

The Ability of Cardiac Autonomic Modulations Stress Index to Independently Predict VO₂max in Cardiometabolically Healthy Individuals

LETICIA C. DE SOUZA¹, RICARDO TORRES¹, CHRISTOPHER WYNWEEN¹, LEROY, BOLDEN¹, TOMAS CHAPMAN-LOPEZ¹, LESLEE K. FUNDERBURK² & JEFFREY. S. FORSSSE¹.

¹ Integrated Laboratory of Exercise, Nutrition, and Renal Vascular Research; Department of Health, Human Performance, and Recreation; Baylor University; Waco, TX

² Nutritional Sciences, Baylor University, Waco, TX

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Advisor / Mentor: Forsse, Jeffrey S. (jeff_forsse@baylor.edu)

ABSTRACT

Cardiac autonomic modulation (CAM) is crucial for heart health, mediated by the sympathetic and autonomic systems (SAS). The link between CAM and aerobic exercise underscores the importance of aerobic fitness assessments in optimizing training to enhance performance. Heart rate variability (HRV) assesses CAM in various healthy populations, with the Stress Index (SI) identified as key in determining the SAS regulation involvement in performance and recovery outcomes. The SI may provide a quick and non-invasive metric to assess aerobic performance. **PURPOSE:** To determine if the SI can accurately predict aerobic performance via VO₂max in healthy individuals free of metabolic diseases. **METHODS:** fifty cardiometabolically healthy individuals (n = 30 males, n = 20 females; Age 37.8 ± 12.7 years, %BF 24.9 ± 4.0) completed a single maximal treadmill exercise protocol to determine VO₂max. HRV was measured for 5 minutes in the supine position prior to performing the exercise protocol using an elastic belt and Bluetooth monitor (Polar H7). CardioMood software was used to process HRV indices; SI, high frequency (HF), low frequency (LF), and total power (TP) were assessed for the frequency domain, and standard deviation of all NN intervals (SDNN) and the square root of the mean of the squares of successive R-R interval differences (RMSSD) for the time domain. The data was analyzed using a multiple correlation and linear regression between HRV indices and VO₂max to determine the relationship between the two. All analyses were performed using SAS (v. 28.0.1.1). **RESULTS:** HRV indices SI was not significantly correlated to VO₂max (r = -0.118, p = 0.414). Additionally, SI and all other HRV indices were not able to independently or combined predict VO₂max (R² = 0.014, p = 0.414). **CONCLUSION:** The utilization of HRV to assess CAM has proven beneficial in multiple clinical and athletic settings. However, the utilization of the SI to predict aerobic performance via VO₂max does not appear to be significant. Thus, there are potential limitations to HRV to non-invasively assess aerobic performance.