Unique Mechanisms of Bilateral Blood Pressure Control

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Introduction

- Blood pressure (BP) measurement is used to aid in appropriate clinical decision making

- Inter-arm differences (IAD) in systolic BP exists in many individuals at rest
  - ≥10 mmHg between arms
    - Linked with hypertension, peripheral vascular disease, arterial stiffness, and premature morbidity and mortality.

- At rest, BP should be measured in both arms to determine which is most appropriate for future use
  - During exercise, it is also suggested that bilateral BP is measured, if possible

Active/Passive Bicep Curl

- 12-lead EKG preparation and electrode placement
- Simultaneous BP monitoring with two automated, auscultatory BP monitors
- Exercise Pressor Reflex
  - Active Bicep Curl
    - Mechanical and Metabolic receptors
  - Passive Bicep Curl
    - Metabolic Receptors

Cold pressor test (CPT)

- Non-invasively excites sympathetic nervous system
  - Nociceptors
- Raises systolic and diastolic BP
- Normal increase in SBP= 15-20 mmHg

Purpose and Hypotheses

- To examine the effects of ALM, PLM, andthe CPT on IAD in systolic BP

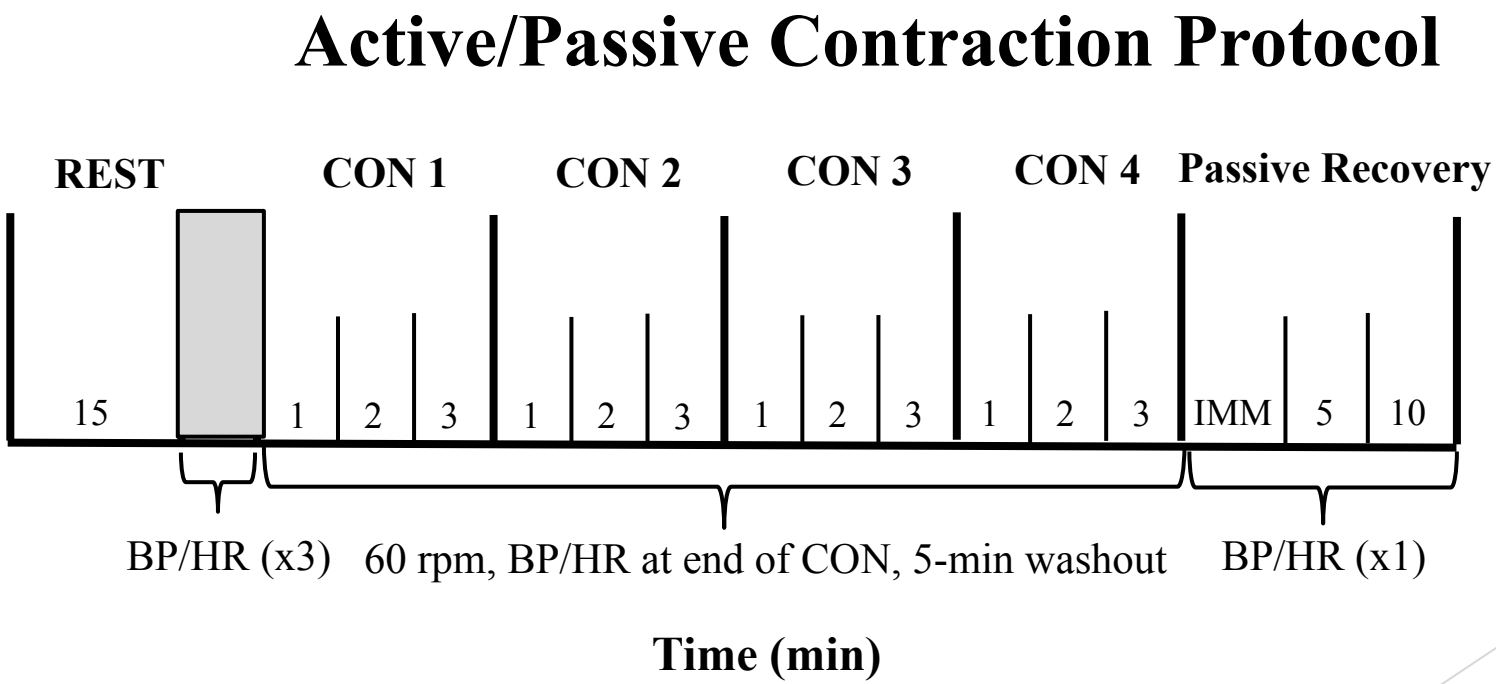
- Hypotheses
  - CPT will induce significant changes in the IAD in systolic BP and provide insight into novel aspects of nervous system control on blood pressure regulation
  - PLM in the upper limbs will stimulate the exercise pressor reflex and alter IAD
  - ALM in the upper limbs will stimulate NO release and alter IAD

