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Acute stress affects heart rate variability during sleep.

Abstract

OBJECTIVE:

Although stress can elicit profound and lasting effects on sleep, the pathways whereby stress affects sleep are not well understood. In this study, we used autoregressive spectral analysis of the electrocardiogram (EKG) interbeat interval sequence to characterize stress-related changes in heart rate variability during sleep in 59 healthy men and women.

METHODS:

Participants (N = 59) were randomly assigned to a control or stress condition, in which a standard speech task paradigm was used to elicit acute stress in the immediate presleep period. EKG was collected throughout the night. The high frequency component (0.15-0.4 Hz Eq) was used to index parasympathetic modulation, and the ratio of low to high frequency power (0.04-0.15 Hz Eq/0.15-0.4 Hz Eq) of heart rate variability was used to index sympathovagal balance.

RESULTS:

Acute psychophysiological stress was associated with decreased levels of parasympathetic modulation during nonrapid eye movement (NREM) and rapid eye movement sleep and increased levels of sympathovagal balance during NREM sleep. Parasympathetic modulation increased across successive NREM cycles in the control group; these increases were blunted in the stress group and remained essentially unchanged across successive NREM periods. Higher levels of sympathovagal balance during NREM sleep were associated with poorer sleep maintenance and lower delta activity.

CONCLUSIONS:

Changes in heart rate variability associated with acute stress may represent one pathway to disturbed sleep. Stress-related changes in heart rate variability during sleep may also be important in association with chronic stressors, which are associated with significant morbidity and increased risk for mortality.