**Title:** Impact of age and napping on actimetry-derived sleep and 24-h rest-activity indices.

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**Introduction:** Sleep appears as a protective factor in models of cognitive and brain aging. However, temporal organisation of sleep and wakefulness over the 24-hour cycle still remains underestimated in these models. Chronic napping is frequent in the older population and might interfere with sleep-wake regulation. Here, we explored age-related changes in actimetry-derived indices of both sleep and sleep-wake fragmentation.

**Methods:** Actimetry data (Actiwatch plus device, Cambridge Neurotechnology) were collected for 7 days in 24 younger (20-32 years, 16 women) and 21 older participants (58-85 years, 8 women, 9 chronic nappers [naps > 20 min/day, > 3*week, since >1 year]). Periods of complete inactivity > 2 hours were excluded from analyses since the latter presumably reflect actigraph removal. Sleep-wake fragmentation was explored by estimating transition probability to rest during daytime (kAR), transition probability into activity during night-time (kRA), volume of sleep in the afternoon (fSOD), intra-diaily variability (IV) and inter-diaily stability (IS).

**Results:** Significant age-related changes were observed for indices measuring sleep-wake cycle fragmentation (IV, t(43)= -3.79, p < 0.001) and wake fragmentation (kAR, t(43)= -3.05, p < 0.01, fSOD, t(43)= -3.60, p < 0.01). The younger presented lower wake fragmentation compared to both older no-nappers (kAR, t(34)= -3.41, p < 0.01, fSOD, t(34)= -2.74, p < 0.05) and nappers (fSOD, t(31)= -2.69, p < 0.05). Furthermore, sleep-wake cycle fragmentation was lower in younger participants compared to older nappers only (IV, t(31)= -5.10, p < 0.001). Finally, compared to older no-nappers, older nappers presented higher sleep-wake cycle fragmentation (IV, t(19) = -3.64, p < 0.01) and lower inter-diaily stability (IS, t(19) = 2.24, p < 0.05).

**Conclusions:** Overall, our data suggest that the impact of age is more evident in actimetry-derived indices taking into account wake fragmentation during daytime. Nappers presented higher sleep-wake cycle fragmentation compared to no-nappers, while sleep fragmentation did not significantly differ. Future analyses aim at taking into account individually-tailored rest-activity profiles to estimate sleep-wake cycle fragmentation. Finally, whether these indices explain significant part of variance in cognitive ageing remain to be assessed.

**Disclosures of potential conflict of interest:** the authors do not disclose a potential conflict of interest

**Sources of funding:** Swiss National Foundation (SNF), Belgian Fund for Scientific Research (FNRS), European Research Council (ERC-Starting Grant).