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-daily variability (IV) and inter-daily 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-daily 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.

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