

Elevated Cardiac Vagal Tone in Hypoestrogenic Active Premenopausal Women with Functional Hypothalamic Amenorrhea

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Compared with eumenorrheic women, exercise-trained women with functional hypothalamic amenorrhea (ExFHA) have a low heart rate (HR), absent reflex activation of their renin-angiotensin-system, and augmentation of the normal increase in muscle sympathetic nerve burst incidence during orthostatic stress, suggesting concurrently altered autonomic HR modulation. To test this hypothesis, three age-matched (pooled mean, 24±1 years; mean±SEM) groups of women were studied: ExFHA (n=11), exercise-trained and eumenorrheic (ExOv; n=17), and sedentary and eumenorrheic (SedOv; n=17). Blood pressure (BP), HR, and HR variability (HRV) in the frequency domain were measured at supine rest and during simulated orthostatic stress induced by graded lower body negative pressure (LBNP; -10, -20, and -40mmHg). Very low (VLF), low (LF) and high (HF) frequency power spectra (ms²) were determined, and due to skewness, were log₁₀ transformed. LF/HF ratio and Total power (VLF+LF+HF) were calculated. At baseline, HR and systolic BP were lower (p<0.05), and HF and Total power higher (p<0.05) in ExFHA than eumenorrheic women. In all groups, LBNP decreased (p<0.05) systolic BP, HF and Total power, and increased (p<0.05) HR, and LF/HF ratio. However, in ExFHA, HF and Total power remained higher (p<0.05), and HR, systolic BP

and LF/HF ratio lower ($p < 0.05$) than in eumenorrheic women, in whom measures did not differ ($p > 0.05$). In conclusion, ExFHA women demonstrate augmented vagal HR modulation, whereas sympathetic HR modulation is unchanged, both at rest and during orthostatic stress. Less central angiotensin II may play a role.

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