Sleep and cardiovascular risk: how much is too much of a good thing?

Dominik Linz1*, Kadhim Kadhim1, Jonathan M. Kalman2, R. Doug McEvoy3, and Prashanthan Sanders1

1Centre for Heart Rhythm Disorders, South Australian Health and Medical Research Institute (SAHMRI), University of Adelaide and Royal Adelaide Hospital, Adelaide, Australia; 2Department of Cardiology, Royal Melbourne Hospital and Department of Medicine, University of Melbourne, Melbourne, Australia; and 3Adelaide Institute for Sleep Health (AISH), College of Medicine and Public Health, Flinders University and Sleep Health Service, Respiratory and Sleep Services, Southern Adelaide Local Health Network, Adelaide, Australia

Online publish-ahead-of-print 5 December 2018

This editorial refers to ‘Association of estimated sleep duration and naps with mortality and cardiovascular events: a study of 116 632 people from 21 countries’, by C. Wang et al., on page 1620.

In addition to physical activity and a balanced diet, sleeping for 6–8 h a day is an important component of a healthy lifestyle. Getting sufficient sleep helps regulate appetite, improves immune system function, and is associated with lower cardiovascular (CV) risk and mortality. Moreover, specific sleeping habits such as daytime napping may further influence CV risk. Naps are brief sleeps, typically taken during the day, and can range from several minutes to several hours. The frequency varies from an occasional nap to several planned rest periods daily for habitual nappers, which can be reflective of regional and cultural factors. Generally, long sleep is considered to be a healthy habit; recent consensus manuscripts by the American Academy of Sleep Medicine and the Sleep Research Society recommend that the optimal duration of sleep for adults is >7 h per night. However, it remains unclear whether excessive sleep duration or daytime napping may expose individuals to greater risk of death and CV disease.

In this issue of the European Heart Journal, Wang and colleagues investigated the association of self-reported estimated durations of total daily sleep and daytime naps with deaths and major CV events in The Prospective Urban Rural Epidemiology (PURE) cohort study, which included 116 632 participants from seven international regions followed-up over a median of 7.8 years. They found that an estimated total sleep duration of 6–8 h per day was associated with the lowest risk of deaths and major cardiovascular events. In addition to sleep duration, daytime napping was associated with an increased risk of major CV events and deaths in those with >6 h of night-time sleep but not in those sleeping <6 h a night. These findings are consistent with recent meta-analyses which demonstrated a U-shaped association between increased CV risk and daytime napping and sleep duration. However, this study by Wang et al. can help generalize the findings to different ethnicities and geographical regions, owing to its strong, large international prospective design. Further, it presents evidence for increased CV risk associated with daytime napping in individuals with sufficient overnight sleep durations.

This study provides important epidemiological information, but causative factors explaining the described associations with increased CV risk remain speculative. Among adults, sleep disturbances and sleep-related symptoms such as daytime sleepiness, nocturia, nocturnal dyspnoea, and morning headache are common complaints, and are frequently associated with CV disease, poor medication adherence, heart failure, and all-cause mortality. Daytime naps could represent a physiological response to disease-related disturbed sleep, even in those with normal sleep durations. In this study, the group with the longest sleep duration (>10 h) had relatively higher prevalence of CV risk factors, and the highest proportion of daytime nappers (71.6%), nearly triple that of the reference group (6–8 h), which had only 27.4% of participants reporting daytime napping. This can potentially indicate that subclinical non-diagnosed CV disease may explain some of the association between daytime napping and major CV events in patients with sufficient sleep duration during the night. Interestingly, in those with short nocturnal sleep durations, daytime napping may represent a compensatory mechanism for sleep deficit and debt, and was accordingly not associated with increased CV risk. In others, daytime napping may be related to cultural factors and habits, as demonstrated by the wide intraregional variation in reported napping in this study. Whether ‘compensatory naps’ and ‘habitual naps’ are associated with comparable CV risk irrespective of the cause of naps remains unclear and was not further investigated in the current study.

The opinions expressed in this article are not necessarily those of the Editors of the European Heart Journal or of the European Society of Cardiology.


