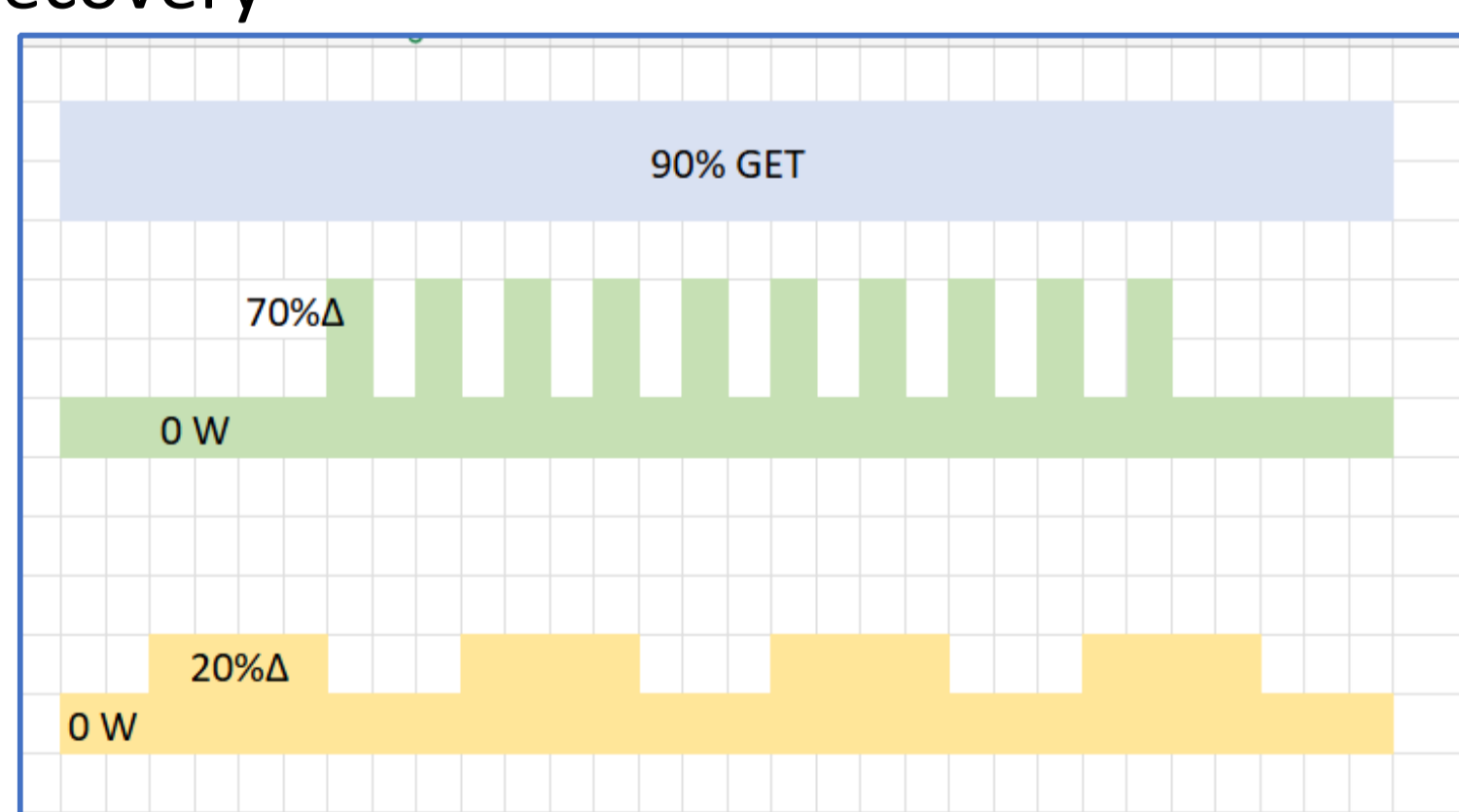
Experimental Visits (Visits 2-4)

- Participants completed three 30-min time matched experimental trials:
 1. MICT: 30 Minutes of continuous moderate-intensity exercise at 90% of GET
 2. HIIE 1: 10 x 1-min intervals at severe intensity (70% Δ) with 1-min recovery
 3. HIIE 2: 4 x 4-min intervals at heavy intensity (20% Δ) with 3-min recovery

