Is napping in older adults problematic or productive? The answer may lie in the reason they nap.

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Words matter. When scientists choose to swap out the impartial term ‘habitual’ for the more disease-oriented ‘chronic’, readers may be led to understand that the practice in question has been strategically shifted into a maladaptive category, sharing semantic space with behaviors such as smoking and overeating. We may be witnessing such a sea-change in the scientific description of regular naps. Whereas research has historically referred to this practice as ‘habitual’, the article by Deantoni et al. appearing in SLEEP is one of the first research papers framing it in the new, albeit dimmer, light, of ‘chronic napping’\(^1\). While this strategic switch in terms oversimplifies the multifaceted function of a sleep behavior, the authors’ goal, i.e., to understand the impact of napping on behavioral and physiological changes related to circadian regulation in older adults, is an important step in understanding how the propensity to fall asleep during the day may impact nighttime sleep variables.

The authors compared 30 older adults who declared they had napped twice a week for the last year with 30 older adults who reported no naps in the same stretch of time. Critically, the methods provide few nap characteristics that would be helpful for interpreting the study outcomes. For example, we are not informed about the reasons participants nap or how long they have been in the habit of napping; although we do learn that nappers had higher BMI and trait sleepiness, potentially revealing a higher burden of poor health in the nappers at baseline. Multiple sleep latency tests were conducted throughout a 40-hour period to measure the propensity to sleep across a full circadian period, with salivary melatonin collected as an indicator of circadian phase. Overall, the nap groups showed no differences in melatonin levels, quantity of sleep (i.e., total time, sleep stages), or subjective sleep quality. However, when statistically accounting for baseline daytime fluctuations of melatonin, nappers were determined to have reduced melatonin, suggesting an intriguing relation between daytime melatonin and nap propensity. Nappers also had an easier time achieving REM sleep during wake promoting circadian periods than non-nappers, suggesting a reduction in the REM sleep propensity drive.

Complementary results have been shown in a prior study from this group that used a similar study design (i.e., 40-hour multiple nap protocol under constant routine conditions) and compared older adults who napped more frequently with those who napped less frequently\(^2\). In agreement with the current findings the authors reported that more frequent napping was generally associated with reduced propensity for sleep during morning hours, and later naps were associated with earlier melatonin onset and increased evening activity, suggesting greater circadian misalignment in nappers and a strategic use of napping as an evening fatigue countermeasure. More frequent napping was also correlated with lower episodic memory, but, interestingly, not associated with executive function or attentional performance. Together these results implicate more frequent and later in the day napping habits in older adults may indicate altered in circadian rhythms, reduced early morning sleep, with potential functional impact on memory function. And yet, before these results are translated to general health recommendations against napping and the nap ‘habit’ be relabeled ‘chronic’, we need to first ask the question whether all naps in older adults lead to unhealthy outcomes? Or are there nuances to this health behavior?

Napping is a multi-faceted, culturally embedded, life-span developmental phenomenon\(^3\) with historical roots that predate the industrial age and that likely formed at the beginning of human culture\(^4\). Universal in early development, napping undergoes significant shifts as nighttime sleep consolidates into longer bouts and daytime nap frequency reduces from three to one, and
eventually to none as children enter primary school\textsuperscript{5}. Importantly, however, most studies on the developmental trajectory of naps have been conducted in western industrialized societies\textsuperscript{6}, which are not considered nap-positive cultures. Patterns of daytime sleep during early development are strongly influenced by environmental factors, whereas nighttime sleep is largely influenced by genetic factors\textsuperscript{7,8}. It is, therefore, unclear whether these developmental nap trajectories hold true in cultures where napping is an accepted or even promoted behavior throughout the lifespan, such as in many parts of Asia\textsuperscript{9,10}. In adults, current estimates of the prevalence of habitual napping, usually defined as taking two to three naps a week, fluctuate between 40-60\%, depending on many factors including age, education, ethnicity, geography, and culture\textsuperscript{11}. However, the lack of cross-cultural research on the topic leaves open a large gap in our understanding of napping in adult and elderly populations.

Laboratory experimental studies have measured the effect of short bouts of sleep as a fatigue countermeasure under conditions of sleep deprivation, as well as a cognitive enhancer under well-rested conditions. These studies are usually conducted in small, convenience samples of young adults without medical and mental health problems. This large corpus of studies has repeatedly reported positive effects of napping, including greater vigilance, attention, memory, motor performance, creativity, and more, compared with equivalent wake periods\textsuperscript{12-15}. In contrast with experimental nap studies, a recent spate of epidemiological studies demonstrate some surprisingly nefarious health outcomes of daytime sleep, including increased risk of cardiovascular disease, dementia, and mortality\textsuperscript{16-19}. These studies have been conducted in older, less healthy, less active populations who tend to have poorer eating habits, multiple co-morbidities, psychological problems, and a wide range in socio-economic status. They may also be limited by confounds, disparate approaches to control for comorbid illnesses, and different definitions of napping, which, as noted by Stang\textsuperscript{20}, make it difficult to compare results. In fact, large cohort studies that control for some of these limitations report that habitual napping can predict better health outcomes, including lower mortality risk and increased brain volume\textsuperscript{21,22}.

