Effect of 60-hour sleep deprivation on cardiovascular regulation was assessed by measuring heart rate variability (HRV) and blood pressure. Also body temperature was measured. Volunteers consisted of 20 healthy cadets (17 men, 3 women, age 26 ± 3 yrs) from National Defence University of Finland. They were not allowed to drink caffeine containing liquids during the sleep deprivation period, but water could be consumed ad libitum. Physical activity was restricted to minimum while they performed military tasks related to tactics. It was strictly controlled that the volunteers did not fall asleep during the sleep deprivation period.

Each measurement period consisted of active orthostatic tests (5 min sitting, 3 min standing) and a deep breathing test (90 s). Measurements were done each day in the morning and evening after 2h, 16h, 28h, 38h, 50h and 60h of sleep deprivation. Spectral analysis of heart rate variability (HRV) was calculated to examine cardiac parasympathetic modulation with following parameters: high-frequency power (HF), low-frequency power (LF) and the square root of the mean of the sum of differences between adjacent RR-intervals (RMSSD).

In sitting position RMSSD and HF component increased between first and third day (P<0.001) and between second and third day (P<0.001). LF component increased between first and third day (P<0.001). The mean heart rate decreased between first and third day (P<0.001) and between second and third day (P<0.001).

At standing position RMSSD component increased between first and third day (P<0.001). HF component increased between first and third day (P<0.05). LF component increased statistically significantly between first and third day (P<0.001) and between first and second day (P<0.001). The mean heart rate decreased between first and third day (P<0.001) and between second and third day (P<0.05). The deep breathing test and blood pressure did not change during sleep deprivation. Body temperature decreased during the 60 hours but remained its circadian variation.

In conclusion, the accumulation of sleep loss results in an increased vagal outflow, documented by increased vagally mediated heart rate variability indices and decreased heart rate. In addition, the cardiovascular regulation is differently modified by sleep deprivation of two or three days than that of one day.

Keywords: Cardiovascular, Heart Rate Variability