

Gender-Related Effects of Sucrose Ingestion and Hypoxia on Cardiac Autonomic Modulation in Young Subjects

Tanja Princi*, Agostino Accardo, Petra Golja and Matjaz Klemenc

Department of Life Sciences, University of Trieste, Trieste, Italy

Several factors can influence the cardiac autonomic nervous system (ANS) activity, such as acute exposure to hypoxia and carbohydrate ingestion. The differences between genders in cardiac autonomic modulation in normoxia are well documented, while gender-related ANS responses following exposure to hypoxia or carbohydrate loading demonstrate dissimilar results. The aim of the present study was to assess gender-related effects of sucrose ingestion and hypoxia on cardiac ANS function in young healthy subjects by using non-linear (Poincaré plot) heart rate variability (HRV) analysis. All subjects (6 males and 8 females) were exposed to normoxia. After the first 15-min normoxic period, the subjects ingested a 10% water solution of sucrose in the amount of 4 kcal per kg body mass (4 kcal = 1 g sucrose). A 30-min acute normobaric hypoxia ($FiO_2 = 12.86\%$) followed. During the experiment, ECG, minute ventilation (V; L/min), and haemoglobin saturation (SaO_2 ; %) were monitored. The Poincaré plot parameters (SD1 - marker of vagal influence SD2 marker of sympathetic activity) and SD1/SD2 ratio (marker of vago/sympathetic balance) were calculated on 5-10 min ECG segments. In comparison to normoxia, the sucrose ingestion and hypoxia provoked in women, but not in men, a significant reduction of vagal and sympathetic activities ($p < 0.05$) as well as a significant decrease of vago/sympathetic balance ($p < 0.03$). Haemoglobin saturation, similar between genders in normoxia, decreased significantly during hypoxia only in females ($p < 0.01$). The ventilation, in normoxia higher in males than in females, increased significantly only in females after sucrose loading ($p < 0.01$) and during hypoxia ($p < 0.02$). These results indicate a different gender-related cardiac ANS modulation after carbohydrate ingestion and acute exposure to hypoxia, suggesting a higher sensitivity to both these factors in females in comparison to males, with a shift in vago/sympathetic balance towards relatively more sympathetic and less parasympathetic activity.