* Corresponding author. Centre for Heart Rhythm Disorders, Department of Cardiology, Royal Adelaide Hospital, Adelaide, 5000, Australia. Tel: +61 8 8222 2723, Fax: +61 8 8222 2722, Email: Dominik.Linz@adelaide.edu.au

Published on behalf of the European Society of Cardiology. All rights reserved. © The Author(s) 2018. For permissions, please email: journals.permissions@oup.com.
Sleeping patterns may predispose to increased CV risk by different direct pathophysiological mechanisms. Sleep depth, efficacy, and duration regulate metabolic and endocrine hormones, such as insulin and leptin, leading to alterations of appetite and glucose metabolism that may accelerate the development of obesity and diabetes as important CV risk factors. Additionally, daytime napping, dependent on duration and sleep depth, may interrupt the circadian rhythm. The timing of the circadian clock is influenced by environmental cues such as light, and daytime napping may indirectly influence the timing of the circadian clock via different light exposure. Circadian rhythm disruption can also alter gene expression in cardiomyocytes and the vascular system, affecting metabolism and organ function. Self-reported daytime napping and daytime sleepiness are common among those with primary sleep disorders such as sleep apnoea, which may provide a further potential explanation for the excess all-cause mortality observed in those who nap during the daytime. Another proposed mechanism involves a possible increase in CV disease risk due to the abrupt increases in blood pressure and heart rate upon awakening from a nap, closely resembling the period soon after waking up in the morning when the onset of acute CV events is generally high. Wang et al. determined the napping habits at baseline but, in addition to the categorical classification of patients into nappers vs. non-nappers, the timing of naps during the day, nap frequency, and nap duration, as well as whether certain sleep stages are achieved during the individual naps, are all dynamic processes and may influence the related biological responses in patients.

What should we conclude from the results of this study so far? The optimal sleep duration appears to be 6–8 h a day. Longer or shorter durations potentially expose us to increased CV risk. Additionally, daytime napping, particularly among those with adequate duration of nocturnal sleep, might be an early indicator of poorer health and help identify those at higher risk of CV disease and mortality. Therefore, in clinical practice, assessment of sleep patterns may be of value in identifying higher risk individuals. Objective measures of sleep patterns, however, are challenging and influenced by various situations and conditions, which would not be likely to be captured by questionnaires or conventional sleep screening during a single overnight sleep study. Potentially, detailed and long-term sleep duration and napping tracking by algorithms implemented in smartphone-based apps or implantable devices such as loop recorders or pacemakers may provide options for more accurate sleep pattern assessment.

Nevertheless, a bigger question remains; once a ‘pathological sleeping/napping pattern’ has been identified, what interventions (if...
any) should be applied? In those patients, actively looking for modifiable CV risk factors may be of value, given their increased risk of CV events. Lifestyle and behavioural interventions have become increasingly recognized as important tools for risk factor modification for primary and secondary CV disease prevention.\textsuperscript{13,14} In this area, the close interdisciplinary collaboration between primary and secondary care (e.g. cardiologists and sleep or respiratory physicians) is essential, and an integrated care approach may help identify sleep-related problems early and facilitate management.\textsuperscript{15} Whether advocating for sleep interventions is likely to alter CV outcomes remains unclear. It appears that sleeping in moderation and a good sleep hygiene is the best advice a clinician can provide in this regard. Further sleep intervention studies including objective and long-term tracking of the dynamic nature of sleep duration and napping habits are warranted to assess whether sleep patterns represent a risk marker or a modifiable CV risk factor. Daytime napping could represent a risk marker of subclinical non-diagnosed CV disease or may even expose to higher CV risk, particularly in those with adequate sleep duration during the night. In those with short nocturnal sleep, daytime napping may be a compensatory mechanism and might be beneficial. We need to be aware, and communicate to our patients, that sleeping a lot and having daytime naps may not always be that harmless. Perhaps the ancient Greek poet Homer, author of the Iliad and the Odyssey, summed it up millennia of years ago when he said: ‘Even where sleep is concerned, too much is a bad thing’.

\textbf{Conflict of interest:} none declared.

\textbf{References}


