Title: Daytime rest, circadian timing and cognitive performance in healthy older adults

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Introduction: Ageing goes along with an increased occurrence of daytime rest and epidemiological evidence points towards an association between rest-activity fragmentation and cognition. However, the biological correlates of daytime rest remain mostly elusive. Here, we assessed whether daytime rest characteristics are associated with circadian timing, concurrent changes in 24-h rest probability profiles and neurobehavioral outcomes in healthy older adults.

Methods: Sixty-three individuals (68.4 ± 5.6 years (mean±SD), 23 women) underwent field actigraphy monitoring, in-lab dim light melatonin onset (DLMOn) assessment and a cognitive test battery, encompassing episodic memory, executive functions and attentional performance. Daytime rest frequency (mean number of rest bouts per day), duration (overall mean duration of rest bouts) and timing (median delay between rest bouts start time and DLMOn) were computed using actigraphy. Regression analyses were performed to investigate the link between these daytime rest characteristics and (1) concurrent 24-h rest probability profile, (2) cognitive performance and (3) circadian

rhythm outcomes (DLMOn and phase angle between DLMOn and actigraphy-derived activity offset times). Concurrent 24-h rest probability profiles were analysed using 1D statistical parametric mapping.

Results: As expected, increasing daytime rest frequency was associated with higher rest probabilities during the day ($p_{cluster}$<0.01), but also with lower rest probabilities during the night, suggesting more altered night-time rest ($p_{cluster}$<0.001). Higher daytime rest frequency was also predictive for lower episodic memory performance (β=-0.38, p<0.01). Moreover, late-timed daytime rest was associated with an advanced circadian phase (β=-0.67, p<0.001) and with an increased phase angle of entrainment between the activity offset time and circadian phase (β=0.57, p<0.001).

Conclusion: Our data show that increased intrusion of rest into the active wake period is linked to reduced night-time rest consolidation and reduced episodic memory performance in healthy older adults. Concomitantly, resting later in the day is associated with an advanced circadian phase and with misalignment between circadian timing and the rest-activity cycle. Our results point towards a cross-talk between daytime rest characteristics, the circadian timing system, and memory decline in older adults. Understanding the mechanisms underlying wake fragmentation is timely, considering that napping habits are increasingly used as health indicator in the context of aging and associated neurodegeneration.

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