

Association Between Body Mass Index and Cardiovascular Responses During Eucapnic Voluntary Hyperpnea Among Young Adults



Sequoia D. Ernst^{a,b}, Thomas G. Bissen^{a,b}, Christin Domeier^{a,b}, Joseph D. Vondrasek^{a,b}, Pannonica Silvestri^{a,b}, Joseph C. Watson^{a,b}
^aCardiovascular and Applied Physiology Laboratory, Florida State University; ^bInstitute of Sports Sciences and Medicine, Florida State University

INTRODUCTION

- A high body mass index (BMI) is linked with exaggerated cardiovascular responses during exercise among adults¹.
- Hyperpnea (i.e., increased minute ventilation) is associated with increases in heart rate and blood pressure². The greater ventilation-related cardiovascular responses may contribute to augmented cardiovascular responses during exercise.
- However, the association between BMI and cardiovascular responses during hyperpnea independent of exercise is unclear.

PURPOSE & HYPOTHESIS

- We tested the hypothesis that a higher BMI correlates with greater cardiovascular responses during experimental hyperpnea without concurrent exercise.

EXPERIMENTAL DESIGN

- We measured heart rate (electrocardiogram), beat-to-beat hemodynamics (photoplethysmography), and ventilation (spirometry) during a 5-minute rest period and an 8-minute eucapnic (4 or 5% inspired CO₂) voluntary hyperpnea (EVH) test at 60 L per min at 20 breaths per min among adults free from overt disease.
- We calculated the rate pressure product (systolic blood pressure * heart rate) as an index of myocardial oxygen demand (i.e., heart stress). We report data as mean±SD for normally distributed data or median[IQR] for non-normal data determined by Shapiro-Wilk tests.
- We correlated cardiovascular responses (final 30 seconds of EVH minus rest) with BMI using Spearman's rank (ρ) correlations before and after adjusting for maximal voluntary ventilation (MVV; 10-15 seconds on room air).

Table 1. Participant Characteristics

	Mean±SD or Median[IQR]
Biological Sex	10 Female/12 Male
Race	14% Asian, 5% Black, 81% White
Ethnicity	36% Hispanic/Latinx
Age (years)	24[6]
Body Mass Index (kg/m ²)	29.0±6.2
Resting Systolic Blood Pressure (mmHg)	115±15
Resting Diastolic Blood Pressure (mmHg)	73±15
Maximal Voluntary Ventilation (L/min)	140±27

AFFILIATION & FUNDING SOURCES

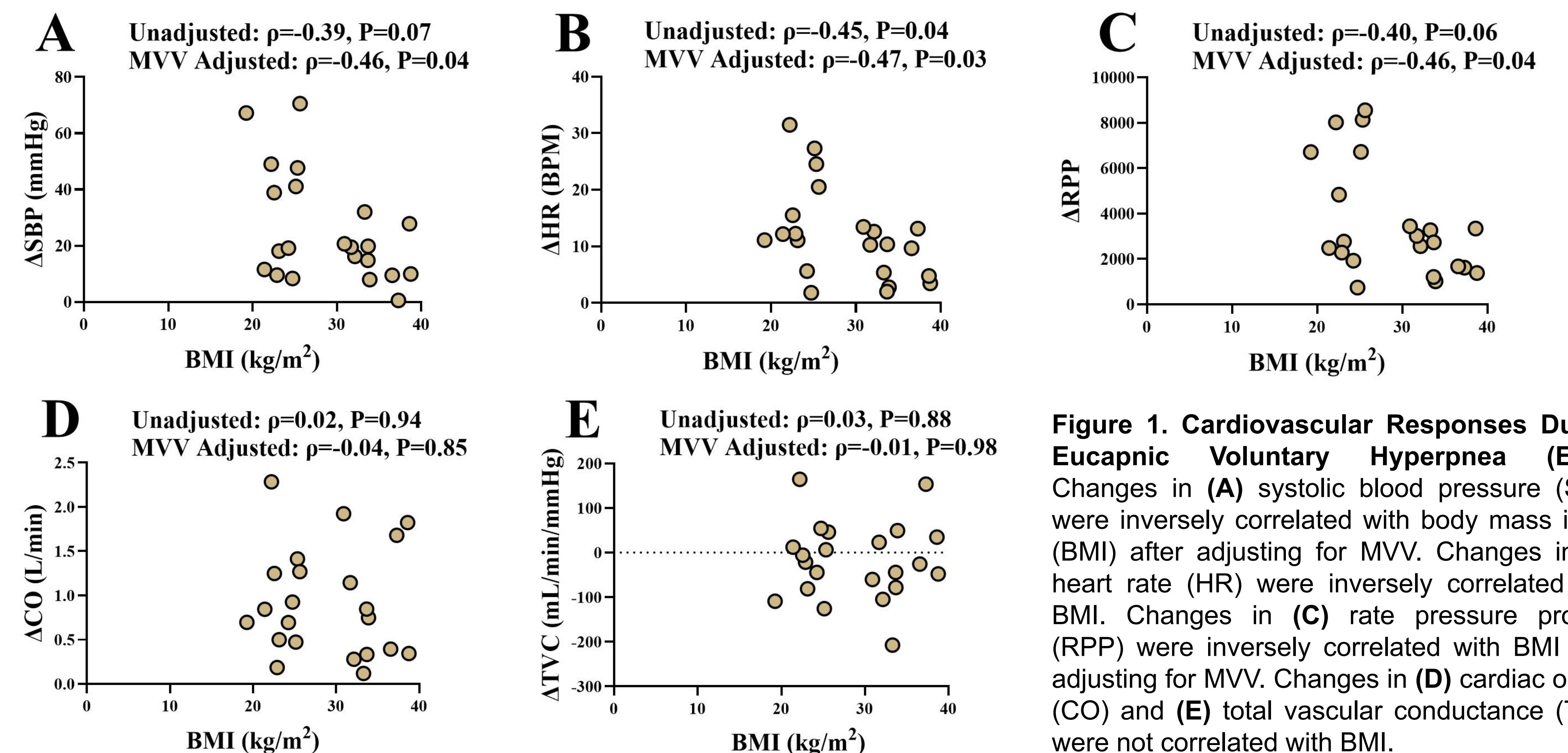


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RESULTS

Table 2. Cardiovascular Variables

	Systolic Blood Pressure (mmHg)	Heart Rate (BPM)	Rate Pressure Product (mmHg*BPM)	Cardiac Output (L/min)	Total Vascular Conductance (mL/min/mmHg)
Rest	116[12]	69[8]	7982[2270]	5.9±2.2	67±28
EVH	134[26]	82[11]	11592[3687]	6.8±2.1	66±27
Δ (EVH - Rest)	19[27]	11[8]	2756[2752]	0.9±0.6	-2±9



CONCLUSIONS

Contrary to our hypothesis, these data suggest that a higher BMI is associated with attenuated blood pressure and heart rate responses during experimental hyperpnea among young adults with and without obesity free from overt disease.

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