Methods- Visit One

- Informed Consent
- Body Composition
  - Height, weight, BMI, SECA
- Cholestech Panel
  - Total, high-density, low-density cholesterol and glucose
- Pre-test instructions for follow-up:
  - 4 hour fast, 24-hour abstinence from exercise, caffeine, alcohol

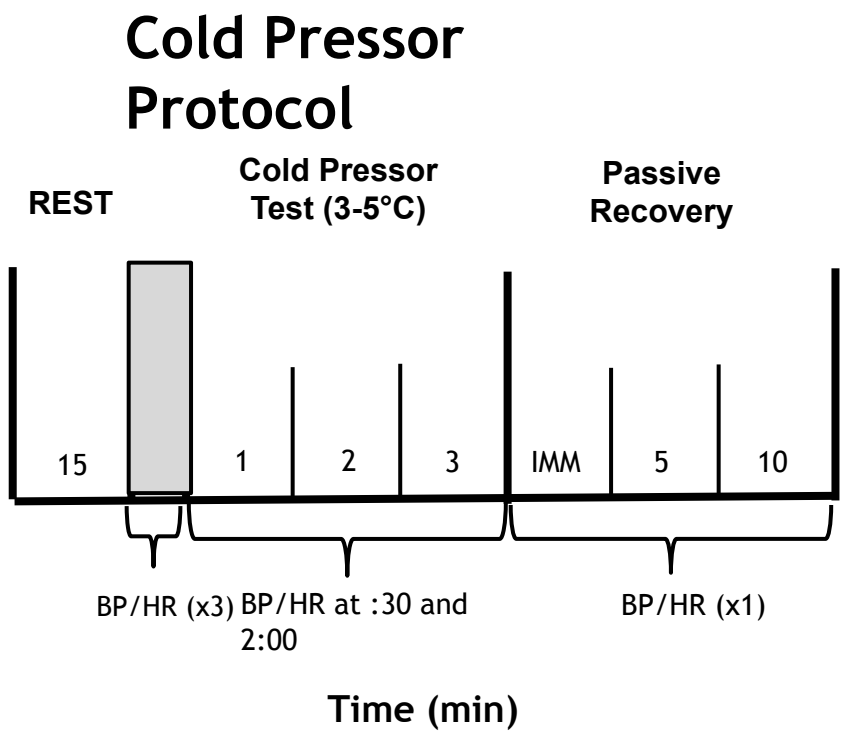
Methods- Visit Two

- Order of intervention randomized



Methods- Visit Two

- Order of affected hand randomized



Data Analysis

- IAD+, >10 mmHg IAD at rest
- IAD-, <10 mm Hg IAD at rest
- Descriptive statistics- calculated as mean ± SEM
- A repeated-measures ANOVA was used to compare the relative IAD response to the CPT between IAD+ and IAD- individuals at rest

