Habitual traffic noise at home reduces overall cardiac parasympathetic tone during sleep

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Environmental noise from aircraft, road, or rail traffic during the night has been identified as a major cause of sleep disturbance. Also, long running cohort studies indicate that long-term 24-hour road traffic noise exposure can influence long-term health. The mechanisms through which environmental noise may act upon human physiology during sleep in real-life conditions are at present not entirely understood. Because of the possible role in the mechanisms of noise-induced health effects, the influence of road and rail traffic noise exposure on cardiac sympathetic and parasympathetic tone during sleep (assessed by pre-ejection period (PEP) and respiratory sinus arrhythmia (RSA), respectively) was investigated in a field study. Thirty-six subjects from the general population of 7 residential areas within the Netherlands participated for 6 consecutive nights (approximately 190 valid subject-nights). The relationships between the mean levels of PEP and RSA and road or rail traffic noise exposure levels within the bedroom during the sleep period were investigated. Multilevel linear regression models for PEP and for RSA, with subjects as random factor, were employed. The possible influence of covariates (e.g. gender, age, body-mass index, noise source) was investigated. The results suggest that increased indoor traffic noise exposure levels may lead to a reduction in overall cardiac parasympathetic tone during sleep. No statistically significant effect of indoor traffic noise on cardiac sympathetic tone was established. The apparent alteration in autonomic nervous system activity during sleep found here could constitute part of an environmental noise-induced sleep disturbance mechanism.