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Introduction: In the current epidemic of opioid-related deaths, and widespread use of opioids to treat chronic pain, there is a pressing need to understand the underlying risk factors that contribute to such devastating conditions. Shiftwork has been associated with adverse health outcomes. We tested whether shiftwork during middle age is linked to the development of chronic pain and opioid misuse.

Methods: We studied 116,474 participants in active employment between 2006–2010 (mean age 57±8; range 37–71) from the UK Biobank, who have been followed for up to 10 years until 2017. We included participants who were free from all forms of self-reported pain, and were not taking opioid medications at baseline. Chronic pain and opioid use disorder diagnoses were determined using hospitalization records and diagnostic coding from ICD-10. Multivariate logistic regression models were performed to examine the associations of shiftwork status (yes/no) and nightshift frequency (none/occasional/permanent) and with incident chronic pain and/or opioid use disorder during follow-up. Models were adjusted for demographics, education, Townsend deprivation index, major confounders (BMI, diabetes, bone fractures/injuries, operations, peripheral vascular disease, joint/inflammatory diseases, cancer, standing/manual labor at work) and covariates (smoking, alcohol, high cholesterol, depression/anxiety, and cardiovascular diseases).

Results: In total, 190 (1.6/1,000) developed chronic pain or opioid use disorders. Shiftworkers (n=17,673) saw a 1.5-fold increased risk (OR 1.56, 95% CI: 1.08–2.24, *p*=0.01) relative to day workers. Within shiftworkers, those who reported occasional nightshift work (n=3,966) were most vulnerable (OR 1.57, 95% CI: 1.06–2.34, *p*=0.02). Results remained similar after adjusting for baseline sleep duration, chronotype and insomnia.

Conclusion: Shiftwork, and in particular rotating nightshift work is associated with increased risk for developing chronic pain and opioid use disorders. Replication is required to confirm the findings and to examine underlying mechanisms.

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ASSOCIATION BETWEEN FREE-LIVING PHYSICAL ACTIVITY AND SLEEP IN ICELANDIC ADOLESCENTS

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Introduction: Sleep and physical activity are both important to health, but the demands of our modern schedule often require individuals to choose one over the other. In adolescents, the association between objectively measured sleep and physical activity is not well established in the literature. The aim of current study was to assess associations between free-living and physical activity and sleep among 15-year-old adolescents.

Methods: Free-living physical activity and sleep were assessed with wrist-worn accelerometers, sleep diary, and questionnaires during a 7-day period including school days and non-school days in 270 (161 girls) adolescents (mean age 15.8±0.3y) in Reykjavik, Iceland. Linear regression analysis was used to explore the associations between objectively measured physical activity and sleep. T-test was used to determine if there is a significant difference in objectively measured sleep between those who reported sports or exercising <6 versus ≥6 h/week.

Results: Weekly mean physical activity (2040±466 counts/min of wear/day) was negatively associated with total sleep time (6.6±0.64 h/night) (β ±SE=-3.5±0.7, *p*<0.001). However, physical activity was also negatively associated with minutes of wake after sleep onset on non-school days (*p*=0.047) and standard deviation (i.e. night-to-night variability) of total sleep time over the week (*p*=0.028). Subjects who reported exercising ≥6 h/week (n=116) had lower night-to-night variability in bedtime (41.2±27.9 min) than those who did not (49.8±37.5 min), *p*=0.033.

Conclusion: The negative association between physical activity and sleep duration suggests that in more active individuals' physical activity may be displacing sleep. However, greater physical activity is also associated with fewer minutes of awakening and a less variable sleep schedule, indicating better sleep quality. These findings suggest that physical activity is important for good sleep quality, but students should more closely consider sleep guidelines when designing an exercise schedule. Future studies should test how change in sleep patterns might influence physical activity.

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A RANDOMIZED TRIAL ON THE EFFECTS OF STANDARD AND FLEXIBLE DUTY-HOUR RULES ON INTERN SLEEP AND ALERTNESS

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Introduction: Duty hour regulations affect resident sleep, education, and patient care in complex ways. We performed a national cluster-randomized trial (iCOMPARE) in 63 internal medicine residency programs comparing the effects of the 2011 duty-hour standards to a more flexible set of duty hour rules characterized by maintaining an 80-hour workweek but without limits on shift length or mandatory time off between shifts, relative to patient mortality, intern educational outcomes, and intern sleep and alertness.

Methods: In the sleep and alertness sub-study, sleep duration and morning sleepiness and alertness were assessed with actigraphy, the Karolinska Sleepiness Scale, and a 3-minute Psychomotor Vigilance Test (PVT-B) for 14 days in 193 interns from 6 standard programs and 205 interns from 6 flexible programs.

Results: During the 14-day study periods, interns in standard and flexible programs averaged 7.03h sleep/24h (95% confidence interval [CI] 6.78h, 7.27h) and 6.85h sleep/24h (95% CI 6.61h, 7.10h), respectively. Sleep duration (difference between arms of -0.17h/24h; 1-sided lower 95% confidence limit -0.45h; NIM -0.5h; *P*=0.02 for noninferiority) and KSS sleepiness (difference 0.12 points; 1-sided upper 95% confidence limit 0.31 points; NIM 1 point; *P*<0.001)