

Commentary

Meeting guidelines for physical activity, muscle strength, and sleep lowers mortality risk: Commentary on: “Associations between aerobic and muscle-strengthening physical activity, sleep duration, and risk of all-cause mortality: A prospective cohort study of 282,473 U.S. adults”

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In 2022, Duncan et al.¹ published results from an investigation of the combined effects of moderate-to-vigorous aerobic exercise (AER), muscle-strengthening activities (MSA), and sleep durations on the risks for all-cause mortality in 282,473 U.S. adults aged 18–84 years. The authors aggregated data from the 2004 to 2014 U.S. National Health Interview Survey (NHIS)² and followed respondents for 5.4 years to ascertain risks for all-cause mortality. They obtained mortality data from the U.S. National Death Index.³ Multiple combinations of AER and MSA patterns were analyzed: meeting the U.S. Physical Activity (PA) Guidelines⁴ for AER only (150–299 min/week of moderate PA or 75–149 min/week of vigorous PA), MSA only (at least 2 days per week of muscle strengthening PAs), both AER and MSA (Active), or meeting neither guideline (Inactive), stratifying by the National Sleep Foundation’s updated sleep duration recommendations for hours of sleep per night (<7 h, 7–9 h, or >9 h).⁵ The referent category was Active status and sleeping 7 h to 9 h per night. AER only, MSA only, and Inactive at all sleep durations increased the risks for all-cause mortality from 21% to 120% (hazard ratio (HR): 1.21 to 2.20, 95% confidence intervals (95%CIs) above 1.0) (Fig. 1). An exception to the pattern was Active and sleeping less than 7 h per night which conferred no risk for all-cause mortality. All-cause mortality risks were elevated with more than 9 h per night sleep, regardless of the PA status (HRs ranging from 1.40 to 2.20, 95%CIs above 1.0). Multiplicative or additive interactions between PA and sleep durations on all-cause mortality risk were not statistically significant.

This research highlights the importance of regular participation in AER and MSA consistent with the 2018 U.S. PA Guidelines⁴ and sleeping at least 7 h to 9 h per night, according

to the National Sleep Foundation’s updated sleep duration recommendations.⁵ The PA Guidelines state that one can achieve health benefits from performing 150 min per week of moderate intensity AER (3.0–5.9 metabolic equivalents) or 75 min per week of vigorous intensity AER (≥ 6.0 metabolic equivalents) or a combination of the 2 doses. The guidelines also emphasize that doubling the recommended amount of AER accrues additional health benefits. In addition to AER, adults should engage in MSA at least twice a week. Moreover, sleeping from 7 h to 9 h per night confers the lowest health and mortality risks.^{6,7}

Duncan et al.¹ observed that meeting the AER and the MSA guidelines was necessary for all combinations of sleep duration to have the lowest risks for all-cause mortality. This observation underscores the powerful effects of AER and MSA on adaptations made to body tissues and systems following regular PA. AER reduces the risks for coronary heart disease, stroke, hypertension, insulin resistance, type 2 diabetes, obesity, osteoarthritis, and non-alcoholic fatty liver. It also reduces the risk of breast, endometrial, and colon cancers, sarcopenia, depression, and anxiety.^{4,8,9} MSA reduces the risks for cardiometabolic indices, such as insulin resistance, and improves sleep quality, bone mineral density, muscle mass, and resting blood pressure.¹⁰ Further, engaging in moderate to vigorous PA sufficient to achieve low-to-moderate physical fitness levels reduces risks for all-cause and cause-specific mortalities.^{11,12}

Studies consistently find that short- and long-sleep durations increase the risks for obesity, type 2 diabetes, cardiovascular disease, coronary heart disease, and all-cause mortality.^{6,7,13} Jike et al.’s¹³ meta-analysis of long-sleepers (defined as >7.5 h per night) found the cumulative relative risks for all-cause mortality ranged from 1.08 to 1.69 (95%CIs above 1.0). In the current study, Duncan et al.¹ reported HRs