MICT

HIIE 1

HIIE 2



Middle cerebral artery blood velocity (MCAv)



- MCAv was measured using Transcranial doppler ultrasonography (TCD)

Data Analysis

- MCAv was exported second by second during MICT, HIIE 1 and HIIE 2 exercise bouts
- Mean MCAv, peak MCAv and area under the curve was calculated for each of the 17 participants

Statistical analysis

- One way repeated measures ANOVA explored the effect of MICT, HIIE 1 and HIIE 2 on mean MCAv, peak MCAv and AUC during the exercise bouts

Results

MCAv responses during MICT, HIIE-1 and HIIE-2

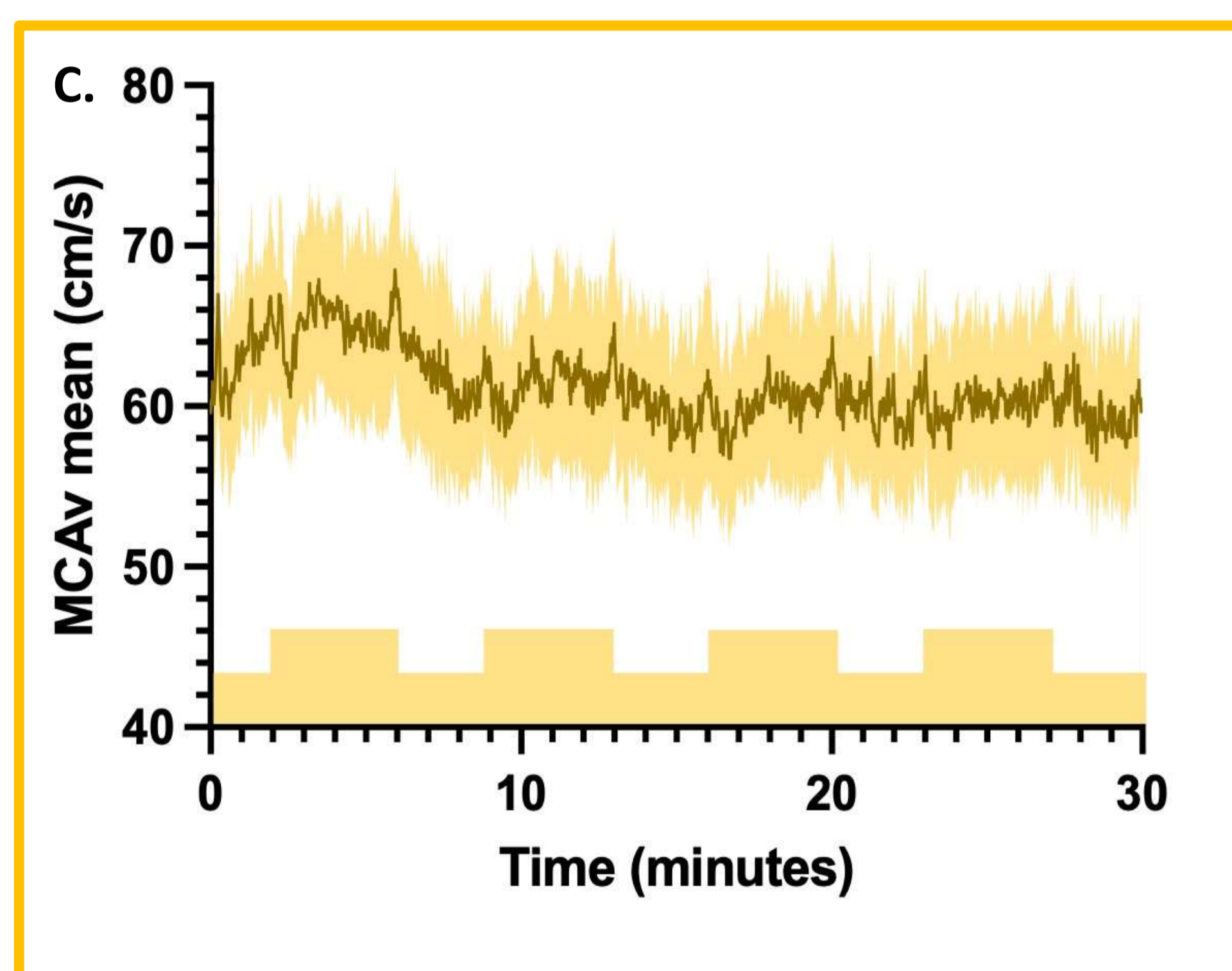
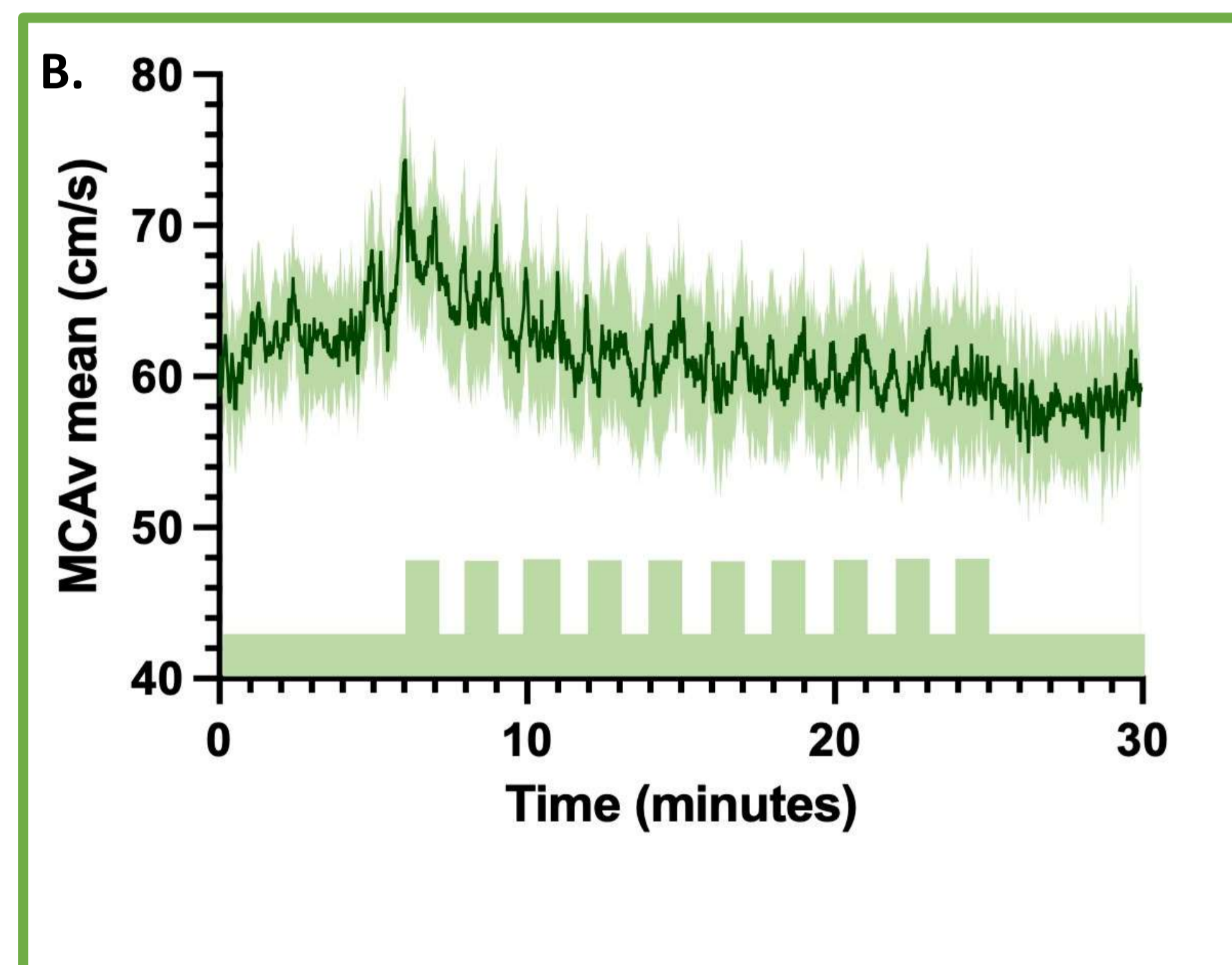
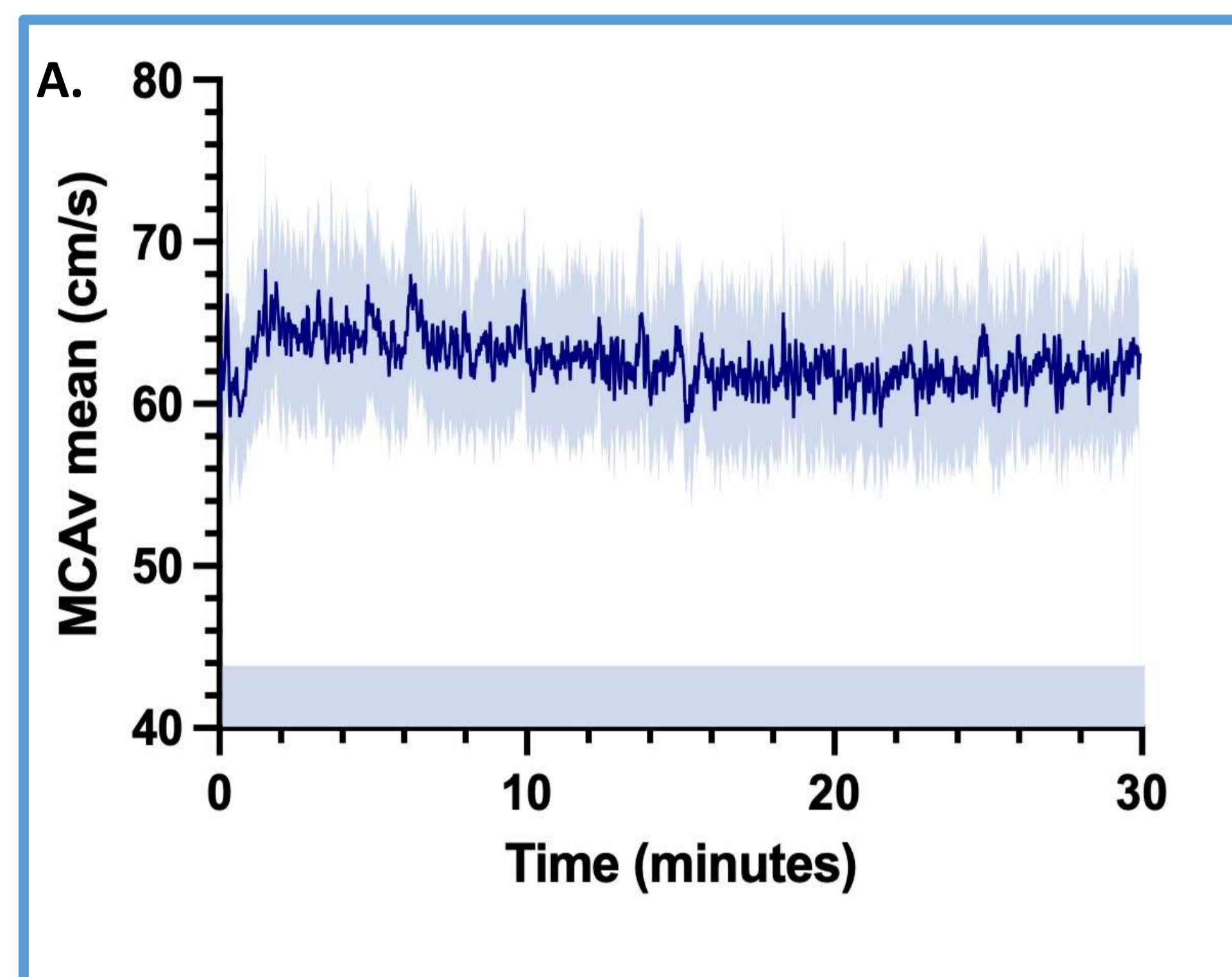


