

Heart Rate and Heart Rate Variability Response to Sleep Deprivation and Recovery Sleep in Males versus Females

Introduction

Elevated heart rate (HR) and low HR variability (HRV) are indicators of increased sympathetic tone and cardiovascular risk. Here, we assess the effect of one night of sleep deprivation and a subsequent night of recovery sleep on HR and HRV in healthy males versus females.

Methods

Fifty-nine subjects (29.5 ± 8.5 y, $n=35$ female) completed a 4-day/3-night laboratory study. Subjects had a baseline sleep opportunity (22:00–08:00), followed by 38h of sleep deprivation, and a recovery sleep opportunity (22:00–08:00). EKG was monitored via Holter monitors to measure HR and the pNN50 and rMMSD variables of HRV. Time points used for analyses included 09:00–09:20 during a seated task on each day: baseline (1h after waking), sleep deprivation (25h after waking), and recovery (1h after waking).

Results

There was no significant interaction of day by sex in HR, pNN50, or rMMSD ($p > 0.05$). There was, however, a significant effect of day ($p < 0.01$): HR decreased and HRV measures increased during sleep deprivation. There was also a significant effect of sex ($p < 0.01$): HR was lower and HRV measures were higher in males versus females.

Conclusion

The effect of sleep deprivation on HR and HRV indicates a decrease in sympathetic activity, in-line with previous research reporting inhibition of the brain's arousal centers as a consequence of increasing time awake. Notably, HR and HRV returned to baseline levels following a night of recovery sleep. Despite higher HR and lower HRV in females versus males at baseline, both sexes showed a similar cardiac autonomic response to sleep deprivation.

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