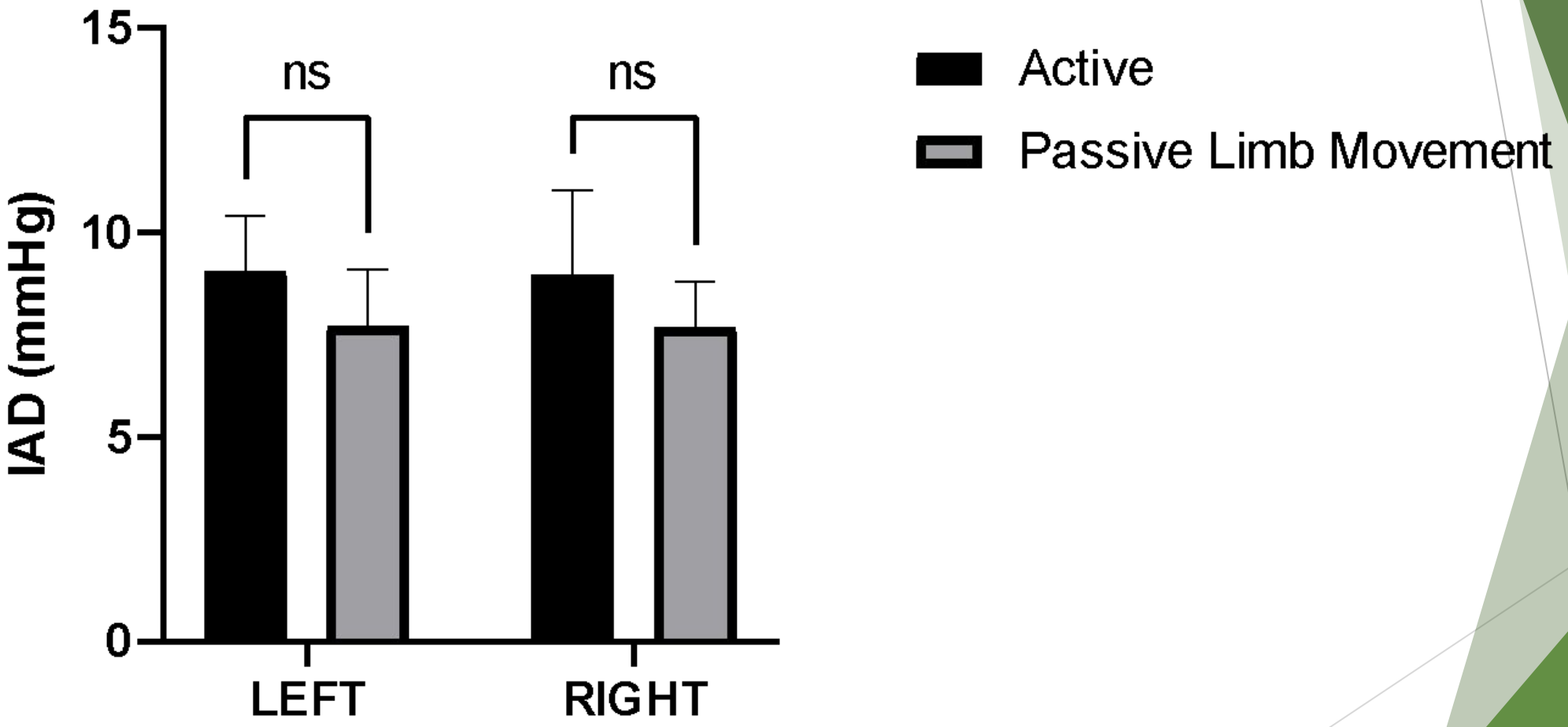
Participant Demographics - Active/Passive

	IAD- (n=7; <10mmHg)	IAD+ (n=18; ≥10mmHg)
Cholestech Panel:		
Total Cholesterol (mg/dL)	193.1 ± 10.4	182.5 ± 10.3
High-Density Lipoprotein (mg/dL)	56.1 ± 4.0	55.9 ± 6.5
Low-Density Lipoprotein (mg/dL)	112.9 ± 7.9	108.9 ± 6.8
LDL/HDL Ratio	3.7 ± 0.3	3.5 ± 0.3
Blood Glucose (mg/dL)	90.6 ± 2.5	90.1 ± 1.9
Anthropometrics:		
Weight (kg)	77.0 ± 4.8	74.4 ± 4.2
Height (cm)	168.0 ± 2.6	168.6 ± 3.8
BMI (kg/m^2)	27.2 ± 1.5	26.2 ± 1.4
Fat-Free Mass (kg)	54.1 ± 2.8	56.5 ± 3.7
Body Fat Percentage (%)	29 ± 2.4	24 ± 3.4