Figure 1. Mean \pm 95% CI (shaded) MCAv across the three experimental trials MICT (A), HIIE 1 (B) and HIIE 2 (C).

- MCAv responses during MICT, HIIE-1 and HIIE-2 are shown in Fig 1. There was no significant difference in Mean MCAv ($P = 0.71$), MCAv peak ($P = 0.20$) or MCAv AUC ($P = 0.71$) among the exercise modalities (Fig 2).

MCAv Mean, Peak and AUC during MICT, HIIE-1 and HIIE-2

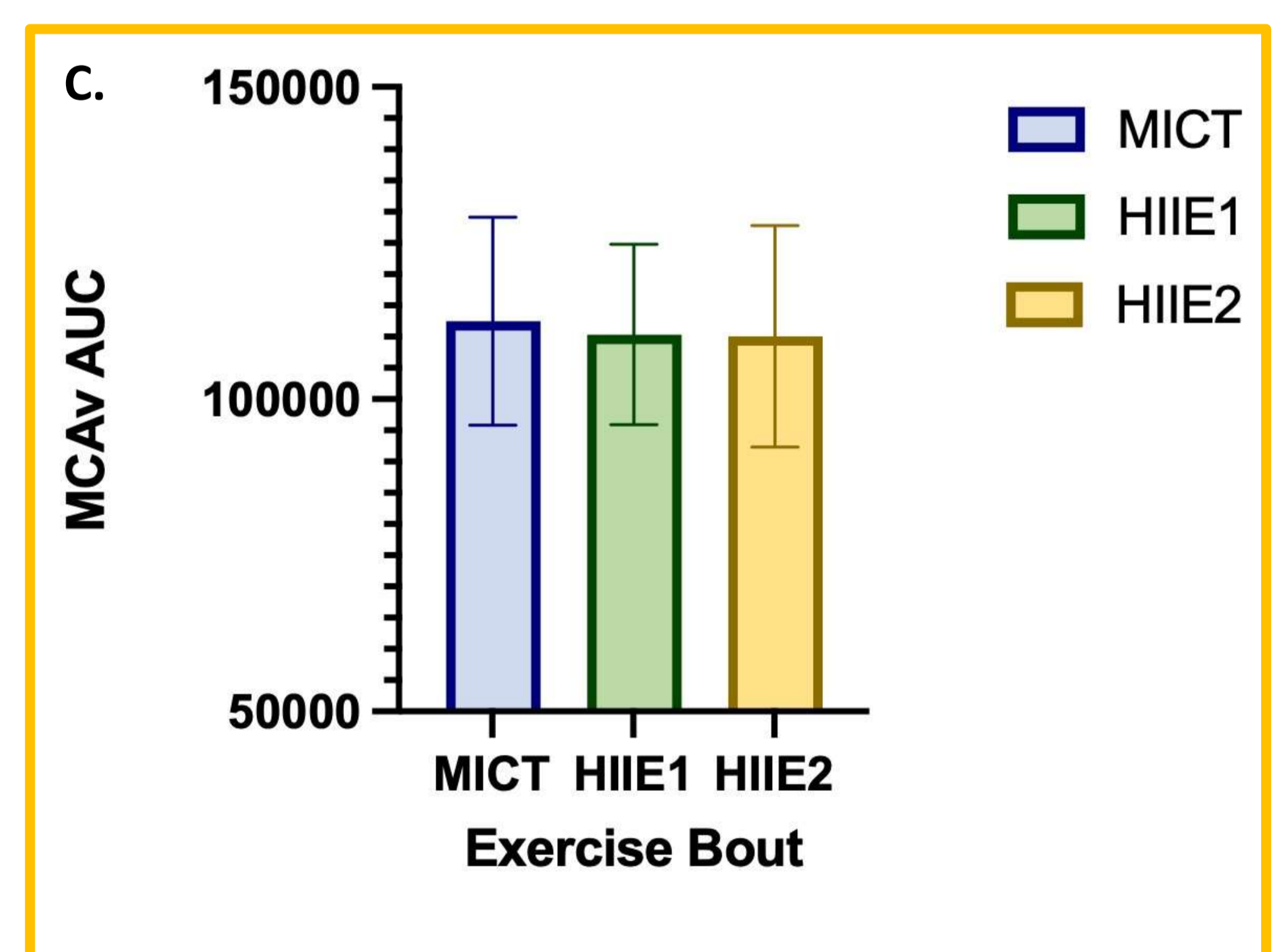
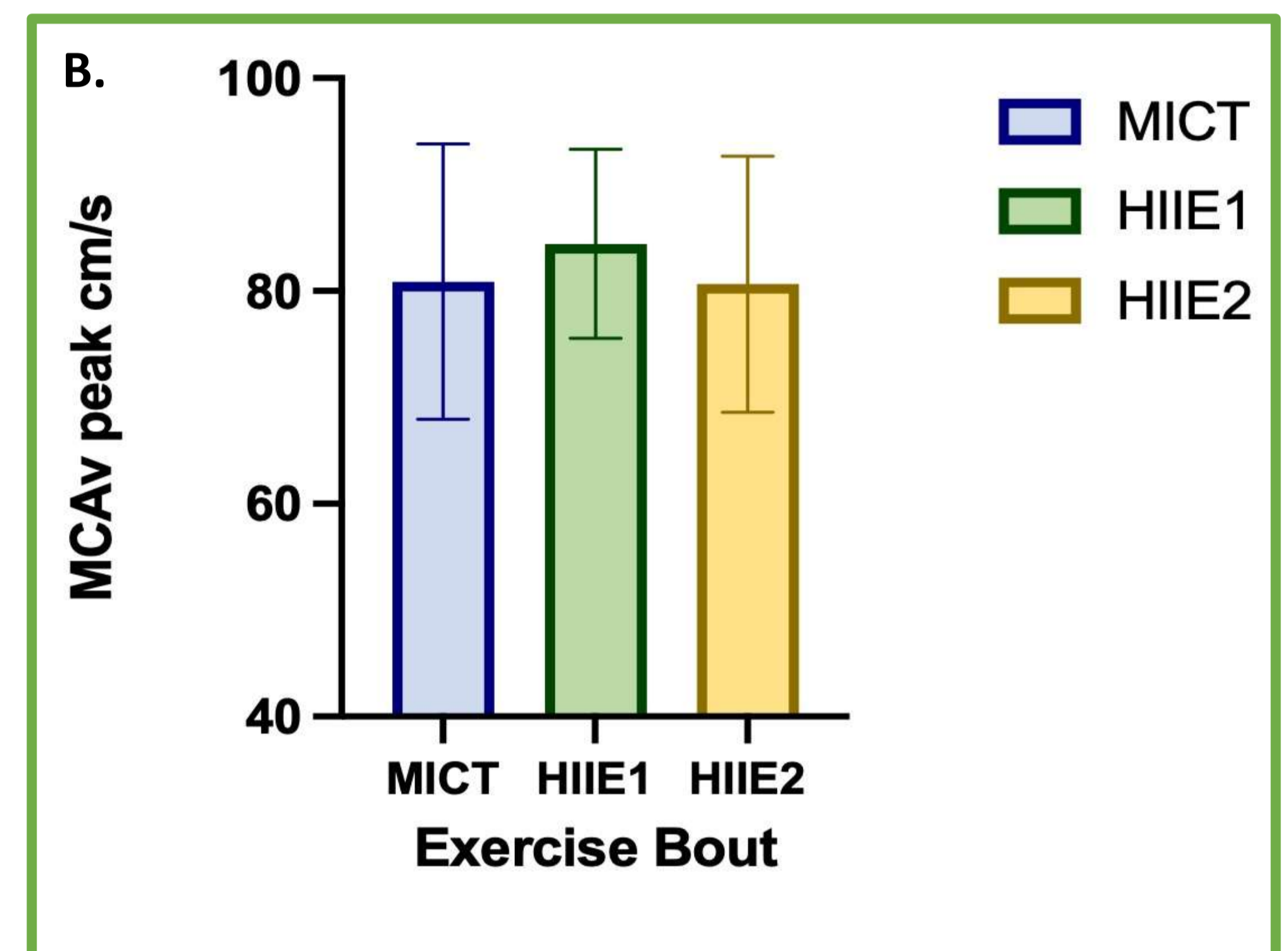
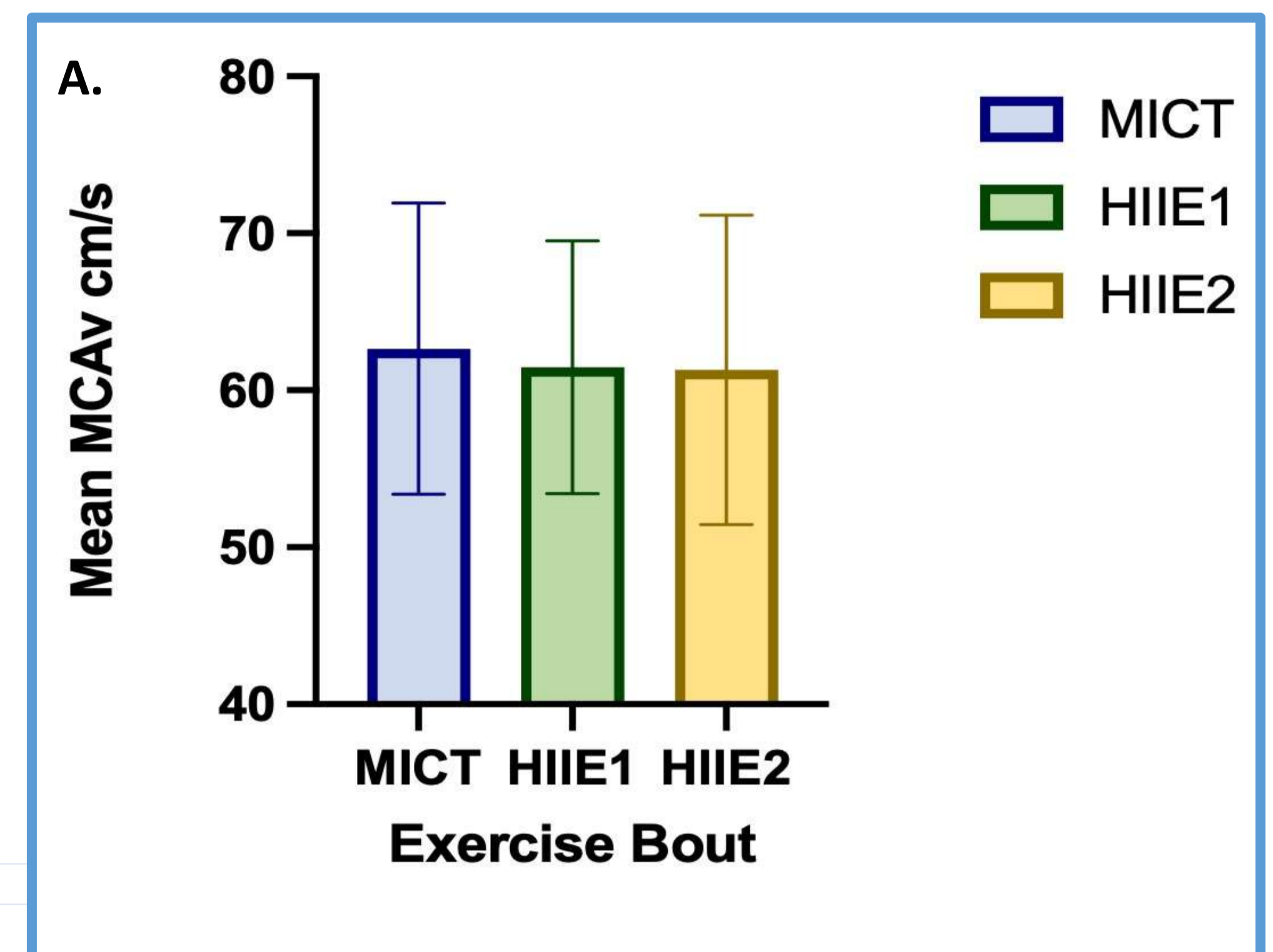


Figure 2. MCAv mean (A), MCAv peak (B) and MCAv AUC (C) for MICT HIIE 1 and HIIE 2.

Conclusion

- These findings demonstrate that there is no difference between mean MCAv, MCAv peak and MCAv AUC during moderate-intensity continuous and high-intensity intermittent exercise in inactive middle aged adults. This demonstrates that despite a shorter period of activity HIIE can be as effective at stimulating cerebrovascular blood flow. Further research is needed to look at these effects on clinical populations with cerebrovascular risk factors such as type two diabetes.

References

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