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MELATONIN CAN PHASE SHIFT THE ENDOGENOUS CIRCADIAN RHYTHM OF HEART RATE AND ITS VARIABILITY

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Heart rate and heart rate variability undergo marked fluctuations over the sleep-wake cycle and the 24-h day. We investigated whether part of this variation is driven by the endogenous circadian pacemaker and whether this rhythm can be shifted by repeated melatonin administration.

Methods. Eight healthy young males (age 24.4 ± 4.4 yr) participated in a double-blind cross-over design with placebo and melatonin treatment arms. Each 14-day arm consisted of a baseline sleep assessment, an initial circadian phase assessment through a constant routine protocol (CR), during which subjects were kept awake, followed by 9 phase advanced 16-h sleep opportunities (16:00-08:00) in near darkness and a final CR. Melatonin (1.5 mg, p.o., surge-sustained release) or placebo was administered prior to the first eight extended sleep opportunities. Placebo was administered in the 9th extended sleep episode in both conditions. EEG and ECG was recorded during all sleep episodes and the constant routines using Embla 16-channel digital recorders. EEGs during the constant routines were visually inspected and scored for sleep and artifacts. Heart rate and heart rate variability during the constant routines were computed over 5 minute epochs. All epochs that contained sleep and artifacts as well as 5 minute epochs preceding or following any epoch scored as sleep were excluded.

Results. During the first circadian phase assessment (8 subjects, 13 CRs), heart rate and heart rate variability exhibited a pronounced circadian variation in the absence of sleep. The fitted maximum of heart rate was located at 16:36h (95% CI 15:33-17:38) whereas the rhythm of heart-rate variability exhibited its crest at 06:59h (95% CI 05:25-08:31). After melatonin administration the crests of the circadian rhythm of heart rate and heart rate variability (n=5) occurred at 12:29 (CI 9:45-15:14) and 04:13 (CI 01:09-07:18), respectively.

HEART RATE AND HEART RATE VARIABILITY ARE UNDER CONTROL OF A CIRCADIAN PACEMAKER AND CAN BE SHIFTED BY MELATONIN ADMINISTRATION

Keywords. HEART RATE VARIABILITY-CIRCADIAN-MELATONIN

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