Spindle density and arousability from acoustic stimulation during sleep

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ABSTRACT

Night-time transportation noise can disturb sleep by causing awakenings, sleep-stage changes or EEG arousals. However, not all acoustic stimuli disrupt sleep. Processing of sensory stimuli is modulated by transient EEG rhythms during sleep as sleep spindles where sensory relay is hindered at a sub-cortical level. Thus, we investigated whether sleep spindle density rhythms predict arousability from acoustic stimulation (traffic noise) during sleep.

Twenty-six healthy participants (age: 19-33y) were exposed to 80 pre-recorded railway noise events (RNE) that were played back during an 8-h night. Polysomnography was recorded throughout the night. Sleep and EEG arousals were scored according to standard criteria. Spindles on central channels were detected using an automatic scoring algorithm. Single RNE's that occurred during stage 2 sleep were post-hoc classified as Non-arousal or Arousal trials depending on whether an EEG arousal occurred during the particular RNE duration. Associations were evaluated using logistic regression models.

The mean spindle density during RNE duration was a significant predictor for arousal probability.

We have first evidence that arousability from noise during sleep is modified by the spindle density.