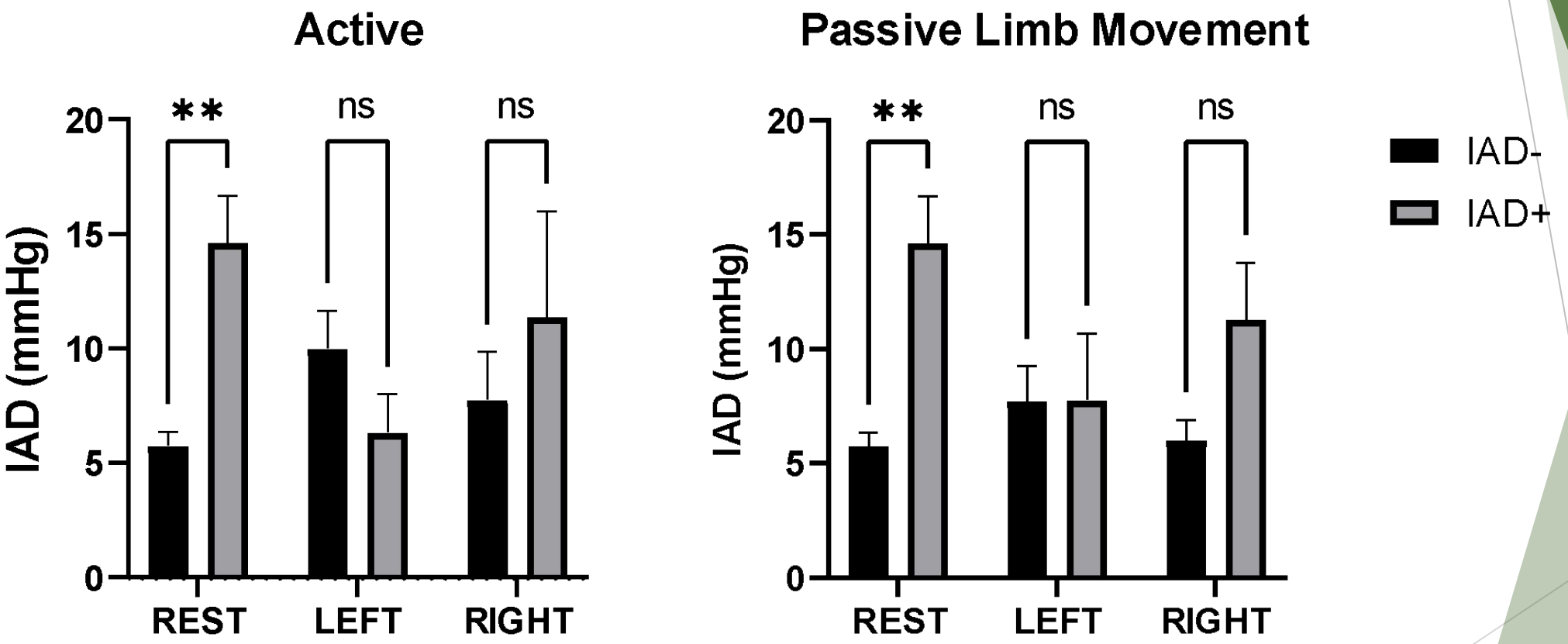
Participant Demographics - CPT

	IAD- (n=11; <10mmHg)	IAD+ (n=12; ≥10mmHg)
Cholestech Panel:		
Total Cholesterol (mg/dL)	183.9 ± 11.2	201.2 ± 4.0
High-Density Lipoprotein (mg/dL)	53.8 ± 5.3	56.4 ± 2.4
Low-Density Lipoprotein (mg/dL)	96.9 ± 4.9	122.5 ± 3.1*
LDL/HDL Ratio	3.5 ± 0.3	3.7 ± 0.35
Blood Glucose (mg/dL)	91.2 ± 3.1	90.9 ± 2.8
Anthropometrics:		
Weight (kg)	73.8 ± 5.3	76.8 ± 2.7
Height (cm)	170.6 ± 3.4	165.5 ± 3.7
BMI (kg/m^2)	25.1 ± 1.2	28.0 ± 1.7
Fat-Free Mass (kg)	55.7 ± 3.6	52.1 ± 2.1
Body Fat Percentage (%)	24 ± 1.6	31 ± 1.9