Thus, the extant literature on napping appears to paint a picture of a single health-related behavior with two potential outcomes, one of which is to be avoided, while the other might be recommended. An alternative and potentially more realistic view is that there are many different naps with multiple possible outcomes depending on a range of biopsychosocial factors. These differences would then be better understood if individual motivations for napping were taken into consideration, rather than combining all daytime sleep behaviors into one all-encompassing group.

Early work categorized nap behavior into three types\textsuperscript{23}: appetitive (napping for enjoyment), restorative (napping in response to subjective fatigue), and prophylactic (napping in preparation for future sleep loss; see\textsuperscript{24} for a review). Studies in this area typically categorized naps post hoc based on other measures, such as daytime sleepiness ratings\textsuperscript{25} or frequency of napping (categorized as Appetitive/Habitual nappers\textsuperscript{26}). Recent studies have taken a more systematic approach by having study participants self-endorse their reasons for napping based on a long inventory, including “I heard it is good for improving my cognitive skills” to “I nap to avoid people.” Using factor analysis, five napping categories emerged in our own work that we summarized by the acronym DREAM: dysregulative, restorative, emotional, appetitive, and mindful\textsuperscript{27,28}. 
Dysregulative napping occurs due to shift work (occupational dysregulation), long sleep duration (homeostatic dysregulation), or due to illness, pain, preparing for exercise, or after exercise (physical or physiological dysregulation).

Restorative napping primarily happens in the context of poor sleep, including short sleep duration, poor sleep quality, tiredness, prophylactically napping before a night of short sleep, and accidental napping.

Emotional napping occurs in response to negative mood due to stress, depression, or boredom, or to avoid work or a social situation.

Appetitive napping happens in people who enjoy napping, make it a habit, incorporate it into their schedules, and report doing better with a nap.

Mindful napping is used to refocus, to increase alertness, attention, and energy, to decrease grogginess, and because people have heard about the advantages of taking a nap.

These five nap DREAM categories differed significantly on moderating health outcomes, including anxiety, depression, personality, and general health. In fact, only emotional napping was associated with poor health outcomes, including worse sleep quality and sleep hygiene, as well as higher daytime sleepiness and dysfunctional beliefs about sleep. Emotional reasons for napping were also associated with worse psychological and physical health, including higher levels of depression, stress, and poor general health. Additionally, emotional reasons for napping correlated with personality: emotional nappers tend to score higher on neuroticism and lower on conscientiousness, factors that predict general health and the ability to stick with positive health behaviors. Thus, in young adults, only emotional reasons for napping is associated with poor sleep, psychological functioning, and physical health, regardless of the indicator used.

These results shed new light on the variegated motivations and health outcomes associated with napping and suggest that it is not habitual or “chronic” napping per se that is associated with poor health, but a specific subset of napping behavior that can be targeted for interventions. It would be an exciting advancement of the Deantoni and colleagues report to, for example, categorize older adults’ motivations and histories of napping and use these quantifiers as covariates in their statistical design. Such an approach might reveal that lifetime habits of napping as opposed to recently emerging patterns may differentiate between ‘good’ and ‘bad’ naps in terms of circadian outcomes. Given the increased rates of loneliness and depression in older adults, a recently acquired nap habit may reveal emotional nap motivations that contribute to poor health outcomes. In contrast with methodological approaches that start at the end of life and work backwards to identify behavioral culprits, there is also value in tracking napping motivations and their associated mental health patterns in adolescents and adults as a fruitful approach to distinguish between salutary and perilous trajectories.

Future research efforts with an eye on recommendations for health policy will need to consider the psychological motivation underlying napping behaviors to better understand how theoretically meaningful sleep behaviors differentially relate to psychological and physical well-being. Since medical doctors and scientists alike prefer to use meaningful, well-defined terms, the
Present moment appears to be a good time to call for a thorough characterization of daytime sleep that will provide boundary conditions between healthy and unhealthy napping behaviors. A better understanding of the biopsychosocial factors related to napping, as exemplified in the new paper by Deantoni et al., will help avoid potentially unwarranted generalizations that malign and oversimplify the nuanced outcomes of this enduring health behavior.

This editorial is dedicated to the ground-breaking research on napping in early development by the late Monique le Bourgeois PhD.

I have nothing to disclose.
References


