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Title of Research: Modulation of cardiac autonomic control by high intensity interval training in obesity-related hypertension

Abstract

Background: Obesity-related hypertension (HTN) is a growing cardiometabolic disorder frequently accompanied by cardiac autonomic dysfunction (CAD) characterized by impaired heart rate variability (HRV) and abnormal cardiac autonomic reflex tests (CARTs). Sleep disturbances, prevalent in this population, may even contribute to autonomic impairment, yet their predictive role remains unclear. Although lifestyle interventions are central to management, the effects of high-intensity interval training (HIIT) on cardiac autonomic control, cardio-metabolic risk factors, sleep quality, health related quality of life (HRQoL) in obesity-related HTN remains underexplored.

Objectives: This study examined the correlation between HRV parameters and HRQoL measures. Further investigated the predictive ability of sleep quality for detecting CAD, and evaluated the impact of a 12-week HIIT intervention on multiple outcomes.

Methods: A total of 125 adults were screened for obesity-related HTN. CART's, HRV and HRR were measured as markers of cardiac autonomic function and recovery. HRQoL was evaluated with the SF-36 questionnaire, and sleep quality with the Pittsburgh Sleep Quality Index (PSQI). Cardio-metabolic risk factors and body composition parameters were also assessed. Participants were randomized into HIIT and control groups. Correlation analyses tested associations between HRV and HRQoL, logistic regression and ROC analysis evaluated the predictive validity of sleep quality, and mixed-model ANOVA compared changes between groups. A p-value < 0.05 was considered statistically significant.

Results: Most parasympathetic HRV parameters correlated positively with HRQoL, while marker of sympathovagal imbalance correlated negatively. Sleep quality significantly

predicted CAD. Additionally, the HIIT intervention led to significant improvements in majority of the cardiac autonomic function parameters including HRV, CARTs, HRR, cardio-metabolic risk factors, body composition parameters, HRQoL, and sleep quality compared with controls.

Conclusion: HRV is associated with several HRQoL measures in obesity-related HTN. Sleep quality serves as a reliable predictor of CAD, and a structured 12-week HIIT program produces significant improvements across autonomic, cardio-metabolic, and psychosocial health domains.

Keywords: obesity-related hypertension, heart rate variability, cardiac autonomic dysfunction, sleep quality, high-intensity interval training.