EXPERIMENTAL SLEEP RESTRICTION INCREASES NOCTURNAL BLOOD PRESSURE AND ATTENUATES BLOOD PRESSURE DIPPING IN HEALTHY INDIVIDUALS

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Background: Although growing evidence suggests that insufficient sleep is linked to enhanced risk of adverse events including hypertension, mechanistic investigations supporting causal relationships are lacking. In this study we sought to evaluate changes in ambulatory blood pressure in healthy individuals exposed to experimental sleep restriction.

Methods: Eight healthy subjects (4 males; age 25.5±6.7 years) underwent a randomized, cross-over trial consisting of a 4-day period of acclimation followed by 9 days of either experimental sleep restriction (4 hours of sleep per night - from 12:30 AM to 4:30 AM) or normal sleep, and 3 days of recovery. Twenty-four hour ambulatory blood pressure was measured at each study phase during the 16-day inpatient protocol. Measures of 24-hour, daytime, nighttime (10 PM to 7 AM), sleep (12:30 AM to 4:30 AM), and nocturnal and sleep blood pressure dipping were computed for systolic (SBP) and diastolic (DBP) blood pressure and heart rate (HR).

Results: In experimental sleep restriction phase compared to normal sleep phase, SBP and DBP increased during the nighttime (sleep restriction vs normal sleep, SBP/DBP: 115±7/64±6 mmHg vs 105±7/57±6 mmHg, both p<0.01) and during comparable sleep time (SBP: 109±5 mmHg vs 104±8 mmHg, p<0.05). Analyses of nocturnal dipping revealed that percentage fall in blood pressure was reduced in sleep restriction both during nighttime (SBP/DBP: 4.5±1.4/7.9±2.4% vs 12.4±2/17.6±2.6%, both p=0.001) and sleep periods (SBP: 8.7±2.8% vs 13.3±2.5%, p<0.05). Concomitantly, nighttime HR was higher with sleep restriction than in normal sleep (63±3 bpm vs 60±6 bpm, p<0.05), and showed an attenuated dipping (nighttime: 10.3±5% vs 13.7±4.2%, p<0.05). No significant changes were seen in 24-hour and daytime values of blood pressure and HR.

Conclusion: Prolonged sleep restriction causes selective elevations in blood pressure during nighttime and sleep periods, thus resulting in blunted nocturnal dipping. The parallel acceleration in HR occurring in sleep restriction suggests that impairment in baroreflex sensitivity and/or activation of central sympathetic outflow may mediate the detrimental effects of sleep curtailment on blood pressure.