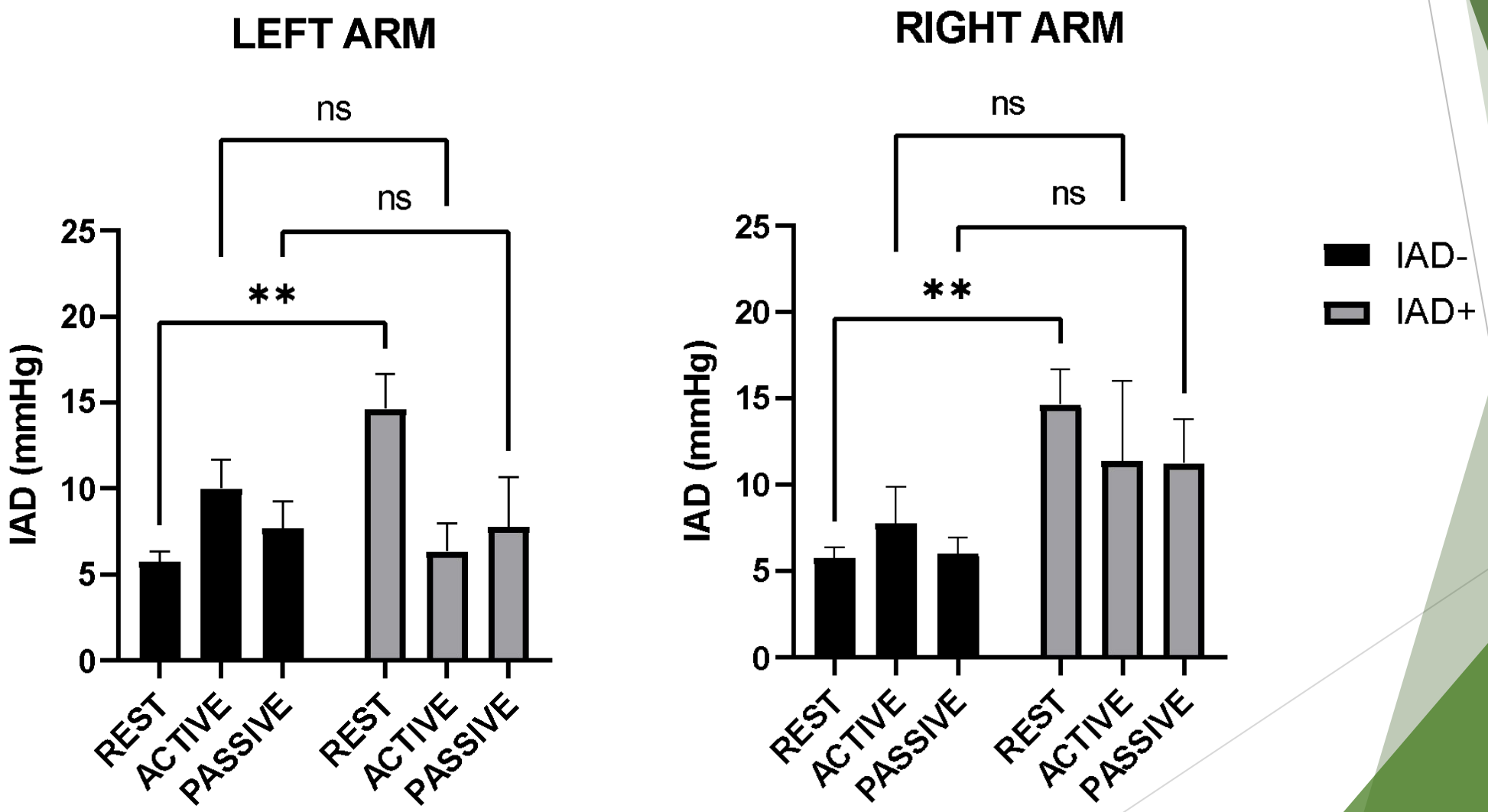
Results - Active/Passive



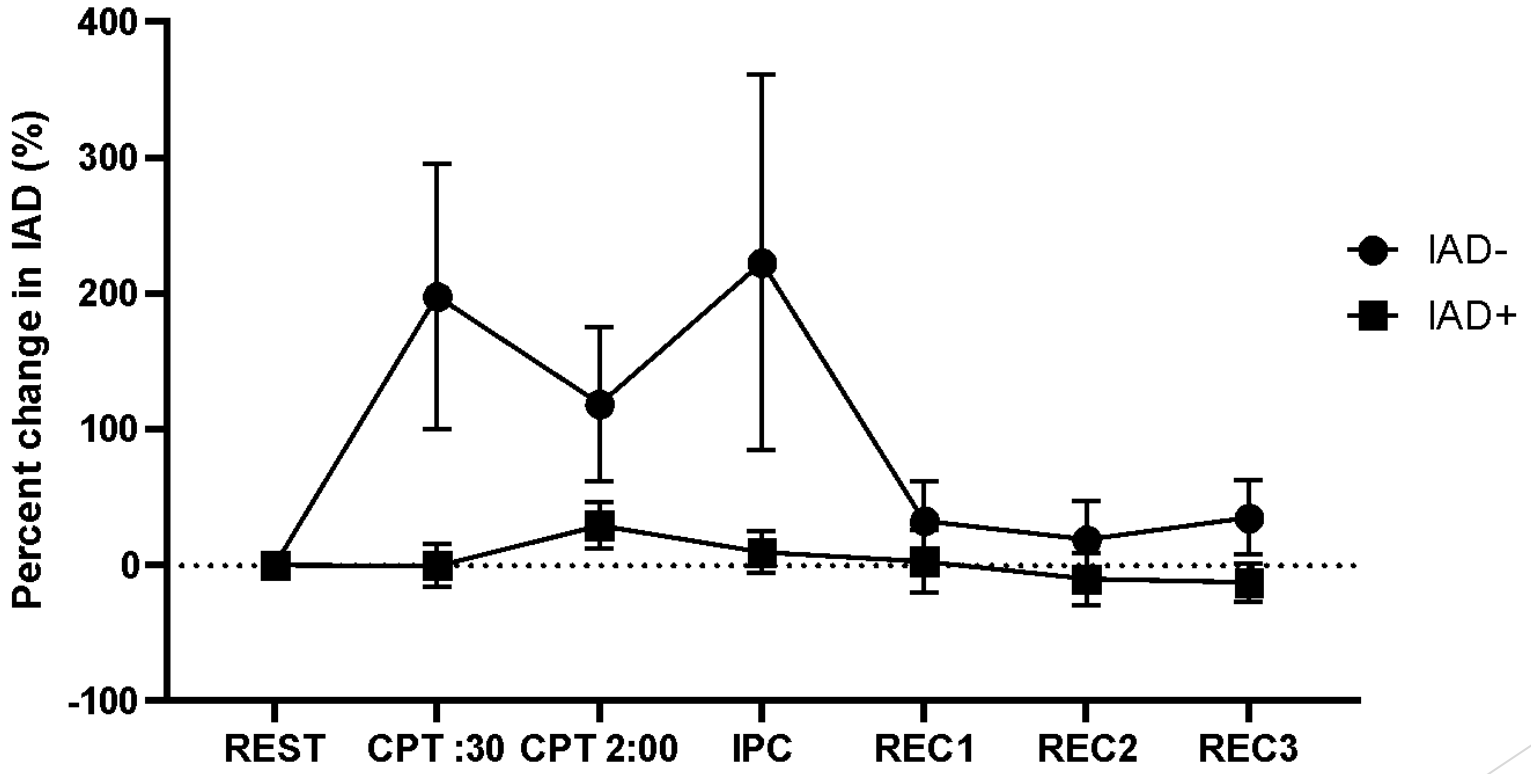
Results - Active/Passive



Results - Active/Passive



Results - CPT


400
300
200
100
0
-100
Percent change in IAD (%)
REST
CPT :30
CPT 2:00
IPC
REC1
REC2
REC3
IAD-
IAD+

Conclusions - Active/Passive

- Both passive and active limb movement mediated IAD similarly in both IAD+ and IAD- participants

Conclusions - CPT

- Similar to prior stimuli on the IAD response:
  - CPT augmented IAD response in IAD- individuals
  - IAD+ individuals had a blunted response to the CPT, possibly indicating that suggested anatomical bases, and physiological responses derived by sympathetic means, deserve further investigation as potential mechanisms behind resting and exercise IAD.

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