

Sleep spindle characteristics and arousability from nighttime transportation noise exposure in healthy young and older individuals

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Abstract

Study Objectives

Nighttime transportation noise elicits awakenings, sleep-stage changes, and electroencephalographic (EEG) arousals. Here, we investigated the potential sleep-protective role of sleep spindles on noise-induced sleep alterations.

Methods

Twenty-six young (19–33 years, 12 women) and 18 older (52–70 years, 9 women) healthy volunteers underwent a repeated measures polysomnographic 6-day laboratory study. Participants spent one noise-free baseline night, followed by four transportation noise-exposure nights (road traffic or railway noise; continuous or intermittent: average sound levels of 45 dB, maximum sound levels of 50–62 dB), and one noise-free recovery night. Sleep stages were scored manually and fast sleep spindle characteristics were quantified automatically using an individual band-pass filtering approach.

Results

Nighttime exposure to transportation noise significantly increased sleep EEG arousal indices. Sleep structure and continuity were not differentially affected by noise exposure in individuals with a low versus a high spindle rate. Spindle rates showed an age-related decline along with more noise-induced sleep alterations. All-night spindle rates did not predict EEG arousal or awakening probability from single railway noise events. Spindle characteristics were affected in noise-exposure nights compared to noise-free nights: we observed a reduction of the spindle amplitude in both age groups and of the spindle rate in the older group.

Conclusions

We have evidence that spindle rate is more likely to represent a trait phenomenon, which does not seem to play a sleep-protective role in nighttime transportation noise-induced sleep disruptions. However, the marked reduction in spindle amplitude is most likely a sensitive index for noise-induced sleep alterations.

[road traffic noise](#), [railway noise](#), [arousal](#), [awakening](#), [EEG](#), [automatic detection](#), [intermittency ratio](#)

Topic:

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[electroencephalography](#)

[noise, transportation](#)

[sleep stages](#)

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