Association between daytime rest, night-time sleep and hippocampal integrity in healthy older adults.

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Introduction. The interaction between the circadian timing and wake-dependent homeostatic processes provides humans with a temporal alternation between consolidated periods of sleep and wakefulness across the 24-h cycle. Napping is a prevalent behavior in older individuals and represents an intrusion of sleep into the wakefulness period, potentially leading to a disruption of the sleep-wake cycle. Here, we assessed the association between daytime naps and night-time sleep macro- and microstructure, as well as their relationships with hippocampal integrity as a sensitive marker of brain aging.

Methods. Daytime rest was measured through actigraphy (≥10 consecutive days; threshold: 15min of consecutive rest) in 48 healthy older adults (69±5.9 years, 43% female). In-lab polysomnography assessments were used to derive night-time sleep parameters, including total sleep time, sleep stages duration (N1-N3 and REM; % of total sleep time), slow wave activity during N3 and spindle density during N2. High-resolution T2-weighted images were used to derive hippocampal subfields (CA1, CA2, CA3, dentate gyrus, subiculum) using the Automatic Segmentation of Hippocampal Subfields algorithm. Myelin content in these different subfields was assessed using quantitative magnetization transfer saturation mapping on a subsample of 39 participants. Acquisitions were performed on a 3T magnetic resonance scanner.

Results. Generalized linear models adjusted for age and sex revealed that daytime rest periods were negatively related to N3 ($R^2\beta^*$=0.093, p=0.038) and slow wave activity ($R^2\beta^*$=0.097, p=0.034) and positively associated with N2 ($R^2\beta^*$=0.089, p=0.043) and spindle density ($R^2\beta^*$=0.121, p=0.017). Spindle density was further negatively associated with myelin content within the CA1 subfield ($R^2\beta^*$=0.108, p=0.046).

Discussion. Our results suggest that daytime rest goes along with decreased N3 and slow wave activity. This result may be interpreted as an altered homeostatic sleep pressure build-up as a cause or a consequence of daytime napping. The concomitant positive association between daytime rest, N2 and sleep spindle density might reflect a compensatory mechanism by which night-time sleep continuity is maintained despite altered sleep need. However, higher spindle density was related to lower myelin content within CA1 subregion. Mediation analyses will be

performed to assess whether napping alters hippocampal integrity through sleep structural changes.

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