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Sympathovagal Tone Assessed by Heart Rate Variability Is Directly Related to Body Mass Index, Percent Body Fat, and Skeletal Muscle in Healthy Male and Female Young Volunteers

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Introduction: Sympathovagal balance has been described as related to obesity and metabolic syndrome, assessed by heart rate variability (HRV) and body mass index (BMI). Bioelectric impedance (BI) is used, among other variables, to measure body fat percentage (%BF), skeletal muscle percentage (%SM), and %BF/%SM ratio. BMI takes into account only body weight and height. In order to determine whether HRV relates to body composition in healthy young males compared with females, we analyzed HRV and BI variables.

Methods: Two hundred twenty-eight healthy volunteers, 110 males (20.7 ± 2.0 years) and 118 females (20.2 ± 1.6 years) participated in the study. Five-minute recordings of HRV time-and frequency-domain indices were analyzed and correlated with BI variables: The root mean of the squared successive interbeat intervals differences (RMSSD) was taken as the time domain measure of HRV. High-frequency (HF: 0.15–0.4 Hz), low-frequency (LF: 0.04–0.15 Hz), very-low-frequency (VLF: < 0.04 Hz) band power, and HF power or LF/HF ratio were calculated on the electrocardiogram recordings obtained. All time- and frequency-domain indices were automatically calculated by the commercially available Norav ECG Management System (Wiesbaden, Germany). Standard measures for BMI and BI for %BF, %SM and %BF/%SM ratio were measured with commercially available Omron BF500 Body Composition Monitor (Kyoto, Japan).

Results: T-test for equality of means between male and female volunteers is shown in the **Table**.

Conclusion: Differences in sympathovagal balance between male and female healthy volunteers were observed. We found an augmented sympathetic tone (LF) and VLF (related to thermogenesis) in healthy male volunteers related to a higher %SM, and an augmented vagal (HF) and parasympathetic tone (LF/HF) in healthy female volunteers, related to an increase in %BF. Bioelectric impedance parameters should also be used to estimate cardiovascular risk factors related to sympathovagal equilibrium.

TABLE

T-TEST FOR EQUALITY OF MEANS BETWEEN MALE AND FEMALE VOLUNTEERS

	Mean	SD	*P*
Bioimpedance			
Weight (kg)			
Male	75.2	14.5	.000
Female	60.2	11.1	
BMI			
Male	24.7	4.4	.007
Female	23.2	3.8	
%Fat			
Male	23.7	7.9	.000
Female	35.2	7.0	
%Skeletal muscle			
Male	37.8	4.4	.000
Female	25.8	2.6	
%Fat/%SM			
Male	.66	.30	.000
Female	1.3	.37	
HRV			
RMSSD			
Male	53.3	30.9	.05
Female	61.3	30.2	
VLF			
Male	166.4	91.1	.000
Female	124.9	67.7	
LF			
Male	174.0	84.0	.000
Female	141.3	71.6	
HF			
Male	201.4	81.7	.000
Female	276.1	96.0	
LF/HF			
Male	1.09	0.86	.000
Female	0.69	0.67	

BMI = body mass index; HF = high frequency; HRV = heart rate variability; LF = low frequency; RMSSD = root mean of the squared successive interbeat intervals differences; VLF = very low frequency