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Napping is frequently advertised as an activity that promotes health, and research points to nap sleep being beneficial for the consolidation of previously acquired memories, highlighting its clinical value. Nap sleep has been suggested as a potential countermeasure to keep stable cognitive performance despite reduced night-time sleep opportunities. In older adults, however, epidemiological evidence links chronic napping to cognitive decline and increased risk for developing Alzheimer's disease. In this symposium we aim to highlight the causes and/or consequences of daytime sleep on cognition and to discuss potential mechanisms underlying napping and cognition across different age groups. Dr.J.Lo will present data on the cognitive effects of split sleep schedules in adolescents as a potential countermeasure to keep total sleep opportunity within the recommended range. Dr.Y.Leng will present epidemiological evidence of the association between napping and cognitive impairment in the elderly and discuss underlying implications of these epidemiological findings. Dr.C.Schmidt will focus on the impact of different nap characteristics on sleep, circadian rhythm markers, and brain integrity in the aged. Finally, Dr.S.Postnova will complete the picture by presenting physiologically-based model predictions on the impact of different sleep schedules on neurobehavioral outcomes. The proposal integrates novel findings using a variety of approaches (in-lab, epidemiological, computational) to characterize pathways by which the sleep-wake cycle, or more specifically sleep schedules, affect cognition. The topic is of high relevance, since both cognitive impairment and insufficient or mistimed sleep represent dominant health determinants across lifespan, and easy implementable interventions are urgently needed.

Abstract talk C.Schmidt:

Impact of daytime napping on circadian markers, cognition and brain integrity in the aged

Introduction: Sleep homeostasis and circadian rhythmicity can act as powerful modulators of human brain function. During ageing, cognitive decline goes along with altered sleep regulation. One visible manifestation of such alteration might be the increasing occurrence of chronic daytime napping while getting older. Here we assessed the impact of napping on circadian sleep propensity, cognition and its underlying structural and functional brain changes in healthy older adults.

Methods: Fifty-six healthy older adults were prospectively recruited with respect to their napping habits (20 women/69+-5.5y., ½ nappers). All individuals underwent actimetry screening to objectify daytime rest frequency, timing and duration. They further underwent a 40-h multiple nap constant routine (10 alternating cycles of 80 minutes of sleep opportunity and 160 minutes of scheduled wakefulness). During the protocol, salivary melatonin, subjective sleepiness, psychomotor vigilance and electrophysiologically derived sleep parameters over nap opportunities were assessed. Participants finally underwent functional and structural magnetic resonance imaging (MRI). During functional MRI, they performed a working memory task (Sternberg

paradigm) allowing for the assessment of functional compensation with increasing working memory load.

Results: Compared to non-nappers, nappers presented a reduced amplitude of circadian sleep propensity, characterized by higher sleep efficiencies during daytime sleep opportunities and lower sleep efficiency during night time sleep (interaction session*group: $p<0.05$). Furthermore, nappers showed reduced episodic memory performance compared to non-nappers ($p<0.05$) and more particularly daytime rest frequency was negatively associated with memory performance ($p<0.05$). Finally, independent of nap group, actimetry-derived late daytime rest timing was associated circadian misalignment as expressed by an increased phase angle of entrainment between dim light melatonin onset and activity onset time ($p<0.05$).

Conclusion: Our results suggest altered circadian sleep regulation and associated reduced cognitive performance in healthy older nappers. They are in line with recent reports suggesting chronic and long daytime napping as a health risk factor in the aged, including for cognitive fitness. The assessment of daytime napping and associated circadian sleep propensity on functional compensation during working memory performance as well as structural brain integrity (magnetization transfer derived myelin estimation) is currently ongoing.