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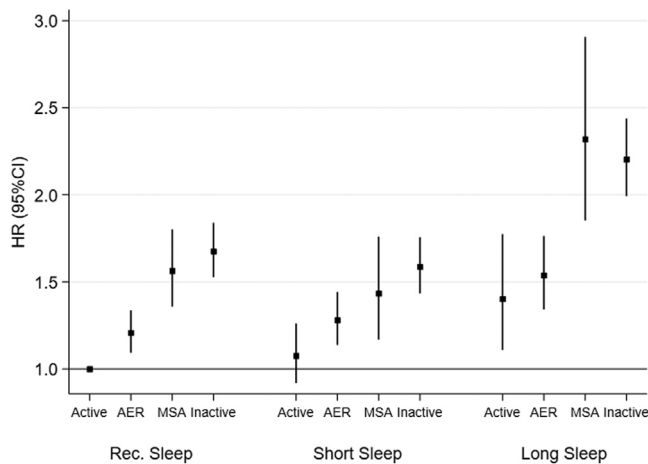


Fig. 1. Adjusted associations of physical activity classification and sleep duration with all-cause mortality risk among adults ($n = 282,473$) in NHIS surveys (2004–2014). Adjusted for sex, age², education, ethnicity, work status, BMI category, alcohol consumption, smoking status, self-rated health, and chronic disease presence. 95%CI = 95% confidence interval; AER = aerobic; BMI = body mass index; HR = hazard ratio; MSA = muscle-strengthening activity; NHIS = National Health Interview Survey; Rec. = recommended. From Duncan et al.¹ with permission.

between 1.40 and 2.32 for sleeping more than 9 h per night and all-cause mortality, regardless of PA status.

Other investigators have published NHIS and the U.S. National Death Index studies to determine univariate associations between AER, MSE, sleep durations, and all-cause mortality. Coleman et al.¹⁴ aggregated NHIS data from 1997 to 2014 to identify the protective benefits of AER on all-cause mortality in 416,420 U.S. adults. Compared with those engaging in no AER, the authors observed a dose-dependent mortality risk reduction with 1 h per week AER (HR = 0.85, 95%CI: 0.83–0.86) to 3 h per week AER (HR = 0.73, 95%CI: 0.71–0.75). Longer AERs conferred little additional reduction in all-cause mortality. Mortality risks also were reduced when MSA was performed at least once a week (HR = 0.89, 95%CI: 0.81–0.97). Wang et al.¹⁵ aggregated NHIS data from 1997 to 2013 to examine the benefits of meeting the PA Guidelines for moderate PA (150–299 min/week) and vigorous PA (≥ 75 –149 min/week) on all-cause and cause-specific mortality. The authors observed significant risk reductions in all-cause mortality for moderate PA (HR = 0.83; 95%CI: 0.80–0.87) and vigorous PA (HR = 0.80; 95%CI: 0.76–0.84).

Studies also have examined independent associations between sleep and all-cause mortality. Yang et al.⁶ aggregated the NHIS data from 2004 to 2014 and observed dose-dependent increased risks for all-cause mortality with short (≤ 4 h/night, 5 h/night, and 6 h/night) and long sleep (8 h/night, 9 h/night, and ≥ 10 h/night) durations. Compared to sleeping 7 h per night, HRs were 1.46 to 1.10 (95%CI above 1.0) for short sleepers and 1.22 to 2.00 (95%CI above 1.0) for long sleepers. In the Sleep Heart Health Study¹⁵ of 4278 older adults, long sleepers (≥ 9 h per night) had 25% increased all-cause mortality compared with those who slept 7 h per night (HR = 1.25, 95%CI: 1.05–1.47). Interestingly, sleeping less than 7 h per night conferred no risks for all-cause mortality.

Duncan et al.¹ acknowledged that some combinations of PA and sleep durations had small sample sizes and few all-cause mortality events, which could make their risk estimates unstable. They also noted that the NHIS data are self-report, which can introduce bias into the data (e.g., social desirability bias, recall bias).¹⁶ These limitations are common in observational studies and should not diminish the significance of the study. Duncan et al.'s¹ study is unique because it is among the first to examine the combined effects of AER and MSA (following national PA Guidelines⁴) and three sleep durations on the risks for all-cause mortality. Results showed that engaging in AER and MSA sufficient to meet the PA Guidelines^{4,9} and sleeping 7–9 h per night are essential for avoiding premature mortality. Additional studies are needed in other population samples to confirm their findings.

Competing interests

The author declares that she has no competing interests.

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